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Green Growth Index

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Foreword

The Government of the Republic of Zambia (GRZ) has resolved to transition the country into a green economy. This is because the economic growth attained so far towards the vision of becoming a prosperous middle-income nation by the year 2030, has come at a great cost to the environment, ecosystems and natural resources and has not been inclusive as total poverty remains persistently high and income inequality, as measured by the Gini Coefficient, has been on the rise.

As part of the transition to the green economy, the GRZ has identified the need for a strong and coherent institution for the coordination of the environmental sustainability function, hence the establishment of the Ministry of Green Economy and Environment in 2021. Additionally, the green economy has been mainstreamed across the four (4) pillars of the Eighth National Development Plan (8NDP, 2022 - 2026) with a dedicated pillar on environmental sustainability.

The GRZ has also commenced the development of a Green Growth Strategy (GGS) to act as a blueprint for guiding Zambia's economic growth towards a trajectory that is resource efficient, low-carbon, climate-resilient, and socially inclusive. Further, the execution of the GGS will contribute to the implementation of climate change and biodiversity actions to meet the targets set in Zambia's Nationally Determined Contribution, National Biodiversity Action Plan, and the Sustainable Development Goals (SDGs).

Therefore, I am delighted to present the Zambia Green Growth Index (GGI), which will act as an evidence-based tool for assessing the impacts of green growth policy implementation and investments in Zambia and for comparing green growth performance against our peers in the Southern African Development Community (SADC) and African regions over time. The GGI has four (4) dimensions according to the pillars of green growth, namely: efficient and sustainable resource use; natural capital protection; green economic opportunities; and social inclusion. Additionally, to ensure ease of comparison of performance, the GGI has been developed using global sustainability indicators that are policy relevant and contextualized to Zambia and which are drawn from the Sustainable Development Goals (SDGs), the Paris Agreement, and the Aichi biodiversity targets. The GGI will be periodically improved as data on indicators is developed and becomes available in Zambia and will inform the development of the GGS.

Zambia's overall score is 49.41 for the GGI in 2021, entailing that the green growth performance was only moderate and about halfway to achieve the sustainability targets. Therefore, there is ample space to improve green growth performance by pursuing the development priorities, including economic transformation, environmental sustainability, water-land-food nexus, and human and skills development, which offer huge opportunities in greening Zambia's economy.

Hon. Eng. Collins Nzovu, M.P.
Minister of Green Economy and Environment

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The preparation of the Green Growth Index (GGI) for Zambia is a culmination of collective work that could not have been completed without the concerted efforts of various stakeholders. I wish to mention that the formulation of the GGI involved two (2) physical workshops, two (2) webinars, several online surveys, and review meetings of the draft report on the National Green Growth Index, all of which were supported by the Global Green Growth Institute (GGGI). In this regard, special thanks go to the GGGI for the facilitation, technical backstopping and financial support rendered towards the development of Zambia's GGI.

Additionally, I would like to express gratitude to all in-country institutions that participated in the formulation of Zambia's GGI. These include private sector associations such as the Zambia Chamber of Commerce and Industry (ZACCI), the Zambia Chamber of Small and Medium Business Associations (ZACSMBA), the Zambia National Farmers Union and the Zambia Association of Manufacturers (ZAM), and civil society organizations namely, the Non-governmental Gender Organizations' Coordinating Council (NGOCC) and the Zambia Climate Change Network (ZCCN). I also extend profound appreciation to the academic and research institutions comprising the University of Zambia (UNZA), the Zambia Institute for Policy Analysis and Research (ZIPAR), and the Indaba Agricultural Policy Research Institute (IAPRI), which played a part in the development of the GGI.

In the same vein, I wish to sincerely thank the Government line ministries and statutory bodies that took part in the preparation of the GGI, including the Ministry of Finance and National Planning, the Ministry of Agriculture, the Ministry of Fisheries and Livestock, the Ministry of Mines and Minerals Development, the Ministry of Infrastructure, Housing and Urban Development, the Ministry of Energy, the Ministry of Transport and Logistics, the Ministry of Water Development and Sanitation, the Ministry of Lands and Natural Resources, the Ministry of Small and Medium Enterprise Development, the Ministry of Health, the Bank of Zambia, the Securities and Exchange Commission, the Zambia Environmental Management Agency, the Zambia Statistics Agency and the Rural Electrification Authority (REA).

Lastly, but not the least, sincere appreciation goes to the members of staff in the Ministry of Green Economy and Environment for their hard work and for providing technical and logistical support in the process of developing the GGI for Zambia.

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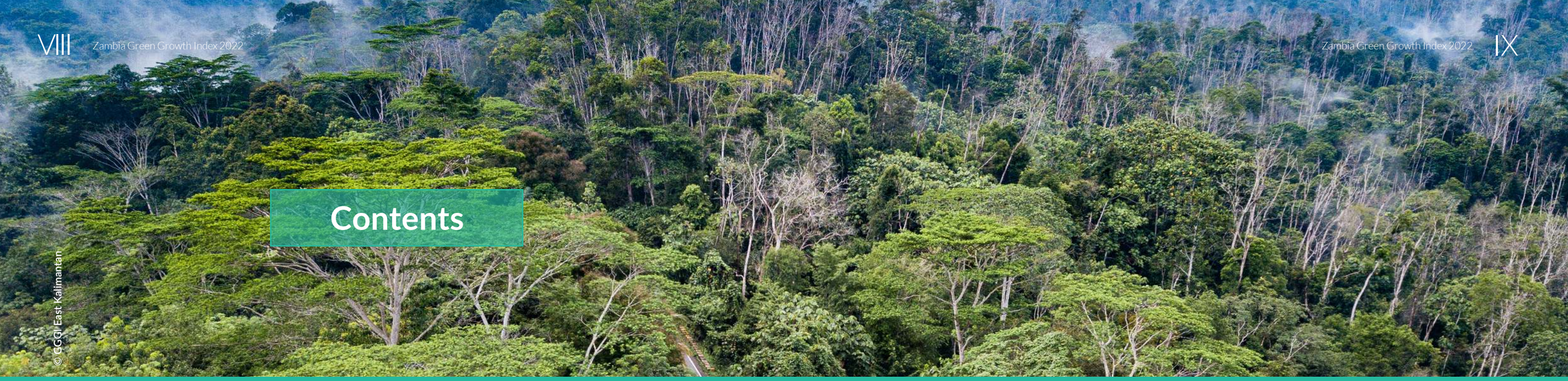

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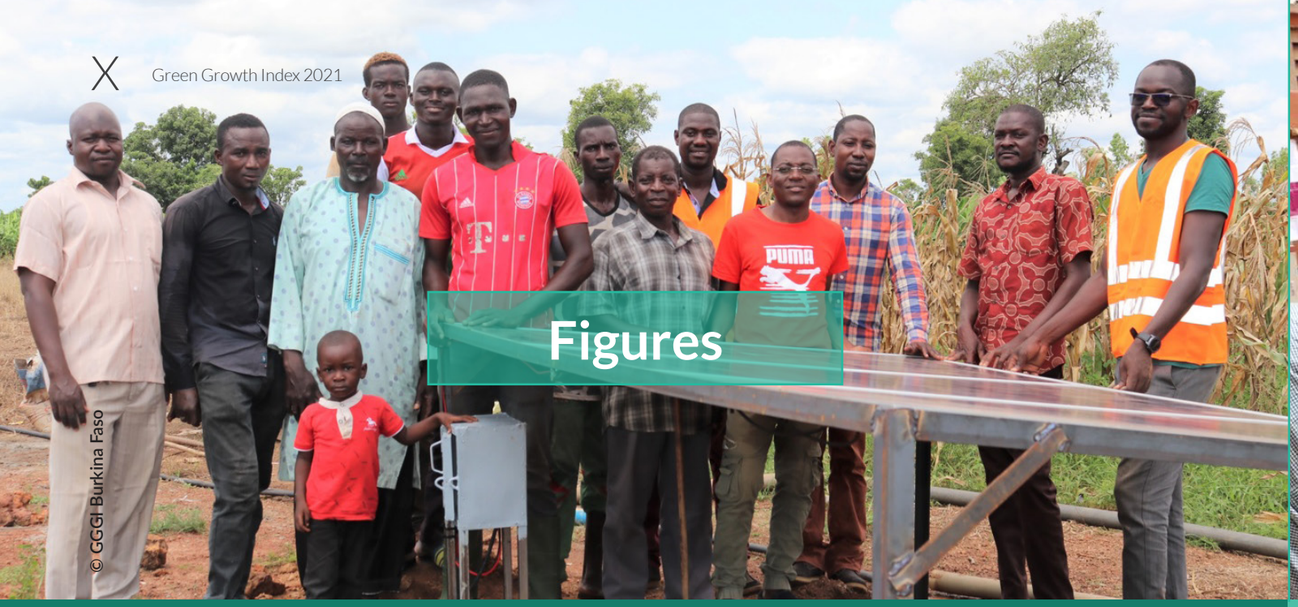
Contents



Figures

Tables

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Acronyms and Abbreviations

2G	Second Generation
4G	Fourth Generation
7NDP	7th National Development Plan
8NDP	8th National Development Plan
AB	Access to Basic Services and Resources
ADB	Asian Development Bank
AfDB	African Development Bank
AIDS	Acquired Immunodeficiency Syndrome
AFOLU	Agriculture, Forestry, and Other Land Use
BE	Biodiversity and Ecosystem Protection
BP	The British Petroleum Company plc
CH_4	Methane
CO_2	Carbon Dioxide
CO_2eq	Carbon Dioxide equivalent
COVID-19	Coronavirus disease
CW	ClimateWatch
CV	Cultural and Social Value
DALY	Disability-Adjusted Life Year
DMC	Domestic Material Consumption
ECE	Early Childhood Education
EE	Efficient and Sustainable Energy
EQ	Environmental Quality
ESRU	Efficient and Sustainable Resource Use
EW	Efficient and Sustainable Water Use
FAO	Food and Agriculture Organization of the United Nations
FOLU	Forestry, and Other Land Use
GB	Gender Balance
GDP	Gross Domestic Product
GE	GHG Emissions Reduction
GEO	Green Economic Opportunities
GG	Green Growth
GGI	Green Growth Index
GGGI	Global Green Growth Institute
GGPM	Green Growth Performance Measurement
GHG	Greenhouse Gas
GJ	Green Employment
GN	Green Innovation
GNI	Gross National Income
GT	Green Trade
GV	Green Investment
GW	Gigawatt
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
HF	The Heritage Foundation
HNAP	Health component in the National Adaptation Plan
ICT	Information Communications Technology
IEA	International Energy Agency
IHME	Institute for Health Metrics and Evaluation
IMF	The International Monetary Fund
IUCN	International Union for Conservation of Nature
ILO	The International Labour Organization
IPU	Inter-Parliamentary Union
IRENA	International Renewable Energy Agency
KBA	Key Biodiversity Areas
kWh	Kilowatt-hour
ME	Material Use Efficiency
MF	Material Footprint
MJ	Megajoule
MoGEE	Ministry of the Green Economy and Environment
MoF	Zambia Ministry of finance
MSW	Municipal solid waste
MT	Metric ton
N2O	Nitrous Oxide
NAP	National Adaptation Plan
NCP	Natural Capital Protection
NDC	National Determined Contributions
NDP	National Development Plan
NBSAP-2	National Biodiversity Strategy and Action Plan
NPCC	National Policy on Climate Change
NPE	National Policy on Environment
NWASCO	National Water Supply and Sanitation Council
OECD	Organisation for Economic Co-operation and Development
OECS	Organisation of Eastern Caribbean States
PA	Protected Area
PM2.5	Particulate matter with a diameter of less than 2.5 micrometers
PPP	Purchasing power parity
R&D	Research and Development
REDD	Reducing Emissions from Deforestation and Forest Degradation
SDGs	Sustainable Development Goals
SE	Social Equity
SI	Social Inclusion
SL	Sustainable Land Use
SP	Social Protection
Sum4All	Sustainable Mobility for All
TNA	Technology Needs Assessment
UN	United Nations
UHC	Universal Health Coverage
UN-ECLAC	Economic Commission for Latin America and the Caribbean
UNCTAD	United Nations Conference on Trade and Development
UNICEF	the United Nations International Children's Emergency Fund
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
UNEP	The United Nations Environment Programme
UNEP-WCMC	UN Environment Programme World Conservation Monitoring Centre
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UN-Habitat	The United Nations Human Settlements Programme
UNODC	United Nations Office on Drugs and Crime
UNISDR	United Nations International Strategy for Disaster Reduction Secretariat
UNSTATS	United Nations Statistics Division
USD	United States Dollar
WHO	World Health Organization
WB	World Bank
WEF	World Economic Forum
ZICTA	Zambia Information and Communications Technology Authority

1 Introduction

1.1 About the Green Growth Index

Green Growth is a multidimensional concept encompassing human well-being, efficient use of natural resources, ecosystem services, and many other sustainability issues. [1] It is a new sustainable development growth model introduced primarily by international organizations during the Rio +20 Summit in 2012. Various definitions have been proposed for green growth, which is interchangeably called green economy.[2] Still, it is mainly linked to improving human well-being and equality while protecting the environment.[3] While no universal definition for green growth exists[4], defining the economic, social, and environmental contexts is essential to guide the green growth transition. The Global Green Growth Institute (GGGI) defines green growth as:

> *"...a development approach that seeks to deliver economic growth that is both environmentally sustainable and socially inclusive. It seeks opportunities for economic growth that are low-carbon and climate resilient, prevent or remediate pollution, maintain healthy and productive ecosystems, and create green jobs, reduce poverty and enhance social inclusion."*
> *(GGGI Refreshed Strategic Plan 2015-2020, (GGGI, 2017:p.12)*

This definition guided the development of the green growth framework for the Green Growth Index, which represents a composite value for different groups of green growth indicators. These indicators refer to the four dimensions in the green growth framework, which include efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. The framework recognizes that the green growth transition will build on the interlinkages and interdependence of these dimensions, which are pre-requisite to achieving a low carbon economy, ecosystem health, resilient society, and inclusive growth -- all of which support the Sustainable Development Goals (SDGs).[5] Green growth indicators help track progress in achieving national development goals and international commitments on SDGs. Applying the multidimensional green growth framework to identify indicators requires understanding the social, economic, and environmental contexts as well as challenges and opportunities for green growth transition.

1.2 Purpose for developing the Index

Zambia defines green growth as an "inclusive development that makes sustainable and equitable use of Zambia's natural resources within ecological limits"[6]. It aspires to become a middle-income country by the year 2030, requiring the long-term management of its portfolio of development assets, including natural assets and risks, to be adequately considered. The major driver of introducing a green economy in Zambia is the need to enhance environmental sustainability, sustainable development, and growth that considers the well-being of the people and nature because of the increased production and consumption of goods and services. Thus, the green growth framework aligns well with Zambian's green growth contexts. Partnering with the local government is the key to achieving green growth[7] because it is involved at all levels, from policy formulation to implementation. Green growth indicators will provide them with the necessary tool to measure and monitor the impacts of policies on Zambian's green growth transition.

The GGGI is providing support to the Government of Zambia through a collaborative project to benchmark the country's green growth performance and establish its readiness to transition to a green economy growth model using GGGI's Green Growth Performance Measurement (GGPM) framework and tools, including the green growth potential assessment and Green Growth Index. The outputs will provide the baseline data to benchmark green growth performance and information for greening national development frameworks, particularly the 8th National Development Plan (8NDP), by highlighting potential green interventions and supporting the green growth diagnosis and assessment process in the development of Zambia's National Green Growth Strategy. This is a critical step to measure Zambia's readiness to transition to a green economy model of growth. It applies two complementary strategies to enhance its practical utility in policy decision-making. The first is a stepwise scientific approach to using the framework of the Green Growth Index in selecting green growth indicators. The second is a participatory process involving experts and stakeholders to assess the indicators' policy relevance. The former involves rigorous research to understand the complexity and multidimensionality of green growth, while the latter entails consultations to understand the national and regional contexts that influence green growth policies.

1.3 Structure of the report

Chapter 1 introduces the Green Growth Index and briefly explains the purpose of developing the Index for Zambia.

Chapter 2 describes the detailed process for designing the Zambia Green Growth Index, mainly focusing on the participatory approach to capacitate the participants in identifying green growth indicators that are relevant to the economic, social, and economic contexts of the country as well as interpreting the challenges and opportunities to green growth transition based on the Index scores. The participants are experts from different ministries and institutions who participated in developing the Zambia Green Growth Index. The chapter also explains the participants' role and the purpose of the different activities in the participatory approach. The stepwise analytical approach complementing the participatory approach is presented in Annex 1.

Chapter 3 discusses the contexts, policies, and priorities for green growth in Zambia. The contexts include social, economic, and environmental issues that pose policy challenges and create economic and societal opportunities during the green growth transition. The chapter introduces the national and sectoral policies that support green growth in Zambia. Finally, based on the assessment of the contexts and policies, four development priorities for green growth transition are briefly discussed in this chapter. These priorities include economic transformation, human skills and development, environmental sustainability, and the land-water-food nexus. The chapter corresponds to Step 1 of the analytical approach presented in Annex 1.

Chapter 4 presents the 80 green growth indicators identified by the participants from the participatory approach of designing the Zambia Green Growth Index. Using checklist tables, the chapter identifies the links of the indicators to the issues being addressed in national and sectoral policies and their relevance to the development priorities. The relevance of the indicators to the SDGs and Global Green Growth Index is also discussed in this chapter. The computation of the Green Growth Index involves benchmarking against sustainability targets. This chapter introduces the sustainability targets used for each green growth indicator. Finally, data are not available for all the indicators; thus, it was necessary to use proxy variables until data availability for the indicators improved. The proxy variables are presented in this chapter. The chapter corresponds to Step 2 of the analytical approach presented in Annex 1.

Chapter 5 presents the scores for the Zambia Green Growth Index. First, it discusses the overall green growth performance at the pillar and dimension levels of the Index by looking at the distance to sustainability targets and performance dashboards. The trend in green growth performance at these levels of score aggregation is also presented for the period 2010-2021. Second, the chapter presents the scores for the 80 green growth indicators and discusses the challenges and opportunities identified by the participants in improving performance in these indicators. It also discusses how different national and sectoral policies could support to further enhance the performance of the green growth indicators. Third, the chapter briefly presents the results of the Monte Carlo analysis to validate the scores and check the robustness of the Zambia Green Growth Index. The chapter corresponds to Step 3 of the analytical approach presented in Annex 1.

Chapter 6 provides the summary and conclusions of the report. It highlights the challenges and opportunities to green growth transition based on the discussion in Chapter 5, identifies policy gaps based on the links between green growth performance and issues being addressed in national and sectoral policies, and suggests the following steps to improve and update the green growth indicators in the Zambia Green Growth Index in the next years.

Chapter 7 presents the scores for the 80 green growth indicators from 2010 to 2021, which were computed from the normalization and benchmarking methods, and the scores for pillars, dimensions, and Green Growth Index, which were calculated from the aggregation of the normalized scores of the green growth indicators.

2 Design process

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The Ministry of the Green Economy and Environment (MoGEE) has closely collaborated with the GGGI in developing the Zambia Green Growth Index. Mr. Hedges Tempo, MoGEE's Chief Green Economy Officer, and Ms. Angela Nantulya, GGGI's Country Lead for Zambia, together identified the cross-ministerial participants for the development activities for the Index. Over 40 participants from 28 ministries and institutions participated in the design process (Table 1). Many of them are also participating in developing the Zambia Green Growth Strategy and participated in updating the 8NDP.

Table 1 Participants in the design process of the Zambia Green Growth Index

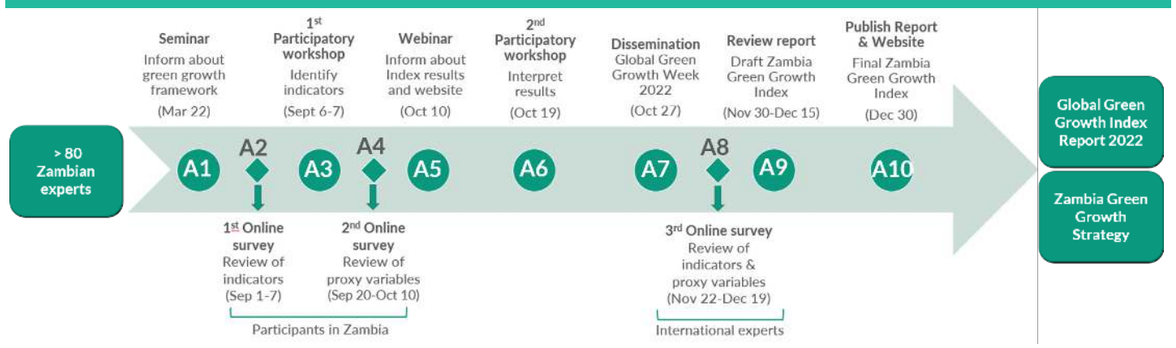
Ministries/Institutions	Number of participants	Number of activities participated
Ministry of Green Economy and Environment (MoGEE)	6	5
Ministry of Finance and National Planning (MoFNP)	4	4
Securities and Exchange Commission (SEC)	3	3
Rural Electrification Authority (REA)	2	3
Zambia Statistics Authority (ZAMSTATS)	2	4
Ministry of Health (MOH)	2	3
Bank of Zambia (BoZ)	1	2
Development Bank of Zambia (DBZ)	1	2
Disaster Management and Mitigation Unit (DMMU)	1	4
Ministry of Energy (MOE)	1	4
Ministry of Fisheries and Livestock (MFL)	1	2
Ministry of Infrastructure, Housing and Urban Development (MIHUD)	1	3
Ministry of Lands and Natural Resources (MLNR)	1	2
Ministry of Mines and Minerals Development (MMMD)	1	4
Ministry of Small and Medium Enterprise Development (MSMED)	1	2
Ministry of Technology and Science (MOTS)	1	2
Ministry of Transport and Logistics (MTL)	1	2
Ministry of Water Development and Sanitation (MWDS)	1	4
Zambia Environmental Management Agency (ZEMA)	1	4
Private sector*	3	4
Academic Institutions**	5	5
NGOs and others***	3	4
TOTAL	**43**	

**Private Sector: Zambia Association of Manufacturers (ZAM), Zambia Chamber of Commerce and Industry (ZACCI), Zambia Chamber of Small and Medium Business Associations (ZCSMBA)*
***Academic Institutions: Indaba Agricultural Policy Research Institute (IAPRI), University of Zambia (UNZA), Zambia Institute for Policy Analysis and Research (ZIPAR)*
****NGOs and others: Non-governmental Gender Organisations' Coordinating Council (NGOCC), Zambia Climate Change Network (ZCCN), Zambia National Farmers Union (ZNFU)*

The process for developing the Zambia Green Growth Index followed systematic and participatory approaches, facilitating the capacity building of the participants. It is systematic because the output from each activity feeds in as input into the following activity. It is participatory because the participants, identified before the process, were not only recipients but also sources of knowledge for developing the Index (Figure 1). Throughout the consultation process[8], the participants discussed, suggested, and selected the indicators that are policy relevant – with GGGI providing the needed technical support and expertise. The process combined different forms and mediums to allow interactive participation with and among the participants, including seminar/webinar, participatory workshops, online surveys, and dissemination (e.g., global conference). Figure 2 shows the chronological occurrence of the nine activities conducted in developing the Index. Details on each activity are discussed below. These activities were supported by analytical methods, which were conducted by GGGI's Green Growth Performance Measurement (GGPM) team and are discussed in Annex 1.

Figure 1 Selected photos of the participants during the first (top) and second (bottom) participatory workshops

Figure 2 Design process for the Zambia Green Growth Index



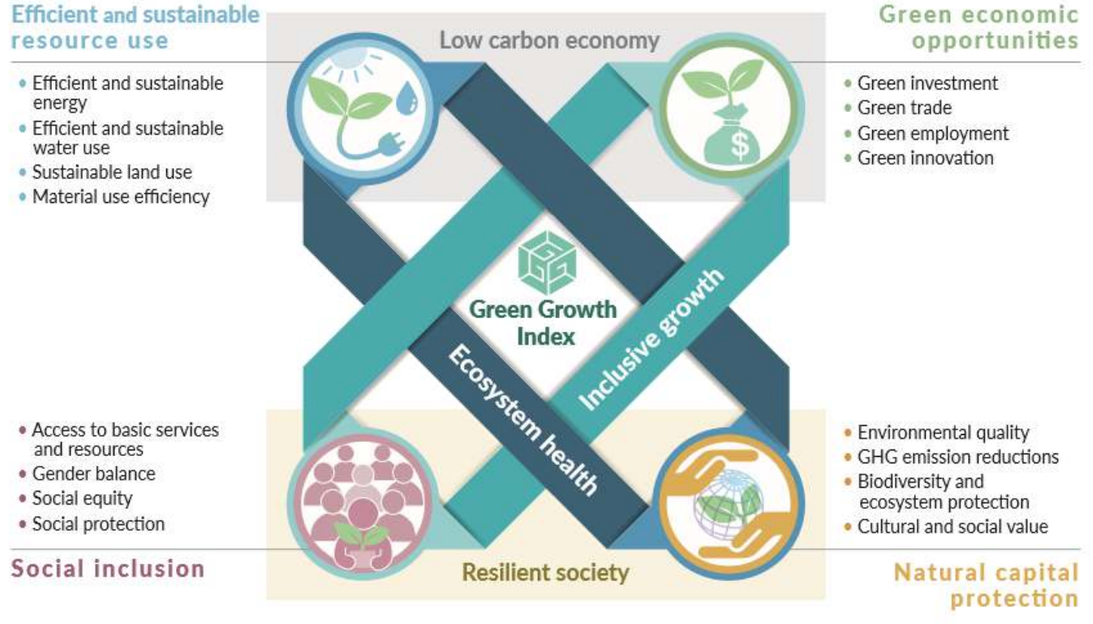
Activity 1 (A1) – Seminar on green growth framework

Objective: Inform the participants about the concepts and applications of the Green Growth Index.

Output: Created knowledge among participants on the different green growth dimensions and the indicators representing each dimension, enabling them to respond to the questions in the 1st online survey.

The seminar on the green growth framework was held on 22 March 2022 in Lusaka, Zambia. The GGPM team presented the framework for the Index, which was developed through a consultative process with national, regional, and international experts in 2019.[9] Figure 3 shows that the framework has four green growth dimensions – efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. Each dimension has four pillars relevant to low carbon economy, resilient society, ecosystem health, and inclusive growth. The framework builds on the GGGI's definition of green growth as *"a development approach that seeks to deliver economic growth that is both environmentally sustainable and socially inclusive. It seeks opportunities for economic growth that are low-carbon and climate resilient, prevent or remediate pollution, maintain healthy and productive ecosystems, and create green jobs, reduce poverty and enhance social inclusion."*[10]

Figure 3 Framework for the Green Growth Index



The framework emphasizes that efficient and sustainable use of natural resources will produce more goods and services with less resources. This will in turn protect natural capital including water, energy, land, and materials as well as the ecosystem services they provide. A healthy ecosystem characterized by, for example, fertile soil, multifunctional forests, productive land and seas, good quality freshwater and clean air, and pollination increases economic productivity and creates new economic opportunities. The green growth framework also highlights the importance of protecting natural capital, which provides sources of economic growth such as green jobs, trade, and investment. Finally, social inclusion is considered a pivotal mechanism to both achieving and distributing the gains from green growth, where people are not only beneficiaries of economic growth but also contributors to creating economic opportunities.

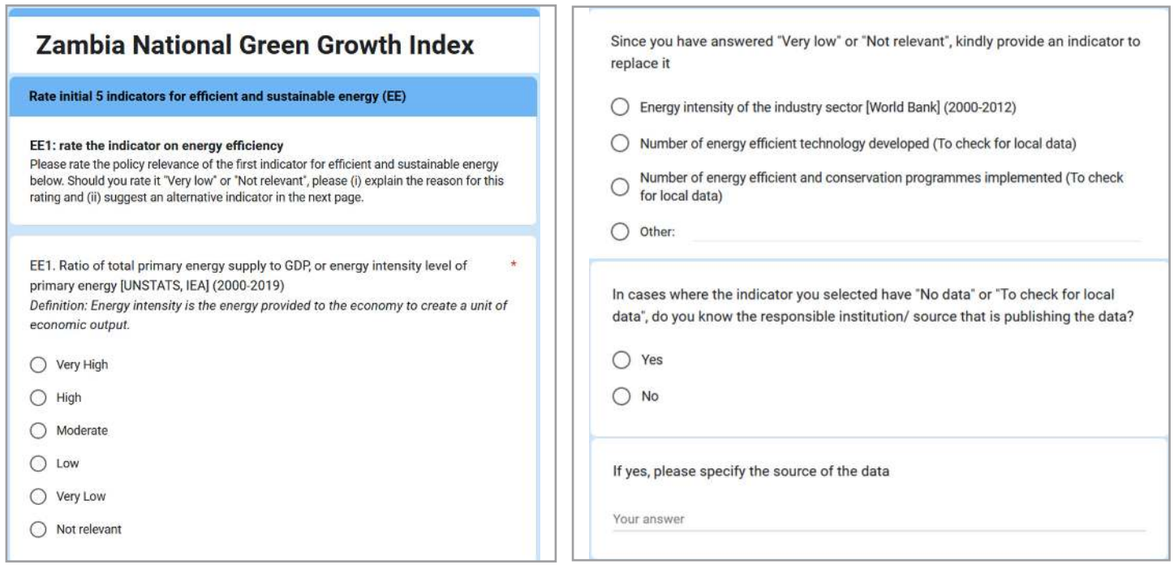
Activity 2 (A2) – 1st Online survey

Objectives: (i) Familiarize the participants with the potential indicators for the different green growth dimensions, (ii) Build the capacity of participants to assess the policy relevance of the green growth indicators to Zambia's economic, social, and environmental contexts; and (iii) Train participants on how to use the online survey form which will be used during 1st participatory workshop.

Output: Created knowledge among participants on the policy relevance of the green growth indicators, which was necessary for the discussion during the 1st participatory workshop and selection of indicators for the Zambia Green Growth Index.

The first online survey wasconducted on 1-6 September 2022. The survey consisted of a semi-structured questionnaire suggesting five potential green growth indicators for each pillar, which the participants rated according to the policy relevance to Zambia's economic, social, and environmental contexts (Figure 4). The ratings are very high, high, moderate, low, very low, and not relevant. The participants provided ratings based on expertise in their fields and/or expert judgements. They were asked to explain for the ratings they gave to the green growth indicators in each pillar. If the participants gave a very low or not relevant rating, they were asked to suggest alternative indicators and provide information on the data sources. The alternative indicators can come from the list suggested in the survey or from the participants' knowledge. The results of the indicator ratings from the 1st online survey are presented in Annex 2.

Figure 4 Example of questions in the 1st online survey



The participants had to rate 80 main indicators in the online survey. In addition, at least 100 indicators were added to the list of alternative indicators. The GGPM team identified these indicators by assessing Zambia's policy frameworks and development priorities, which are discussed in Chapter 3. Based on this assessment, the team created checklist criteria to determine the policy relevance of the suggested green growth indicators. The criteria are described in Annex 1. The GGPM team also checked the online sources and data availability for the suggested indicators. When the data were unavailable online, the participants were requested to suggest possible data sources from national databases or statistics.

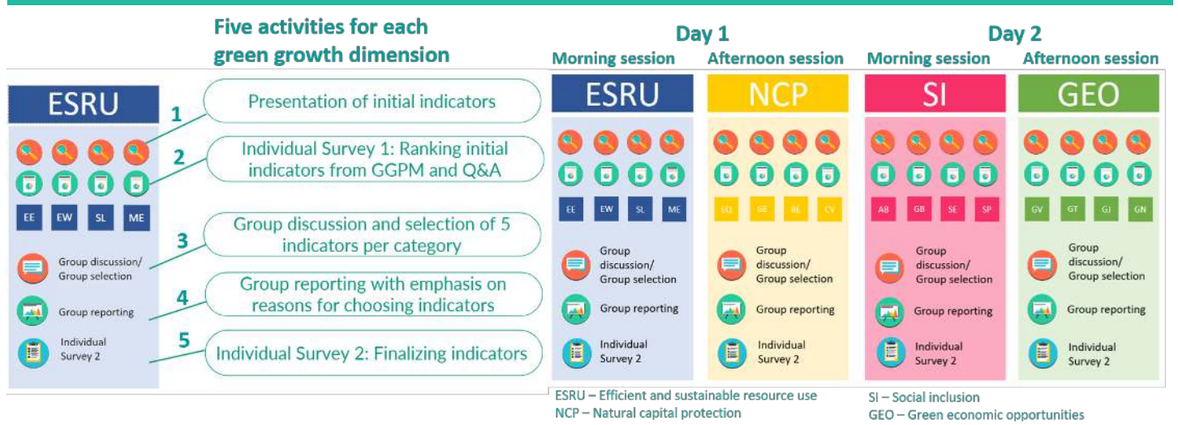
Activity 3 (A3) – 1st Participatory workshop

Objectives: (i) Allow participants to discuss with each other the policy relevance of the green growth indicators and (ii) Allow participants to rate and vote on the green growth indicators with the highest policy relevance to Zambia's economic, social, and environmental contexts.

Output: Selected 80 green growth indicators to be included in the Zambia Green Growth Index.

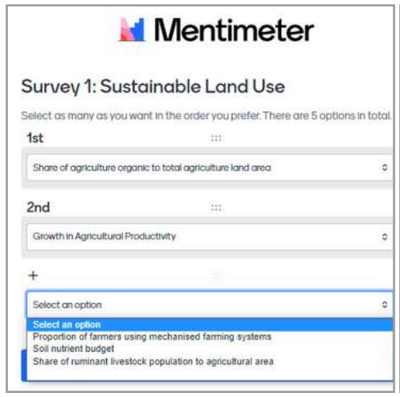
The first participatory workshop was conducted on 6-7 October 2022 in Lusaka, Zambia. The workshop allowed participants to discuss the green growth indicators, which they individually rated in the 1st online survey. It provided well-structured activities to enable the participants to rate and vote on the green growth indicators before and after the breakout sessions, during which they discussed with each other the policy relevance of the indicators in each dimension (Figure 5). For example, for the efficient and sustainable resource use (ESRU) dimension, the first activity was the GGPM team's presentation of the five indicators for each pillar; the second activity was the initial individual voting on the indicators for each pillar using Mentimeter software; the third activity allowed the participants to join one of the three breakout groups to discuss the relevance of the indicators and provide agreed ratings using the online survey form; the fourth activity was a reporting from each breakout group on the reasons for the votes given to the indicators; and the fifth activity was final voting on the indicators for each pillar using Mentimeter software. The same structure was followed for all other green growth dimensions.

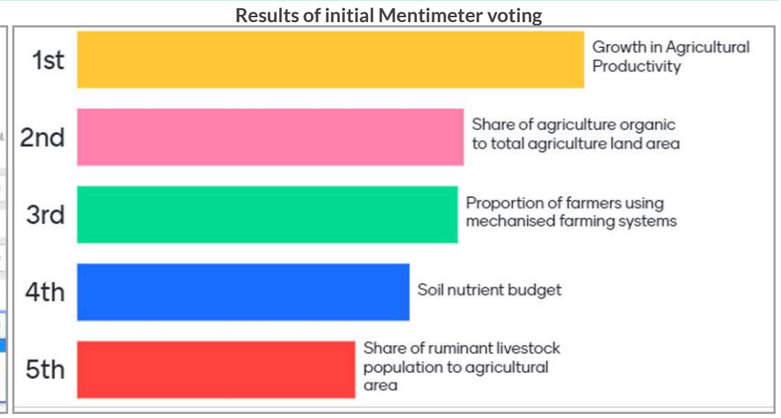
Figure 5 Activities during the first participatory workshop



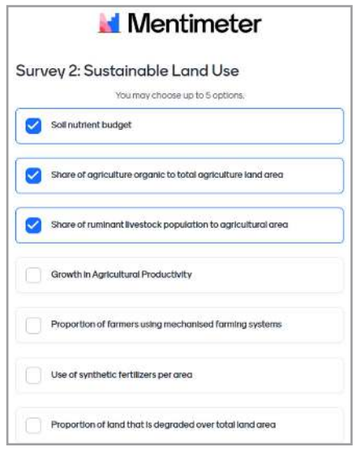
During the breakout sessions, the participants recognized the importance of the suggested indicators, so their discussion mainly revolved around their perceived challenges and limitations. Each breakout group filled in their agreed ratings (i.e., only one rating for each group) for the indicators using the online survey. In some cases, the participants included alternative or new indicators in the list of indicators. As a result, after combining the suggested indicators from the three groups, more than five indicators were selected for each pillar. Figure 6 shows an example of results from Mentimeter voting for the five indicators before and ten indicators after the breakout sessions for the sustainable land use pillar. In the case of the latter, only the first five indicators with the highest votes were included in the final list of indicators for the Index. Thus, the final individual voting aimed to not only validate the list of indicators but also reduce the number of indicators to only five for each pillar. The results of the initial and final votes for the indicators for all pillars are presented in Annex 3. After conducting the first participatory workshop, the experts voted on the 80 indicators that they think are relevant for measuring the green growth transition in Zambia. The GGPM team checked data sources and availability for all 80 indicators, but several indicators had insufficient data and could not be included in the computation of the Index.

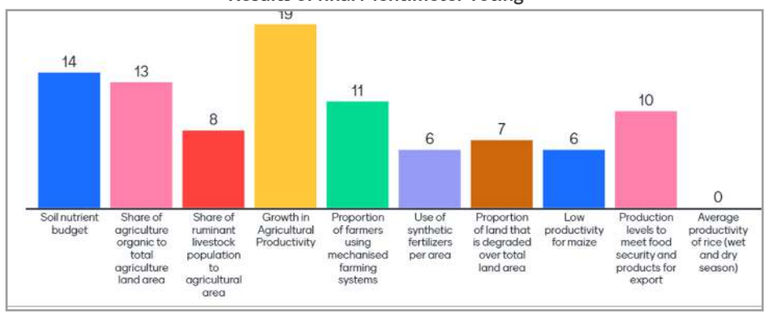
Figure 6 Examples of initial and final Mentimeter votings on the indicators for sustainable land use





Note: Participants were asked to rank the five indicators according to their policy relevance for Zambia





Note: Participants were asked to choose up to five indicators that they want to include in the Zambia Green Growth Index. The five indicators with the highest number of votes were included in the Index.

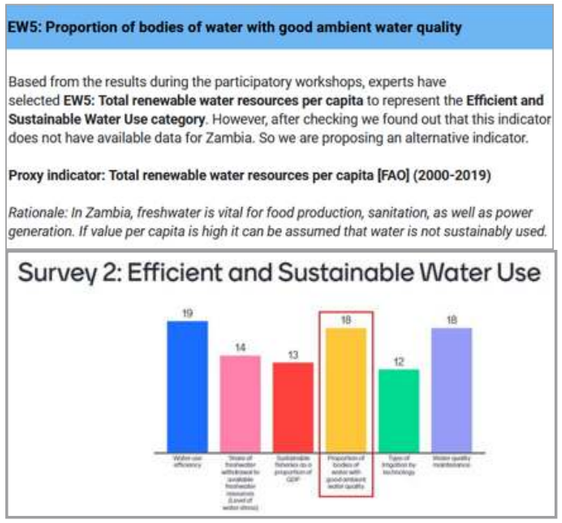
Activity 4 (A4) – 2nd Online survey

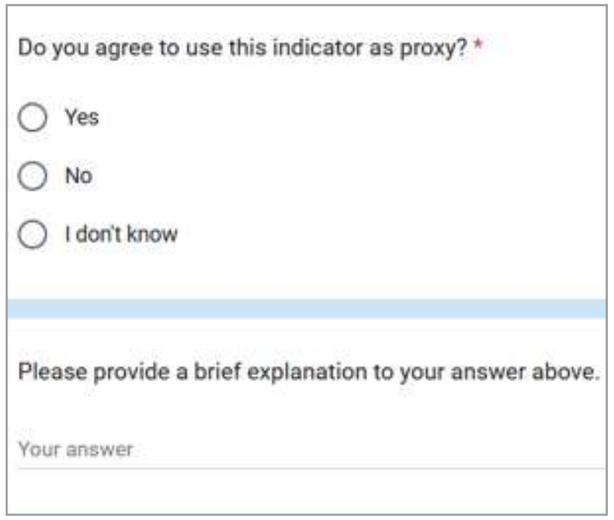
Objectives: (i) Inform the participants about the green growth indicators with insufficient data and (ii) Collect feedback on the policy relevance of the proxy variables that can be used to replace these indicators.

Output: Participants' ratings on the proxy variables for the green growth indicators with insufficient data.

The second online survey was conducted from 20 September to 10 October 2022. The survey consisted of a semi-structured questionnaire suggesting proxy variables for indicators with insufficient data to compute Index scores (Figure 7). There was a total of 28 proxy variables – seven for efficient and sustainable resource use, seven for natural capital protection, eight for green economic opportunities, and six for social inclusion. These proxy variables will be replaced with more appropriate indicators when data availability has improved in the next years. The proxy variables were mainly taken from the alternative indicators listed in the 1st online survey. The GGPM team used the 52 indicators selected from the 1st participatory workshop and the 28 proxy variables rated as policy-relevant in the 2nd online survey to compute the Zambia Green Growth Index. The computation methods are presented in Annex 1.

Figure 7 Example of questions in the 2nd online survey





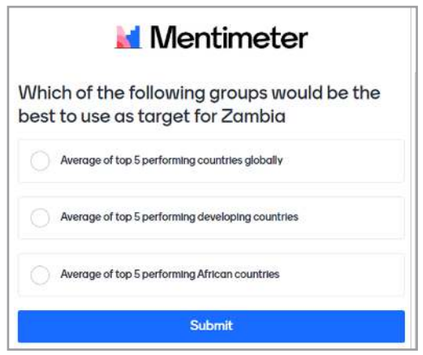
Activity 5 (A5) – Webinar

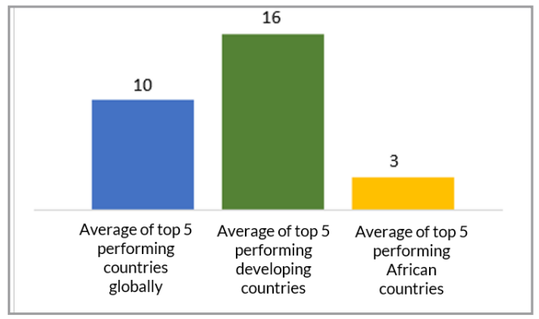
Objectives: (i) Share with the participants the link to the website of the preliminary Zambia Green Growth Index; (ii) Explain to the participants how to navigate the website and how the results were computed in the Zambia Green Growth Index: and (iii) Collect feedback on the sustainability targets that will be used to benchmark indicators which do not have SDG targets.

Output: (i) Access to the website to prepare participants for discussing the Index scores during the 2nd participatory workshop and (ii) Participants' preference on sustainability targets for indicators with no SDG and national targets.

The webinar was conducted on 10 October 2022. It allowed the participants to access the preliminary scores of the Zambia Green Growth Index from the website, which was prepared by the GGPM team. Because the indicators are benchmarked against sustainability targets, the scores measure Zambia's performance in achieving these targets. There are three possible sources of sustainability targets: (1) SDG targets in the case of SDG indicators (Zambia's Index consists of __percent SDG indicators); (2) national targets for indicators from national databases; and (3) average values of top 5 performing countries for indicators without targets. For the third source, the GGPM team used the top 5 performing countries globally to compute the preliminary Index scores. During the webinar, the participants voted on sustainability targets from three options – average values from global, developing, or African top 5 performing countries. Because most participants voted to use the average values of the top 5 performing developing countries (Figure 8), the GGPM team re-computed the scores for the Zambia Green Growth Index.

Figure 8 Results of Mentimeter votings on sustainability targets





Note: These results combined the results of Mentimeters from the webinar and the 2nd participatory workshop.

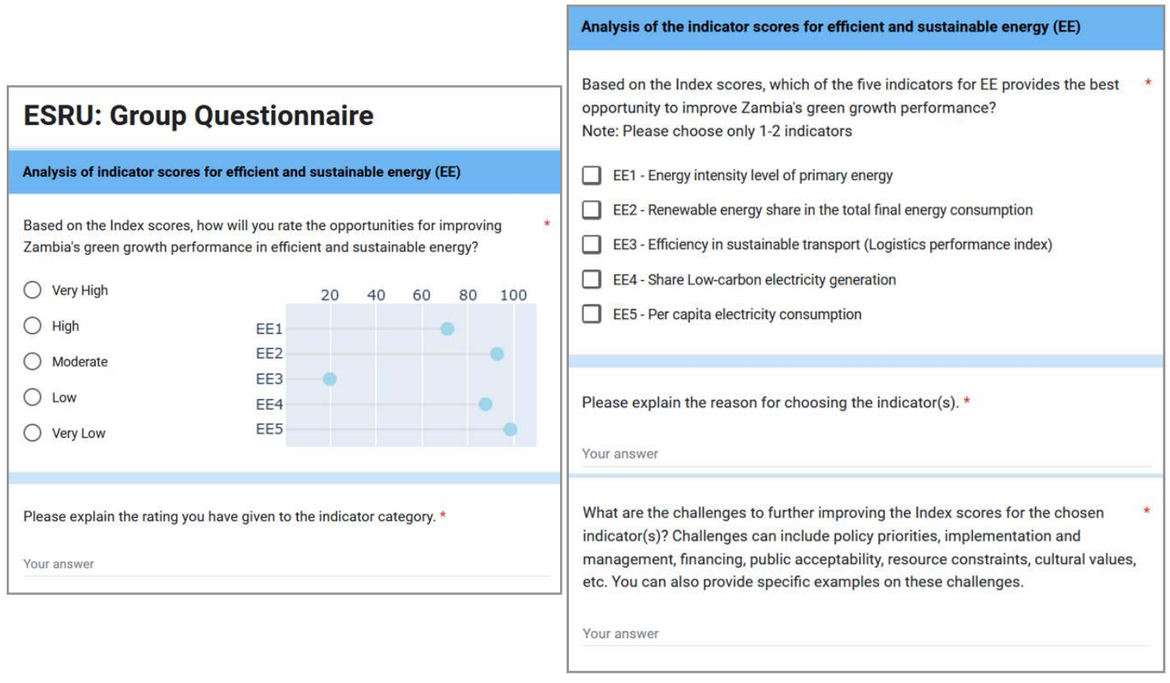
Activity 6 (A6) – 2nd Participatory workshop

Objectives: (i) Share with the participants the link to the website of the revised Zambia Green Growth Index; (ii) Allow the participants to discuss with each other the challenges and opportunities for green growth transition based on the Index scores; and (iii) Build capacity of the participants to interpret the scores of the Zambia Green Growth Index.

Output: (i) Access to the website on the final scores of the Zambia Green Growth Index and (ii) Participants' contribution to the analysis of scores in the Index report.

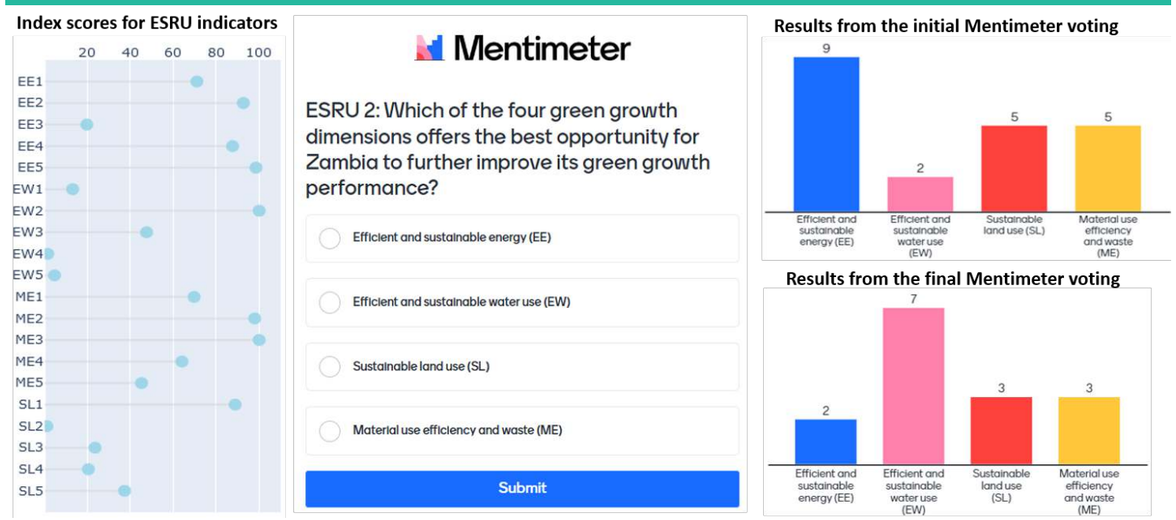
The second participatory workshop was conducted on 19 October 2022 in Lusaka, Zambia. The workshop allowed the participants to discuss and interpret the final scores in the Zambia Green Growth Index, which was revised to consider the participants' preference for sustainability targets (i.e., average values of the top five performing developing countries). It followed a similar structure as in the 1st participatory workshop (Figure 5) wherein (1) the GGPM team presented the Index scores for each pillar in each dimension; (2) participants provided initial votes on green growth pillars that could enhance Zambia's green growth performance; (3) breakout groups discussed the challenges and opportunities to enhance green growth performance based on the Index scores; (4) breakout groups reported on the results of their discussions; and (5) participants provided final votes on green growth pillars. Figure 9 shows examples of questions the participants had to answer during the breakout sessions. In the three breakout groups, the participants discussed and responded to the same questions for all pillars.

Figure 9 Results of Mentimeter votings on sustainability targets



The scores were computed at the indicator, pillar, and dimension levels, as well as overall Index scores from 2010 to 2021. When the scores for the indicators and pillars were presented, Figure 10 shows that initial and final votes on the pillars changed, implying that the discussion can influence the participants' opinions. However, a more important outcome of the discussion was building the participants' capacity to interpret the Zambia Green Growth Index scores and understand their relevance in policymaking and planning. Because the indicators were benchmarked against sustainability targets, an indicator with a score of 100 implies that its target had been achieved. The lowest score of 1 means that Zambia performed poorly in achieving the target. Through the group discussion and guidance given by the GGPM team, the participants understood that indicators with low scores offer opportunities to improve green growth performance but, at the same time, pose challenges to be overcome to enable green growth transition. Moreover, although these indicators reduce Zambia's overall Index score, they need to be included in the Index and closely monitored to enhance performance in achieving sustainability targets and transitioning to a green economy. The results from initial and final Mentimeter votes for all pillars are presented in Annex 4.

Figure 10 Results of initial and final Mentimeter votings on the Index scores



Activity 7 (A7) – Dissemination

Objectives: (i) Create awareness on the collaborative project between GGGI and MoGEE to develop the Zambia Green Growth Index; (ii) Train government officers who are participating in the development of the Index to disseminate it to the experts globally; and (iii) Inform international organizations on the application of the Global Green Growth Index at the national level.

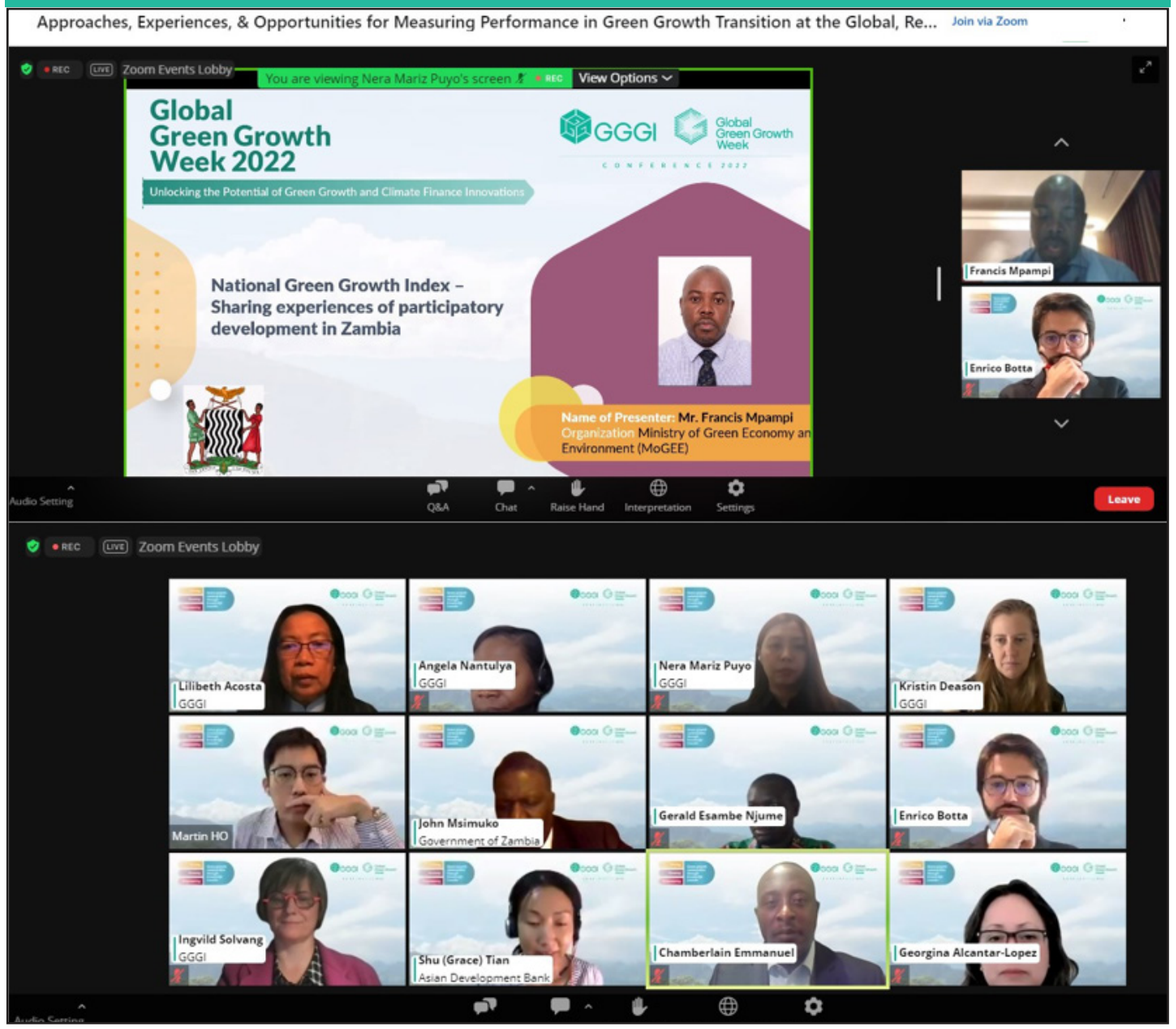
Output: Dissemination of the Zambia Green Growth Index at a global conference.

The Zambia Green Growth Index was presented in the session on Approaches, Experiences, & Opportunities for Measuring Performance in Green Growth Transition at the Global, Regional & National Levels during the Global Green Growth Week 2022, which was held virtually on 24-28 October 2022 (Figure 11). Mr. John Msimuko, MoGEE's Permanent Secretary, provided the opening remarks for this session on 27 October. Dr. Lilibeth Acosta, GGPM's Program Manager, introduced the concepts and applications of GGGI's Green Growth Index and its tools. Mr. Francis Mpampi, the National Coordinator for the Green Climate Fund's National Designated Authority, shared his experiences in participating in the development of the Zambia Green Growth Index. Ms. Angela Nantulya, GGGI's Country Lead and Project Lead for Zambia Green Climate Fund readiness, informed about GGGI's work in Zambia and the importance of the Zambia Green Growth Index for the development of the national Green Growth Strategy. The session was participated by experts from international organizations, allowing dissemination of information on the first national application of the Green Growth Index. Many of these international experts are participating in the annual review of the Global Green Growth Index and, for this year, the review of the indicators for the Zambia Green Growth Index.

Other speakers and panelists in the session included the following (Figure 11):

- Ms. Nera Mariz Puyo, Associate Officer, Climate Action and Inclusive Development Global Practice, GGGI, South Korea
- Mr. Chamberlain Emmanuel, Head of Environmental Sustainability Division, Organisation of Eastern Caribbean States (OECS) Commission, Saint Lucia
- Ms. Georgina Alcantar-Lopez, Chief Environment and Climate Change Statistics Unit/Statistic Division, Economic Commission for Latin America and the Caribbean (UN-ECLAC), Mexico
- Dr. Kristin Deason, Caribbean Representative, GGGI, St. Lucia
- Mr. Gerald Esambe Njume, Senior Climate Change and Green Growth Officer, African Development Bank Group (AfDB), Côte d'Ivoire
- Dr. Shu Tian, Senior Economist, Economic Research and Regional Cooperation Department, Asian Development Bank (ADB), Philippines
- Mr. Enrico Botta, Policy Analyst, Green Growth & Global Relations Division, Environment Directorate, OECD, France
- Ms. Ingvild Solvang, Deputy Director, Head of Climate Action and Inclusive Development Global Practice, GGGI, Luxembourg

Figure 11 Selected photos of the speakers and panelists during the presentation of the Zambia Green Growth Index on Global Green Growth Week 2022



Activity 8 (A8) – 3rd Online survey

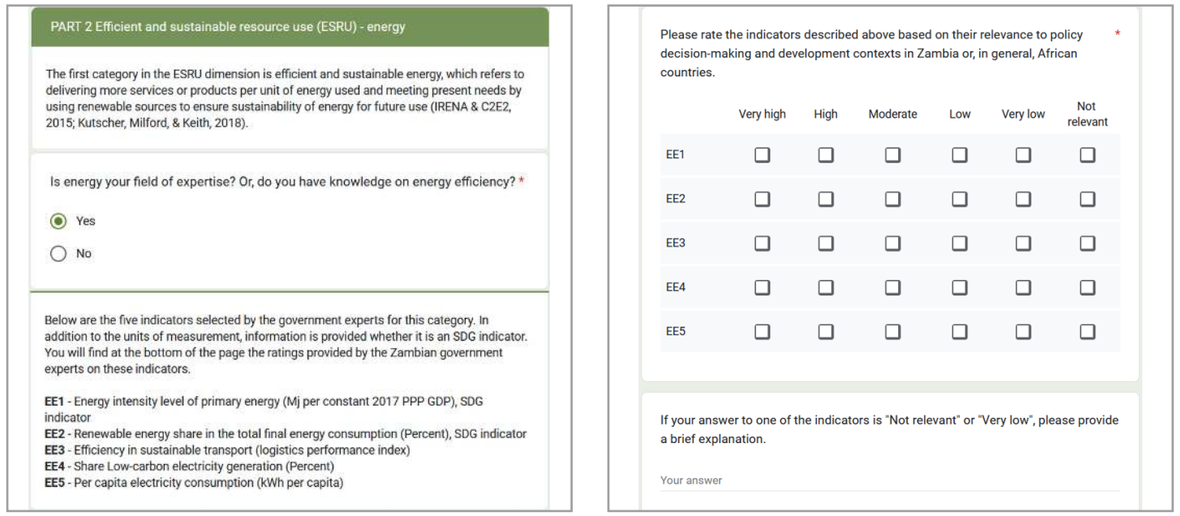
Objectives: (i) Inform the international experts on the first application of the Green Growth Index at the national level and (ii) Collect feedback on the policy relevance of the indicators selected by the participants for the Zambia Green Growth Index.

Output: International experts' ratings on the relevance of the indicators to policy decision-making and development contexts in Zambia or, in general, African countries.

The third online survey was conducted from 22 November to 9 December 2022. It consisted of a semi-structured questionnaire for the international experts to review the relevance of the green growth indicators to policy decision-making and development contexts in Zambia or, in general, African countries.

Since 2019, at least 100 experts have been participating worldwide in the annual review of the green growth indicators in the Global Green Growth Index reports. The GGPM team continues to review the indicators and update the Index to replace proxy variables with SDG indicators when their data availability has improved. Because the Zambia Green Growth Index was featured in the 2022 Global Green Growth Index report, the international experts were also requested to review the indicators in the former. The GGPM team designed the survey with an "adaptive" questionnaire so that the international experts could only provide feedback on the indicators in their field(s) of expertise (Figure 12). The feedback from the international experts would be helpful in updating the Zambia Green Growth Index next year and assessing green growth indicators to be considered in the national Green Growth Strategy. Overall, the online survey results, presented in Annex # in this report, show that the international experts agree with the green growth indicators selected for the Zambia Green Growth Index.

Figure 12 Example of questions for international experts in the 3rd online survey



Activity 9 (A9) – Review of the report

Objectives: (i) Inform the participants of the contents of the Zambia Green Growth Index and (ii) Allow the participants to review the 2022 Zambia Green Growth Index report before its publication.

Output: List of suggestions to be considered in finalizing the 2022 Zambia Green Growth Index report.

The last activity prior to the publication of the 2022 Zambia Green Growth Index report was the review of the draft report by the participants, MoGEE's relevant experts, and GGGI's publication committee from 30 November to 15 December 2022. The comments and suggestions were considered in the published version of the report.

Activity 10 (A10) – Publish report and website

Objectives: (i) Widely disseminate the 2022 Zambia Green Growth Index report and website and (ii) Provide reference to the green growth indicators and scores for Zambia in the 2022 Global Green Growth Index report and national Green Growth Strategy.

Output: First version of the 2022 Zambia Green Growth Index report.

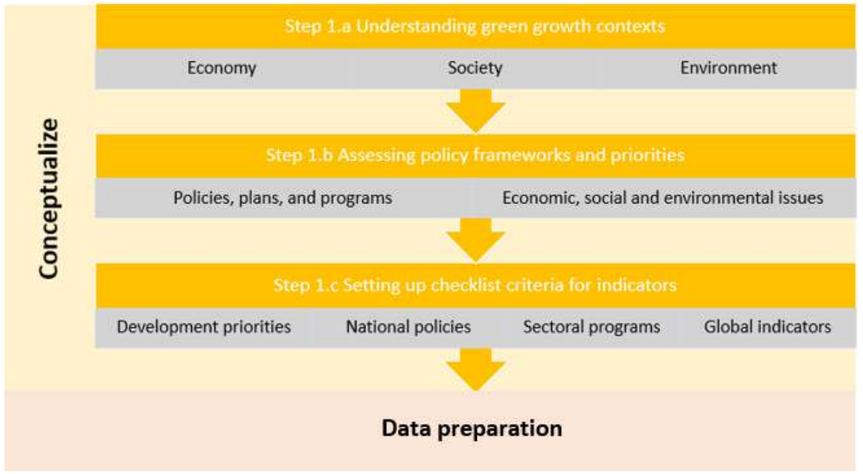
This report on the Zambia Green Growth Index and the interactive website, available at this link https://zambia-greengrowthindex.gggi.org, are the outcome of the collaborative project between the MoGEE and GGGI with the participation of experts from different Zambian ministries. It is envisaged to support the development of the Zambia Green Growth Strategy.

3 Green Growth contexts, policies, and priorities in Zambia

© GGGI Ethiopia

This chapter assesses Zambia's green growth contexts, national and sectoral policies, and development priorities to determine their alignments with the green growth indicators, which were identified through the participatory process for the Zambia Green Growth Index. The knowledge presented here is the outcome of Step 1 of the analytical methods that provide a rationale for including the indicators in the Zambia Green Growth Index (Figure 13). The assessment results supported the structure of the checklist criteria for the indicators (see Chapter 4 and Annex 1).

Figure 13 Conceptualization of green growth



Note: Complete diagram and description of analytical methods are in Annex 1.

3.1 Green Growth contexts

This section provides an overview of the economic, social, and environmental issues influencing Zambia's performance and transition to green growth. These issues are related to the national and sectoral policies which the Government of Zambia implements to overcome development challenges and create socioeconomic opportunities for sustainable growth.

3.1.1 Economy

Generally, Zambia's economic growth is anchored on the mining, agriculture, and tourism sectors. The mining sector attracts investments while the agriculture and tourism sectors contribute to employment. The agriculture sector provides livelihood to more than 70 percent of Zambia's population and employs 67 percent of the labor force[11]. In rural areas, it remains the primary source of income and employment for both women and men. The sector's contribution to the country's GDP was 5.8 percent, with an average growth rate of 0.4 percent over the ten-year period from 2011 to 2020[12]. Tourism including Arts and Culture, is one of the priority sectors for development in Zambia. The tourism sector grew by an average of 3.1 percent and its share of GDP was 1.5 percent from 2011 to 2020. Tourism has become a significant source of employment, accounting for 15.7 percent of employment in 2019[13].

From 2006 to 2010, Zambia's annual real Gross Domestic Product (GDP) growth rate was favorable, averaging 8.7 percent, with the highest annual growth rate at 10.3 percent in 2010.[14] The increased investments in the mining sector spurred GDP growth. It was also driven by the Information and Communications Technology (ICT), trading, construction, and transportation sectors. The ICT sector experienced significant structural growth due to the progressive migration from 2G to 4G technologies, resulting in increased adoption rates, higher data usage, and wider signal penetration rates, especially in rural areas. The increase in consumption, growth in import and export of locally manufactured food products, and investment in retail outlets had driven the growth in the trading sector. The increase in public infrastructure investments mainly drove the growth of the construction sector.

However, their economic growth rate slowed between 2011 and 2016, averaging 4.9 percent. During this period, the price of copper, Zambia's main export product, fell from over $4 per pound to just around $2 per pound[15] .Additionally, adverse climate change effects led to a drought in 2015, causing lower water levels and affecting Zambia's hydro power generation. The subsequent power outages of load shedding had constrained the productivity of the business and manufacturing sectors. Also, Zambia's agricultural sector is vulnerable to climate change impacts as it depends on rainfall for

water supply. The adverse impacts on crops, livestock, and fisheries led to reduced agricultural productivity, thereby contributing to food insecurity. The increase in temperatures resulted in increased difficulties in controlling and managing pests and diseases. Moreover, climate variability has kept a proportion of the population dependent on subsistence agriculture below the national poverty line. The tourism sector is also very vulnerable to climate change because of its dependence on wildlife and water resources. Droughts and floods affect the water levels of the different waterfalls including the famous Victoria Falls, thus affecting the flow of tourists visiting the country.

Their GDP rate further declined from 2017 to 2021, only averaging 1.4 percent. The decline was mainly due to unfavorable weather conditions, which impacted the agricultural and energy sectors in the earlier years of the period. The most significant reduction was experienced in 2020, when economic growth contracted by 2.8 percent, registering the first recession since 1998. Like other countries around the world, the COVID-19 pandemic caused disruptions in Zambia's supply chains, and the containment measures affected their industries, including tourism, construction, wholesale and retail trade, and manufacturing. The situation was compounded by the country's high debt levels, resulting in low economic growth and a decrease in available resources for their developmental programs. The country's worsening fiscal position also resulted from increased borrowing on the domestic market, which crowded out the private sector. The tourism sector was also one of the hardest hits by COVID-19 due to travel restrictions, resulting in a 26 percent contraction in the growth rate in 2020. Therefore, there is a need to revive the sector by encouraging domestic tourism and addressing the challenges of low product diversification, low investment, poor infrastructure, and the high cost of doing business.

But in 2021, the real GDP growth recovered to 3.6 percent, with the agriculture, manufacturing, energy, wholesale and retail trade, and ICT sectors driving growth[16] . But their mining output still declined despite a pick-up in global economic activity and commodity prices.

3.1.2 Society

Between 2005 and 2021, Zambia recorded improvements in human development measured by life expectancy, access to learning and knowledge, and standard of living. Zambia's Human Development Index (HDI) improved from 0.471 in 2005 to 0.584 in 2019[12].This primarily reflected the increase in life expectancy at birth from 48.5 years to 63.9 years[17] . The country has continued to register progress in service delivery for human development.

Regarding education, the country has made strides in achieving universal primary education and gender parity. In 2011, Zambia incorporated Early Childhood Education into its education system and introduced its centers in primary schools to accommodate early learners and recruit teachers. This increased enrollments from 47,317 pupils in 2011 to 258,616 pupils in 2020. From 2005 to 2020, enrollments in Grade 1 increased by 22 percent, from 444,300 to 543,675 pupils. Although there has been an increase in Grade 1 enrollees over the years, the average annual increase was still at 1.5 percent, which is below the population growth rate of 2.8 percent. This implies that a significant proportion of the target population remained outside the school system. The secondary school enrollment rates improved from 22.2 percent in 2006 to 37.6 percent in 2020 but remained very low. The low enrollments were due to the low number of school places at Grade 10 and low transition rates from Grade 9 to Grade 10.

Between 2007 and 2018, the population with access to an improved water source increased from 41.1 percent to 72.3 percent and improved sanitation facilities increased from 35.5 percent to 54.4 percent[17].The improvement was attributed to consistent public sector investments in water and sanitation, and support from cooperating and development partners. But access to both services remained lower in rural areas, with only 37.2 percent compared to 77.7 percent in urban areas in 2018[13]. Despite the gains in improving access to water and sanitation in urban areas, increasing unplanned settlements were a major drawback on the Government's efforts to provide safe water and adequate sanitation.

Despite the progress in education and skills development, health, water and sanitation, job creation, and empowerment of citizens, Zambia still ranks among the countries with high poverty and inequality in Africa and globally. A reduction of 8.4 percent in poverty was recorded between 2006 and 2015, from 62.8 percent to 54.4 percent[18] . However, extreme poverty, or individuals whose consumption was less than the cost of the food basket, only marginally improved from 43 percent to 41 percent of the total population (MOF, 2022).In 2015, poverty in rural areas remained higher at 76.6 percent compared to 23.4 percent in urban areas[18]. These persistently high poverty levels in rural areas were mainly attributed to inadequate nutrition, households' inability to afford agricultural inputs, low wages or salaries, and lack of capital to start or expand their business.

As measured by the Gini coefficient, inequality in income distribution worsened because Zambia's growth was driven by industries that were not labor-intensive. At the national level, the Gini coefficient declined from 0.60 in 2006 to 0.69 in 2015[19]. This relegated most of the labor force to low-paying informal jobs. Moreover, productivity in the agricultural sector, which was the mainstay of the rural population, did not improve, resulting in stagnation of incomes. But income inequality is higher in urban than in rural areas. Between 2011 and 2015, while income inequality in urban areas slightly worsened from 0.60 in 2006 to 0.65 in 2015 , it remained constant at 0.60 in the same period in rural areas[12].Access to social protection services such as food security packs, social cash transfers, and public welfare assistance for the poor and vulnerable increased between 2006 and 2021. However, their effective implementation of the social cash transfer interventions, especially targeting the extremely poor and vulnerable faced several challenges. These included poor targeting of beneficiaries, low integration of social protection programs, the intermittent release of funds to cash transfer beneficiaries, and lack of an integrated automated Social Protection Management Information System.

In terms of Zambia's epidemiological profile, it has been characterized by the high prevalence and impact of preventable and treatable communicable diseases (e.g., malaria, HIV and AIDS, pneumonia, and tuberculosis) as well as the growing burden of non-communicable diseases (e.g., cancers, cardiovascular diseases, and diabetes). But key national health indicators such as infant mortality, under-five mortality, and maternal mortality improved from 2007 to 2018. The gains were due to increased investments in health infrastructure, such as the construction of general hospitals, specialist hospitals, mini hospitals, and health posts. Moreover, the implementation of universal health access increased the proportion of eligible people covered by national health insurance from 3.9 percent in 2016 to 29 percent in 2020[19].

However, challenges remained in delivering quality health services due to the need to ensure a consistent supply of essential medical supplies, recruitment and placement of health personnel, and effective management of non-communicable diseases. Rural communities continued to face challenges in accessing health services. This was mainly due to a low health-seeking culture among the communities, low health personnel to population ratio, long distances to health facilities, inadequate supplies of medical commodities, and inadequate numbers of specialists to deal with complex medical conditions.

3.1.3 Environment

In pursuit of the economic transformation agenda, development pathways must be sustainable. This entails the sustainable utilization of natural resources, which are the basis for wealth creation, as well as building the resilience of both economy and society to the adverse effects of climate change. Forests cover approximately 66 percent of the land in Zambia[20]. This represents about 49.97 million hectares, an estimated 9.6 percent of which is covered by gazetted forest reserves[21]. Forests are essential in promoting carbon absorption from the atmosphere and providing critical services such as watershed protection. For example, most of the water resources in Zambia originate in forested watersheds, which makes forestry very important in regulating water quality and quantity for livelihoods.

Wildlife resources are also crucial to Zambia's national economy due to its role in tourism, which is considered a major potential growth engine in the coming years. The open and closed grasslands and forests constitute the natural habitats of endemic species and other large wild animals, including lions, buffaloes, and elephants. Water animals like hippos, crocodiles, and various bird species also inhabit rivers, lakes, and other wetland ecosystems. In relation to the impacts of climate change, drought conditions reduce soil moisture and give rise to poor-quality fodder, stress, uncontrolled migration, and wildlife-human conflicts. Under excessive rainfall, wetland animals like the Lechwe and Puku would be adversely affected.

The water resources in Zambia represent about 40 percent of the water resources in the Southern African region[22]. The country has major rivers such as the Zambezi, the fourth largest in Africa and its tributaries (Luangwa and Kafue), and lakes such as Tanganyika, Mweru, Bangweulu, and Kariba. In as much as Zambia has abundant water resources, the country has isolated semi-arid areas in the southern and western parts. With changes in rainfall variability, these regions have experienced devastating floods and/or droughts. Furthermore, both flood and drought conditions have worsened household access to safe and clean drinking water. This situation has increased the prevalence of waterborne diseases and labor burden on women and girls who are the main drawers of water for their households in the peri-urban and rural areas. Other impacts of climate change on ecosystems include reduced flows and drying up of water bodies leading to possible degradation of aquatic habitats and disruption of aquatic ecosystem functions and services.

Agricultural expansion is a widespread phenomenon in Zambia and has a cyclical link to soil degradation. Soil degradation compels farmers to expand into natural habitats for fertile soils; however, these soon degrade into poor soils. According to Mweemba & Wu[23], deforestation in Zambia is related positively to population pressure on cultivated land (the smaller the cultivated area per person, the higher the rate of deforestation), the rate of population growth (the higher the population growth rate, the higher the rate of deforestation due to land clearance and fuel wood provision), and policies favorable to agriculture (the more profitable the agricultural policy, the lower the rate of deforestation).Deforestation is negatively related to the use of modern farm inputs such as fertilizer (the more significant the use of modern inputs, the lower the need to clear more farmland).

3.2 Zambia's institutional frameworks

3.2.1 National policies

In assessing the policy relevance of the green growth indicators, six national policies were considered including the Vision 2030, the 8NDP, the National Policy on Climate Change (NPCC), the updated Nationally Determined Contribution (NDC), the National Adaptation Plan (NAP), and the Second National Biodiversity Strategy and Action Plan (NBSAP-2).

Addressing economic, social, and environmental challenges in the national and cross-sectoral policies would support Zambia's transition to green growth. Through its Vision 2030, the government aspires to transform the country into "A Prosperous Middle-Income Nation by 2030". The Government's objective in Vision 2030 is to attain and sustain an annual real economic growth rate of between 6 percent and 10 percent by 2030. At the same time, it is recognized in Vision 2030 that human development, which entails having a well-educated, highly skilled, and healthy labor force, is critical to propel Zambia to a thriving and industrialized nation. Zambians look forward to living in a strong, dynamic, competitive, and self-sustaining middle-income industrial country that is resilient to external shocks and provides opportunities for improving the well-being of all. The Vision coincides with the 2030 Agenda for Sustainable Development, which aims to end poverty, fight inequality and injustice, and tackle climate change by achieving SDG goals and targets. It also seeks to establish fully integrated and sustainable water and resource management programs.

The 8NDP provides an avenue for catalyzing the nation's response to address the developmental challenges over the 2022-2026 period and attain Vision 2030, SDGs, and other regional and international commitments. It is the country's medium-term blueprint designed to unlock the country's potential in all sectors of the economy for sustainable, holistic, and inclusive national development. Through the National Development Plans (NDPs), Zambia has made considerable progress toward integrating economic, social, and environmental assessments in the planning process. The NDPs cover key sectors and subsectors in the country that constitute the economic, social, and environmental pillars. For the first time in the history of Zambia, however, the ward level was also involved in formulating the 8NDP. The 8NDP not only aims at ensuring growth for its own sake but pursues growth that transforms the people's livelihood, hence the theme of the Plan, "Socio-economic transformation for improved livelihoods". During the 8NDP period, interventions will thus focus on increasing access to and improving the quality of education, health, water and sanitation, and enhancing social protection. Also, it will prioritize promoting green growth, safeguarding the environment and natural resources, enhancing climate change mitigation and adaptation, and strengthening disaster risk reduction.

The Zambia National Policy on Climate Change, a cross-sectoral policy enacted in 2016, aims to provide a framework for coordinating climate change programs to ensure climate-resilient and low-carbon development pathways for sustainable development towards the attainment of Zambia's Vision 2030. The policy is guided by the principle of sustainable climate change response, according to which all climate change actions shall be environmentally sustainable and positively contribute to national economic growth and social development objectives, including poverty alleviation, access to natural resources and basic amenities, gender equality and equity, and infrastructure development. Zambia has other climate-related legislations that support National Policy on Climate Change. For example, their 2015 Forests Act covers the establishment and declaration of national forests, local forests, joint forest management areas, botanical reserves, private forests, and community forests, providing for the conservation and use of forests and trees for the sustainable management of forests ecosystems and biological diversity. The 2011 Environmental Management Act mandates the continuation of the Zambia Environmental Management Agency to have oversight on implementing integrated environmental management, protection and conservation of the environment, and sustainable management and use of natural resources.

Zambia's latest NDC, submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2021, presents a revised and updated NDC for Zambia to the Paris Agreement on climate change. This is under Decision 1/CP.19, 1/CP.20, and 1/CP.21 of the Conference of Parties to the UNFCCC for countries to enhance their climate ambitions and update their NDCs by 2020 . Zambia's first NDC was submitted on 9 December 2016 and consisted of mitigation and adaptation components based on the country's national circumstances. Adaptation actions in this NDC focused on strategic productive systems (agriculture, wildlife, and water), strategic infrastructure and health systems, and enhanced capacity building, research, technology transfer, and finance for adaptation. The country requires substantial resources to implement these interventions. In this submission, Zambia enhances its NDC by broadening the scope of sectors under mitigation by adding transport, liquid waste, and coal (production, transportation, and consumption) and elaborating the adaptation component of the NDC by developing indicators that will enable the country to track the progress on building resilience in both the human and physical systems and on adaptation actions.[25] In the subsequent submissions, Zambia will endeavor to consider all sectors and categories as potential contributors to its mitigation efforts. Zambia has focused its efforts on sectors with the most significant mitigation potential, and the greatest likelihood of rapid implementation, and aligned, where possible, with the GHG Inventory Key Category Analysis as the country progressively moves towards an economy-wide approach. Zambia has identified several mitigation benefits from adaptation actions, including under Climate Smart Agriculture and sustainable forest management, where adaptation measures have also resulted in substantial emissions reductions.

Zambia's Ministry of Lands and Natural Resources initiated the development of the country's NAP of Action for climate change in March 2021 and is working towards finalizing the plan in the first quarter of 2023. The NAP will guide Zambia's government in taking action against the current and forecasted negative impacts of climate change on the country's economy, environment, and society. In Zambia, as in many other African countries, sectors such as food production, water security, and forestry are highly vulnerable to the impacts of climate change. The country has experienced several climatic hazards over several decades. The most severe problems have been drought, seasonal floods and flush floods, extreme temperatures, and dry spells. Some of these, especially droughts and floods, have increased in frequency, intensity, and magnitude over the last two decades and adversely impacted the food and water security, water quality, energy, and the sustainable livelihoods of rural communities.[26] The current NAP process builds on the previous adaptation planning that, since 2004, has assisted the government in prioritizing responses such as promoting better land management, diversifying crops and livestock to improve food security, and climate-proofing sanitation in urban areas.

Zambia's NBSAP-2 is a national cross-sectoral strategic document for 2015-2025. Its goals are, by 2025, for their biodiversity to be valued, conserved, restored, and wisely used and to maintain ecosystem services, sustain a healthy environment, and deliver benefits to all Zambians and the Zambian economy[27]. Specifically, the document aims to address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society, reduce the direct pressures on biodiversity and promote sustainable use, improve the status of biodiversity by safeguarding ecosystems, species, and genetic diversity, and enhance the benefits from biodiversity and ecosystem services. In the area of climate change, the NBSAP-2 covers the mainstreaming of climate change adaptation measures that will improve the resiliency of priority ecosystems and regularize forest management plans for habitat resilience and wildlife refuges.

3.2.2 Sectoral policies

In addition to the national policies, several sectoral policies that are relevant to the green growth indicators were considered including the National Policy on Environment (2007), Technology Needs Assessment (2013), National Forestry Policy (2014), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD+, 2015), Second National Agriculture Policy (2016), Health National Adaptation Plan (2017), Climate Change Gender Action Plan (2018), National Energy Policy (2019),, and Transport Policy (2019). A summary of these sectoral policies is provided below.

National Policy on Environment (2007)

The origins of concern for the environment and the tremendous wealth of natural resources, ecosystems, habitats, soils, minerals, water, plants, and animals, set in a rich, social and cultural setting in Zambia, go back to early indigenous systems. The Government of Zambia recognized that a National Policy on Environment should be promulgated to avoid conflicts of interest, harmonize sectoral strategies, rationalize legislation that concerns the use and management of land, water, and natural resources, and attain an integrated approach to development through a national cross-cutting consensus. The policy was developed through a comprehensive research and consultative process and fully integrated into principles of decentralization, community participation and privatization that underpin sustainable development.

Technology Needs Assessment (2013)

The Technology Needs Assessment project considered several adaptation technologies related to water and agriculture and some of the most vulnerable sectors in Zambia. It developed concrete action plans to increase the resilience of these sectors in facing the expected adverse effects of climate change. Additionally, it has developed mitigation options in energy supply, energy efficiency, sustainable charcoal production, and sustainable agriculture.

National Forestry Policy (2014)

The National Forestry Policy aligns the forestry sector with the current trends in forestry and the necessity of meeting the national strategies enshrined in Vision 2030. The National Forestry Policy was issued with a strong emphasis on the sustainable use and management of forest resources – including the goals of climate change mitigation, income generation, poverty reduction, job creation and protection, and biodiversity maintenance[28]. One of the ten policy objectives is local community empowerment. The policy states that "public participation in forestry and/or natural resource management [is] an end in itself, or a means to an end. Community empowerment is central to participatory forest management." The objective is "to empower local communities and traditional leaders to ensure adequate protection and management of forests"[29].

National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD+) (2015)

The forest cover in Zambia comprises around 45 million hectares or over 60 percent of the total land area. The prevailing high deforestation rate in the country is estimated to be between 250,000 and 300,000 hectares per annum. This places Zambia among the top 10 countries with the highest deforestation rates in the world. In pursuit of its long-term development vision (Vision 2030), which emphasizes poverty reduction and development based on "sustainable environment and natural resource management principles", the Government of Zambia decided in 2009 to participate in REDD as an opportunity to directly address the drivers of deforestation and forest degradation.

Second National Agriculture Policy (2016)

The launch of the Second National Agricultural Policy 2016 -2020 sought to address the challenges faced during implementing the First National Agricultural Policy. The Second National Agricultural Policy focuses on ten strategic objectives, including promoting productivity, promoting R&D, strengthening capacity building, promoting markets (inputs and outputs), private sector participation, nutrition, and food security. It encompasses key facets of the agriculture sector, namely, food and nutritional security, agricultural production and productivity, agricultural diversification, agricultural research and extension services, sustainable resource use, promotion of irrigation, agro-processing and value addition, agricultural marketing and trade, livestock, and fisheries development. The Institutional and legislative framework, decentralization, private sector participation, support to co-operatives and other farmer organizations, and crosscutting issues such as Gender mainstreaming, HIV and AIDS, and mitigation of climate change are also addressed by the Policy.

Health National Adaptation Plan (2017)

Climate change and variability pose a challenge to sustainable human development. The effects of climate change on human health are the results of interactions of environmental, social, and health system conditions. The health sector is susceptible to climate change, and to ensure that the health of populations is protected from the effects of climate change, it is imperative to include a health component in the National Adaptation Plan (NAP). The plan recognizes the negative impacts of climate change on the development goals of the country and the need to respond to this threat. Moreover, it presents the results of a national consultative process to identify climate risks and adaptation measures relevant to the health sector and sets out the road map for implementing the Health National Adaptation Plan.

Climate Change Gender Action Plan (2018)

With the development of Zambia's first Climate Change Gender Action Plan, the Government endeavored to take action on women's leadership in climate change. This Action Plan is grounded in Zambia's comprehensive institutional and policy framework, particularly in the National Climate Change Policy and the National Gender Policy. The policy aims to ensure that Zambia's climate change processes mainstream gender considerations to guarantee that women and men have equal access to the benefits of climate change initiatives.

National Energy Policy (2019)

The National Energy Policy builds on previous policies of 1994 and 2008 and is anchored on the Seventh National Development Plan (7NDP) and Vision 2030. The policy aims to guide the energy sector in developing electricity generation, transmission, and distribution capacity. Further, it was created to enhance cost-effectiveness, and efficiency in the supply of petroleum products, facilitating the development and deployment of renewable and alternative energy. It also considers climate change mitigation and adaptation while advancing sustainable development of the sector. In addition, it mainstreams gender and disability aspects aimed at increasing access to clean and efficient energy, thereby reducing poverty among vulnerable groups, especially women and children.

Transport Policy (2019)

The National Transport Policy aims to enhance the facilitatory role of the transport sector in the social and economic development of the public and private sectors. It seeks to promote private sector involvement in infrastructure development and service provision under a regulated environment. Further, it focuses on promoting integrated modal transportation of goods and passengers, enhancing cost efficiency in transport service provision, ensuring optimal maintenance and rehabilitation of existing transport infrastructure, promoting regional corridor competitiveness, and promoting safe transport infrastructure and services.

3.3 Development priorities for green growth

Four development priorities were identified from the assessments of economic, social, and environmental contexts as well as the national and sectoral policies. These priorities, which will be important drivers to green growth transition, include economic transformation, human development and skills, environmental sustainability, and land-water-food nexus.

3.3.1 Economic transformation

Diversification and industrialization are constrained by inadequate infrastructure in economic sectors such as transport, energy, agriculture, and ICT, especially in rural areas. This contributes to the high cost of doing business and ultimately affects the economy's productivity and competitiveness. In addition, inadequate access to productive resources, especially low-cost financing, adversely impacts the efforts to industrialize and diversify the economy at the desired rate. Further, limited research and development coupled with low use of applied research and innovation have compounded the low rate of industrialization and diversification. The primary constraints to economic transformation and job creation are low diversification and industrialization, low citizen participation, low private sector competitiveness, and access to affordable finance.[30] To overcome these constraints, strategies and programs aimed at achieving a diversified and industrialized economy, enhancing citizenry participation, and promoting private sector competitiveness will be implemented during the 8NDP period.

3.3.2 Human skills and development

Various factors and challenges, including inadequate infrastructure and skilled human resources, constrain the attainment of human development. The education system in Zambia has been challenged with limited classroom furniture like desks, inadequate education materials, and a lack of ICT equipment for learning. The lack of appropriate facilities and teaching materials contributes to poor quality education among early childhood learners. This is more evident in the rural and remote communities in the country. Thus, most children enter primary school without experience in early childhood education, impeding their capability to develop numeracy and literacy skills.

The health sector also affects human development and the capability to develop skills. In Zambia, the constraints in their health sector include long distances to health centers, poor healthcare-seeking behavior, limited national health insurance coverage, insufficient dietary diversity for promoting nutrition and health of the people, and lack of health personnel, transport facilities, and medical equipment and supplies. For water and sanitation, their main constraints include poor management and monitoring of water resources, inadequate and dilapidated infrastructures particularly in rural areas, an increase in informal settlements, and uncontrolled access to water sources[31].

3.3.3 Environment sustainability

Zambia's natural environment and ecosystems are threatened by inefficient environmental management, poor waste and sanitation management, and air, water, and land pollution. The industries in mining and manufacturing and the increase in the use of motor vehicles significantly contribute to air pollution as they release dust particles and harmful gases into the atmosphere. The major polluters of ground and surface water are agriculture, ineffective sewage treatment facilities, and the mining and manufacturing industries. The contribution of these sectors to water pollution limits people's access to safe water.[32]

The factors limiting environmental sustainability in Zambia include communities' lack of education and awareness on the environment and the value of natural resources, inefficient legal and institutional frameworks and capabilities to implement actions on environmental protection, unsustainable agricultural practices and utilization of environmental products, and undiversified sources of income. Moreover, Zambia only receives limited funding and has a low technical and technological capability to implement bolder climate change actions. Climate change strategies are also poorly integrated into the main sectors at the national and subnational levels. There are also limited climate information services, hydro-meteorological infrastructure, and early warning systems.

3.3.4 Water-land-food nexus

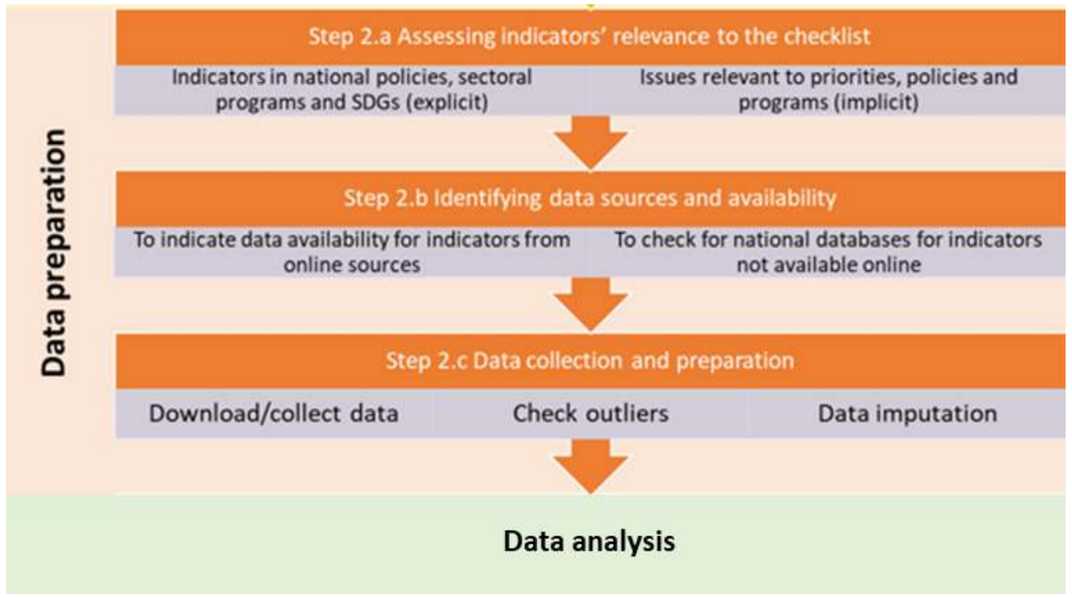
Zambia's abundant water and land resources significantly contribute to its economic development. Thus, the Government of Zambia has strategized to gradually expand the country's irrigated areas to improve agricultural productivity. Improving productivity helps meet the food demands of the people, supply international and regional markers, and provide employment for the rural population. However, the large-scale land use change from rainfed to irrigation creates competition with the water users. Besides competition on the water, it also creates conflicts between the smallholders and commercial investors, between the local community and the land chiefs, as the expansion covers the areas under the customary land tenure.

A study by Scheumann (2018)[33] shows that the water-land-food nexus covers more than just the issue of cross-sectoral or horizontal coordination but also the issue of vertical coordination. This can be observed in land issues. The management of land issues begins with the variety and coexisting conventional and modern systems for land tenure. Efficient implementation of the policies and strategies addressing these issues covers the designating of distinct tasks for public sectors, providing them with enough resources for implementation, upgrading the public units to administrative units, and adapting a practical financial model for the Water Resources Management Authority.

4 Green growth indicators for Zambia

This chapter discusses the relevance of the green growth indicators to national policies, sectoral programs, and development priorities in Zambia based on the checklist criteria. It presents the sources and availability of the data for the indicators. The proxy variables used to replace indicators with insufficient data are also discussed in this chapter. The information presented here is the outcome of Step 2 of the analytical methods, dealing with the preparation of the indicators' data before calculating the Zambia Green Growth Index (Figure 14 and Annex 1).

Figure 14 Data preparation of green growth indicators



Note: Complete diagram and description of analytical methods are in Annex 1.

4.1 Indicator checklists

The checklists aim to determine the alignment of the green growth indicators in the national policies, sectoral programs, and development priorities of Zambia, which were discussed in the previous chapter. The checklist will inform whether the indicators are SDG indicators or used in the Global Green Growth Index. Suppose the indicators are part of SDGs but neither explicitly ✓ (exact indicator name with the same unit of measurement) nor implicitly ✓ (relevance to the issue without mentioning the indicators' name and unit) mentioned in policies and priorities. In that case, this could indicate policy gaps or gaps to monitor policies for green growth transition. The green growth indicators included in the Zambia Green Growth Index are presented in Table 2. Except for sanitation coverage (ME4), allocation to education as a percentage of budget expenditure (GN3), and mobile broadband penetration per 100 users (AB4), which were drawn from national statistics in Zambia, the data for all indicators were developed and published by the international organizations. The indicators are valuable tools for monitoring green growth performance and will be useful to integrate into national policies and sectoral programs.

Table 2 Green growth indicators selected by the Zambian participants for the Green Growth Index, by dimensions and pillars

Code	Indicator name	Unit	Publisher
	EFFICIENT AND SUSTAINABLE RESOURCE USE		
EE1	Energy intensity level of primary energy	MJ per constant 2017 PPP GDP	IEA
EE2	Renewable energy share in the total final energy consumption	percent	IEA, IRENA
EE3	Efficiency in sustainable transport	Index	WB
EE4	Share of low-carbon electricity generation	percent	BP, Ember
EE5	Electricity consumption per capita	kWh per capita	BP, Ember
EW1	Water use efficiency, total all sectors	USD per m^3	FAO
EW2	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	percent	FAO
EW3	Capture fisheries as a proportion of GDP	Tons per GDP	FAO
EW4	Irrigated agriculture water use efficiency	USD per m^3	FAO
EW5	Total renewable water resources per capita	m^3/inhabitant/year	FAO
SL1	Nutrient balance per unit area	Tons per hectare	FAO
SL2	Share of organic agriculture to total agriculture land area	percent	FAO
SL3	Cereal yield	Kg per hectare	FAO
SL4	Agricultural production divided by total area of arable land under crops and pasture	USD per hectare	FAO
SL5	Natural capital productive capacity index	Score	UNCTAD
ME1	Total domestic material consumption (DMC) per unit of GDP	Kg per GDP	UNEP
ME2	Total material footprint (MF) per capita	Tonnes per capita	UNEP
ME3	Average of food loss to production and food waste to consumption	percent	FAO
ME4	Sanitation coverage	percent	NWASCO
ME5	Trends in sewer, septic tank, and latrine coverage	percent	WHO, UNICEF
	NATURAL CAPITAL PROTECTION		
EQ1	PM2.5 air pollution, mean annual exposure	Micrograms per m^3	WHO
EQ2	Age-standardized Disability-Adjusted Life Years (DALY) rate due to unsafe water sources	DALY lost per 100,000 persons	IHME
EQ3	Municipal solid waste (MSW) generation per capita tons per capita	Tons per capita	WB
EQ4	Share of urban population practicing open defecation	percent of urban population	WHO, UNICEF
EQ5	People with basic handwashing facilities including soap and water	percent of population	WHO, UNICEF
GE1	Ratio of CO_2 emissions to population, including AFOLU	Tons per capita	CW, WB
GE2	Ratio of non-CO_2 emissions (CH_4, N_2O and F-gas) excluding AFOLU to population	Tons per capita	CAIT, WB
GE3	CO_2 emissions growth rate	percent growth rate	CAIT, WB
GE4	Carbon intensity of energy production	kg per kilowatt-hour	BP
GE5	Carbon intensity of electricity	gCO_2 per kWh	BP
BE1	Average proportion of (freshwater, terrestrial and mountain) Key Biodiversity Areas covered by protected areas	percent	BLI, IUCN, UNEP-WCMC
BE2	Share of forest area to total land area	percent	FAO
BE3	Proportion of forest area with a long-term management plan	percent	FAO
BE4	Annual forest area change rate	percent	FAO
BE5	Change in the extent of water-related ecosystems over time: Lakes and rivers permanent water area	percent of total land area	UNEP

Table 2 Green growth indicators selected by the Zambian participants for the Green Growth Index, by dimensions and indicator categories *(continued)*

Code	Indicator name	Unit	Publisher
CV1	Red List Index	Score	IUCN, BLI
CV2	Share of protected areas in total territorial area	percent	BLI, IUCN, UNEP-WCMC
CV3	International tourism arrivals as proportion of total population	Ratio	WTO
CV4	Share of employment in services to total employment	percent	ILO
CV5	Share of exports of cultural goods to exports of total goods	percent	UNESCO
	GREEN ECONOMIC OPPORTUNITIES		
GV1	Adjusted net savings, including particulate emission damage	percent of GNI	WB
GV2	Installed renewable electricity-generating capacity	Watts per capita	IRENA
GV3	Revenue generated and finance mobilized from biodiversity-relevant economic instruments	Millions of constant 2020 USD	OECD
GV4	Agriculture orientation index for government expenditures	Score	FAO
GV5	Transport productive capacity index	Score	UNCTAD
GT1	Share of export of environmental goods (OECD and APEC classifications) to total export	percent	OECD
GT2	Share of ores and metals exports to merchandise exports	percent	WB
GT3	Share of medium and high-tech exports to manufactured exports	percent	WB
GT4	Doing business: New business density (new registrations per 1,000 people ages 15-64)	Number per 1,000 people	WB
GT5	Share of manufactures exports to total merchandise exports	percent	WB
GJ1	Renewable energy employment by technology	Number	IRENA
GJ2	Employed population below international poverty line	percent	ILO
GJ3	Share of vulnerable employment total employment	percent	ILO
GJ4	Share of youth not in education, employment, or training to total youth population	percent	ILO
GJ5	Volume of official development assistance flows for scholarships by sector and type of study	Millions of constant 2020 USD	OECD
GN1	7 years rolling average of share of environment-related technologies to all technologies		OECD
GN2	University-industry collaboration in Research & Development	Rank	WEF
GN3	Allocation to Education as percentage of Budget expenditure.	percent	Zambia MoF
GN4	Proportion of medium and high-tech manufacturing value added in total value added	percent	UNIDO
GN5	Charges for the use of intellectual property, Balance of Payments (BoP)	USD	IMF
	SOCIAL INCLUSION		
AB1	Share of population with access to safely managed water and sanitation	percent	WHO, UNICEF
AB2	Share of population with access to electricity and clean fuels	percent	WB, WHO
AB3	Prevalence of stunting, height for age	percent of children under 5	UNICEF, WHO, WB
AB4	Mobile Broadband penetration per 100 users	Number per 100 users	ZICTA
AB5	Property rights score	Score	HF
GB1	Proportion of seats held by women in national parliaments	percent	IPU
GB2	Gender ratio of account at a financial institution or mobile-money-service provider	Ratio	WB

Table 2 Green growth indicators selected by the Zambian participants for the Green Growth Index, by dimensions and indicator categories *(continued)*

Code	Indicator name	Unit	Publisher
GB3	Getting paid, laws and regulations for equal gender pay score	Score	WB
GB4	Maternal mortality ratio per 100,000 live births	Number per 100,000 live births	WHO
GB5	School enrollment, primary (gross), gender parity index (GPI)	Score	UNESCO
SE1	Inequality in income based on Palma ratio	Ratio	WB
SE2	Population with access to basic services by urban/rural, i.e., electricity	Ratio	WB, WHO
SE3	Disparity of unemployment: Ratio of Youth (15-24 years old) and above 25 years old unemployment	Ratio	ILO
SE4	Unemployment rate, age 25+	percent	ILO
SE5	Unemployment rate, by disability, ratio of persons with disability to persons without disability	Ratio	ILO
SP1	Proportion of population above statutory pensionable age receiving a pension	percent	ILO
SP2	Universal health coverage (UHC) service coverage index	Score	WHO
SP3	Proportion of urban population living in slums	percent	UN-Habitat
SP4	Number of victims of intentional homicide per 100,000 population	Number per 100,000 population	UNODC
SP5	Internally displaced persons, new displacement associated with disasters	Number of cases	UNISDR

Definitions: *International Energy Agency (IEA), International Renewable Energy Agency (IRENA), World Bank (WB), The British Petroleum Company plc (BP), Food and Agriculture Organization (FAO), United Nations Conference on Trade and Development (UNCTAD), The Organization for Economic Cooperation and Development (OECD), The United Nations Environment Programme (UNEP), National Water Supply and Sanitation Council (NWASCO), World Health Organization (WHO), the United Nations International Children's Emergency Fund (UNICEF), Institute for Health Metrics and Evaluation (IHME), Climate Watch (CW), Climate Analysis Indicators Tool (CAIT), Bird Life International (BLI), International Union for Conservation of Nature (IUCN), UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), World Trade Organization (WTO), The International Labour Organization (ILO), The United Nations Educational, Scientific and Cultural Organization (UNESCO), World Economic Forum (WEF), Zambia Ministry of finance (MoF), United Nations Industrial Development Organization (UNIDO), The International Monetary Fund (IMF), Zambia Information and Communications Technology Authority (ZICTA), The Heritage foundation (HF), Inter-Parliamentary Union (IPU), The United Nations Human Settlements Programme (UN-Habitat), United Nations Office on Drugs and Crime (UNODC), United Nations International Strategy for Disaster Reduction Secretariat (UNISDR)*

4.1.1 Efficient and sustainable resource use

Among the different indicators for efficient and sustainable resource use, energy is most represented in national policies and sectoral programs (Table 3). Except for per capita electricity consumption (EE5), issues relevant to four indicators for efficient and sustainable energy were mentioned in the 8NDP and NDC. Although indicator EE5 was not mentioned in other national policies, issues on electricity consumption were well covered in Zambia's 2019 National Energy Policy. Increasing the share of renewable energy (EE2) is widely represented in all national policies, including the NBSAP, which considers the promotion of alternative renewable energy technologies. Similarly, indicator EE2 is discussed in several sectoral policies, including the National Energy Policy, Zambia REDD+ Strategy, and Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation. Except for the NBSAP, the efficiency in sustainable transport is well represented in national policies. It is also covered not only in Zambia's 2019 National Transport Policy but also in Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation. The latter discusses many issues related to reducing emissions and improving logistic performance and public access. The importance provided to the issues related to efficient and sustainable resource use is well aligned with climate mitigation actions. The first two indicators - energy intensity level of primary energy (EE1) and share of renewable energy in the total final energy consumption (EE2) – are both SDG indicators. However, efficient and sustainable energy indicators were considered relevant only to economic transformation when assessing development priorities.

Compared to energy, the issues of efficient and sustainable water use are not thoroughly considered in different national policies. They are, however, considered in different sectoral policies including the National Policy on Environment (2007), Second National Agriculture Policy (2016), and National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015). Except for economic transformation, these indicators are relevant to Zambia's development priorities. The issues of water use efficiency and freshwater withdrawal are part of SDGs and essential for climate adaptation. Two indicators of sustainable land use are explicitly mentioned in Vision 2030, including cereal yield (SL3) and agricultural productivity (SL4). In general, however, few are mentioned in the national and sectoral policies, like waste and material use efficiency indicators. All indicators for efficient and sustainable land use, as well as waste and material use efficiency, have significant contributions to climate adaptation. Moreover, the first three indicators for waste and material use efficiency - total domestic material consumption (ME1), total material footprint (ME2), and average food loss and food waste (ME3) are all SDG indicators. Although ME3 is mentioned in the NAP, ME1 and ME2 are not.

4.1.2 Natural capital protection

Like efficient and sustainable resource use, many natural capital protection indicators are aligned with national and sectoral policies. Among the pillars, biodiversity and ecosystem protection has the highest number of checks in the checklist table (Table 4). The indicators for this pillar are all covered not only in the NBSAP but also in the NDC. The share of forest land to total land area is directly mentioned as an indicator in Vision 2030 and sectoral policy on National Strategy for REDD+. This national strategy for REDD+ also covers the other three indicators for biodiversity and ecosystem protection, including the average proportion of key biodiversity areas (BE1), the proportion of forest areas with a long-term management plan (BE3), and the annual forest area change rate (BE4). While not included in the national strategy for REDD+, the change in the extent of water-related ecosystems over time (BE5) is discussed in two sectoral policies, namely, National Policy on Environment (2007) and Second National Agriculture Policy (2016). All five indicators for biodiversity and ecosystem protection are SDG indicators and important for climate adaptation.

Table 3 Checklist for the green growth indicators in efficient and sustainable resource use

Indicator code	Indicator name	National policies*						Sectoral policies**	Development Priorities				Climate action		Global issues	
		Vision 2030	8NDP	NPCC	NDC	NAP	NBSAP-2		ECON	HUMA	ENVI	NEXU	MITI	ADAP	GG Index	SDG
EE1	Energy intensity		✓		✓			✓	✓				✓		✓	✓
EE2	Renewable energy share	✓	✓	✓	✓	✓	✓	✓					✓		✓	✓
EE3	Efficient transport		✓	✓	✓			✓	✓				✓	✓	✓	✓
EE4	Low-carbon electricity	✓	✓		✓	✓		✓					✓	✓		✓
EE5	Per capita electricity consumption							✓					✓	✓		✓
EW1	Water use efficiency					✓	✓	✓				✓	✓	✓	✓	✓
EW2	Level of water stress			✓			✓	✓			✓	✓		✓	✓	✓
EW3	Capture fisheries	✓				✓	✓	✓								✓
EW4	Agriculture water use efficiency		✓					✓				✓	✓	✓	✓	✓
EW5	Renewable water resources per capita				✓			✓		✓	✓	✓				✓
SL1	Soil nutrient balance				✓				✓					✓	✓	✓
SL2	Organic agriculture area				✓			✓					✓	✓	✓	✓
SL3	Cereal yield	✓												✓		✓
SL4	Agricultural productivity	✓	✓					✓	✓			✓		✓		✓
SL5	Natural capital productivity								✓		✓			✓		
ME1	Domestic material consumption												✓	✓	✓	✓
ME2	Material footprint												✓	✓	✓	✓
ME3	Food loss and food waste					✓							✓	✓	✓	✓
ME4	Sanitation coverage	✓	✓					✓		✓	✓			✓		✓
ME5	Sewer, septic and latrine coverage		✓							✓	✓			✓		✓

Legend: ✓ *direct relevance, explicit mention of the indicator with the same measurement unit* ✓ *indirect relevance, implicit mention of the indicator with no relevant unit*

Notes: **National policies include Vision 2030 - A Prosperous Middle-income Nation by 2030, 8th National Development Plan (8NDP), National Policy on Climate Change (NPCC), updated Nationally Determined Contribution (NDC), National Adaptation Plan (NAP), and Second National Biodiversity Strategy and Action Plan (NBSAP-2).*

***Sectoral policies include National Policy on Environment (2007), National Forestry Policy (2014), Health National Adaptation Plan (2017), National Energy Policy (2019), Second National Agriculture Policy (2016), Transport Policy (2019), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015), Technology Needs Assessment (2013), Climate Change Gender Action Plan (2018)*

ECON – economic transformation, HUMA – Human development and skills, ENVI – environmental sustainability and NEXU – land-water-food nexus

MITI – climate mitigation, ADAP – climate adaptation, GGG Index –Global Green Growth Index, SDG – Sustainable Development Goals

Table 4 Checklist for the green growth indicators in natural capital protection

Indicator code	Indicator name	National policies*						Sectoral policies**	Development Priorities				Climate action		Global issues	
		Vision 2030	8NDP	NPCC	NDC	NAP	NBSAP-2		ECON	HUMA	ENVI	NEXU	MITI	ADAP	GG Index	SDG
EQ1	PM2.5 air pollution		✓		✓			✓			✓		✓	✓	✓	✓
EQ2	DALY rate from unsafe water	✓	✓			✓	✓	✓			✓			✓	✓	✓
EQ3	Solid waste generation		✓					✓			✓		✓	✓	✓	✓
EQ4	Urban people with open defecation	✓	✓					✓		✓	✓					✓
EQ5	People with basic handwashing facilities		✓			✓				✓	✓					✓
GE1	CO2 emissions per capita		✓	✓	✓			✓			✓		✓	✓	✓	✓
GE2	Non- CO2 per capita		✓	✓	✓			✓			✓		✓	✓	✓	✓
GE3	CO2 emissions growth rate			✓							✓		✓	✓	✓	✓
GE4	Carbon intensity of energy production		✓	✓				✓					✓	✓		✓
GE5	Carbon intensity of electricity		✓	✓		✓		✓					✓	✓		✓
BE1	Protected key biodiversity areas	✓		✓	✓		✓	✓					✓	✓	✓	✓
BE2	Share of forest areas	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓
BE3	Forest area with management plan		✓		✓	✓		✓			✓		✓	✓		✓
BE4	Annual forest area change	✓	✓	✓	✓			✓					✓	✓	✓	✓
BE5	Change in extent of water ecosystems		✓	✓	✓	✓		✓						✓		✓
CV1	Red list index					✓		✓						✓	✓	✓
CV2	Terrestrial protected area	✓				✓		✓			✓		✓	✓	✓	✓
CV3	International tourism arrivals	✓	✓	✓				✓			✓					✓
CV4	Share of employment in services								✓							
CV5	Share of exports of cultural goods	✓												✓		✓

Legend: ✓ *direct relevance, explicit mention of the indicator with the same measurement unit* ✓ *indirect relevance, implicit mention of the indicator with no relevant unit*

*Notes: *National policies include Vision 2030 - A Prosperous Middle-income Nation by 2030, 8th National Development Plan (8NDP), National Policy on Climate Change (NPCC), updated Nationally Determined Contribution (NDC), National Adaptation Plan (NAP), and Second National Biodiversity Strategy and Action Plan (NBSAP-2).*

***Sectoral policies include National Policy on Environment (2007), National Forestry Policy (2014), Health National Adaptation Plan (2017), National Energy Policy (2019), Second National Agriculture Policy (2016), Transport Policy (2019), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015), Technology Needs Assessment (2013), Climate Change Gender Action Plan (2018)*

ECON – economic transformation, HUMA – Human development and skills, ENVI – environmental sustainability and NEXU – land-water-food nexus

MITI – climate mitigation, ADAP – climate adaptation, GGG Index –Global Green Growth Index, SDG – Sustainable Development Goals

After biodiversity and ecosystem protection, environmental quality and GHG emissions reduction are the next important issues covered in national and sectoral policies, receiving almost equal importance across policy documents. Vision 2030 and NPCC cover all issues related to the indicators for environmental quality (i.e., EQ1-EQ5) and GHG emissions reduction (i.e., GE1-GE5), respectively. The indicators for both pillars are also relevant to the development priority for environmental sustainability. Moreover, three indicators from each pillar are SDG indicators. The indicators for social and cultural values are mainly covered in Vision 2030 and NBSAP. One indicator in this pillar – the share of employment services to total employment (CV4) – was not covered in national or sectoral policies. CV4 is only a proxy variable for the total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage. This SDG indicator does not have sufficient data for Zambia. The other two indicators in this pillar, including international tourism arrivals (CV3) and share of exports of cultural goods (CV5), are only proxy variables, which is why they appear not to be relevant to policies and priorities but also to SDGs. .

4.1.3 Green economic opportunities

Green economic opportunities are least covered in national and sectoral policies. Only the 8NDP has discussed issues related to creating economic opportunities from green growth particularly to investment and employment (Table 5). Both Vision 2030 and 8NDP explicitly mentioned the indicator on installed renewable electricity-generating capacity (GV2). In addition, while Vision 2030 has also explicitly mentioned share of manufactures exports to merchandise exports (GT5) and government expenditure on education (GN3), the 8NDP has directly referred to the share of ores and metals exports to merchandise exports (GT2). Not surprisingly, many of the indicators for green economic opportunities are relevant to Zambia's priority for economic transformation. Compared with the indicators for efficient and sustainable resource use and natural capital protection, there are fewer indicators in green economic opportunities that are directly or indirectly related to SDGs. While

many SDG indicators relate to economic growth, they are not yet "green" oriented. For example, employment does not refer to renewable or other green employment generating sectors. Another reason for low number of SDG related indicators is that some of the proxy variables are specific to Zambian contexts, for example, share of ores and metals exports to total merchandise exports (GT2). This proxy variable has replaced hazardous waste exported, an SDG indicator for which data is not available for Zambia.

4.1.4 Social inclusion

The 8NDP covered many issues relevant to social inclusion, except for the gender indicators. Gender has been represented in sector policy on Zambia's first Climate Change Gender Action Plan (Table 6). Vision 2030 also discussed many issues related to social inclusion. Two indicators were directly mentioned in more than one national policy document, including population with access to safely managed water and sanitation (AB1), which is both in Vision 2030 and 8NDP, and maternal mortality ratio (GB4), which is mentioned not only in Vision 2030 and 8NDP but also in NAP. Other indicators that were explicitly mentioned in the 8NDP are the prevalence of stunting, height for age (AB3) and proportion of seats held by women in national parliaments (GB1). The population with access to electricity and clean fuels (AB2) and population with access to basic services by urban/rural, i.e., electricity (SE2), were mentioned in the NPCC. Many social inclusion indicators are represented in the development priority for human development and skills. Almost all indicators are relevant to climate adaptation and are part of the SDGs. Like efficient and sustainable resource use and natural capital protection, many social inclusion indicators are included in the Global Green Growth Index.

Table 5 Checklist for the green growth indicators in green economic opportunities

Indicator code	Indicator name	National policies*						Sectoral policies**	Development Priorities				Climate action		Global issues	
		Vision 2030	8NDP	NPCC	NDC	NAP	NBSAP-2		ECON	HUMA	ENVI	NEXU	MITI	ADAP	GG Index	SDG
GV1	Adjusted net savings		✓						✓		✓			✓	✓	
GV2	Renewable electricity capacity	✓	✓		✓			✓					✓	✓		✓
GV3	Revenue from biodiversity economic instruments					✓			✓		✓			✓		✓
GV4	Agriculture orientation index	✓	✓						✓			✓	✓	✓		✓
GV5	Transport productive capacity	✓	✓						✓	✓			✓			
GT1	Exports of environmental goods							✓					✓	✓	✓	✓
GT2	Ores and metals exports	✓	✓	✓				✓								
GT3	Medium and high-tech exports												✓	✓		✓
GT4	New business density		✓						✓							
GT5	Exports of manufactured goods	✓	✓													
GJ1	Renewable energy employment								✓				✓	✓		✓
GJ2	Employed below poverty line		✓									✓		✓		✓
GJ3	Vulnerable employment		✓	✓										✓		✓
GJ4	Youth not in education, employment, training	✓	✓		✓					✓				✓	✓	✓
GJ5	ODA flows for scholarships									✓				✓		✓
GN1	Environmental technologies	✓		✓					✓		✓					
GN2	Collaboration in research & development		✓						✓				✓	✓		✓
GN3	Share of education expenditure	✓	✓							✓				✓		✓
GN4	Medium/high-tech manufacturing value added								✓		✓		✓	✓		✓
GN5	Intellectual property charges		✓	✓										✓		✓

Legend: ✓ *direct relevance, explicit mention of the indicator with the same measurement unit* ✓ *indirect relevance, implicit mention of the indicator with no relevant unit*
*Notes: *National policies include Vision 2030 - A Prosperous Middle-income Nation by 2030, 8th National Development Plan (8NDP), National Policy on Climate Change (NPCC), updated Nationally Determined Contribution (NDC), National Adaptation Plan (NAP), and Second National Biodiversity Strategy and Action Plan (NBSAP-2).*
***Sectoral policies include National Policy on Environment (2007), National Forestry Policy (2014), Health National Adaptation Plan (2017), National Energy Policy (2019), Second National Agriculture Policy (2016), Transport Policy (2019), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015), Technology Needs Assessment (2013), Climate Change Gender Action Plan (2018)*
ECON – economic transformation, HUMA – Human development and skills, ENVI – environmental sustainability and NEXU – land-water-food nexus
MITI – climate mitigation, ADAP – climate adaptation, GGG Index – Global Green Growth Index, SDG – Sustainable Development Goals

Table 6 Checklist for the green growth indicators in social inclusion

Indicator code	Indicator name	National policies*						Sectoral policies**	Development Priorities				Climate action		Global issues	
		Vision 2030	8NDP	NPCC	NDC	NAP	NBSAP-2		ECON	HUMA	ENVI	NEXU	MITI	ADAP	GG Index	SDG
AB1	Access to safe water and sanitation	✓	✓	✓		✓		✓		✓	✓			✓	✓	✓
AB2	Access to electricity and clean fuels	✓	✓	✓	✓			✓						✓	✓	✓
AB3	Prevalence of children stunting		✓							✓				✓	✓	✓
AB4	Mobile broadband penetration	✓	✓		✓								✓	✓		✓
AB5	Property rights	✓					✓					✓		✓		✓
GB1	Women in national parliaments		✓					✓						✓	✓	✓
GB2	Gender account in financial institution							✓						✓	✓	✓
GB3	Equal gender pay							✓						✓	✓	✓
GB4	Maternal mortality ratio	✓	✓		✓	✓		✓						✓		✓
GB5	School enrollment gender parity	✓	✓					✓		✓				✓		✓
SE1	Inequality in income	✓	✓									✓		✓	✓	✓
SE2	Rural-urban access to electricity	✓	✓	✓						✓				✓	✓	✓
SE3	Youth unemployment disparity		✓											✓		✓
SE4	Old people unemployment disparity	✓	✓											✓		✓
SE5	Unemployment disabled disparity		✓											✓		✓
SP1	Share of old people receiving pension		✓											✓		✓
SP2	Universal health coverage	✓	✓			✓		✓		✓				✓	✓	✓
SP3	Population living in slums		✓					✓		✓				✓	✓	✓
SP4	Victims of intentional homicides		✓											✓		✓
SP5	Displacement related to disasters		✓	✓		✓				✓				✓		✓

Legend: ✓ direct relevance, explicit mention of the indicator with the same measurement unit ✓ indirect relevance, implicit mention of the indicator with no relevant unit
*Notes:*National policies include Vision 2030 - A Prosperous Middle-income Nation by 2030, 8th National Development Plan (8NDP), National Policy on Climate Change (NPCC), updated Nationally Determined Contribution (NDC), National Adaptation Plan (NAP), and Second National Biodiversity Strategy and Action Plan (NBSAP-2).*
***Sectoral policies include National Policy on Environment (2007), National Forestry Policy (2014), Health National Adaptation Plan (2017), National Energy Policy (2019), Second National Agriculture Policy (2016), Transport Policy (2019), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015), Technology Needs Assessment (2013), Climate Change Gender Action Plan (2018)*
ECON – economic transformation, HUMA – Human development and skills, ENVI – environmental sustainability and NEXU – land-water-food nexus
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4.2 Data availability

4.2.1 Green growth indicators and sustainability targets

The information on the availability and sources of data for the 80 green growth indicators used to compute the Zambia Green Growth Index is presented in Table 7. For efficient and sustainable resource use, few indicators have data for the most recent year, 2021, and others have data only until 2018, 2019, and 2020. The total material footprint (MF) per capita (ME2) data is only available until 2015. The data are available for irregular year intervals for efficiency in sustainable transport (EE3). Almost all other indicators have data from 2010, which is the data covered for the previous years in the Zambia Green Growth Index. The data for the indicators were collected from online databases of various international organizations. For SDG indicators, data from the UNSTATS database were prioritized. Other databases that cover many indicators for efficient and sustainable resource use include WB Open Data, FAO Aquastat, FAOSTAT, and Our World in Data. Due to a lack of data on sanitation coverage (ME4) for Zambia from international online sources, the data were drawn from the statistics of the Zambia National Water Supply and Sanitation Council. The most recent data for natural capital protection were between 2017 and 2021. There needs to be more data for the municipal solid waste (MSW) generation per capita tons per capita (EQ3), with only one data point in 2018. Due to the importance of this indicator, it was assumed that the value in 2018 holds for all years from 2010 to 2021. This is an SDG indicator, so data availability is expected to improve in the coming years. For three indicators, the proportion of forest area with a long-term management plan (BE3), the share of terrestrial protected areas to total territorial area (CV2), and the share of exports of cultural goods to exports of total goods (CV5), data are available for some year intervals. In addition to Climate Watch Data, many indicators for natural capital protection were downloaded from the UNSTATS database, WB Open Data, and Our World in Data. Except for MSW generation per capita tons per capita (EQ3), data for most indicators covered the years from 2010.

In the case of green economic opportunities, besides specialized databases for economic indicators, the data were mainly downloaded from the UNSTATS database and WB Open Data (Table 7). The data for the allocation to education as a percentage of budget expenditure (GN3) were drawn from the database of the Zambia Minister of Finance and National Planning due to a lack of data from international sources. As for the natural capital protection, the most recent data for green economic opportunities were between 2017 and 2021. Moreover, there is also one indicator with only one data point. The data for renewable energy employment by technology (GJ1) is only available for 2021, and this value was thus used to represent other years. The share of youth not in education, employment, or training (GJ4) and the share of patents on environment-related technologies to total technologies (GN1) have incomplete time-series data. Among the four dimensions, the data for social inclusion were mainly available from the UNSTATS database and WB Open Data. The data for mobile broadband penetration per 100 users (AB4) were drawn from the Zambia Information and Communications Technology Authority (ZICTA) Statistics. The most recent available data were between 2017 and 2021, except for the number of victims of intentional homicide per 100,000 population (SP4), which was only until 2015. The data for the prevalence of stunting, height for age (AB3), proportion of population above statutory pensionable age receiving a pension (SP1), universal health coverage service (SP2), proportion of the urban population living in slums (SP3), number of victims of intentional homicide per 100,000 population (SP4), and internally displaced persons, new displacement associated with disasters (SP5) are available for different year intervals. The data for all other indicators for social inclusion cover the years from 2010.

Table 7 Data availability and sources of the green growth indicators

Indicator Code	Available years	Source of downloaded data	Relationship to green growth	Sustainability targets	Source of the targets
EFFICIENT AND SUSTAINABLE RESOURCE USE					
EE1*	2000-2019	UNSTATS database	negative	1.778	top 5 countries
EE2*	2000-2019	UNSTATS database	positive	91.3	top 5 countries
EE3	2010, 2014, 2016, 2018	WB Logistics Performance Index	positive	5	Highest score
EE4	2000-2020	Our World in Data	positive	100	top 5 countries
EE5	1995-2020	Our World in Data	negative	22.237	top 5 countries
EW1*	2000-2019	UNSTATS database	positive	110.35	top 5 countries
EW2*	2000-2019	UNSTATS database	negative	25-75	SDG target
EW3	1960-2021	WB Open Data	positive	1.30E-05	top 5 countries
EW4	1992-2019	FAO Aquastat	positive	5.81	top 5 countries

Table 7 Data availability and sources of the green growth indicators *(continued)*

Indicator Code	Available years	Source of downloaded data	Relationship to green growth	Sustainability targets	Source of the targets
EW5	1961-2019	FAO Aquastat	positive	161071.1	top 5 countries
SL1	1961-2018	FAOSTAT	negative	0-5	Expert opinion
SL2	2005-2018	FAOSTAT	positive	10.39899	top 5 countries
SL3	1961-2020	WB Open Data	positive	10863.91	top 5 countries
SL4	2000-2020	FAOSTAT	positive	121637.9	top 5 countries
SL5	2000-2018	UNSTATS database	positive	100	SDG target
ME1*	2000-2019	WB Open Data and OECD database	negative	0.700729	top 5 countries
ME2*	1990-2015	UNEP Global Material Flows Database	negative	0.997	top 5 countries
ME3*	2014-2018	FAOSTAT	negative	10.063357	top 5 countries
ME4	2008-2021	Zambia National Water Supplyv and Sanitation Council	positive	100	National target
ME5	2000-2020	WASH Data	positive	100	top 5 countries
NATURAL CAPITAL PROTECTION					
EQ1*	1990-2017	WB Open Data	negative	10	SDG target
EQ2*	1990-2019	Institute for Health Metrics and Evaluation GHDx database	negative	0	SDG target
EQ3*	2018	WB What a Waste Global Database	negative	0.069	top 5 countries
EQ4	2000-2020	WB Open Data	negative	0	SDG target
EQ5	2008-2020	WB Open Data	positive	100	SDG target
GE1*	1990-2021	Climate Watch Data and WB Open Data	negative	0.06	top 5 countries
GE2*	1990-2021	Climate Watch Data and WB Open Data	negative	0.126	top 5 countries
GE3	1990-2018	Climate Watch Data and WB Open Data	negative	0	Expert opinion
GE4	1980-2019	Our World in Data	negative	0.36416	top 5 countries
GE5	2000-2020	Our World in Data	negative	19.07	top 5 countries
BE1*	2000-2021	UNSTATS database	positive	100	SDG target
BE2*	1990-2020	WB Open Data	positive	17	SDG target
BE3*	2000, 2010, 2015, 2016, 2017, 2018, 2019, 2020	UNSTATS database	positive	100	SDG target
BE4*	2010, 2020	UNSTATS database	positive	1.576466	top 5 countries
BE5*	2000-2021	UNSTATS database	positive	0.316194	top 5 countries
CV1*	1993-2021	UNSTATS database	positive	1	SDG target
CV2*	2016, 2017, 2018, 2019, 2020, 2021	WB Open Data	positive	17	SDG target

Table 7 Data availability and sources of the green growth indicators *(continued)*

Indicator Code	Available years	Source of downloaded data	Relationship to green growth	Sustainability targets	Source of the targets
CV3	1995-2020	WB Open Data	positive	11.36	top 5 countries
CV4	1991-2019	WB Open Data	positive	77.58	top 5 countries
CV5	2013, 2014, 2015, 2016, 2017, 2018, 2019	UNESCO UIS Data	positive	5.85	top 5 countries
GREEN ECONOMIC OPPORTUNITIES					
GV1	2010-2020	WB Open Data	positive	24.8	top 5 countries
GV2*	2000-2020	UNSTATS database	positive	860.39	top 5 countries
GV3*	2002-2020	UNSTATS database	positive	192.7	top 5 countries
GV4*	2001-2020	UNSTATS database	positive	1.42682	top 5 countries
GV5	2000-2018	UNCTADSTAT	positive	100	Highest score
GT1	2000-2019	COMTRADE DATA	positive	7.89	top 5 countries
GT2	1966-2020	WB Open Data	negative	0.034056	top 5 countries
GT3	1990-2019	WB Open Data	positive	68.3123	top 5 countries
GT4	2006-2020	WB Open Data	positive	12.1	top 5 countries
GT5	1966-2020	WB Open Data	positive	85.2	top 5 countries
GJ1	2021	IRENA database	positive	340.23	top 5 countries
GJ2*	2000-2021	UNSTATS database	negative	0	SDG target
GJ3	1991-2019	WB Open Data	negative	0	top 5 countries
GJ4*	2008, 2017, 2018, 2019, 2020	WB Open Data	negative	0	SDG target
GJ5*	2006-2020	UNSTATS database	positive	15.47	top 5 countries
GN1	1997, 2009, 2015, 2017, 2018	IRENA database	positive	100	top 5 countries
GN2	2007-2017	WB GovData360	positive	7	Highest score
GN3	2006-2021	Zambia Minister of Finance and National Planning	positive	20	National target
GN4*	2000-2019	UNSTATS database	positive	37.96	top 5 countries
GN5	1960-2021	WB Open Data	negative	0.000742	top 5 countries
SOCIAL INCLUSION					
AB1*	2000-2021	UNSTATS database	positive	100	SDG target
AB2*	2000-2021	UNSTATS database	positive	100	SDG target
AB3	1992, 1995, 1996, 1999, 2002, 2007, 2013, 2018	WB Open Data	negative	0	Expert opinion
AB4	2011-2021	Zambia Information and Communications Technology Authority (ZICTA) Statistics	positive	100	National target
AB5	1995-2021	WB TCdata360	positive	100	Highest score
GB1*	2000-2021	UNSTATS database	positive	50	SDG target
GB2*	2000-2021	UNSTATS database	negative	1	SDG target

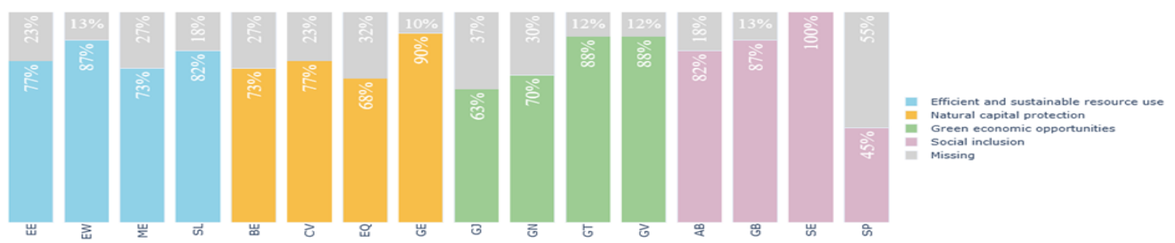
Table 7 Data availability and sources of the green growth indicators *(continued)*

Indicator Code	Available years	Source of downloaded data	Relationship to green growth	Sustainability targets	Source of the targets
GB3	1971-2021	WB Women, Business and the Law	positive	100	Highest score
GB4*	2000-2017	UNSTATS database	negative	0	SDG target
GB5	1970-2017	WB Open Data	negative	1	Expert opinion
SE1	1984-2021	WB Open Data	negative	1.278115	top 5 countries
SE2*	2000-2021	UNSTATS database	negative	1	Top 5 countries
SE3*	2000-2021	UNSTATS database	negative	1	Expert opinion
SE4	2010-2021	ILOSTAT	negative	0	Expert opinion
SE5*	2000-2021	UNSTATS database	negative	1	SDG target
SP1*	2000, 2016, 2020	UNSTATS database	positive	100	SDG target
SP2*	2000, 2005, 2010, 2015, 2017, 2019	UNSTATS database	positive	100	SDG target
SP3*	(2000-2020), 2 Years range	UNSTATS database	negative	0	SDG target
SP4*	1990-2015	UNSTATS database	negative	0	SDG target
SP5	2008-2010, 2013-2015, 2017-2021	WB Open Data	negative	0	Expert opinion

**SDG indicators*

Figure 15 summarizes the data availability and gaps for the different green growth indicators in each pillar. The indicators for social equity (SE) had complete data for 2010-2021. Indicators for GHG emissions reduction (GE), green trade (GT), green investment (GV), efficient and sustainable water use (EW), and gender balance (GB) also had relatively complete databases. The indicators with the most significant data gaps are those in social protection (SP). To allow computation of the Green Growth Index, simple imputations were done to fill in the data gaps. The imputation methods are discussed in Annex 1.

Figure 15 Data gaps for the indicators by pillars, 2010-2021



Green growth pillars:
EE – efficient and sustainable resource use, EW – efficient and sustainable water use, ME – waste and material use efficiency, and SL – sustainable land use
BE – biodiversity and ecosystem protection, CV – cultural and social value, EQ – environmental quality, and GE – greenhouse gas emissions reduction
GJ – green employment, GN – green innovation, GT – green trade, and GV – green investment
AB – access to basic services and resources, GB – gender balance, SE – social equity, and SP – social protection

Through normalization, the different units of the green growth indicators, as shown in Table 2, have been rescaled to a uniform unit with a scale of 1 to 100 to allow their aggregations (see methods in Annex 1). In addition, the green growth indicators were benchmarked against sustainability targets so that the normalized scores would measure how far the indicators are from the sustainability targets (i.e., distance to targets). For example, a score of 100 would mean that the sustainability target for an indicator was achieved. Table 7 shows the different sustainability targets used to benchmark the 80 green growth indicators. The identification of sustainability targets was based on the following rules:

1. For SDG indicators

a. Explicit targets defined in SDG documents or relevant literature, e.g., 17 percent for the share of forest to total land area.
b. Implicit targets which are the expected norm, e.g., 0 percent for the proportion of the urban population living in slums.
c. If explicit and implicit targets are not available, the average value of the top 5 performing developing countries, which the participants selected as the target to benchmark Zambia's performance

2. For non-SDG indicators

a. Expert opinion from the publisher of the indicator, e.g., 0-5 tons per hectare for nutrient balance per unit area according to FAO, zero for the share of unemployment to represent expected norm
b. National targets, e.g., 20 percent for the allocation to education as percentage of budget expenditure as a policy target
c. Average value of top 5 performing developing countries, which was selected by participants as target to benchmark Zambia's performance

Table 7 also presents the relationship of the indicators to green growth. For example, indicators with zero as sustainability targets have a negative relationship to green growth, aiming to reduce the indicators' values as low as possible. For indicators with a positive relationship, the aim is to achieve the highest possible value or, in the case of SDG targets, agreed global targets for the indicators. Out of the 80 indicators for the Zambia Green Growth Index, almost half (38) is SDG indicator. Using the SDG indicators will ensure the policy relevance of the indicators and data availability for future updates of the Index.

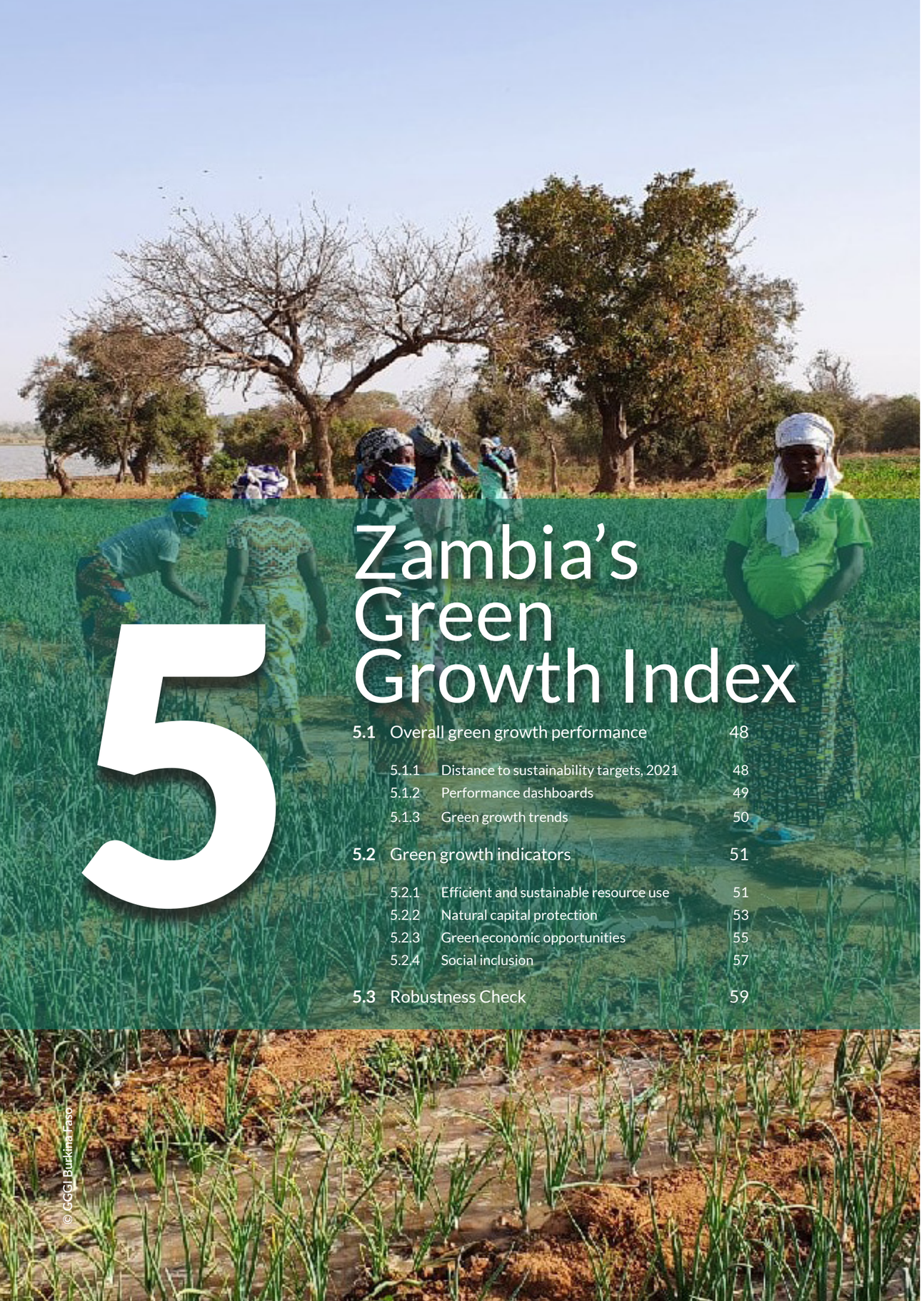
4.2.2 Green growth indicators and proxy variables

Ten SDG indicators, which the participants selected, were not included in the Zambia Green Growth Index due to a lack of data (Table 8). Altogether, however, 28 green growth indicators were excluded from the Index because there is no available data for Zambia. The proxy variables used in lieu of these indicators will be replaced as the data availability for the indicators improves in the coming years. The proxy variables were drawn from the list, which was presented to the participants as alternative indicators during the first participatory workshop. The participants rated the policy relevance of the proxy variables through an online survey (see Annex 2). The green economic opportunities have the highest number of proxy variables (8), followed by efficient and sustainable resource use (7) and natural capital protection (7). Social inclusion has the lowest number of proxy variables (6).

Table 8 Proxy variables for green growth indicators with insufficient data

Indicator Code	Name of proxy variables	Initial green growth indicators
EFFICIENT AND SUSTAINABLE RESOURCE USE		
EW3	Capture fisheries in tons as proportion of GDP	Sustainable fisheries as a proportion of GDP*
EW4	Irrigated agriculture water use efficiency*	Type of Irrigation used in farms, by technology
EW5	Total renewable water resources per capita	Proportion of bodies of water with good ambient water quality*
SL3	Cereal yield	Production levels to meet food security and products for export
SL5	Natural capital productive capacity index	Proportion of farmers using mechanized farming systems
ME4	Sanitation coverage	Municipal solid waste recycled*
ME5	Trends in sewer, septic tank and latrine coverage	Proportion of wastewater treated including reuse/recycling*
NATURAL CAPITAL PROTECTION		
EQ4	Share of urban population practicing open defecation	Share of municipal solid waste disposed off safely*
EQ5	People with basic handwashing facilities including soap and water	percentage of waste reused or disposed through proper methods
GE5	Carbon intensity of electricity	Reduced emissions from renewable energy
BE4	Annual forest area change rate*	Proportion of forest area within legally established protected areas*
CV3	International tourism arrivals to total population	Number of tourists visiting eco-tourism, cultural and historical sites
CV4	Share of employment in services to total employment	Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding*
CV5	Share of exports of cultural goods to exports of total goods	Annual growth rate of handicraft production
GREEN ECONOMIC OPPORTUNITIES		
GV5	Transport productive capacity index	Proportion of paved roads to total national road network
GT2	Share of ores and metals exports to merchandise exports	Hazardous waste exported*
GT3	Share of medium and high-tech exports to manufactured exports*	Share of suppliers with ISO14001 certification, which specifies demands to environmental management
GT5	Share of manufactures exports to total merchandise exports	Share of processed agricultural exports to total exports
GJ4	Share of youth not in education, employment, or training to total youth population*	Participation rate in formal and non-formal education and training
GN1	7 years rolling average of share of environment related technologies to all technologies	Share of patent publications in environmental technology to total patents
GN3	Allocation to education as percentage of budget expenditure	Researchers (in full-time equivalent) per million inhabitants
GN5	Charges for the use of intellectual property, Balance of Payments (BoP)	percent of MSMEs utilizing the services of Research and innovation facilities
SOCIAL INCLUSION		
AB4	Mobile broadband penetration/100 user	Universal access to sustainable transport
AB5	Property rights score	Proportion of people with secure tenure rights to land out of total adult population*
GB4	Maternal mortality ratio per 100,000 live births	Proportion of mothers with newborns receiving maternity cash benefit
SE3	Disparity of unemployment: Ratio of Youth (15-24 years old) and above 25 years old unemployment	Share of youth (aged 15-24 years) not in education, employment or training
SE5	Unemployment rate, by disability, ratio of persons with disability to persons without disability	Proportion of population with severe disabilities receiving disability cash benefit*
SP5	Internally displaced persons, new displacement associated with disasters	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies*

**SDG indicators*



5 Zambia's Green Growth Index

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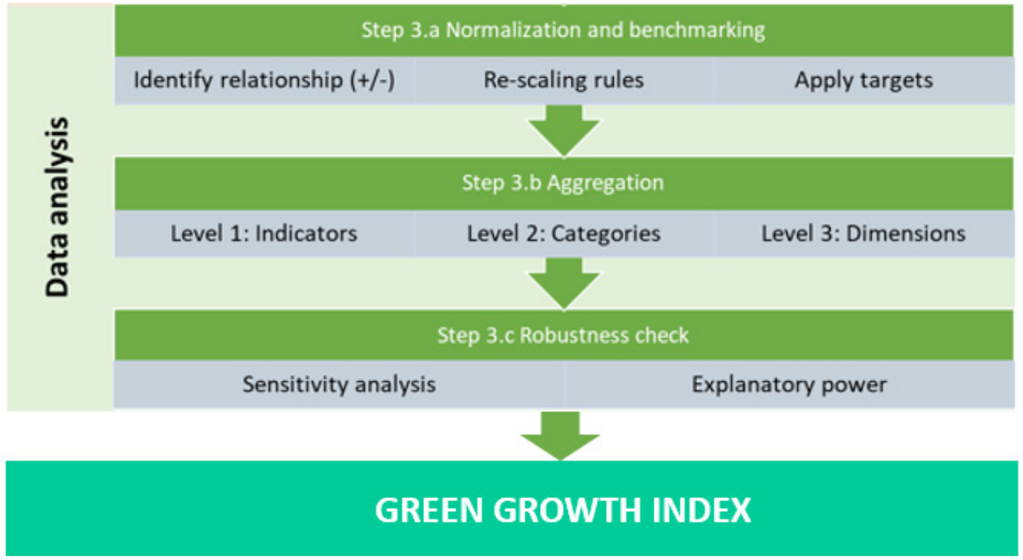
This chapter presents the scores computed from the green growth indicators from 2010 to 2021 for the Zambia Green Growth Index. The scores are discussed for the different levels of aggregation, including pillars (combining normalized scores of indicators), dimensions (combining average scores of the pillars), and Index (combining average scores of the dimensions). The results presented here are the outcome of Step 3 of the analytical methods (Figure 16 and Annex 1).

Figure 16 Data analysis of the green growth indicators



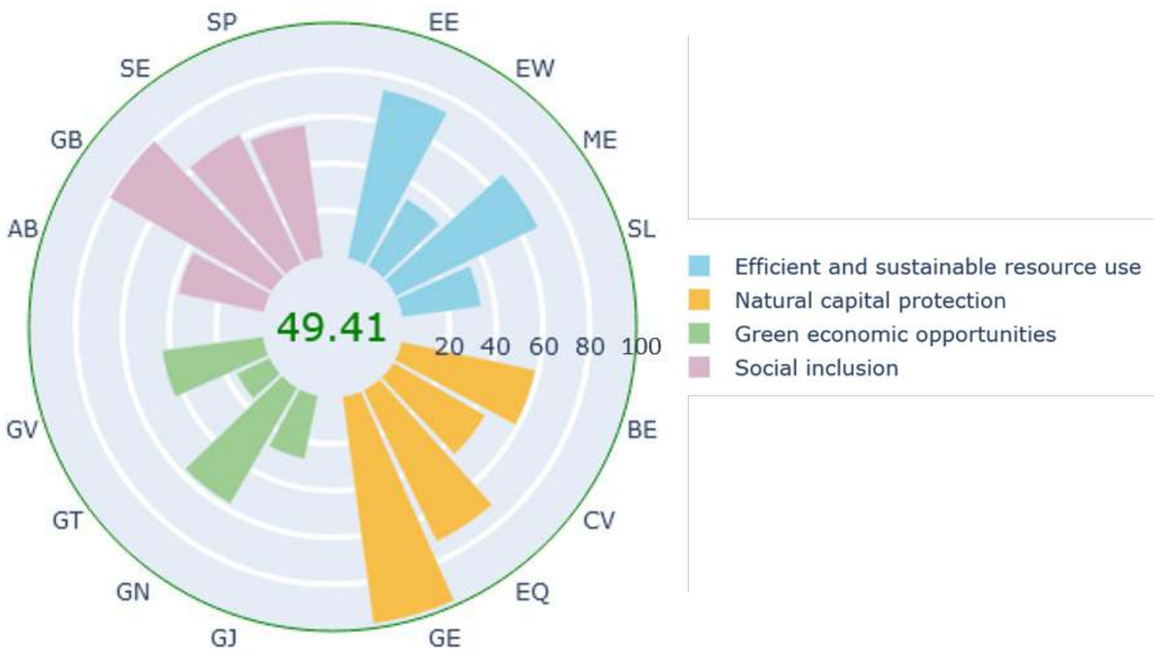
Note: Complete diagram and description of analytical methods are in Annex 1.

5.1 Overall green growth performance

5.1.1 Distance to sustainability targets, 2021

Figure 17 shows that Zambia's score for the Green Growth Index in 2021 was 49.41. The score was computed from the average scores of the four green growth dimensions – efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. Figure 17 also shows the distance to sustainability targets to measure how far Zambia is in achieving the targets, i.e., a score of 100 implies that the sustainability target has been achieved for the different pillars in each dimension. The scores are interpreted as follows: 1-20 very low, 21-40 low, 41-60 moderate, 61-80 high, and 81-100 very high performance in achieving sustainability targets for green growth transition. Zambia's moderate score for the Green Growth Index in 2021 was attributed to the very high score in GHG emissions reduction (GE) and high scores in gender balance (GB), environmental quality (EQ), efficient and sustainable energy (EE), and waste and material use efficiency (ME). With a score of 98.11 for GHG emissions reduction, Zambia had almost reached the target for the indicators in this pillar, which include the ratio of CO2 and Non- CO2 emissions to population, CO2 emissions growth rate, and carbon intensity of energy and electricity production. The good performance in GHG emissions reduction and four other pillars compensated for the very low score in green trade (GT) and low scores in green employment (GJ), efficient and sustainable water use (EW), and sustainable land use (SL). With a score of only 15.7, Zambia performed the weakest in green trade in 2021. Green trade performance was measured by the share of export of environmental goods to total export, the share of ores and metals exports to total merchandise exports, the share of manufactured exports to total merchandise exports, the share of medium and high-tech exports to total manufactured exports, and the capacity in doing business as represented by new business density. Putting priority to overcoming the constraints to economic transformation, one of the key priorities in Zambia's 8NDP, such as low diversification and industrialization, would help to improve performance in green trade.

Figure 17 Distance to sustainability targets by pillars

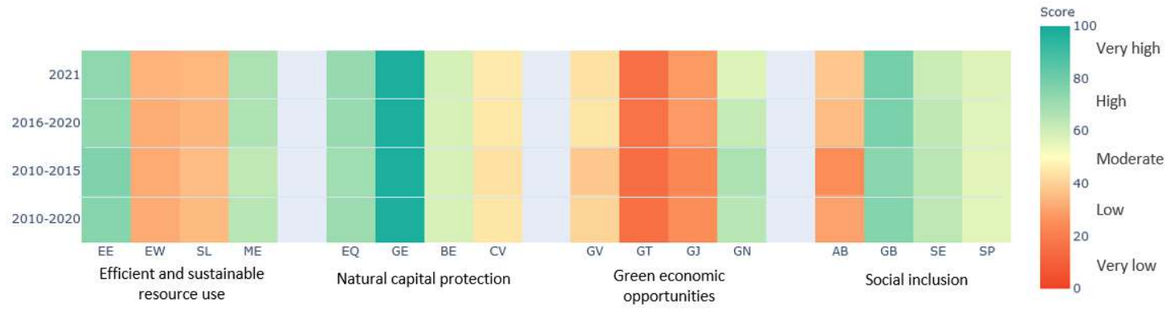


Green growth pillars
EE – efficient and sustainable resource use, EW – efficient and sustainable water use, ME – waste and material use efficiency, and SL – sustainable land use
BE – biodiversity and ecosystem protection, CV – cultural and social value, EQ – environmental quality, and GE – greenhouse gas emissions reduction
GJ – green employment, GN – green innovation, GT – green trade, and GV – green investment
AB – access to basic services and resources, GB – gender balance, - SE – social equity, and SP social protection

5.1.2 Performance dashboards

Figure 18 compares Zambia's scores for the pillars in 2021 against the average scores for the periods 2016-2020, 2010-2015, and 2010-2020. Overall, only minimal difference can be observed for most pillars over these periods, with the scores remaining mostly within the score ranges. For efficient and sustainable resource use, material use efficiency (ME) had the most discernable improvement between 2010-2015, with a score of 63.44, and in 2021 with a score of 67.72. Nonetheless, both scores remained at a high level. There was an insignificant decline in the efficient and sustainable energy (EE) scores from 77.00 in 2010-2015 to 73.88 in 2021, which is almost unnoticeable from the figure. The score for this pillar remained at a high level over these periods. The scores for efficient and sustainable water use (EW) and sustainable land use (SL) remained low. For natural capital protection, except for social and cultural value (CV), with a minimal increase in 2021 compared to the average scores between 2010 and 2015, all pillars showed no visible changes. This means that the very high score of about 98 for GHG emissions reduction (GE) had been consistent over the different periods. For the two other dimensions, green economic opportunities and social inclusion, there are more noticeable changes in scores for at least two pillars. For example, the green investment (GV) scores in the green economic opportunities dimension increased by six points from 37.69 in 2010-2015 to 43.72 in 2021, shifting the level of performance from low to moderate. In contrast, while the scores for access to basic services and resources (AB) in the social inclusion dimension increased by 13 points from 24.72 in the period 2010-2015 to 37.75 in 2021, the performance in this pillar remained at a low level.

Figure 18 Performance dashboard by pillars



Indicator categories
EE – efficient and sustainable resource use, EW – efficient and sustainable water use, ME – waste and material use efficiency, and SL – sustainable land use
BE – biodiversity and ecosystem protection, CV – cultural and social value, EQ – environmental quality, and GE – greenhouse gas emissions reduction
GJ – green employment, GN – green innovation, GT – green trade, and GV – green investment
AB – access to basic services and resources, GB – gender balance, SE – social equity, and SP – social protection

5.1.3 Green growth trends

Figure 19 shows the increasing trend in the scores for the Green Growth Index in Zambia, from 44.81 in 2010 to 49.41 in 2021. These Index scores were from the geometric average of the scores for the four green growth dimensions, which are presented in Figure 20. During 2010-2021, the trend in the Index scores was mainly driven by the changes in green economic opportunities and social inclusion. The trends in scores for these dimensions showed big jumps over time as compared to those for efficient and sustainable resource use and natural capital protection, which remained relatively stable. As discussed in the previous section, green investment and access to basic services and resources were the main drivers for the increasing trend in green economic opportunities and social inclusion, respectively (Figure 18). Despite the remarkable improvement in performance in social inclusion from 2016 to 2018, increasing from 52.65 to 58.01, natural capital protection remained the highest contributor to Zambia's moderate Index score. The performance in social inclusion and green economic opportunities showed a declining trend from 2018, with the latter showing a more significant drop in scores than the former. In contrast, while the trends in natural capital protection and efficient and sustainable resource use were relatively flat and stable, they did not show a decline from 2018. This contributed to the steady increase in the Index score, albeit minimal, until 2021. Reversing the declining trends in social inclusion and green economic opportunities, as they did in 2016, would contribute to a more significant improvement in the Green Growth Index of Zambia.

Figure 19 Trend in the Green Growth Index in Zambia, 2010-2021

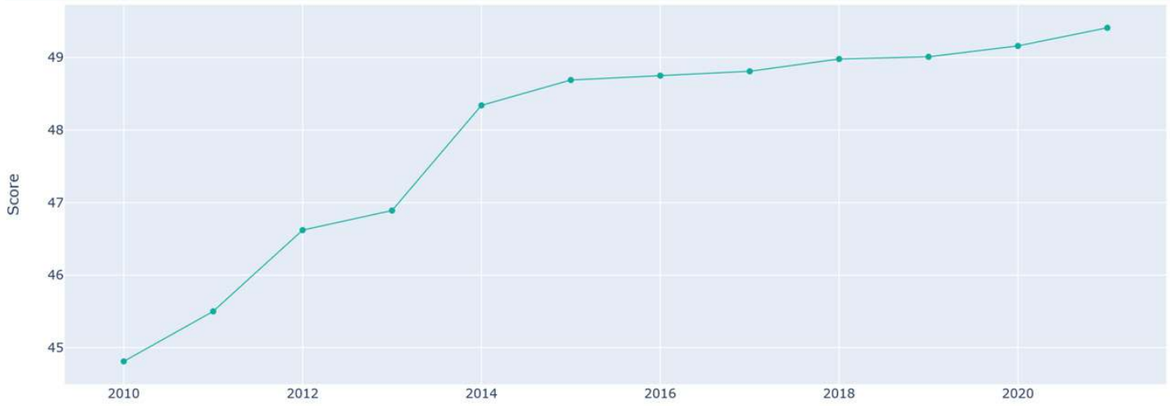
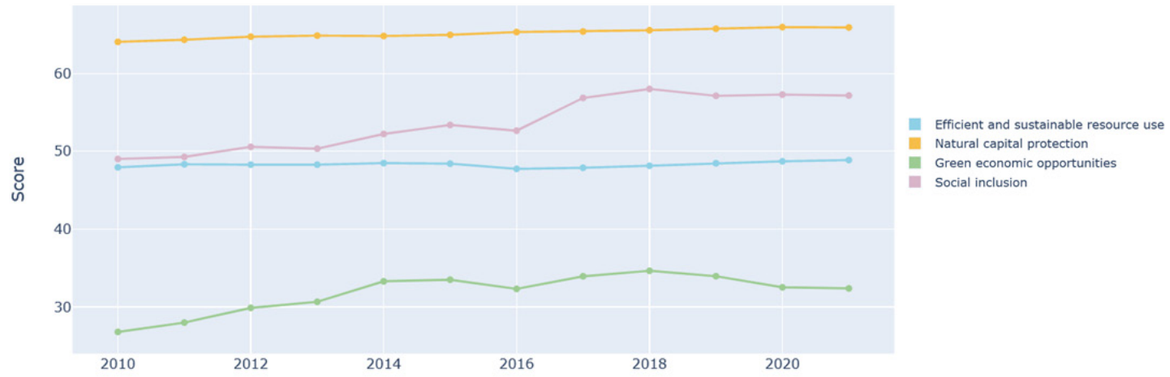


Figure 20 Trend in the green growth dimensions in Zambia, 2010-2021

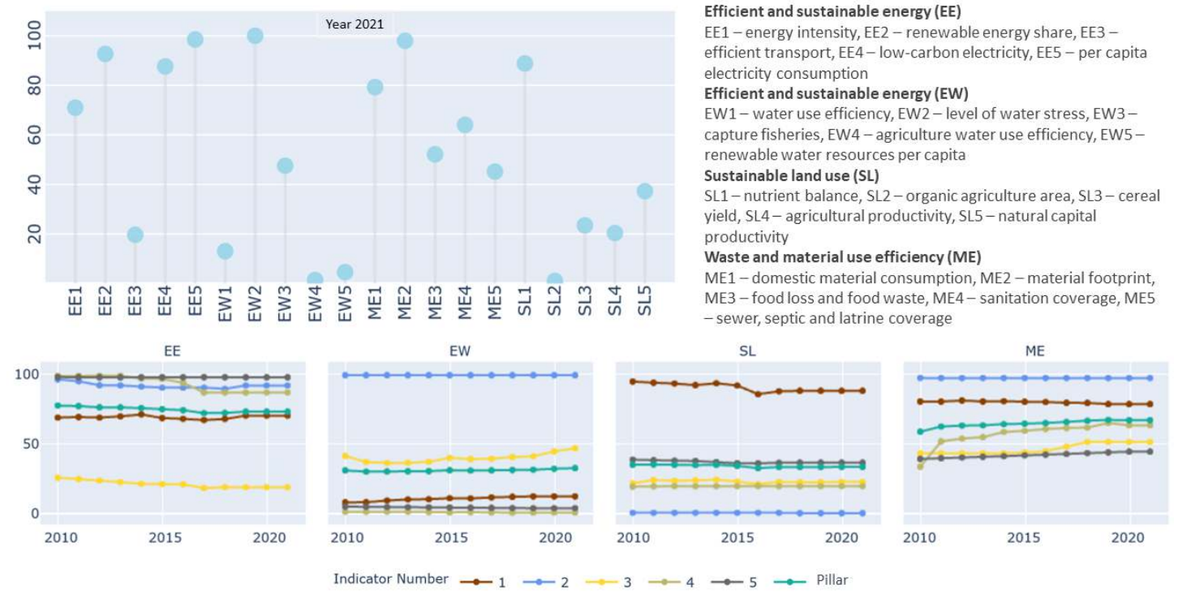


5.2 Green growth indicators

5.2.1 Efficient and sustainable resource use

Figure 21 presents the scores for the 20 green growth indicators in the efficient and sustainable resource use dimension. The country's high performance on efficient and sustainable energy (EE), as shown in Figure 17, was due to very high score in reducing per capita electricity consumption (EE5) and high scores in increasing the share of renewables in energy consumption (EE2) and share of low-carbon electricity generation (EE4) (Figure 21). Around 84.5 percent of Zambia's energy consumption came from renewable sources in 2019, mainly hydropower.[34] Figure 21 shows that the per capita electricity consumption scores were consistently very high at around 98.5 from 2010 to 2021. Performance in efficiency in sustainable transport (EE3) had been the weakest in Zambia, with a score of only 19.68 in 2021. There has been a steady decline in performance in this indicator since 2010, when the score stood at 26.49 in 2010. The workshop participants recognized that there would be significant opportunities to improve green growth by improving efficiency in sustainable transport in Zambia. Improving transportation and logistics is one of the stated goals in several national policies (e.g., Vision 2030, 8NDP, NDC, and NAP) and sectoral policies (i.e., National Transport Policy, Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation) (Table 3). In Vision 2030, a "robust and competitive transport and communications network" had been considered necessary. In the 8NDP, Zambia is envisaged as the "regional transport and logistics hub … through the maintenance, development, modernization, and integration of road, rail, air and water transport infrastructure". In the updated NDC, "major mitigation themes" include an "improved transport infrastructure". And even in the NAP, designing and promoting (on-farm) transportation is recognized to support achieving another SDG indicator, particularly reducing food loss by minimizing and preventing post-harvest losses.

Figure 21 Scores for indicators in the efficient and sustainable resource use dimension



Efficient and sustainable energy (EE)
EE1 – energy intensity, EE2 – renewable energy share, EE3 – efficient transport, EE4 – low-carbon electricity, EE5 – per capita electricity consumption
Efficient and sustainable energy (EW)
EW1 – water use efficiency, EW2 – level of water stress, EW3 – capture fisheries, EW4 – agriculture water use efficiency, EW5 – renewable water resources per capita
Sustainable land use (SL)
SL1 – nutrient balance, SL2 – organic agriculture area, SL3 – cereal yield, SL4 – agricultural productivity, SL5 – natural capital productivity
Waste and material use efficiency (ME)
ME1 – domestic material consumption, ME2 – material footprint, ME3 – food loss and food waste, ME4 – sanitation coverage, ME5 – sewer, septic and latrine coverage

In 2021, the low score of 33.33 for efficient and sustainable water use (EW) (Figure 17) can be traced from the very low scores for three green growth indicators – water use efficiency (EW1) at 13.07, irrigated agriculture water use efficiency (EW4) at 1.45, and renewable water resources per capita (EW5) at 4.61 (Figure 21). With its large river (Zambezi), tributaries (Luangwa and Kafue), and lakes (Tanganyika, Mweru, Bangweulu, and Kariba), Zambia is rich in water resources (see section 3.1.3 Environment). But available water resources per capita had been steadily declining, from 32,140 to 5,867 m^3 per inhabitant per year from 1962 to 2019.[35] Population growth and climate change are contributing to this declining trend. With the government's plan to gradually expand irrigated areas throughout the country to boost agricultural production and productivity (see 3.3.4 Water-land-food nexus), water use efficiency in the agriculture sector will be critical to improving performance in the green growth indicators with very low scores. During the second participatory workshop, the participants highlighted that Zambia could improve these scores by introducing affordable water-saving technologies and infrastructures, e.g., harvest rainfall (see Box 1). The issues of efficient and sustainable water use are recognized in Vision 2030, which aims to establish a fully integrated and sustainable water and resource management programs, and the 8NDP, which aims to engage "communities in activities such as water harvesting, integrated water resources management including scaled-up irrigation development and climate-smart agriculture". The sectoral policies relating to agriculture, environment, and REDD+ also tackled water sustainability and efficiency (Table 3). Effective implementation of the national and sectoral policies could help raise the scores for many water-related indicators, which remained relatively stable at very low levels from 2010 to 2021 (Figure 21). Zambia's performance had been consistently very high for the level of water stress, or freshwater withdrawal as a proportion of available freshwater resources (EW2). With a score of 100, it has achieved the SDG target for this green growth indicator from 2010 to 2021.

Zambia also had a low performance in efficient and sustainable land use (SL), with a score of only 34.2 in 2021 (Figure 17). Like in efficient and sustainable water use, the country is challenged to improve performance in all green growth indicators except for the nutrient balance per unit area (SL1) (Figure 21). The score for the share of organic agriculture to total agriculture land area (SL2) is very low, at only 1.05 in 2021. The other three remaining green growth indicators, including cereal yield (SL3) with a score of 23.49, agricultural productivity (SL4) with a score of 20.4, and natural capital productive capacity (SL5) with a score of 37.27, showed low levels of performance. The workshop participants suggested that cereal yield could be improved with greater resource efficiency in production. Maize is the staple food in Zambia and plays a vital role in the country's economy and society. Most smallholder farmers grow maize, and the country is self-sufficient in its production. But as the population grows, farmers will have to use their land more efficiently by increasing yield and productivity. According to the participants, while productivity is important, it is also important to consider adopting new practices such as climate-smart and organic agriculture, which need proper education and training as well as change in farmers' lifestyles. Increasing cereal yield and, in general, agricultural productivity is addressed in both Vision 2030 and 8NDP (Table 3). But recognizing the interlinkages of food production to both water and land (see 3.3.4 Water-land-food nexus) would be a key to improving performance in efficient and sustainable resource use.

The performance in waste and material use efficiency (ME) was moderate at 67.72 in 2021 (Figure 17). Unlike the other pillars in efficient and sustainable resource use, there is no green growth indicator with a very low score. The lowest score was for the sewer, septic tank, and latrine coverage (ME5) which stood at 45.18. The workshop participants agreed that to improve performance in this indicator, the construction sector needs to implement more rules and regulations to manage the problem better. The indicator on sewer, septic tank, and latrine coverage is a proxy variable for the proportion of wastewater treated including reuse/recycling, which is a more relevant indicator for waste and material use efficiency but for which data is unavailable for Zambia. Average food loss to production and food waste to consumption (ME3) had moderate scores, with participants noting that food loss occurs across the harvesting, processing, and distribution. For example, more than 150,000 tons of maize were wasted in 2011 due to inadequate storage facilities or poor post-harvest management. Moreover, Zambia produces sufficient food to feed its population, but some of it goes to waste at both retailer and consumer levels. The Government considers reducing food loss an important adaptation measure, addressing the issue of improving post-harvest storage in the NAP (Table 3). Two indicators in the waste and material use efficiency measure the extent of extraction of natural resources, including total domestic material consumption per unit of GDP (ME1) and total material footprint per capita (ME2). The score for ME1 was high at 79.26 and for ME2 was very high at 97.95 in 2021. While both are SDG indicators, these were not covered in the national and sectoral policies.

Box 1 Summary of the discussion of one of the breakout session groups on water use

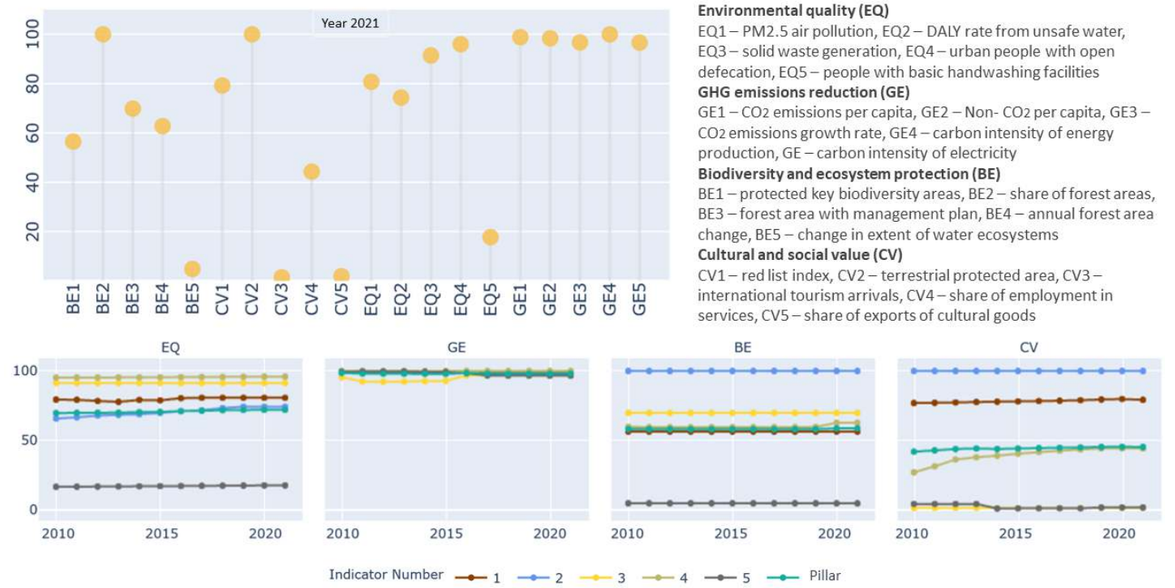
There is a need to balance the increase in productivity of local farming through efficiency in irrigation and water use. Certain rivers in Zambia should not be dammed, like the Luangwa river. In the future, Zambia's wildlife paradise and legendary safari mecca of Luangwa Valley may partially function as one giant tap for some of Zambia's growing water needs. In late 2017, the United Nations World Tourism Organization declared South Luangwa the world's first sustainable National Park.[36] The Luangwa Valley is home to several species on the IUCN Red List, such as wild dogs, grey crowned cranes, elephants, lions, leopards, hippos, and Maasai giraffe (formerly known as Thornicroft's giraffe).

5.2.2 Natural capital protection

GHG emissions reduction (GE), with a score of 98.11, is the best-performing pillar for natural capital protection (Figure 17). Multiple indicators for this pillar have almost reached the sustainability targets, and Zambia has a high potential to maintain its very high performance. Figure 22 shows that the ratio of CO_2 emissions to population, including AFOLU (GE1), ratio of non-CO_2 emissions (CH_4, N_2O, and F-gas) excluding AFOLU to population (GE2), CO_2 emissions growth rate (GE3), carbon intensity of energy production (GE4), and carbon intensity of electricity (GE5) have scores above 96 in 2021. The trend for these five GHG emissions reduction indicators has been consistently very high since 2010. This can be attributed to Zambia having a declining trend in total emissions per capita (1990-2018) and only a 0.19 percent share of the global GHG emissions.[37] As mentioned in the previous sections, around 84.5 percent of renewable energy comes from renewable sources in 2019, mainly hydropower. In addition, based on their updated NDC, Zambia plans to reduce emissions by 25 percent by 2030, or by 47 percent, with substantial international support with mitigation actions focusing on sustainable forest management, sustainable agriculture, and renewable energy and energy efficiency. In addition to the updated NDC, the 8NDP and NPCC as well as sectoral policies (e.g., Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation, National Energy Policy) address the issues of emissions reduction (Table 4). The participants noted that the opportunities to improve green growth performance in natural capital protection lie in the other pillars in this dimension. Nonetheless, they see the importance of monitoring the scores as some challenges may come in the future, which will affect the ability of the government to achieve its own NDC targets.

After GHG emissions reduction, Zambia performed best in environmental quality (EQ), with a high score of 72.06 in 2021 (Figure 17). The performance in PM2.5 air pollution, mean annual exposure (EQ1), municipal solid waste generation per capita tons per capita (EQ3), and urban people practicing open defecation urban (EQ4) were very high, with scores of at least 90 (Figure 22). But indicator for the people with basic handwashing facilities (EQ5) was very low, with a score of 17.78. The participants recognized the importance of indicators for Water, Sanitation and Hygiene (WASH) in Zambia. According to them, basic hand washing facilities including soap and water can reduce cholera and improve sanitation. Moreover, improved water and sanitation infrastructure can help prevent epidemics. Approximately 68 percent of households in Zambia have access to improved water supply,[38] but only 40 percent have improved sanitation. Zambia faces challenges in attaining universal access to safe and clean drinking water, as well as inadequate sanitation, especially in densely populated and unplanned settlements in urban settings. These conditions, coupled with the poor hygiene practices among citizens, have caused recurrent outbreaks of WASH related diseases. The 8NDP is addressing all environmental quality issues, including pollution from not only water (e.g., waste from manufacturing, mining, and agriculture as well as inefficient sewage treatment facilities) but also from soil (e.g., due to and lack of solid waste management) and air (e.g., emissions from mining, manufacturing, and transport sectors) (Table 4). Other national policies like the NAP and NBSAP also cover one to two indicators, Sectoral policies like the Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation and National Policy on Environment address the issues related to all five indicators.

Figure 22 Scores for indicators in the natural capital protection dimension



Environmental quality (EQ)
EQ1 – PM2.5 air pollution, EQ2 – DALY rate from unsafe water, EQ3 – solid waste generation, EQ4 – urban people with open defecation, EQ5 – people with basic handwashing facilities
GHG emissions reduction (GE)
GE1 – CO_2 emissions per capita, GE2 – Non- CO_2 per capita, GE3 – CO_2 emissions growth rate, GE4 – carbon intensity of energy production, GE – carbon intensity of electricity
Biodiversity and ecosystem protection (BE)
BE1 – protected key biodiversity areas, BE2 – share of forest areas, BE3 – forest area with management plan, BE4 – annual forest area change, BE5 – change in extent of water ecosystems
Cultural and social value (CV)
CV1 – red list index, CV2 – terrestrial protected area, CV3 – international tourism arrivals, CV4 – share of employment in services, CV5 – share of exports of cultural goods

With a score of 58.81, Zambia had only a moderate score for biodiversity and ecosystem protection in 2021 (Figure 17). It achieved the SDG target of 17 percent in the share of forest area to total land area (BE2), hence the score of 100 (Figure 22). High scores were also achieved in the proportion of forest area with a long-term management plan (BE3) and annual forest area change rate (BE4). Nonetheless, the participants of the 2nd participatory workshop highlighted the need to closely monitor these indicators to overcome the further deterioration of forests in the last decades (Box 2). The share of forest area to the total land area followed a slow but steady declining trend since 1991, and a sharper decline was even observed from 2010.[39] The performance in the share of key biodiversity areas in freshwater, terrestrial and mountain covered by protected areas (BE1) had been moderate. In biodiversity and ecosystem protection, Zambia had the lowest score of 4.88 in the extent of water related ecosystems over time including lakes and rivers permanent water areas (BE5) in 2021. And here, the trend was also only going down since 2004.[40] As mentioned in section 3.1.3 Environment, climate change impacts reduce flows and increase water ecosystems' drying-up. But the participants also mentioned the problems of "Kafue weeds". Aquatic weeds challenge the sustainable use of the Kafue River.[41] This free-floating perennial aquatic plant is native to South America but has spread to Zambia and countries worldwide.[42] The issues of biodiversity and ecosystem protection are receiving necessary attention from the government, as evidenced by the number of national and sector policies addressing them (Table 4).

Cultural and social value (CV) had only a moderate score of 45.41, representing the lowest score in the natural capital protection dimension in 2021 (Figure 17). The very low scores of less than 2 in international tourist arrivals (CV3) and cultural goods exports (CV5) contributed to the relatively weak performance in cultural and social value (Figure 22). During the participants' discussions, it was mentioned that tourism and cultural goods export pose challenges and opportunities because the products would require grading and standardization to meet international standards and attract investments. They suggested that a careful assessment of the current trends on the supply and demand side of the tourism sector would help drive sustainable economic opportunities and employment for local communities. Zambia's best performance in promoting natural capital's social and cultural value was in the share of protected areas to total terrestrial area (CV2), for which it scored 100 for achieving the SDG target of 17 percent. About 38 percent of its terrestrial area was covered by protected areas from 2000 to 2018 and increased to 41 percent from 2019 to 2021.[43] However, the participants noted that the performance in protected areas should not be isolated from the performance in the share of key biodiversity areas covered by protected areas (BE1). For the latter, as mentioned above, it had only a moderate score. This is because, while Zambia has protected 38 percent of its terrestrial area, only 56 percent of the protected areas are rich in biodiversity. Nonetheless, diverse species are maintained in the country, as shown by the high score of 79.26 on the Red List Index (CV1). Except for the share of employment in services to total employment (CV4), other indicators showed relatively identical scores from 2010 to 2021. The share of service employment had increased from 27 percent in 2010 to 44 percent in 2021. However, this is only a proxy variable for the SDG indicator in total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage, which did not have data for Zambia. The social and cultural value issues are also addressed in national and sectoral policies, although much less than in biodiversity and ecosystem protection and GHG emissions reduction (Table 4).

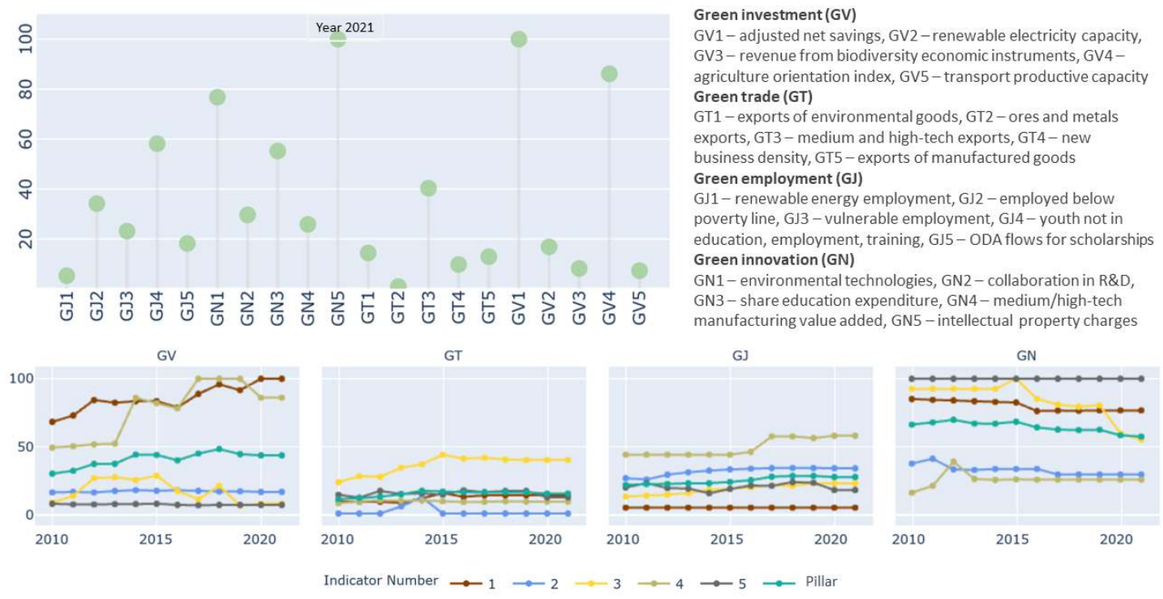
Box 2 Summary of the discussion in one of the breakout session groups on forest area

Deforestation rates are significant in Zambia, with approximately 300,000 hectares of forest cover lost yearly. Problems include low institutional capacity for forest monitoring, limited knowledge regarding forest resources and carbon stocks, and technical challenges such as mapping forest degradation caused by charcoal production in complex dry woodland ecosystems. Forest cover loss and forest degradation are the main processes causing forest and carbon stock change in Zambia.

5.2.3 Green economic opportunities

Zambia had a moderate score of 43.72 for green investment (GV) in 2021 (Figure 17). Adjusted net savings, including particulate emission damage (GV1) and agriculture orientation index for government expenditures (GV4), both with very high scores, were the green growth indicators that mainly contributed to this performance (Figure 23). Both indicators also followed an increasing trend since 2010. For the other three indicators, Zambia had very low values. While the country's performance in the share of low-carbon electricity generation is very high (see 5.2.1 Efficient and sustainable resource use), the installed renewable electricity-generating capacity (GV2) remained with a very low score of 16.9. Moreover, this latter indicator showed a declining trend from 2015 (Figure 23). Renewable electricity is mainly supported by hydropower, so investment in other renewable sources, such as solar, will help improve the capacity for renewable electricity. Zambia supported solar energy through the Scaling Solar program and the Zambian REFiT Strategy and installed 96 MW of solar power from 2019 to 2021.[44] The score for revenue generated and finance mobilized from biodiversity-relevant economic instruments (GV3) was also very low at 8.22. Eco-tourism is one of those instruments, but Zambia is yet to fully utilize this sector to generate revenue, particularly from "higher spending and more sustainability-aware European tourists".[45] In addition, the participants of the second participatory workshop recognized the significant role of green bonds in attracting private green investments (Box 3). They also agreed on the need to secure investments that will benefit the environment, but this all depends on the government's priorities. With a score of 7.34, the transport productive capacity index (GV5) had the lowest score among the green investment indicators. This is used as a proxy variable for the proportion of paved roads to total national road network, which does not have sufficient data for Zambia. But with the 8NDP aiming to improve transport and logistics, it is expected that performance in both these indicators could be improved.

Figure 23 Scores for indicators in the green economic opportunities dimension



Zambia had a very low performance on green trade (GT), with a score of 15.7 (Figure 17). This is the lowest score among pillars not only in green economic opportunities but also across all dimensions in 2021. None of the indicators for green trade had reached a moderate score, i.e., four indicators had very low scores, and one indicator had a low score (Figure 23). Ores and metals exports account for a considerable share of Zambia's merchandise exports (GT2), causing the score for this indicator to become as low as 1 in 2021. The country relies on copper exports, with traditional exports largely dependent on copper which, on average, accounts for more than 70 percent of total exports.[46] The workshop participants emphasized the need to diversify Zambia's export base because extracting and exporting copper is not sustainable. Moreover, they consider it essential to evaluate trade barriers, improve exports' added value, and impose product standards. Improving the added value of products could enhance performance in the share of manufactures exports to total merchandise exports (GT5), which had a very low score of 12.93 in 2021. Meanwhile, imposing product standards, particularly regarding their environmental impacts, could contribute to improving performance in the share of export of environmental goods to total exports (GT1), which score was also very low at 14.43. Zambia performed relatively better in the share of medium and high-tech exports to manufactured exports (GT3), with a score of 40.35. The scores for this indicator showed an increasing trend, which was not observed in the other green trade indicators. The 8NDP recognizes the issues on the share of ores and metals exports (GT2) and share of manufactures exports to total merchandise exports (GT5) as well as Doing business: New business density (GT4) (Table 5). In the latter's case, the government aims to create an enabling environment for forming businesses and cooperatives.

Zambia's green employment (GJ) performance was slightly better than in green trade. With a score of 27.81, the performance in creating employment from green economic opportunities is very low (Figure 17). A moderate score was achieved in reducing the share of youth not in education, employment, or training to the total youth population (GJ4). While the score was only 44.23 in 2010, it increased to 58.17 in 2021 (Figure 23). But in absolute terms (i.e., raw data and not benchmarked against the target), the indicator's value was very low, with about 29 percent of the youth not studying, working, or training in 2021. The participants suggested that jobs will need to be created for younger people to benefit from greening the economy. According to them, local skills development in light manufacturing presents an opportunity for jobs. Youth unemployment is very high, so local innovation technologies must be exploited to create jobs. The renewable energy sector could provide employment opportunities. The score for employment in the renewable energy sector (GJ1) was still very low at 5.3. But with further initiatives and programs to develop this sector, performance in creating green employment for the youth could be improved. For example, the government-owned utility firm, Zambia Electricity Supply Corp. (ZESCO), has planned to develop and construct 50 MW of PV plants in the Southern, Western, and Luapula provinces this year.[47] Another source of green employment for the youth will be eco-tourism, which remains underdeveloped in Zambia. The youth will also need opportunities to develop their innovative skills to participate in developing green sectors (i.e., renewable, eco-tourism, etc.). The volume of official development assistance flows for scholarships by sector and type of study (GJ5), one of the sources of skills development support for developing countries, had been low at 18.23 in 2021. The 8NDP recognizes that "skills training has the highest potential to capacitate the youth for employability" because many of the young Zambians could not complete primary or secondary education (Table 5). Green employment for not only the youth but also the adults should offer opportunities to improve the standard of living and provide stable income sources. The scores for the employed population below the international poverty line (GJ2) and the share of vulnerable employment to total employment (GJ3) showed a slight increase from 2010 to 2021. Still, they remained at low levels below 40. The 8NDP addresses both issues by focusing on developing micro, small and medium enterprises (MSMEs), providing better income, and regulating informal employment to provide income security.

For green economic opportunities, green innovation (GN) was the best-performing pillar, with a moderate score of 57.52 in 2021 (Figure 17). The score for the seven-year rolling average for the share of patents on environmental technologies (GN1) was 76.78 in 2021 (Figure 23). According to the OECD's database on green growth indicators, Zambia's share of environment-related technologies to all technologies was 75.19 in 2015, 33.33 in 2017, and 100 in 2018. The score for 2021 was based on the most recent available data in 2018. The participants emphasized that improving the scores on this indicator would encourage the uptake of more projects that provide innovative solutions. However, these innovations are costly and, thus, would require heavy support from the financial sector to succeed. The indicators on university-industry collaboration in R&D (GN2) and allocation to education as a percentage of budget expenditure (GN3) are both critical in creating enabling environment for innovation. Both indicators have experienced a decline in scores in the last decade. The score for the university-industry collaboration in R&D declined from 37.69 to 29.68, and that for the share in budget expenditure for education from a very high level of 92.63 to moderate 55.26. The score for the proportion of medium and high-tech manufacturing value added in total value added (GN4) was the lowest in green innovation. It was only 25.87 in 2021, albeit slightly higher than the score of 16.28 in 2010. The score for the charges for using an intellectual property (GN5) was very high in 2021 and has stayed stable at this level since 2010. A very high score for this indicator is linked to the development of patents in the country and the promotion and protection of intellectual property, which is addressed in the 8NDP. Almost all other indicators for green innovation are covered in the 8NDP (Table 5), i.e., "promote science, technology, and innovation as well as applied research and development", "promotion of STEM in institutions of learning to build a critical mass of qualified human resource for research and development, by leveraging on digitalization", "investment for research and development will be enhanced, including in institutions of higher learning", "partnerships between higher learning institutions and state and non-state actors will be promoted to enhance the uptake of research", etc.

Box 3 Summary of the discussion in one of the breakout session groups on green investment

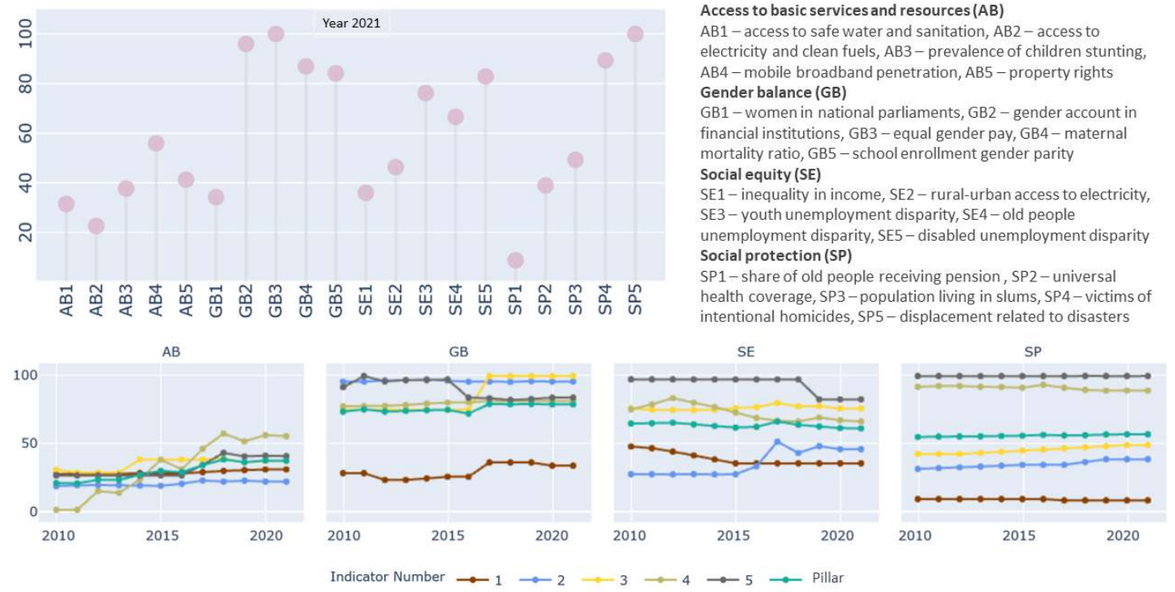
Green finance opportunities are available, but awareness is low. To speed up Zambia's climate change response, the Zambian Securities and Exchange Commission has introduced the option of issuing green bonds to finance business activities with environmental benefits. The emergence of green bonds as a platform for raising funds for projects with environmental advantages is part of the larger notion of green financing as a new financing mechanism to address climate change.

5.2.4 Social inclusion

Access to basic services and resources (AB), which creates an enabling environment for the poor and vulnerable people to benefit from and contribute to green economic opportunities, remained low in Zambia. Although there was an increasing trend in the performance in access to basic services and resources from 2010 (Figure 24), the score remained low at 37.75 in 2021 (Figure 17). Access to electricity and clean fuels (AB2), which had the lowest score of 22.57, contributed to this low performance. The participants noted that the Government set a goal for universal electricity access for all Zambians by 2030. They suggested that access to electricity in rural areas is crucial because it helps replace the consumption of kerosene, diesel, dry cell batteries, and alternative fuels such as firewood that contribute to deforestation. Because more than 90 percent of household fuels come from wood, reducing firewood collection from "woodland areas in forest reserves and open lands" is critical for biodiversity and ecosystem protection.[48] Like in access to electricity and clean fuels, access to safely managed water and sanitation (AB1) had been low, albeit with a slightly higher score of 31.46 in 2021. The participants highlighted that about 55 percent of urban dwellers live in slums with inadequate access to water and sanitation facilities. The national policies, including Vision 2030, 8NDP, and NPCC, recognize the challenges of limited access to water and sanitation services (Table 6). For example, the NPCC stated that the inaccessibility of safe water, combined with the problem of flooding, had caused an increase in water-borne diseases. In contrast, inadequate safe sanitary infrastructure, combined with rising temperatures and more frequent rainfall, had caused the spread of deadly diseases. The participants agreed that these challenges could be overcome through proper planning. Regarding food nutrition and security, as represented by the prevalence of stunting among children under five years of age (AB3), the score had been low at 37.66 in 2021, only showing some improvement in performance in 2010 when the score was at 31.24. Despite this progress, which could be attributed to the launch of Zambia's Scaling Up Nutrition (SUN) movement in 2010, Zambia continues to be one of the Sub-Saharan countries with the highest malnutrition and stunting rates.[49] The country was relatively more successful in improving its performance in the mobile broadband penetration per 100 users (AB4) and property rights score (AB5), raising scores to moderate in 2021 from very low for AB4 and low for AB5 in 2010 (Figure 24). The participants agreed that harmonizing land laws could improve property rights scores, providing people with greater opportunities to succeed and be economically secure.

In 2021, Zambia achieved the second-highest performance in gender balance (GB) across all pillars after GHG emissions reduction (Figure 17). The score for gender balance was 79.2 in 2021, gaining about 5 points relative to the score of 73.9 in 2010. Zambia's goal to ensure gender equality is evident not only in its National Gender Policy (2014) but also on its first Climate Change Gender Action Plan (2018). Other efforts to reduce the gender gap include integrating gender issues into Zambia's first national financial inclusion strategy, aiming to "increase women's financial inclusion to 70 percent in 2022 from 30 percent in 2015".[50] Figure 24 shows that the green growth indicators that contributed to the high performance in gender balance were the laws and regulations for equal gender pay score (GB3) and gender ratio of account at a financial institution or mobile-money-service provider (GB2). In equal gender pay (GB3), Zambia significantly improved scores from 75.25 in 2010 to 100 in 2021. And in an account at a financial institution, the participants emphasized that, currently, women have more financial accounts in the mobile market, which empower them economically. The performance in maternal mortality ratio (GB4) and primary school enrollment, gender parity index (GB5) had also been very high, with scores above 80. The participants in one of the breakout session groups explained that the maternal mortality ratio in Zambia is affected by many issues, not only health and nutrition. Zambia has made significant strides in the past two decades to improve maternal and newborn health outcomes. According to them, the greater availability of skilled midwifery personnel has been critical in this achievement. When midwives are well trained, adequate in number, and appropriately supported to provide a better quality of care, they can avert about two-thirds of preventable maternal and newborn deaths. Another breakout session group also agreed that the challenges of reducing maternal mortality lie in providing health services. They further explained that more women in decision-making positions could improve maternal mortality ratio performance, although it does not always guarantee change. In 2021, the performance in the proportion of seats held by women in national parliaments (GB1) was low, with a score of 34.2. The 8NDP recognizes this challenge and proposes interventions to promote the participation of women in decision-making positions at all levels of governance, aiming to increase the proportion of seats held by women in the national parliament from 18 percent in 2021 to 50 percent in 2026 (Table 6).

Figure 24 Scores for indicators in the social inclusion dimension



Access to basic services and resources (AB)
AB1 – access to safe water and sanitation, AB2 – access to electricity and clean fuels, AB3 – prevalence of children stunting, AB4 – mobile broadband penetration, AB5 – property rights
Gender balance (GB)
GB1 – women in national parliaments, GB2 – gender account in financial institutions, GB3 – equal gender pay, GB4 – maternal mortality ratio, GB5 – school enrollment gender parity
Social equity (SE)
SE1 – inequality in income, SE2 – rural-urban access to electricity, SE3 – youth unemployment disparity, SE4 – old people unemployment disparity, SE5 – disabled unemployment disparity
Social protection (SP)
SP1 – share of old people receiving pension , SP2 – universal health coverage, SP3 – population living in slums, SP4 – victims of intentional homicides, SP5 – displacement related to disasters

Although the score in social equity was high at 61.58 in 2021, there was a decline in performance in this social inclusion pillar by about four score points from 2010 (Figure 17). The indicators that contributed to the decline in social equity were the inequality in income based on Palma ratio (SE1), the unemployment rate among older people (SE4), and the disparity in unemployment among persons with disability (SE5). The decline in income inequality caused the scores for this indicator to shift from a moderate score of 48.3 to a low score of 35.95 from 2010 to 2021 (Figure 24). The participants discussed this issue and agreed with the conclusion in the International Growth Centre report[51] that the largest contributor to income inequality is wage income (Box 4). This year's USAID report for Zambia pointed out that after a decade of high economic growth, a large part of the population, particularly in rural areas, continues to live below the poverty line due to increased income inequality.[52] In Zambia, older persons and persons with disabilities are challenged by social inequality in different ways, including employment. Due to discrimination, older people have limited opportunities to find employment.[53] The National Ageing Policy, developed in 2015, aims to address problems confronting old people. The 8NDP aims to provide disability services and infrastructure to promote access and participation of persons with disabilities across all sectors (Table 6). However, the disparity in unemployment among the youth (SE3) is even slightly higher than among persons with disabilities. As discussed above, developing green sectors could offer youth new opportunities for employment. Although the scores for access to electricity in urban and rural areas (SE2) improved from 2010 to 2020, increasing from a low level (27.96) to a moderate level (46.32), the disparity remains high between urban and rural areas. Using off-grid solar to generate electricity could improve access to electricity in rural areas. While off-grid solar provides reliable, clean, and quick-to-deploy solutions to rural electrification, the market for this technology is confronted by challenges related to "a lack of investor confidence, a lack of market intelligence, a lack of an enabling regulatory environment and a high poverty rate".[54]

The performance in social protection stood at a moderate level, with a score of 57.24 in 2021 (Figure 17). The proportion of population above statutory pensionable age receiving a pension (SP1) had the lowest score and showed a slight decline from 9.71 in 2010 to 8.72 in 2021 (Figure 24). The 8NDP recognizes the need to support old people after retirement by reforming the pension system, which will "increase coverage, enhance its effectiveness as a social safety net and make it financially sustainable" (Table 6). In the presentation on the National Ageing Policy by the Ministry of Community Development and Social Service on 29 November 2017, it was highlighted that old people are facing the challenges of lack of comprehensive social security and decent housing, the impact of HIV and AIDS, severe poverty in households headed by old people, inadequate health care, etc. Many of these challenges could be overcome if they received decent pensions. However, the participants emphasized that men have more access to pensions because they earn for the entire household. Health support and services could overcome health-related issues not only among old people but also in all parts of society. Zambia's universal health coverage service (SP2) performance had also been low, with a score of 38.9 in 2021. There had been only a slight increase in the score, which stood at 31.86 in 2010. Zambia has significantly improved maternal and newborn health outcomes in the past two decades. The increased availability of skilled midwifery personnel resulted in a better quality of care because they averted about two-thirds of preventable maternal and newborn deaths. The performance in reducing the proportion of the urban population living in slums (SP3) had been at a moderate level, with a score of 49.28 in 2021. During

the second participatory workshop, the participants deliberated on this indicator. There would be a need for social welfare net expansion because slums service delivery faces supply-side issues. There is a severe shortage of affordable housing in Zambia. As a consequence, informal settlements are sprawling in urban areas. About 55 percent of urban dwellers live in slums with inadequate access to water and sanitation facilities. Zambia performed relatively well for the two remaining green growth indicators, which refer to social protection against crime and disasters. The scores for reducing the number of victims of intentional homicide per 100,000 population (SP4) and internally displaced persons, new displacement associated with disasters (SP5) were both very high.

Box 4 Summary of the discussion in one of the breakout session groups on income inequality

The disparity in equality persists. Wage income is the largest contributor to income inequality in Zambia, followed by non-agricultural self-employment. Zambia's poorest households have experienced the highest proportional income growth in the past 20 years, albeit from a very low base.[55] While poor households have been catching up with middle-income households, the gap between middle and high-income households has increased.

5.3 Robustness check

Composite indices often face criticism because they can be misleading if poorly constructed and interpreted. Thus, the final important step in developing a composite index is evaluating the confidence in the model and its underlying assumptions (i.e., robustness check). Sensitivity analysis is one of the standard procedures to assess the robustness of an index. It measures the relative contribution to the output variance of individual sources of uncertainty on the input. Using Monte Carlo analysis, the impacts of two sources of data uncertainty on the scores in the Zambia Green Growth Index were checked:

1.Missing data – to check the impacts of data gaps in several indicators.

2.Changes in the values of the indicators – to check the impacts of using alternative databases, which have different values in some datapoints.

Figure 25 presents the results of the Monte Carlo analysis on the sensitivity of the Index and dimensions' scores from missing data, changes in values of the indicators, and both. The missing data and value changes were randomly made at a 10 percent variation. After random changes were made, the scores were again computed to allow a comparison of results with the actual scores (i.e., no changes were made to the input data). The results show only minimal score changes after introducing changes in the data inputs, indicating that the Zambia Green Growth Index results are relatively robust.

Figure 25 Results of the Monte Carlo analysis to check sensitivity of the Index scores

In addition to the sensitivity analysis, regression analysis was conducted to assess the explanatory power of the green growth indicators (represented by the aggregated scores at the pillar level) in their respective dimensions. The aim was to check the ability of the indicators to explain the structure of the Green Growth Index. Panel data analysis was performed on the pillars' cross-sectional and longitudinal global data from 2010 to 2021. A regression analysis is run over these two-dimensional data to determine the variance explained by the green growth pillars. Four regression models were run, one for each of the four green growth dimensions – efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion.

Table 9 presents the P-value statics from the regression analysis, where a P-value lower than 0.05 shows that the indicator is statistically significant. Except for social protection (SP), all pillars have P-values less than 0.05, which implies a high statical significance to the green growth dimensions. The insignificance of social protection can be attributed to the high data gaps of over 55 percent, the highest among the pillars (Figure 15). Among the statistically significant pillars, the following have the most considerable impacts on the variance in their respective dimensions: efficient and sustainable resource water use (EW), cultural and social value (CV), green trade (GT), and access to basic services and resources (AB). In contrast, the pillars with the most negligible impact include efficient and sustainable energy (EE), GHG emissions reduction, green innovation, and social equity. The values of the R-squared show that between 95 and 100 percent of the variance in the dependent variables (i.e., green growth dimensions) can be explained by the variance in the independent variables (green growth pillars). The regression results further confirm the robustness of the Zambia Green Growth Index.

Table 9 Results of the regression analysis of pillar and dimension scores

Codes	Pillar Names	Coefficient	Standard Error	P-Value
MODEL 1 EFFICIENT AND SUSTAINABLE RESOURCE USE: R^2 = 0.999, ADJ. R^2 = 0.999				
EE	Efficient and sustainable energy	0.163	0.004	0.000
EW	Efficient and sustainable water use	0.3647	0.005	0.000
ME	Material use efficiency	0.1933	0.003	0.000
SL	Sustainable land use	0.3449	0.006	0.000
MODEL 2 NATURAL CAPITAL PROTECTION: R^2 = 1.000, ADJ. R^2 = 1.000				
GE	Greenhouse gas (GHG) emissions reduction	0.1623	0.005	0.000
EQ	Environmental quality	0.225	0.003	0.000
BE	Biodiversity and ecosystem protection	0.2751	0.004	0.000
CV	Cultural and social value	0.3737	0.002	0.000
MODEL 3 GREEN ECONOMIC OPPORTUNITIES: R^2 = 1.000, ADJ. R^2 = 0.999				
GJ	Green employment	0.3359	0.015	0.000
GN	Green innovation	0.1308	0.007	0.000
GT	Green trade	0.5567	0.017	0.000
GV	Green investment	0.184	0.009	0.000
MODEL 4 SOCIAL INCLUSION: R^2 = 0.967, ADJ. R^2 = 0.948				
AB	Access to basic services and resources	0.4877	0.028	0.000
GB	Gender balance	0.0891	0.04	0.042
SE	Social equity	0.2375	0.051	0.002
SP	Social protection	0.2245	0.236	0.373

Note: R^2 measures the goodness-of-fit of the regression models, determining the proportion of variance in the dimension scores that can be explained by the aggregated scores of the green growth indicators, i.e., pillars.

6 Summary and Conclusions

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6.1 Challenges and opportunities

With an overall score of 49.41 for the Green Growth Index in 2021, Zambia's green growth performance was only moderate and about halfway to achieving the sustainability targets. There is ample space to improve green growth performance by pursuing the development priorities, including economic transformation, environmental sustainability, water-land-food nexus, and human development skills and development, which offer considerable opportunities in greening Zambia's economy. This report has highlighted that these priorities are closely interlinked; thus overcoming challenges in one would create opportunities in the other.

For example, economic transformation would require economic diversification and industrial innovations. Diversifying and adding value to agricultural exports could support economic diversification. Zambia is rich in agricultural land but is challenged by low productivity. Investment in irrigation systems is a key policy goal to increase agricultural productivity. Off-grid solar pumps could be a solution to enhance access to clean energy and better livelihood in rural areas. Access to affordable solar energy in rural areas will create co-benefits by increasing access to off-grid electricity. However, although Zambia is rich in water resources, climate change will sooner or later affect freshwater availability for agricultural production. Water-efficient irrigation systems and climate-smart agricultural practices (e.g., harvesting rainfall, organic farming) could help reduce water stress when irrigation applications become widespread. Organic agriculture that conforms to international standards would open export opportunities for agricultural products and, at the same time, reduce land degradation. By being mindful of sustainability issues in the water-land-food nexus, there will be more opportunities to improve performance in green growth indicators for efficient and sustainable resource use for land and water, for which Zambia had one of the lowest scores. For rural people to participate in and benefit from this agricultural transformation, they must be capacitated through awareness and training.

However, more than agricultural productivity is needed to support economic diversification. High-value manufactured food products would offer more opportunities to generate higher revenue. Enabling environment will need to be created in the value chain for MSMEs to contribute to product innovations in food industries. Moreover, enabling environment for foreign and private domestic investment in medium and high-tech industries would need to be created to support product innovations. Although Zambia's performance in GHG emissions reduction is very high, innovations will have to rely on renewable technologies to support the achievement of the country's NDC targets. As the economy innovates and diversifies, there will be more demand for skilled labor, which can absorb the young labor force. But because a large proportion of the youth does not have a high level of education, policy goals to develop their skills through training programs and collaboration with academic institutions would help address the skills gap. By ensuring that the innovative labor market would contribute to reducing the income gap through decent income, performance in the indicator of green economic opportunities could be improved and help reverse the declining trend.

Creating a sustainable eco-tourism industry could also contribute to economic diversification and, thus, transformation. Zambia's rich natural resources create excellent opportunities, which would require infrastructure investment. To ensure that rich biodiversity areas, which are important natural capital for eco-tourism, do not suffer from degradation, they should be guaranteed to be covered in the protected areas. When effectively managed and protected, opening key biodiversity areas for eco-tourism could create opportunities to generate revenue, mobilize private finance, create livelihood, and guarantee income for rural people, particularly the youth. Developing awareness and skills to protect and preserve natural resources is key to developing a sustainable eco-tourism industry. Raising awareness on the economic value of forests for rural people will help reduce deforestation from firewood collection. Building climate-resilient infrastructure to support international eco-tourism would also create co-benefits for the rural people in terms of access to transport, clean water, sanitation, etc.

To sum up, opportunities to improve green growth performance should consider interdependencies among economic, social, and environmental issues to overcome challenges.

6.2 Policy recommendations

During the second participatory workshop, the participants came up with policy recommendations based on their interpretation of the Zambia Green Growth Index scores. The following are the highlights of the recommendations for each green growth dimension:

Efficient and sustainable resource use

- Zambia's transport system is heavily reliant on fossil fuels. Penetration of electric vehicles needs to be promoted, and infrastructure needs to be built for charging electric vehicles.
- Dams should not be built in certain rivers. Seasonal low water levels are exacerbated further due to dams on a river upstream.
- Post-harvest losses are critical challenges in the agriculture sector. Forming public-private or private-private partnerships can address the challenges by creating shared economic benefits for smallholders and stakeholders.
- Public investment in "hard" infrastructure for water and sanitation pipes and pumping stations is necessary. However, "soft" infrastructure of institutions must also be enhanced to improve overall access to water and sanitation and prevent future disease outbreaks.

Natural capital protection

- Deliberate policy measures to impart entrepreneurship skills to people in the visual arts and crafts are essential. These will ensure that the cultural products are graded and standardized to meet international standards and attract investments.
- Deforestation is a critical issue in Zambia that requires different solutions. Exports of indigenous wood products need sustainable management. Promoting the value chain of alternative wood fuel needs policy enforcement and regulation. Limited finance for alternative wood fuel needs innovative solutions.
- Economic opportunities for domestic eco-tourism should be created through policy incentives and regulation. Tax rebates would promote cultural goods export.

Green economic opportunities

- The level of awareness and incentive to promote green instruments is low.
- Inclusive green policy support is needed to generate employment.
- Research is not commercialized. The industry does not support research and apprenticeship. There is little interaction between students and industry.

Social inclusion

- Access to electricity is affected by the availability of finance and weak opportunities for business.
- Quality of medicine, service, and equipment affects maternal care provision.
- Addressing inequality is a policy priority because it remains high between rich and poor.
- Opportunity to build social protection remains a significant challenge and requires action.

6.3 Next steps forward

The development of the Zambia Green Growth Index provides the groundwork for other policy-related initiatives of the Government of Zambia, including the following:

- The Zambia Green Growth Index informs about the green growth indicators for measuring and tracking green growth performance. It will thus be helpful to update the Index scores every year. Proxy variables need to be replaced by the green growth indicators selected by Zambian experts in the coming years. The data availability of the excluded indicators in this first edition of the Green Growth Index due to insufficient data will need to be monitored, collected, and improved. The experts should also review the list of green growth indicators if more policy-relevant indicators become available.

- The Green Growth Index, which highlights the challenges and opportunities in the green growth transition, should be used to inform the pathways in the Green Growth Strategy. The trend and scores for the green growth indicators, pillars, and dimensions can inform the policy priorities in different sectors. At the same time, the development of the Green Growth Strategy should inform the updated Green Growth Index, identifying green growth indicators that will need to be included in the Index in the following years.

- The green growth indicators can be used in Zambia's National Development Plan to improve the "greenness" of the development goals and targets. In addition to the SDG targets, national targets can also be used to benchmark the green growth indicators, enabling to track performance against both SDG and NDP targets.

- Using the Green Growth Simulation Tool (GGSim), a complementary approach to the Green Growth Index, one can assess SDG co-benefits of policy interventions and green investments up to the year 2050. The data-driven and scenario-based assessments of SDG co-benefits can be integrated into the Green Growth Strategy, Low-Emission Development Strategy, National Adaptation Plan, etc. Like the Green Growth Index, GGsim's applications follow a participatory approach to ensure the policy relevance of the results and facilitate capacity building among the experts.

7 Statistical Tables

Table 10 Normalized scores for the green growth indicators

Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
EFFICIENT AND SUSTAINABLE RESOURCE USE (ESRU)												
EE1	69.58	69.99	69.60	70.47	71.83	69.28	68.69	67.84	68.59	70.98	70.98	70.98
EE2	97.06	95.64	92.77	92.69	91.83	91.10	91.08	91.09	90.22	92.63	92.63	92.63
EE3	26.49	25.49	24.42	23.28	22.08	21.89	21.71	19.03	19.68	19.68	19.68	19.68
EE4	99.52	99.57	99.60	99.63	97.65	97.33	94.54	87.56	87.58	87.58	87.61	87.61
EE5	98.62	98.52	98.48	98.45	98.52	98.54	98.50	98.58	98.55	98.49	98.50	98.50
EW1	8.78	8.84	10.10	10.89	11.06	11.77	11.62	12.30	12.76	13.07	13.07	13.07
EW2	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
EW3	42.04	37.69	37.04	37.17	37.88	40.72	39.82	40.11	41.28	41.83	45.35	47.55
EW4	2.02	2.00	2.06	2.03	1.84	1.63	1.79	1.54	1.39	1.45	1.45	1.45
EW5	5.73	5.59	5.45	5.32	5.18	5.06	4.94	4.82	4.71	4.61	4.61	4.61
SL1	95.47	94.62	94.02	92.86	94.22	92.62	86.38	88.43	88.81	88.81	88.81	88.81
SL2	1.30	1.29	1.29	1.30	1.30	1.31	1.31	1.32	1.05	1.05	1.05	1.05
SL3	22.59	24.78	24.32	24.58	25.04	23.71	21.88	23.49	23.22	23.22	23.49	23.49
SL4	20.07	20.24	20.40	20.32	20.40	20.40	20.40	20.40	20.40	20.40	20.40	20.40
SL5	39.43	39.04	38.74	38.46	37.64	36.81	36.74	37.20	37.27	37.27	37.27	37.27
ME1	81.12	81.06	81.86	81.15	81.34	80.96	80.80	80.21	80.13	79.26	79.26	79.26
ME2	98.01	97.94	97.92	97.96	97.95	97.95	97.95	97.95	97.95	97.95	97.95	97.95
ME3	43.97	43.97	43.97	43.97	43.97	44.54	45.45	48.77	52.14	52.14	52.14	52.14
ME4	34.34	52.53	54.55	55.56	59.29	60.10	61.41	62.12	62.42	65.66	64.04	64.04
ME5	39.96	40.45	40.95	41.46	41.97	42.49	43.01	43.55	44.09	44.63	45.18	45.18
NATURAL CAPITAL PROTECTION (NCP)												
EQ1	79.46	79.29	78.46	77.82	79.22	78.91	80.49	80.76	80.76	80.76	80.76	80.76
EQ2	65.82	66.74	67.96	68.55	68.93	69.86	71.12	71.79	73.42	74.35	74.35	74.35
EQ3	91.43	91.43	91.43	91.43	91.43	91.43	91.43	91.43	91.43	91.43	91.43	91.43
EQ4	95.25	95.30	95.36	95.43	95.49	95.56	95.64	95.71	95.80	95.89	95.98	95.98
EQ5	16.77	16.87	16.96	17.06	17.16	17.25	17.35	17.45	17.56	17.67	17.78	17.78
GE1	99.61	99.53	99.36	99.32	99.25	99.22	99.14	98.92	98.83	98.86	98.89	98.84
GE2	98.94	98.84	98.73	98.64	98.54	98.45	98.41	98.38	98.35	98.35	98.33	98.37
GE3	95.51	92.43	92.34	92.44	92.73	92.87	96.88	96.77	96.71	96.71	96.71	96.71
GE4	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
GE5	99.40	99.68	99.69	99.70	99.23	99.18	98.41	96.81	96.62	96.68	96.65	96.65
BE1	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52
BE2	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
BE3	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87	69.87
BE4	59.94	59.60	59.60	59.61	59.61	59.61	59.61	59.61	59.61	59.80	62.78	62.78
BE5	4.91	4.91	4.91	4.91	4.91	4.91	4.90	4.89	4.89	4.88	4.88	4.88
CV1	76.96	77.18	77.43	77.70	77.97	78.17	78.42	78.63	79.03	79.51	79.87	79.26
CV2	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 10 Normalized scores for the green growth indicators *(continued)*

Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CV3	1.51	1.52	1.51	1.53	1.53	1.50	1.52	1.51	1.50	1.50	1.50	1.50
CV4	27.17	31.50	36.43	37.99	39.15	40.54	41.74	42.71	43.62	44.33	44.33	44.33
CV5	4.44	4.44	4.44	4.44	1.17	1.27	1.33	1.37	1.29	1.95	1.95	1.95
GREEN ECONOMIC OPPORTUNITIES (GEO)												
GV1	68.38	72.96	84.41	82.42	83.58	83.60	78.95	88.89	95.94	91.65	100.00	100.00
GV2	16.47	16.88	16.45	17.56	18.20	17.75	18.10	17.67	17.20	17.35	16.90	16.90
GV3	9.14	13.97	26.92	27.67	25.66	28.81	17.57	11.47	21.27	6.84	8.22	8.22
GV4	49.46	50.44	51.86	52.31	85.97	82.11	78.26	100.00	100.00	100.00	86.13	86.13
GV5	8.17	7.71	7.69	7.90	7.93	8.21	7.36	7.05	7.34	7.34	7.34	7.34
GT1	9.70	9.61	9.65	8.88	12.16	15.96	13.28	14.42	14.40	14.43	14.43	14.43
GT2	1.00	1.00	1.00	6.17	12.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GT3	24.02	28.41	28.00	34.63	37.22	44.23	41.36	41.97	40.72	40.35	40.35	40.35
GT4	8.50	9.88	10.72	10.29	10.59	10.00	9.43	9.60	9.95	9.74	9.79	9.79
GT5	14.80	12.66	17.58	15.35	15.88	14.81	18.04	16.72	17.56	17.56	12.93	12.93
GJ1	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
GJ2	26.95	26.00	29.51	31.31	32.49	33.35	33.92	34.37	34.49	34.45	34.26	34.18
GJ3	13.49	14.19	14.86	15.99	18.46	19.17	20.28	21.70	21.40	23.15	23.15	23.15
GJ4	44.23	44.23	44.23	44.23	44.23	44.21	46.35	57.66	57.66	56.44	58.17	58.17
GJ5	20.17	23.33	19.69	19.38	15.89	19.05	21.58	21.34	24.09	23.63	18.23	18.23
GN1	85.14	84.53	84.08	83.53	83.01	82.57	76.35	76.62	76.52	76.78	76.78	76.78
GN2	37.69	41.26	33.39	33.03	33.73	33.73	33.78	29.68	29.68	29.68	29.68	29.68
GN3	92.63	92.63	92.63	92.63	92.63	100.00	85.26	81.05	79.47	80.53	60.00	55.26
GN4	16.28	21.33	39.10	26.37	25.71	26.12	25.87	25.87	25.87	25.87	25.87	25.87
GN5	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
SOCIAL INCLUSION (SI)												
AB1	27.90	28.44	27.65	28.20	28.74	28.50	28.50	29.44	30.37	30.92	31.46	31.46
AB2	19.21	19.77	20.02	19.76	19.59	19.45	20.97	23.36	22.57	23.23	22.57	22.57
AB3	31.24	29.15	29.15	29.15	38.71	38.71	38.71	38.71	39.47	36.56	37.66	37.66
AB4	1.82	1.82	15.56	14.24	24.04	38.59	31.52	46.57	57.78	52.12	56.67	55.86
AB5	27.04	27.04	27.04	27.04	27.04	27.04	27.04	34.79	43.59	41.06	41.56	41.23
GB1	28.74	28.74	23.71	23.71	24.89	26.07	26.07	36.56	36.56	36.56	34.20	34.20
GB2	95.88	95.88	96.71	96.93	97.50	96.62	95.86	96.04	95.72	96.23	95.92	95.98
GB3	75.25	75.25	75.25	75.25	75.25	75.25	75.25	100.00	100.00	100.00	100.00	100.00
GB4	81.97	82.43	82.89	83.59	84.80	85.55	85.94	86.89	86.89	86.89	86.89	86.89
GB5	91.85	100.00	96.05	97.11	97.11	97.50	84.12	83.73	82.43	83.12	84.13	84.13
SE1	48.30	47.06	44.51	41.77	38.82	35.95	35.95	35.95	35.95	35.95	35.95	35.95
SE2	27.96	27.94	27.79	28.06	27.75	27.93	33.76	51.90	43.53	48.58	46.32	46.32
SE3	76.20	75.20	75.10	75.07	75.31	76.52	77.16	80.17	77.72	77.97	76.18	76.18
SE4	75.58	79.22	83.83	80.47	77.32	73.20	69.27	67.23	66.59	69.58	67.56	66.59
SE5	97.55	97.55	97.55	97.49	97.49	97.49	97.49	97.49	97.49	82.87	82.87	82.87
SP1	9.71	9.71	9.71	9.71	9.71	9.71	9.71	8.72	8.72	8.72	8.72	8.72
SP2	31.86	32.43	33.00	33.59	34.20	34.81	34.83	34.84	36.87	38.90	38.90	38.90
SP3	42.81	42.78	42.75	43.57	44.38	45.20	46.01	46.83	47.65	48.46	49.28	49.28
SP4	92.10	92.73	92.70	92.13	91.94	91.44	93.59	91.43	89.80	89.34	89.34	89.34
SP5	99.97	99.96	99.94	99.91	99.95	99.93	99.98	99.93	100.00	99.97	99.97	99.98

Table 11 Aggregated scores for pillars, dimensions, and Green Growth Index

Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
EFFICIENT AND SUSTAINABLE RESOURCE USE (ESRU)												
EE	78.26	77.84	76.97	76.91	76.38	75.63	74.90	72.82	72.92	73.87	73.88	73.88
EW	31.72	30.82	30.93	31.08	31.19	31.84	31.63	31.75	32.03	32.19	32.89	33.33
SL	35.77	36.00	35.75	35.51	35.72	34.97	33.34	34.17	34.15	34.15	34.20	34.20
ME	59.48	63.19	63.85	64.02	64.91	65.21	65.73	66.52	67.35	67.93	67.72	67.72
NATURAL CAPITAL PROTECTION (NCP)												
EQ	69.75	69.93	70.04	70.06	70.45	70.60	71.21	71.43	71.80	72.02	72.06	72.06
GE	98.69	98.10	98.03	98.02	97.95	97.94	98.57	98.17	98.10	98.12	98.12	98.11
BE	58.25	58.18	58.18	58.18	58.18	58.18	58.18	58.18	58.18	58.22	58.81	58.81
CV	42.02	42.93	43.96	44.33	43.96	44.30	44.60	44.84	45.09	45.46	45.53	45.41
GREEN ECONOMIC OPPORTUNITIES (GEO)												
GV	30.32	32.39	37.47	37.57	44.27	44.09	40.05	45.02	48.35	44.64	43.72	43.72
GT	11.60	12.31	13.39	15.06	17.77	17.20	16.62	16.74	16.73	16.62	15.70	15.70
GJ	22.03	22.61	22.72	23.24	23.28	24.22	25.48	28.07	28.59	28.59	27.82	27.81
GN	66.35	67.95	69.84	67.11	67.02	68.48	64.25	62.64	62.31	62.57	58.47	57.52
SOCIAL INCLUSION (SI)												
AB	21.44	21.24	23.88	23.68	27.62	30.46	29.35	34.57	38.76	36.78	37.98	37.75
GB	74.74	76.46	74.92	75.32	75.91	76.20	73.45	80.64	80.32	80.56	80.23	80.24
SE	65.12	65.40	65.76	64.57	63.34	62.22	62.73	66.55	64.26	62.99	61.78	61.58
SP	55.29	55.52	55.62	55.78	56.04	56.22	56.82	56.35	56.61	57.08	57.24	57.24
DIMENSIONS												
ESRU	47.94	48.33	48.28	48.28	48.48	48.41	47.74	47.88	48.14	48.46	48.71	48.87
NCP	64.07	64.34	64.73	64.87	64.82	64.97	65.33	65.40	65.56	65.76	65.96	65.92
GEO	26.78	27.98	29.87	30.65	33.28	33.49	32.31	33.93	34.64	33.94	32.51	32.37
SI	49.01	49.28	50.58	50.34	52.23	53.38	52.65	56.86	58.01	57.13	57.29	57.17
Index	**44.81**	**45.50**	**46.62**	**46.89**	**48.34**	**48.69**	**48.75**	**48.81**	**48.98**	**49.01**	**49.16**	**49.41**

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Annexes

Annex A
Methods

The methods applied in the report have three components – conceptualization, data preparation, and data analysis (Figure A.1). Each component consists of three steps, which are described below.

The steps for the conceptualization include applying green growth framework (Step 1.a), assessing policy frameworks and priorities (Step 1.b), and setting up checklist criteria for the indicators (Step 1.c). In Step 1.a, a green growth framework was applied to guide the selection of the indicators. The Green Growth Index framework, which was validated by a hundred of experts from different fields of expertise and countries in 2019, was chosen to systematically organize the indicator selection. In Step 1.b, policy frameworks and priorities in Azerbaijan were identified by assessing policy documents, sectoral programs, and relevant literature. The assessment methods are described in section 1.b below and the results of the assessment, which provided useful knowledge to form the criteria for the next step, are presented in Chapter 2 of the report. In Step 1.c, the checklist criteria as described in section 1.c below were set up to guide the selection of the green growth indicators.

The steps for the data preparation include assessing indicators' relevance to the checklist (Step 2.a), identifying data sources and availability (Step 2.b), and collecting and preparing data (Step 2.c). Step 2.a dealt with the assessment of the green growth indicators, whether they are directly or indirectly linked to the checklist criteria. The assessment method is described in section 2.a below and the results are presented in Annex #. Step 2.b focused on finding data for the green growth indicators, which were previously identified in Step 4. The results on the inventory of data sources and availability are presented in section Annex #. Step 2.c is an important step prior to the data analysis because checking for outliers ensures that data are accurate and imputing data corrects for data gaps. Inaccuracy and gaps in data will affect aggregated scores of the indicators.

The steps for the data analysis include normalization and benchmarking of data (Step 3.a), aggregation of normalized indicators (Step 3.b), and robustness check of the scores (Step 3.c). In Step 3.a, data were normalized to transform the units of the indicators into the same numerical scale, i.e., 1-100. Benchmarking integrates sustainability targets in the normalized scores, allowing interpretation of distance to targets, i.e., a score of 100 implies the targets have been achieved for the indicators. Step 3.b follows aggregation of normalized indicators at different levels to facilitate interpretability of results, e.g., at the pillar, dimension, and overall scores. Step 3.c is an important step to check the robustness of the selected indicators and relevance of the results to green growth.

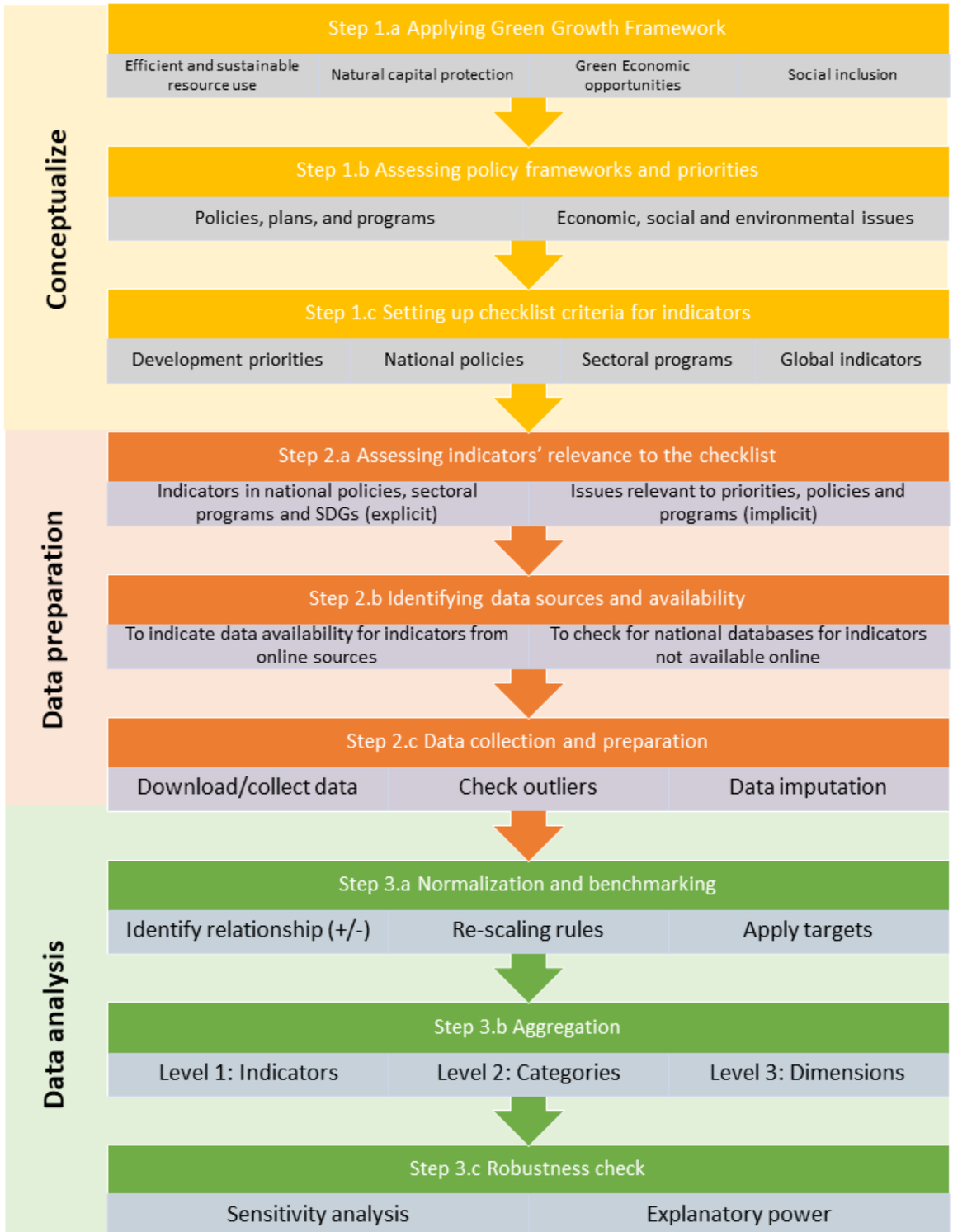
1. Concept

1.a Green growth framework

The objective in Step 1.a is to use a framework that will support the selection of green growth indicators. In the absence of a framework, the indicators may not be aligned with the challenges and opportunities for green growth transition. The framework for the Green Growth Index consists of four dimensions – efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion (Figure 3). These dimensions are closely interlinked based on the concepts of low carbon economy, resilient society, ecosystem health, and inclusive growth. The details on these interlinkages are described in the technical reports on the Green Growth Index (Acosta et al., 2019, 2020). The framework emphasizes that efficient and sustainable use of natural resources will produce more goods and services with less resources. This will in turn protect natural capital including water, energy, land, and materials as well as the ecosystem services they provide. A healthy ecosystem characterized by, for example, fertile soil, multifunctional forests, productive land and seas, good quality freshwater and clean air, and pollination increases economic productivity and creates new economic opportunities. The green growth framework also highlights the importance of protecting natural capital, which provides sources of economic growth such as green jobs, trade, and investment. Finally, social inclusion is considered a key mechanism to both achievement and distribution of gains from green growth, where people are not only beneficiaries of economic growth but also contributors to creating economic opportunities.

Each dimension in the green growth framework is represented by four pillars (Figure A.2). These pillars are important to transitioning to green growth pathways. The efficient and sustainable resource use covers energy, water, land use, and waste and material use. The natural capital protection dimension includes improvement of environmental quality, reduction of GHG emissions, protection of biodiversity and ecosystem, and preservation of cultural and social value. Green economic opportunities are created through investment, trade, innovation, and employment. Social inclusion dimension includes access to basic services and resources, gender balance, social equity, and social protection.

Figure A.1 Methods for the development of the Zambia Green Growth Index



1.b Policy frameworks and priorities

The objective in Step 1.b is to identify green growth indicators that are emphasized in documents published by the government and issues that indicate priorities as well as challenges and opportunities for sustainable development in Zambia. In case of the latter, policy documents such as Vision 2030, 8NDP, NPCC, NDC, NAP, and NBSAP-2 have been reviewed. Various documents on sectoral policies. Development priorities can also provide knowledge on the green growth indicators that will need to be considered when assessing green growth transition. In addition to the policy documents, relevant literature was reviewed to understand the social, economic, and environmental contexts that underpin challenges and opportunities for sustainable development in Zambia.

1.c Checklist criteria

The objective in Step 1.c is to set up checklist criteria based on the knowledge generated from the assessment of policy frameworks and development priorities. Five checklists were identified and provided the rationale for the selection of the green growth indicators.

Checklist 1: National issues that are considered priorities for sustainable development in Zambia including economic transformation, human skills and development, environmental sustainability, and land-water-food nexus.

Checklist 2: Policies relevant to economic development and climate actions provides information on the goals and targets of the government to overcome challenges and maximize opportunities, including those mentioned in the national policy documents (i.e., Vision 2030, 8NDP, NPCC, NDC, NAP, and NBSAP-2).

Checklist 3: Programs and strategies implemented for different sectors to support the achievement of national goals and targets, including National Policy on Environment (2007), National Forestry Policy (2014), Health National Adaptation Plan (2017), National Energy Policy (2019), Second National Agriculture Policy (2016), Transport Policy (2019), National Strategy for Reducing Emissions from Deforestation and Forest Degradation (2015), Technology Needs Assessment (2013), Climate Change Gender Action Plan (2018).

Checklist 4: Climate actions can be aimed at reducing GHG emissions through mitigation or increasing resilience of the society and ecosystem through adaptation.

Checklist 5: Global issues that UN Member Countries commit to address particularly those in the Sustainable Development Goals (SDGs). Due to lack of indicators for green economic opportunities in the SDGs, the Global Green Growth Index was also considered in the list of criteria to address this gap in green growth indicators.

2. Data preparation

2.a Relevance to the checklist

The objective in Step 2.a is to create a table checklist informing about the relevance of the green growth indicators to the criteria (Table A.1). The two categories for the relevance are direct and indirect. Direct relevance, which is represented by the icon ✔ in the table checklist, indicates that the indicators directly correspond to the criteria, i.e., with the same names and measurement units as mentioned in the documents. Indirect relevance, which is represented by the icon ✔, indicates that indicators have been implied from the documents with no mention of names and measurement units. In the case of indirect relevance, the selected indicators were based on expert judgement. Table A.1 below provides an example of the checklist table for the five indicators for efficient and sustainable water use. It summarizes the presence and level of relevance of the indicators to the five criteria described in Step 1.c.

Table A.1 Checklist for the green growth indicators in efficient and sustainable energy

Indicator code	Indicator name	National policies						Sectoral policies*	Development Priorities				Climate action		Global issues	
		Vision 2030	8NDP	NPCC	NDC	NAP	NBSAP		ECON	HUMA	ENVI	NEXU	MITI	ADAP	GG Index	SDG
EE1	Energy intensity		✔		✔			✔	✔				✔		✔	✔
EE2	Renewable energy share	✔	✔	✔	✔	✔	✔	✔					✔		✔	✔
EE3	Efficient transport		✔	✔	✔			✔	✔				✔	✔	✔	✔
EE4	Low-carbon electricity	✔	✔		✔	✔		✔					✔	✔		✔
EE5	Per capita electricity consumption							✔					✔	✔		✔

Legend: ✔ *direct relevance, explicit mention of indicator with the same measurement unit* ✔ *indirect relevance, implicit mention of indicator with no relevant unit*

Notes:
ECON – economic transformation, HUMA – Human development and skills, ENVI – environmental sustainability and NEXU – land-water-food nexus
MITI – climate mitigation, ADAP – climate adaptation, GG Index – Green Growth Index, SDG – Sustainable Development Goals

2.b Data sources and availability

The objective in Step 2.b is to identify sources of data for the green growth indicators and make an inventory of the availability of time-series data. The data from the SDG database was prioritize before checking other online databases published by international organizations. The use of online databases in preferred to increase transparency and allow replicability of the results applied in the report. The information on data sources and availability is presented in Chapter 4.2.

2.c Collected and validated database

The objective in Step 2.c is to prepare and validate the data which were collected from different sources. Scaling and imputation are the most important methods to prepare the data and improve comparability of the indicators. Scaling the data by an appropriate denominator (e.g., population, GDP, land area, etc.) allows an objective comparison across countries. Although the assessment focused on Azerbaijan, normalization and benchmarking required global data. Imputing data based on available time-series data helps improve the country coverage of the indicators. To minimize effects of imputation on data uncertainty, the simple method of imputing data from the closest years was applied. The most important methods to validate the statistical appropriateness of the indicator data are to check for outliers and correlation. Since outliers can distort statistical properties and normalized values of the indicators, their values were capped using lower or upper fences based on the interquartile range (IQR) from 75th and 25th percentiles. The aims of the correlation analysis are to identify redundant indicators with very strong correlation to improve explanatory power of the indicators and verify whether indicators have acceptable levels of association in their respective dimensions.

3. Data analysis

3.a Normalization and benchmarking

The objective in Step 3.a is to transform the data so that the indicators have the same units of measurements and facilitate interpretation of the results. To translate the indicators with different units into a common scale, it is necessary to apply a normalization method. Through normalization, the indicator values measured in different units can be adjusted to a single scale to make the data comparable across the indicators. The re-scaling method (min-max transformation) for normalization was applied for the following reasons: it is the simplest and most widely used method that will facilitate ease of comprehensibility and replication; using upper and lower bounds will reduce issues related to outliers; and integrating targets will allow benchmarking against sustainability targets. Through benchmarking, the indicators are assigned values between 1 and 100, where a score of 100 implies that the target for a given indicator has been achieved. For the SDG indicators, sustainability targets are based on the explicit or implicit SDG targets. For non-SDG indicators, sustainability targets are represented by the average values of the top five performing countries.

3.b Aggregation of normalized indicators

The objective in Step 3.b is to aggregate the scores of the indicators to provide an overall score for the four green growth dimensions – efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. The two most common and simple methods of aggregation include linear aggregation using arithmetic mean and geometric aggregation using geometric mean. These two methods have different underlying assumptions. Linear aggregation allows full and constant compensability, i.e., low values in one indicator can be traded off (substituted) by high values in another. On the other hand, geometric aggregation allows only partial compensability, limiting the ability of the indicators with very low scores to be fully compensated by indicators with high scores. The two methods were applied in the different aggregation models so that, as the level of aggregation increases, the level of substitutability decreases:

Level 1: Arithmetic mean was applied to linearly aggregate the normalized indicators, allowing compensability of the individual indicators in each pillar.
Level 2: Geometric aggregation was applied to the pillars to allow only partial compensability between indicators in each dimension.
Level 3: Geometric aggregation was applied to the dimensions. No dimension was allowed to substitute the other dimensions, thus, the Green Growth Index was not computed when at least one dimension score was missing.

3.c Robustness check

The objective in Step 3.b is to evaluate the confidence level of the scores. Two methods were applied: First, to check the sensitivity of the aggregated scores to changes in the input variables of the aggregation models. Second, to check the explanatory power, regression models are applied to analyze the ability of the indicators to explain the structure of dimension scores.

Details of the methods in Step 3 are provided by Acosta et al., 2019, GGGI Technical Report Number 5, Green Growth Index: Concepts, Methods, Applications.

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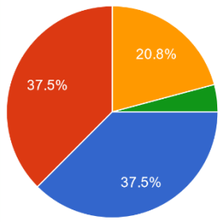
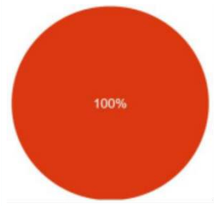
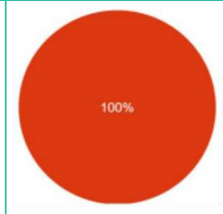
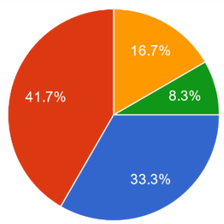
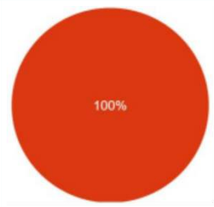
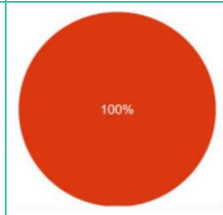
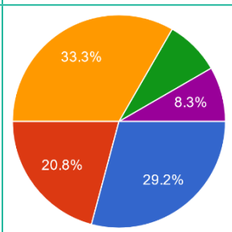
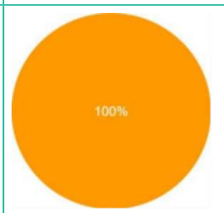
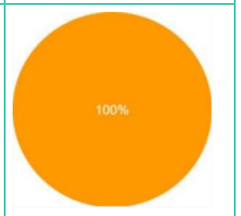
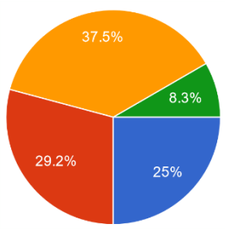
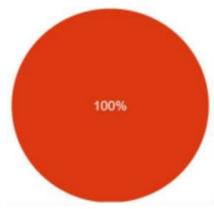
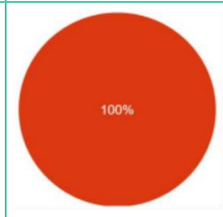
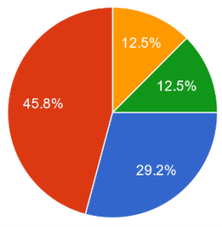
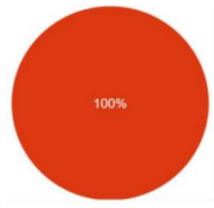
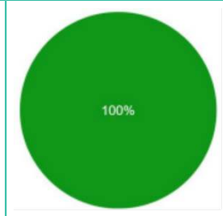
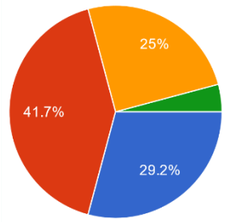
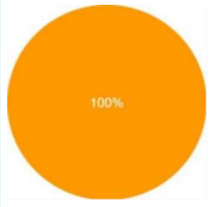
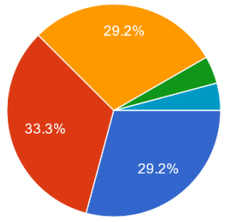
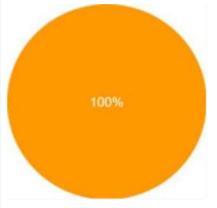
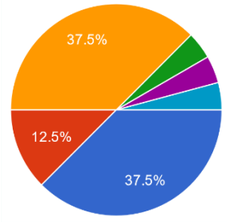
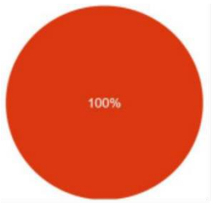
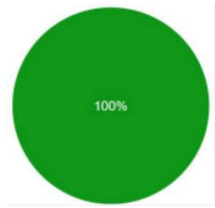
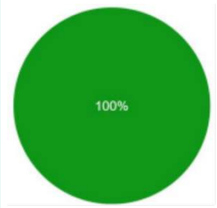
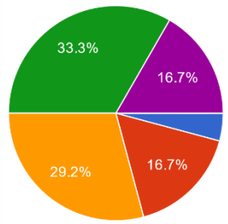
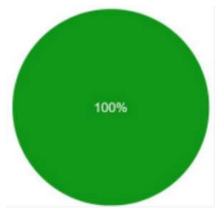
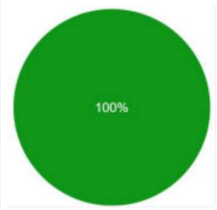
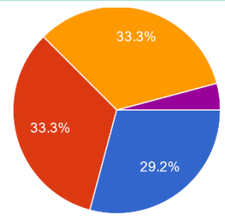
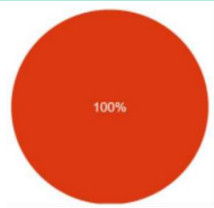
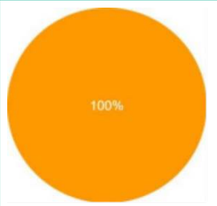
Annex B
Results of Online Surveys

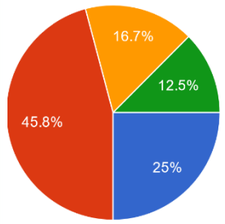
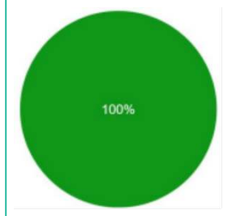
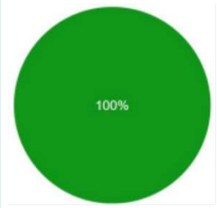
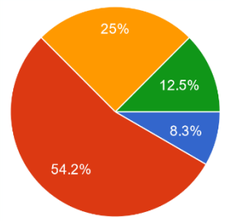
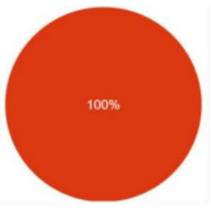
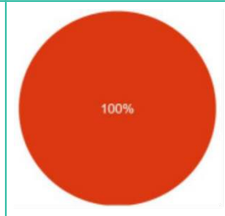
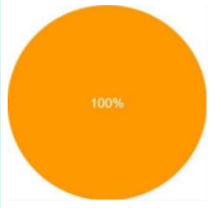
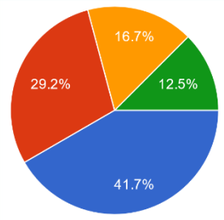
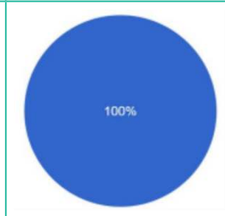
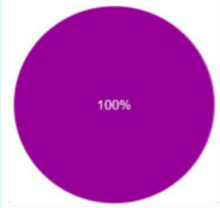
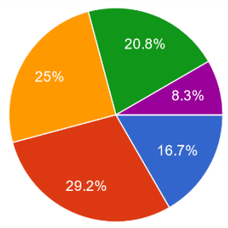
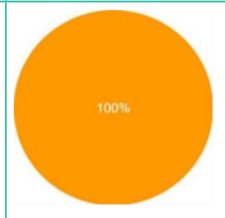
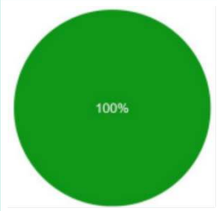
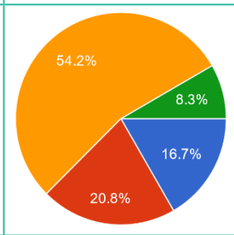
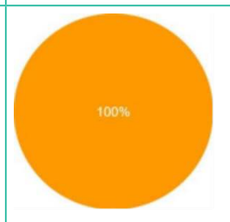
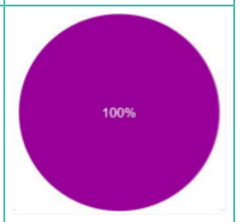
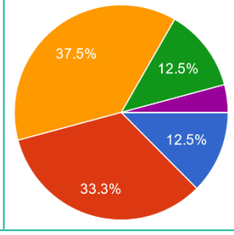
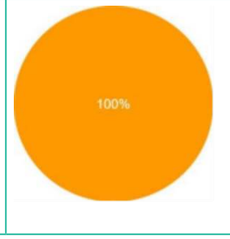
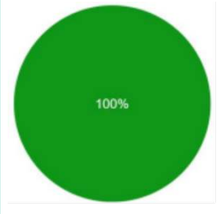
Table A.1 Checklist for the green growth indicators in efficient and sustainable energy

Indicators	24 experts	Breakout sessions during 2nd participatory workshop: Group 1	Group 2	Group 3
EE1. Ratio of total primary energy supply to GDP, or energy intensity level of primary energy				
EE2. Share of renewable to total final energy consumption				
EE3. Efficiency in sustainable transport				
EE4. Low-carbon electricity generation by sources				
EE5. Per capita electricity consumption				

Legend:
Very High High Moderate Low Very Low Not relevant

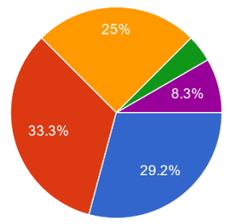
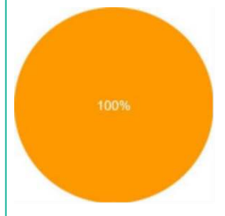
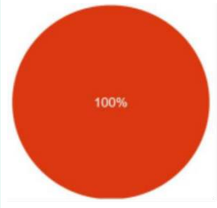
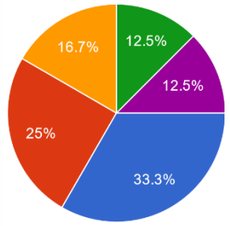
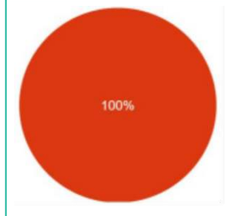
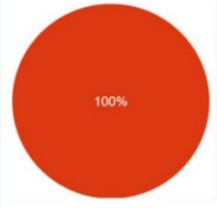
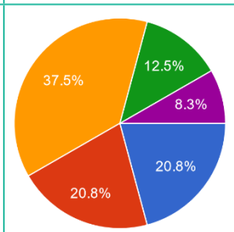
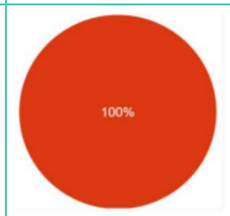
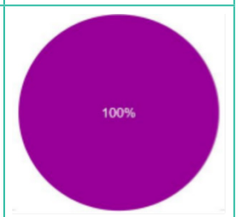
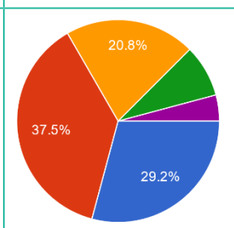
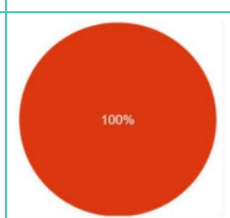
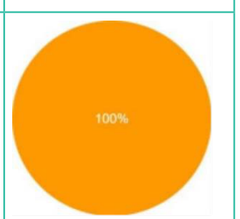
Indicators	24 experts	Breakout sessions during 2nd participatory workshop: Group 1	Group 2	Group 3
EW1. Water use efficiency				
EW2. Share of freshwater withdrawal to available freshwater resources				
EW3. Sustainable fisheries as a proportion of GDP				
EW4. Water management practices in lowland rice cultivation				
EW5. Proportion of bodies of water with good ambient water quality				
SL1. Soil nutrient budget				

Legend:
Very High High Moderate Low Very Low Not relevant

Indicators	24 experts	Breakout sessions during 2nd participatory workshop: Group 1	Group 2	Group 3
SL2. Share of agriculture organic to total agriculture land area				
SL3. Share of ruminant livestock population to agricultural area				
SL4. Growth in Agricultural Productivity				
SL5. Proportion of farmers using mechanised farming systems				
ME1. Total domestic material consumption (DMC) per unit of GDP				
ME2. Total material footprint (MF) per capita				

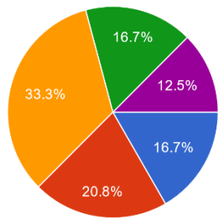
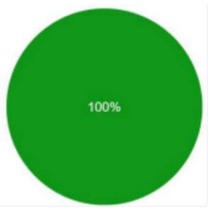
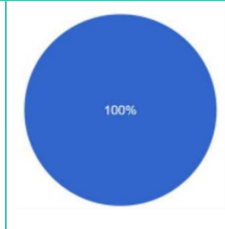
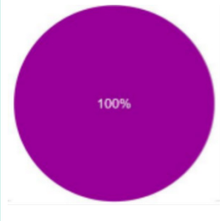
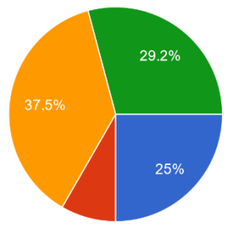
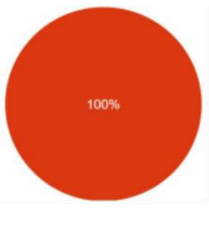
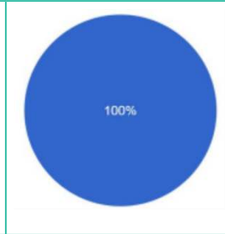
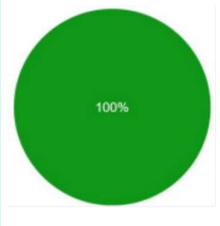
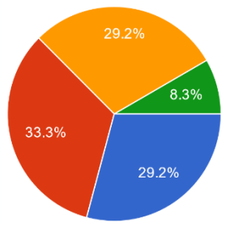
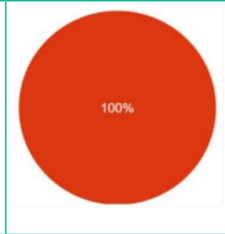
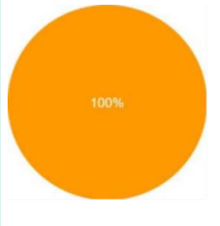
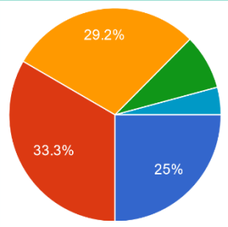
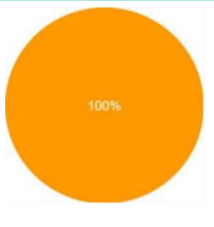
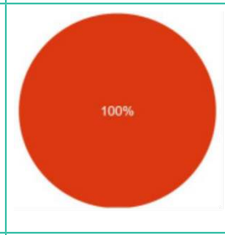
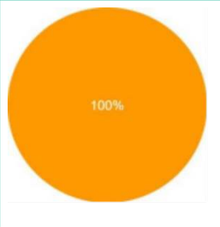
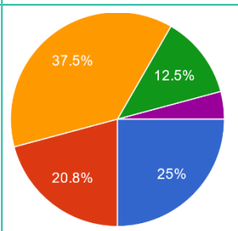
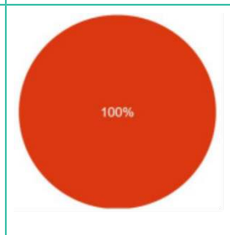
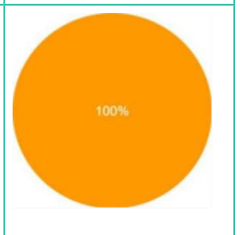
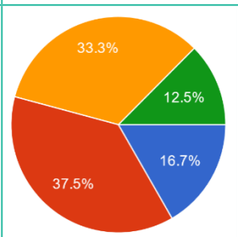
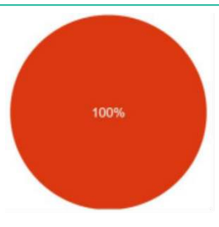
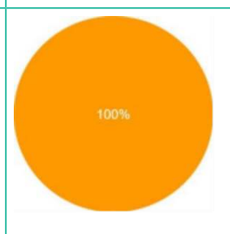
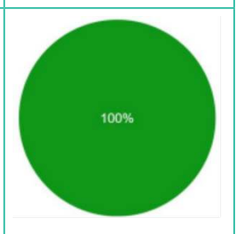
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	24 experts	Breakout sessions during 2nd participatory workshop: Group 1	Group 2	Group 3
ME3. Share of food loss to production and food consumption				
ME4. Municipal solid waste recycled				
ME5. Proportion of wastewater treated including reuse/ recycling				
EQ1. PM2.5 air pollution, mean annual population-weighted exposure				
EQ2. DALY rate due to unsafe water sources [UNSTATS] (2000-2019)				
EQ3. Municipal solid waste (MSW) generation per capita				

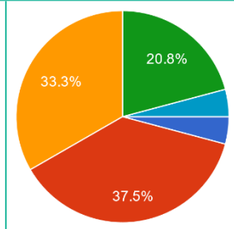
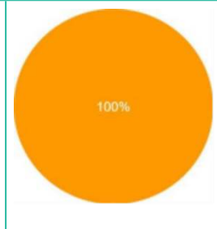
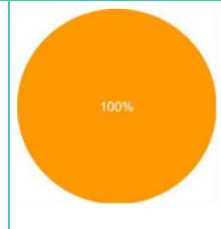
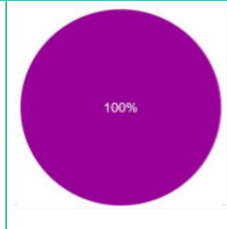
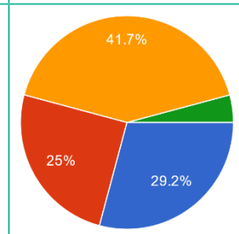
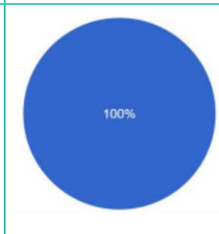
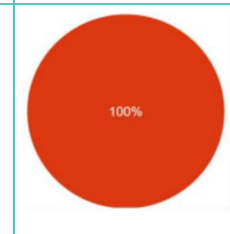
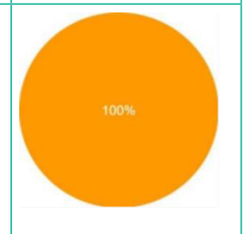
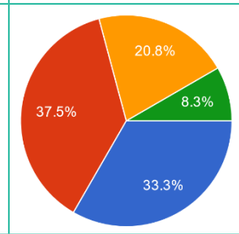
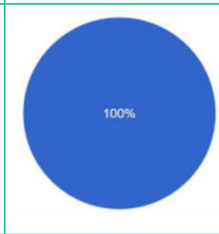
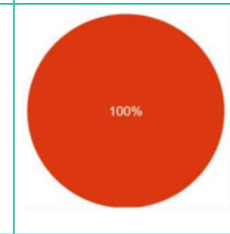
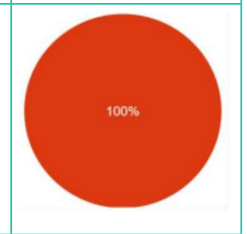
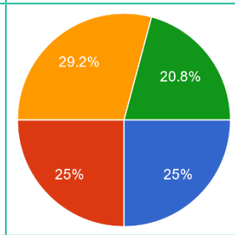
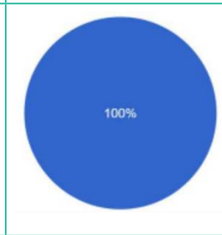
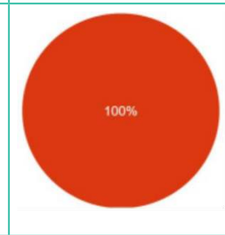
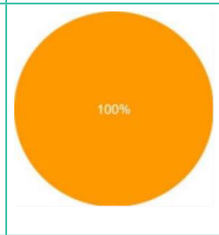
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
EQ4. Total tonnage of municipal waste composted				
EQ5. Percentage of waste reused or disposed through proper methods				
GE1. Ratio of CO2 emissions to population, including AFOLU				
GE2. Ratio of non-CO2 emissions (CH4, N2O and F-gas) excluding AFOLU to population				
GE3. Ratio of non-CO2 emissions (CH4, N2O and F-gas) in Agriculture and LUCF to population				
GE4. Carbon Intensity of energy production				

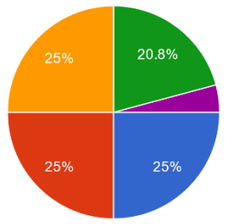
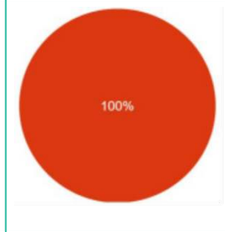
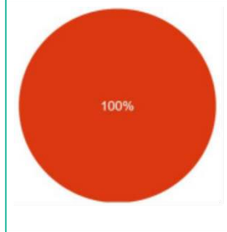
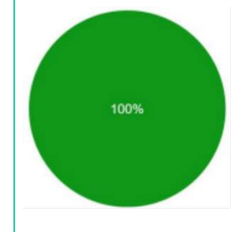
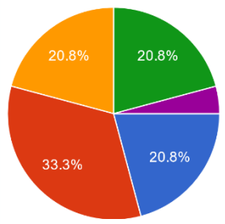
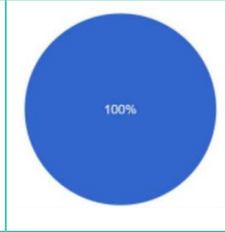
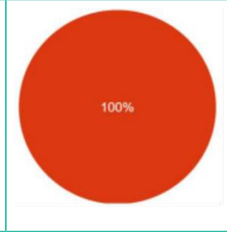
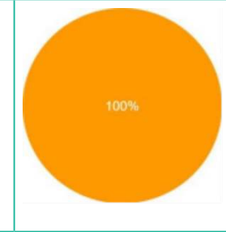
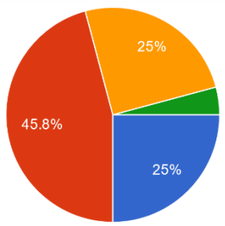
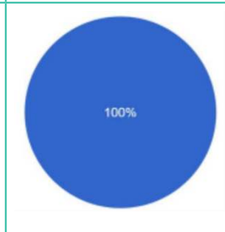
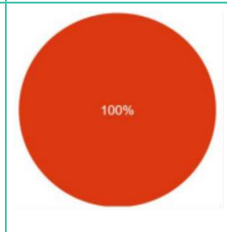
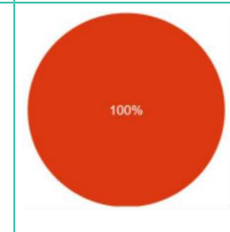
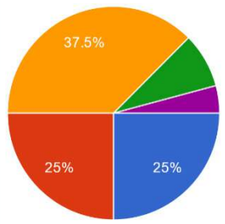
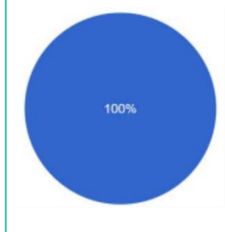
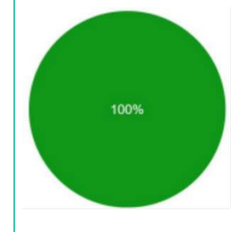
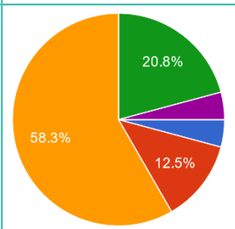
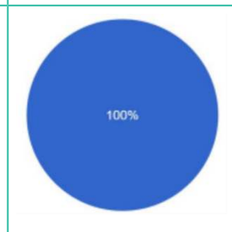
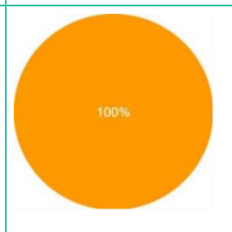
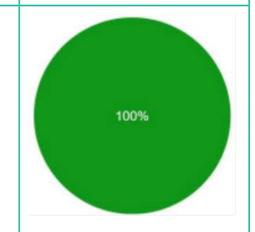
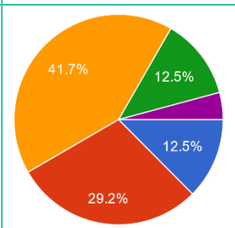
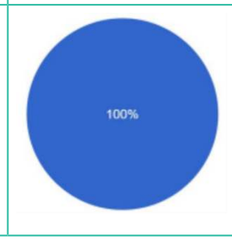
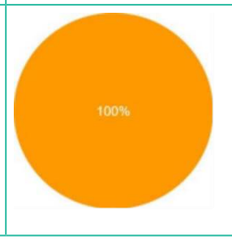
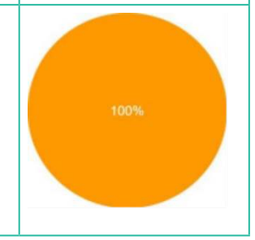
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
GE5. Reduced emissions from Green Buildings and Green Infrastructure				
BE1. Average proportion of Key Biodiversity Areas covered by protected areas				
BE2. Share of forest area to total land area				
BE3. Above-ground biomass stock in forest				
BE4. Forest area under an independently verified forest management certification scheme				
BE5. Change in the extent of water related ecosystems over time				

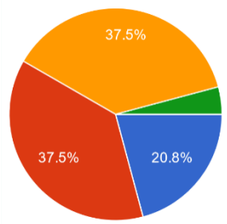
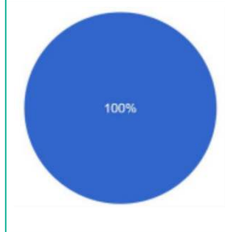
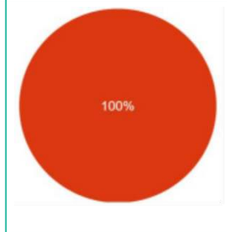
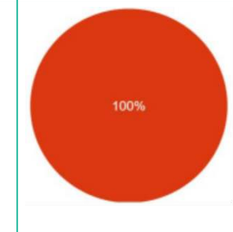
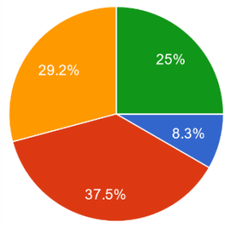
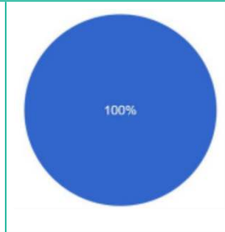
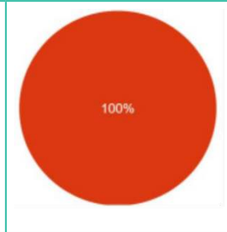
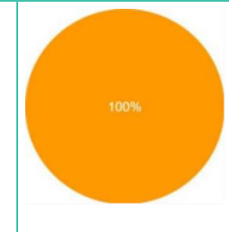
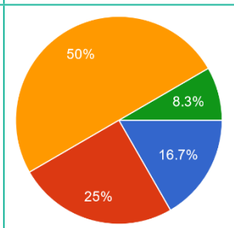
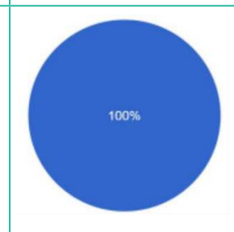
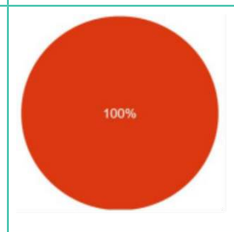
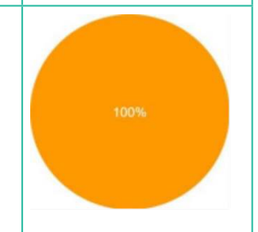
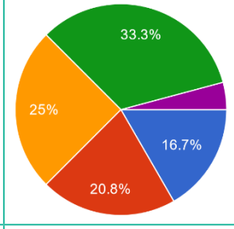
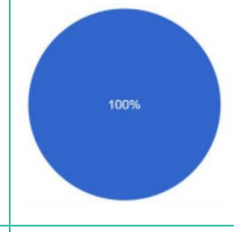
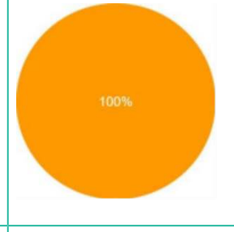
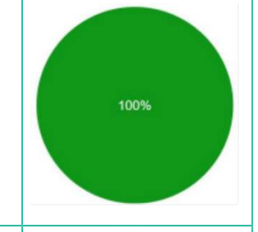
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
CV1. Red list index				
CV2. Share of terrestrial and marine protected areas to total territorial areas				
CV3. Number of tourists visiting Eco-tourism, Cultural and Historical sites				
CV4. Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage				
CV5. Annual Growth rate of Handicraft production				
GV1. Adjusted net savings to GNI, including particulate emissions damage				

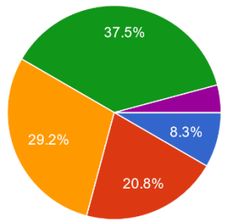
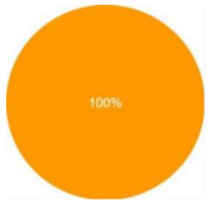
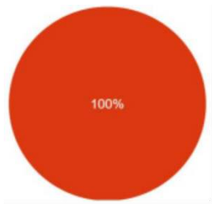
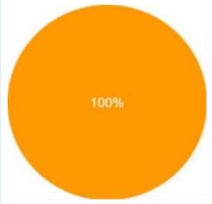
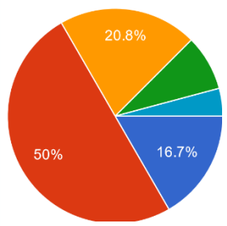
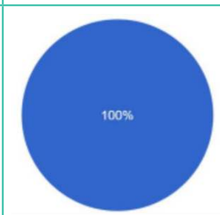
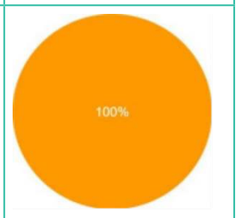
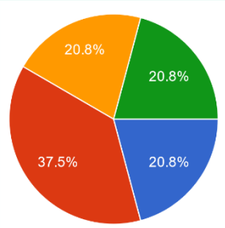
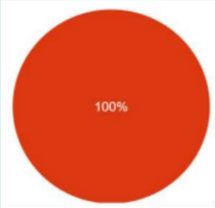
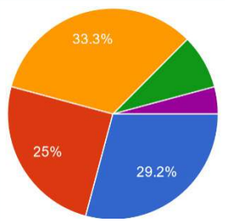
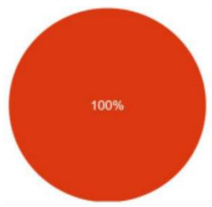
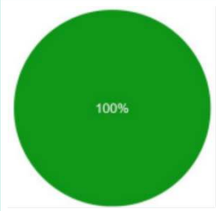
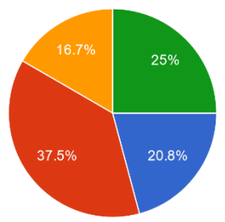
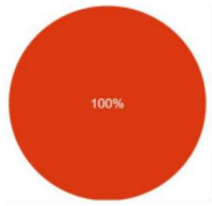
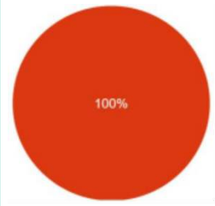
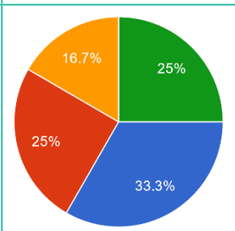
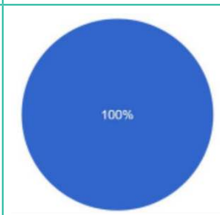
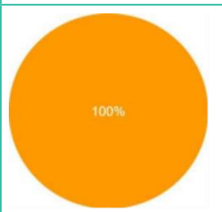
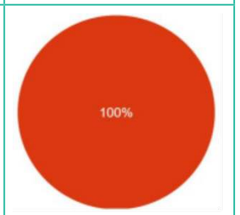
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
GV2. Installed renewable energy-generating capacity in developing countries				
GV3. Revenue generated and finance mobilized from biodiversity-relevant economic instruments				
GV4. Agriculture Orientation Index for Government Expenditures				
GV5. Proportion of paved roads to total national road network				
GT1. Share of export of environmental goods (OECD and APEC classifications) to total export				
GT2. Hazardous waste exported				

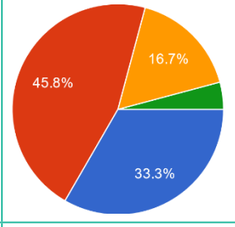
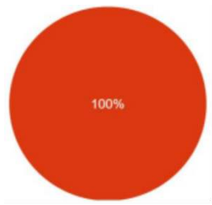
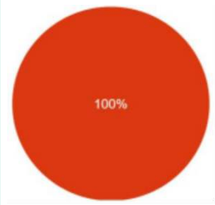
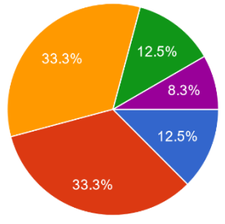
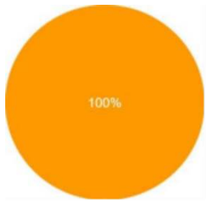
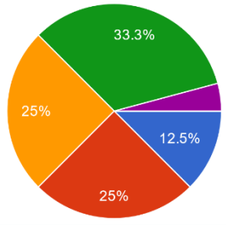
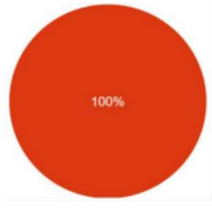
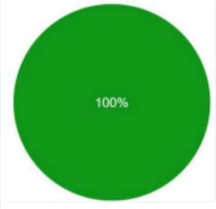
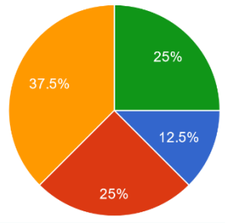
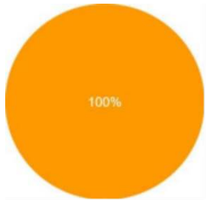
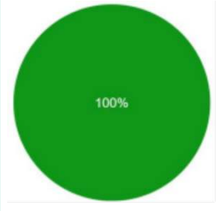
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
GT3. Share of suppliers with ISO14001 certification, which specifies demands to environmental management				
GT4. Ease of doing business in Zambia				
GT5. Share of processed agricultural exports to total exports				
GJ1. Share of green employment in total manufacturing employment				
GJ2. Employed population below international poverty line				
GJ3. Vulnerable employment, total				

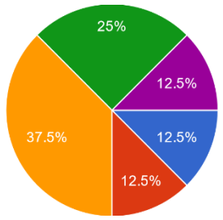
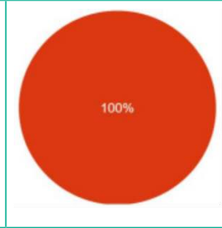
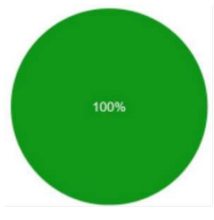
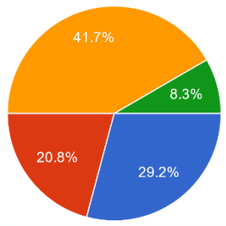
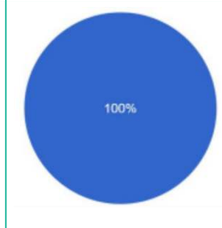
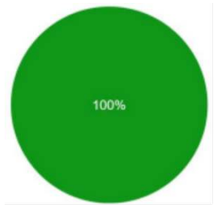
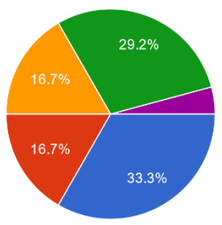
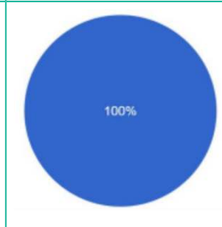
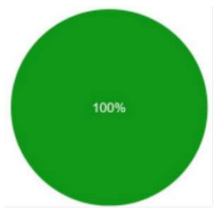
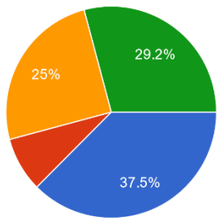
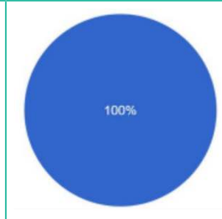
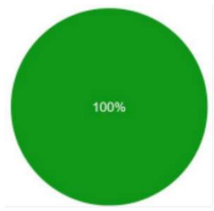
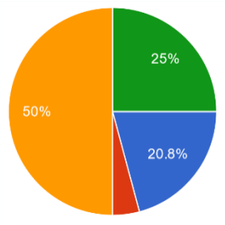
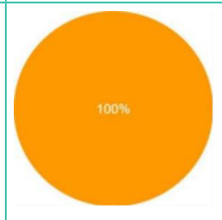
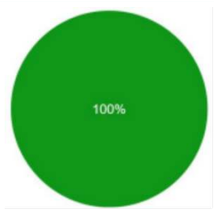
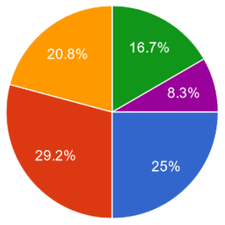
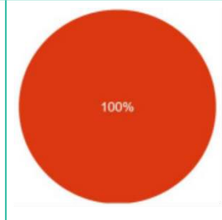
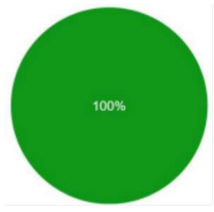
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
GJ4. Participation rate in formal and non-formal education and training, by sex				
GJ5. Volume of official development assistance flows for scholarships by sector and type of study				
GN1. Share of patent publications in environmental technology to total patents				
GN2. Global Innovation Index				
GN3. Researchers (in full-time equivalent) per million inhabitants				
GN4. Proportion of medium and high-tech industry value added in total value added				

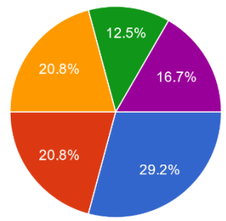
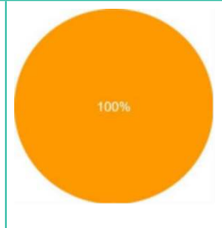
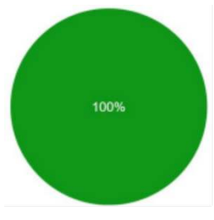
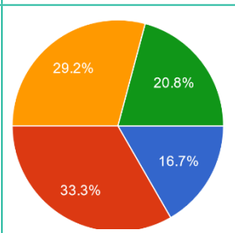
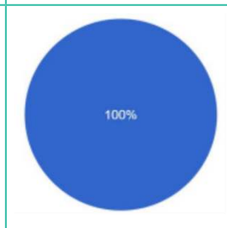
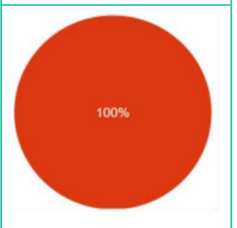
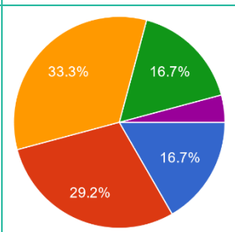
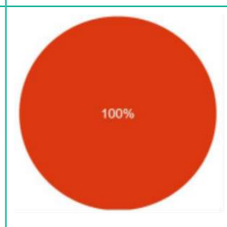
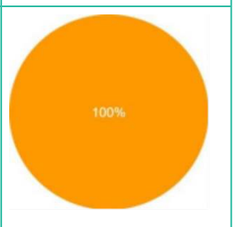
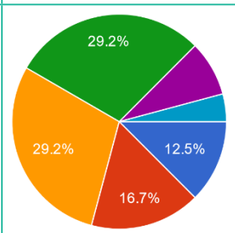
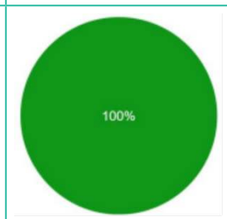
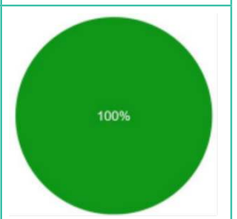
Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
GN5. Percent of MSMEs utilizing the services of Research and innovation facilities				
AB1. Population with access to safely managed water and sanitation				
AB2. Population with access to electricity and clean fuels				
AB3. Prevalence of undernourishment				
AB4. Universal access to sustainable transport				
AB5. Proportion of people with secure tenure rights to land out of total adult population, by sex				

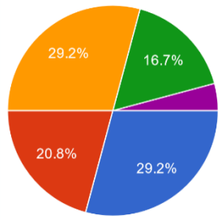
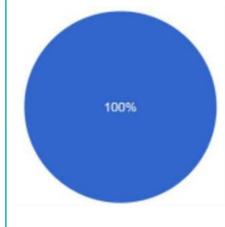
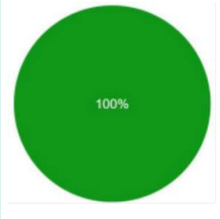
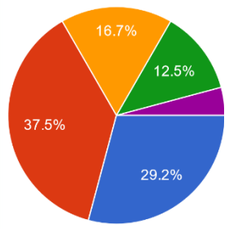
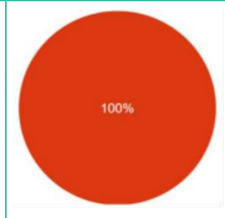
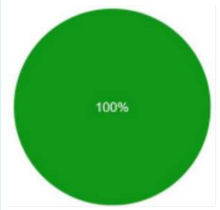
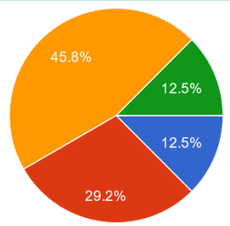
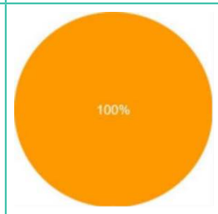
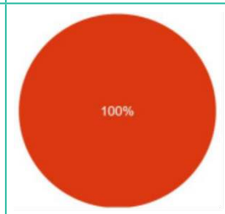
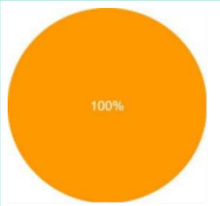
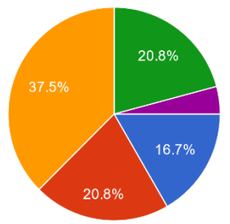
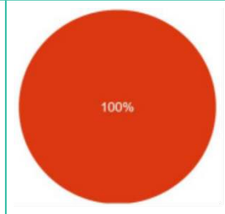
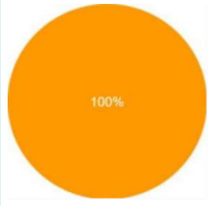
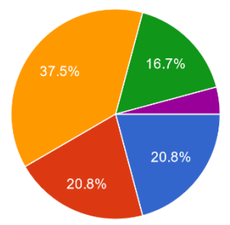
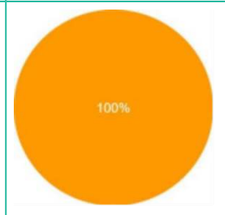
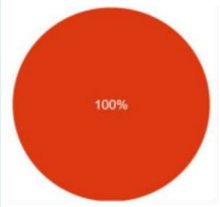
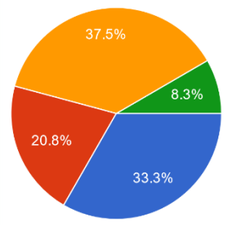
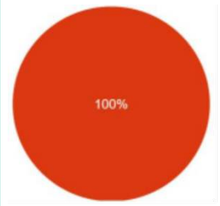
Legend:

Very High High Moderate Low Very Low Not relevant

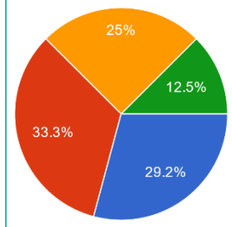
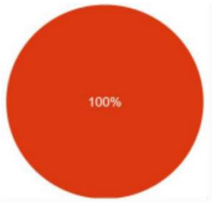
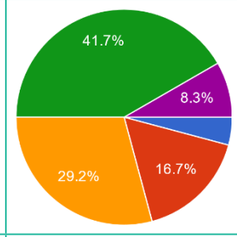
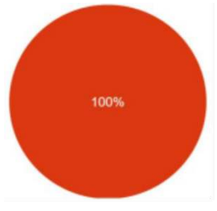
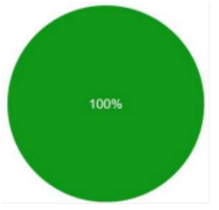
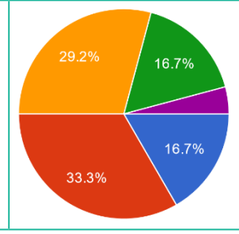
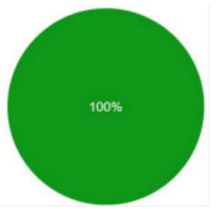
Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
GB1. Proportion of seats held by women in national parliaments				
GB2. Gender ratio of account at a financial institution or mobile-money-service provider				
GB3. Getting paid, laws and regulations for equal gender pay				
GB4. Proportion of mothers with newborns receiving maternity cash benefits				
GB5. School enrollment, primary (gross), gender parity index (GPI)				
SE1. Inequality in income based on Palma ratio				

Legend:

Very High High Moderate Low Very Low Not relevant

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
SE2. Population with access to basic services by urban/rural, i.e. electricity				
SE3. Share of youth (aged 15-24 years) not in education, employment or training				
SE4. Unemployment rate, by age (aged over 50 years)				
SE5. Proportion of population with severe disabilities receiving disability cash benefit				
SP1. Proportion of population above statutory pensionable age receiving a pension				
SP2. Universal health coverage (UHC) service coverage index				

Legend:

Indicators	Breakout sessions during 2nd participatory workshop			
	24 experts	Group 1	Group 2	Group 3
SP3. Proportion of urban population living in slums				
SP4. Number of victims of intentional homicide per 100,000 population				
SP5. Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies				

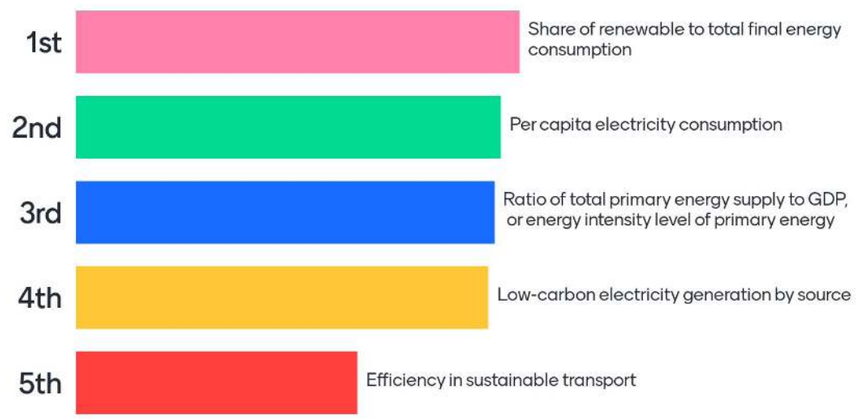
Legend:

Annex C

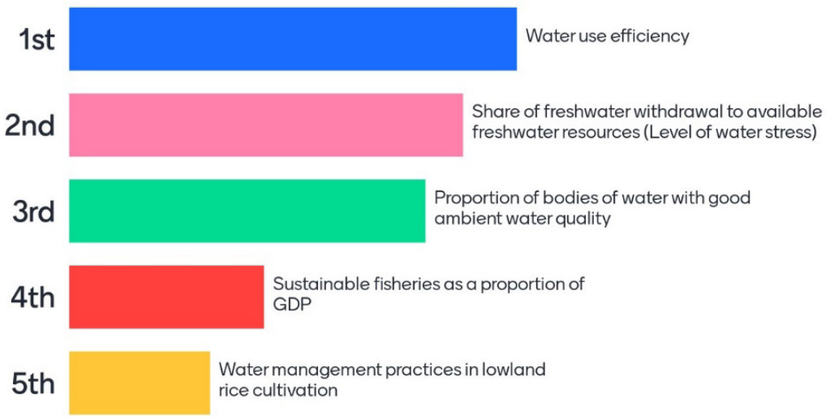
Results of Mentimeter Votings

Survey1: Results of the initial rating of the indicators before the breakout sessions

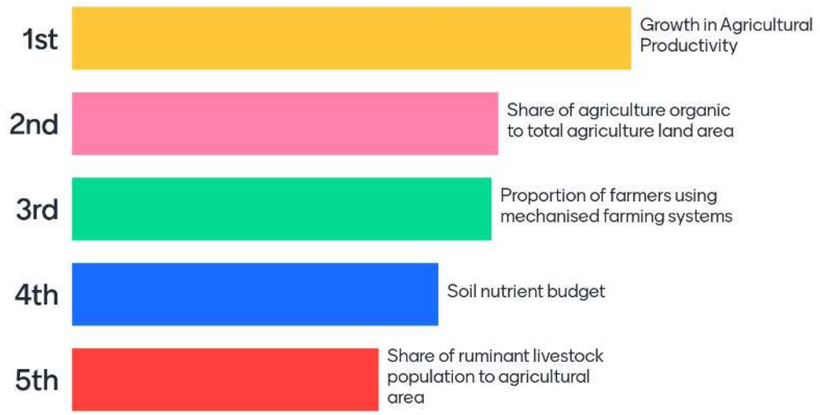
Survey 1: Efficient and Sustainable Energy



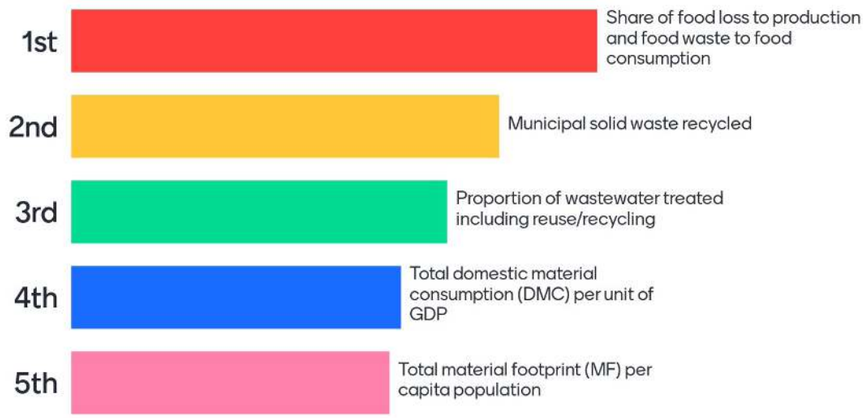
Survey 1: Efficient and Sustainable Water Use



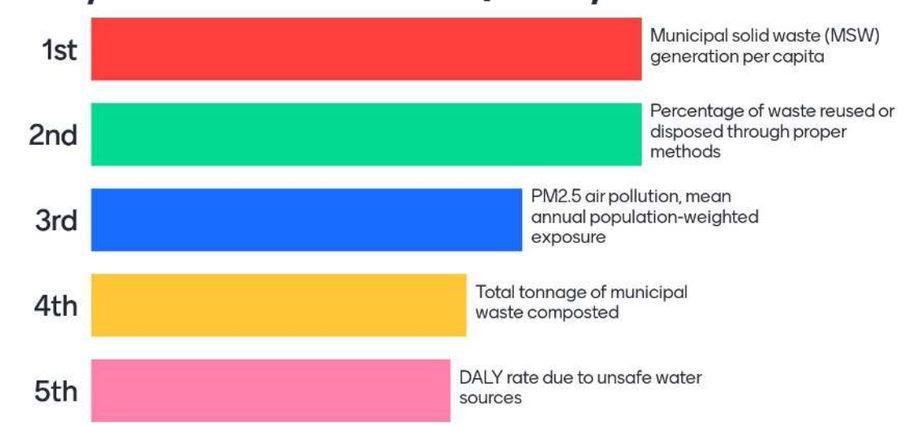
Survey 1: Sustainable Land Use



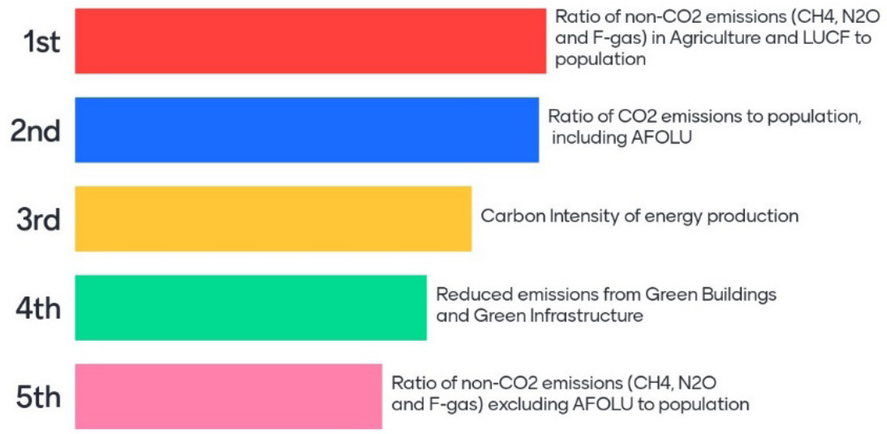
Survey 1: Material Use Efficiency



Survey 1: Environmental Quality



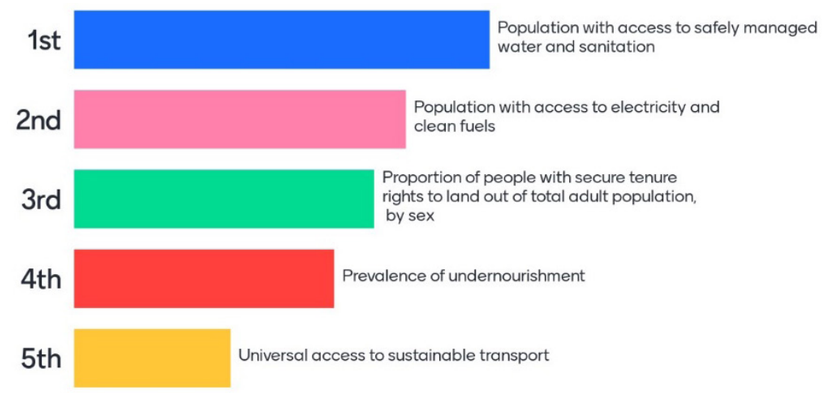
Survey 1: Greenhouse Gas Emissions Reductions



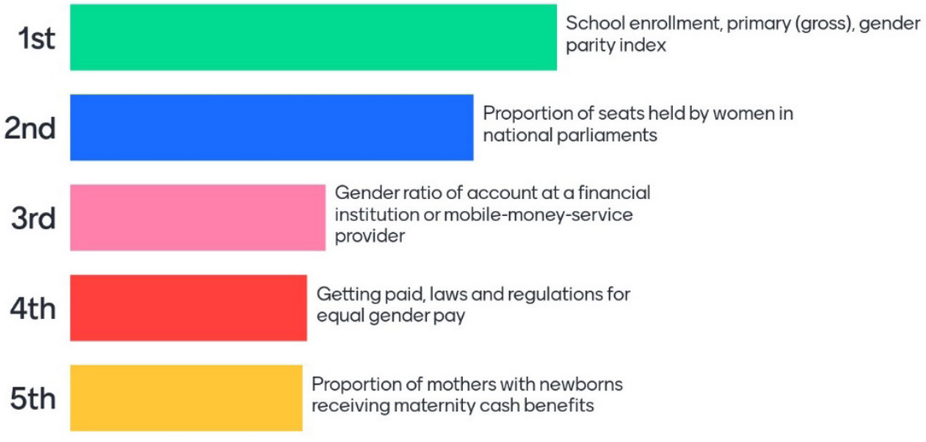
Survey 1: Biodiversity and Ecosystem Protection

Survey 1: Cultural and Social Value

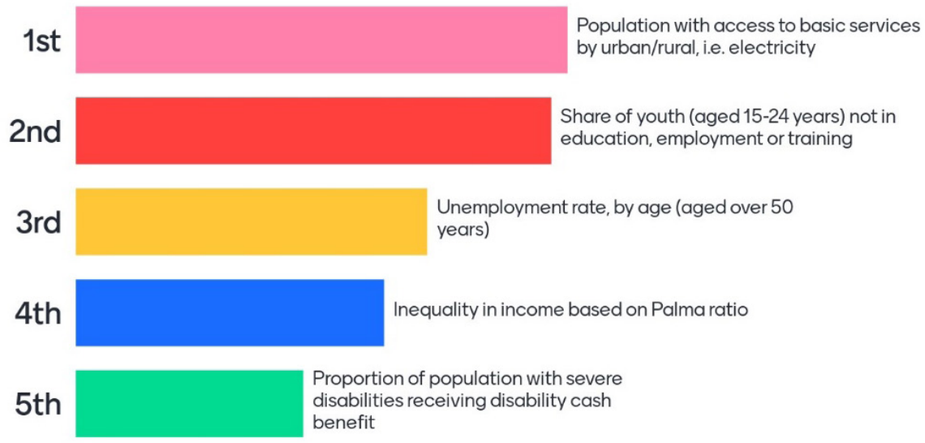
Survey 1: Access to basic services and resources



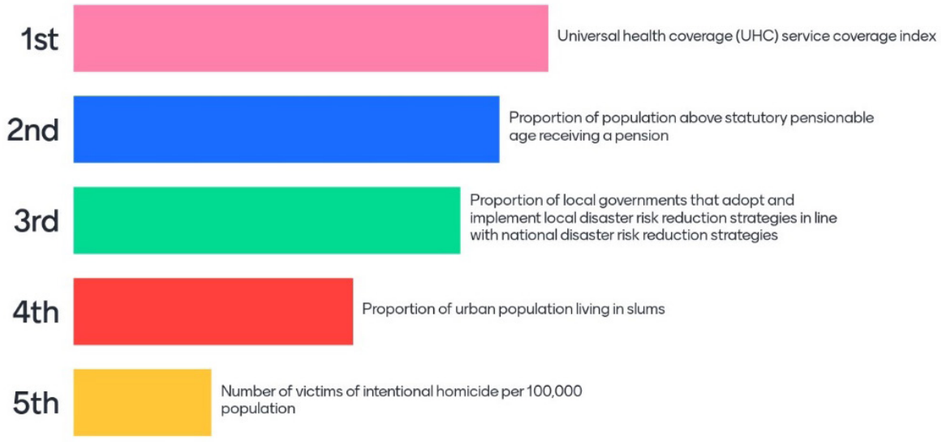
Survey 1: Gender Balance



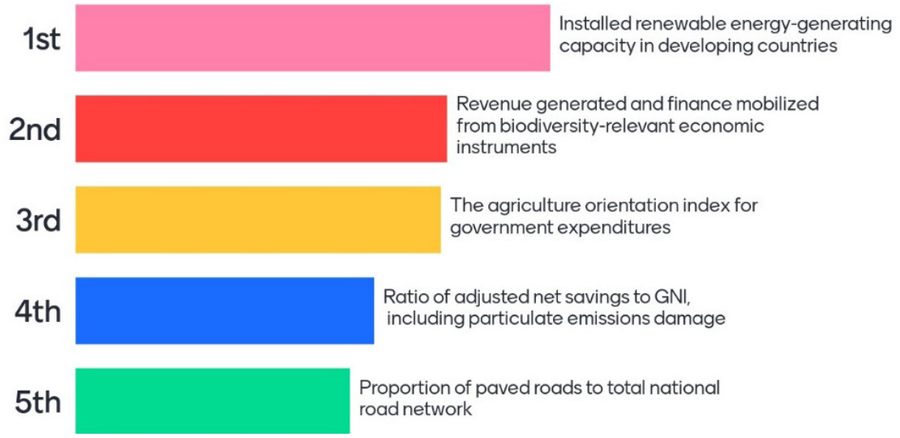
Survey 1: Social Equity



Survey 1: Social Protection

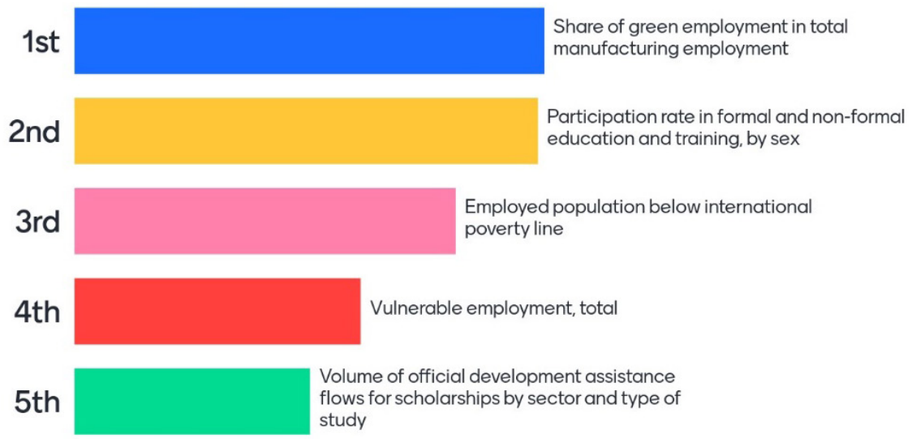


Survey 1: Green Investment

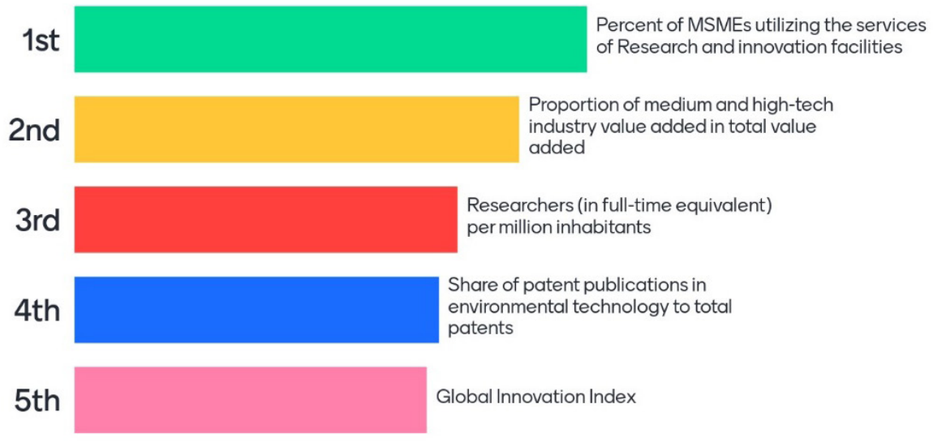


Survey 1: Green Trade

Survey 1: Green Employment

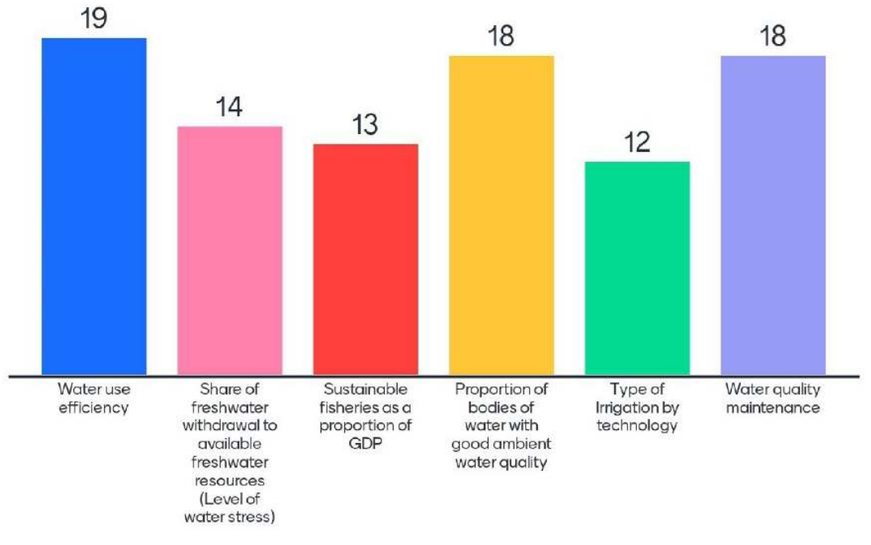


Survey 1: Green Innovation

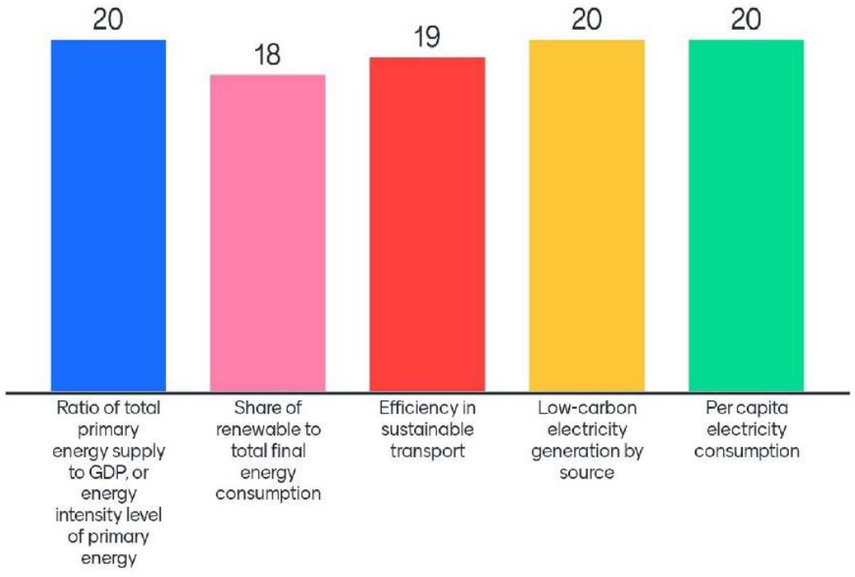


Survey2: Results of the final rating of the indicators after the breakout sessions

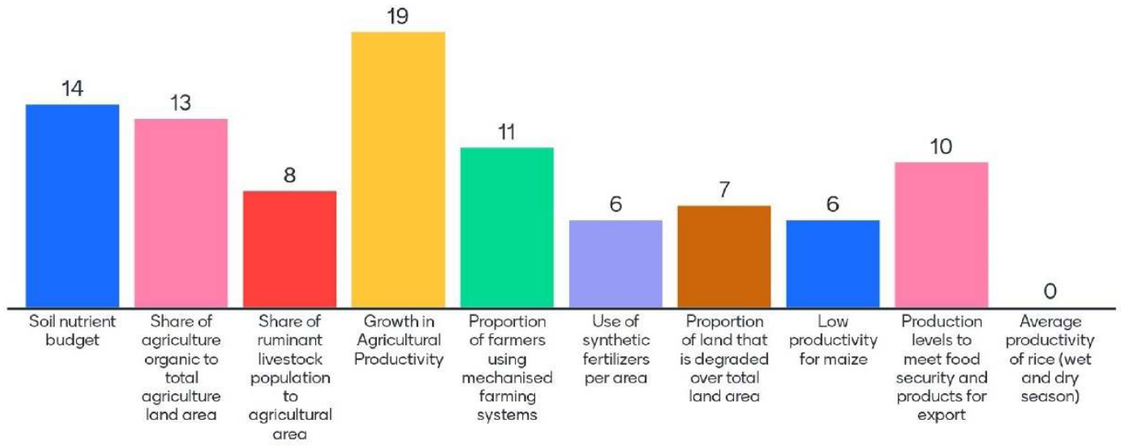
Survey 2: Efficient and Sustainable Water Use



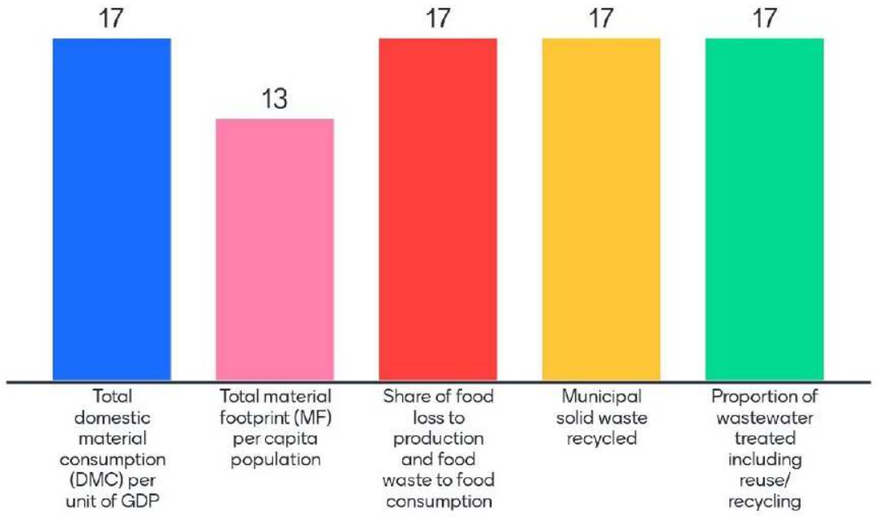
Survey 2: Efficient and Sustainable Energy



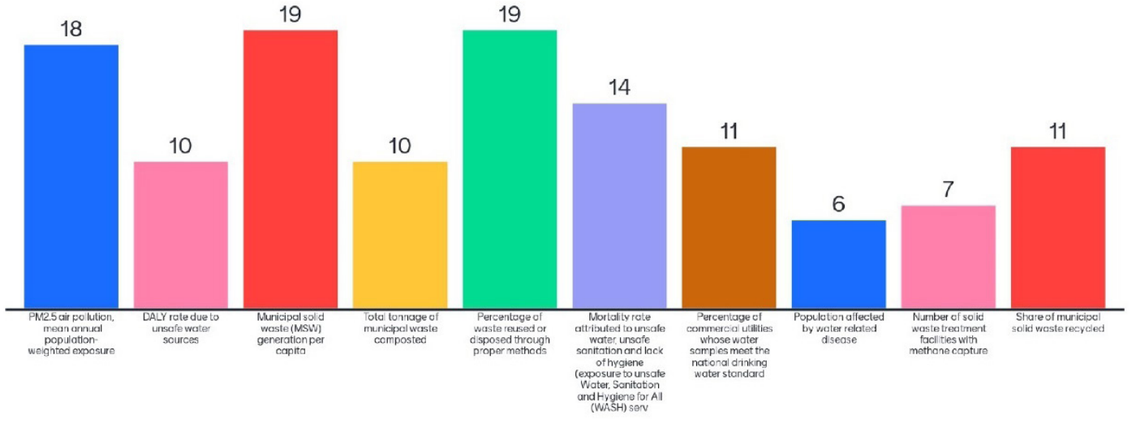
Survey 2: Sustainable Land Use



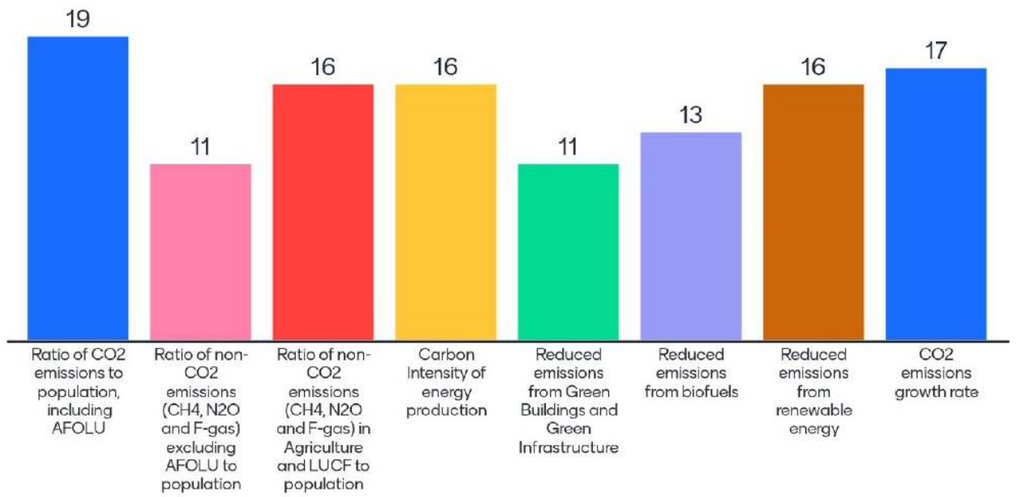
Survey 2: Material Use Efficiency



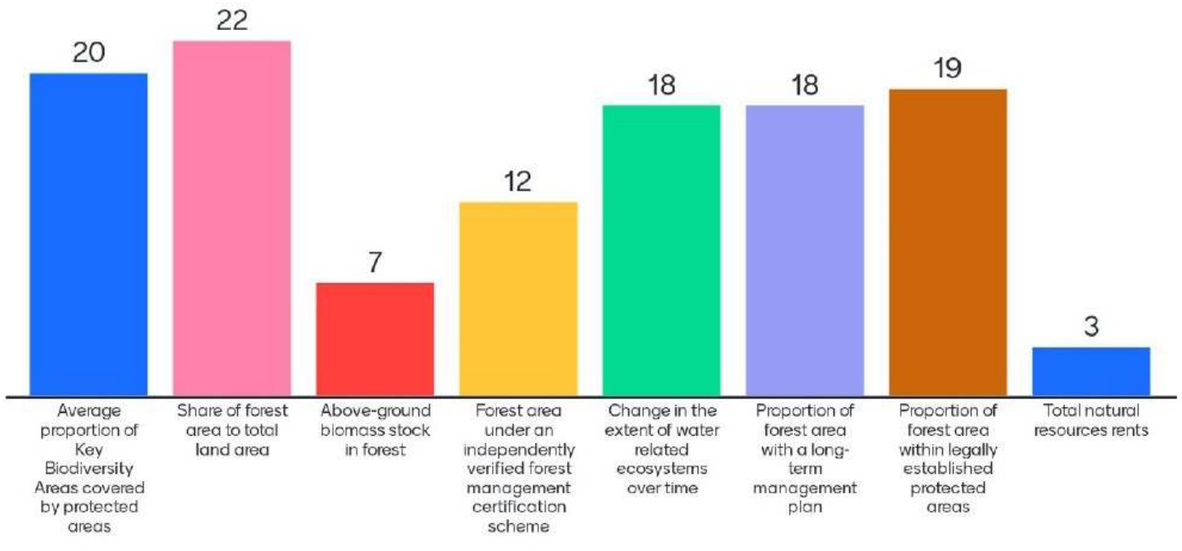
Survey 2: Environmental Quality



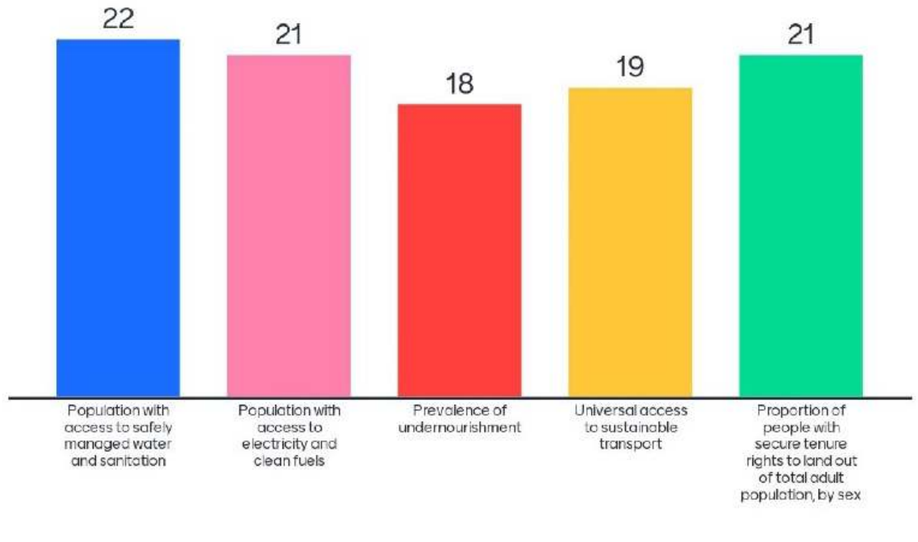
Survey 2: Greenhouse Gas Emissions Reductions



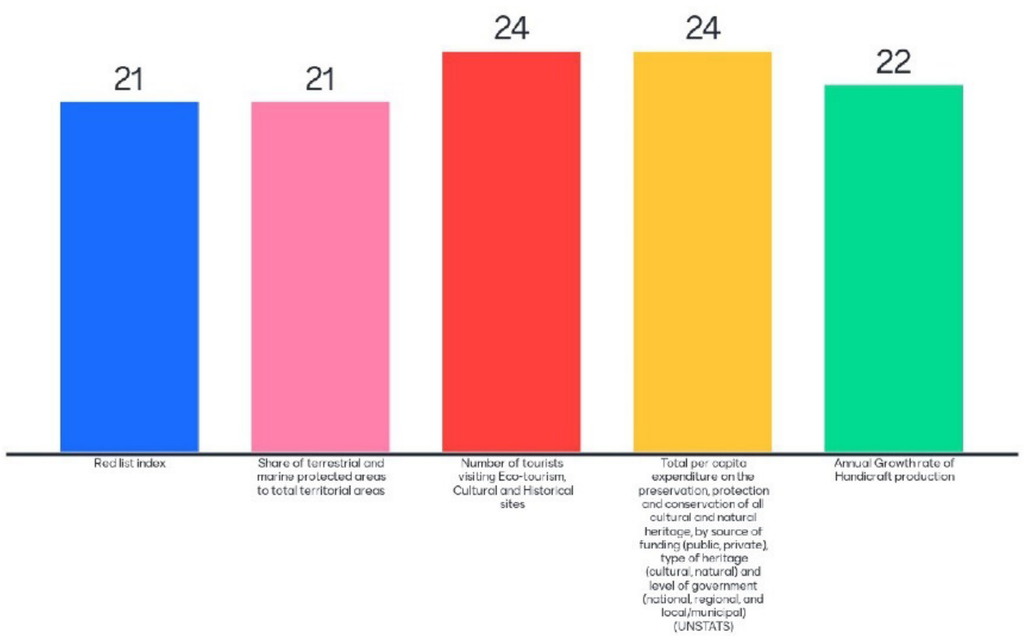
Survey 2: Biodiversity and Ecosystem Protection



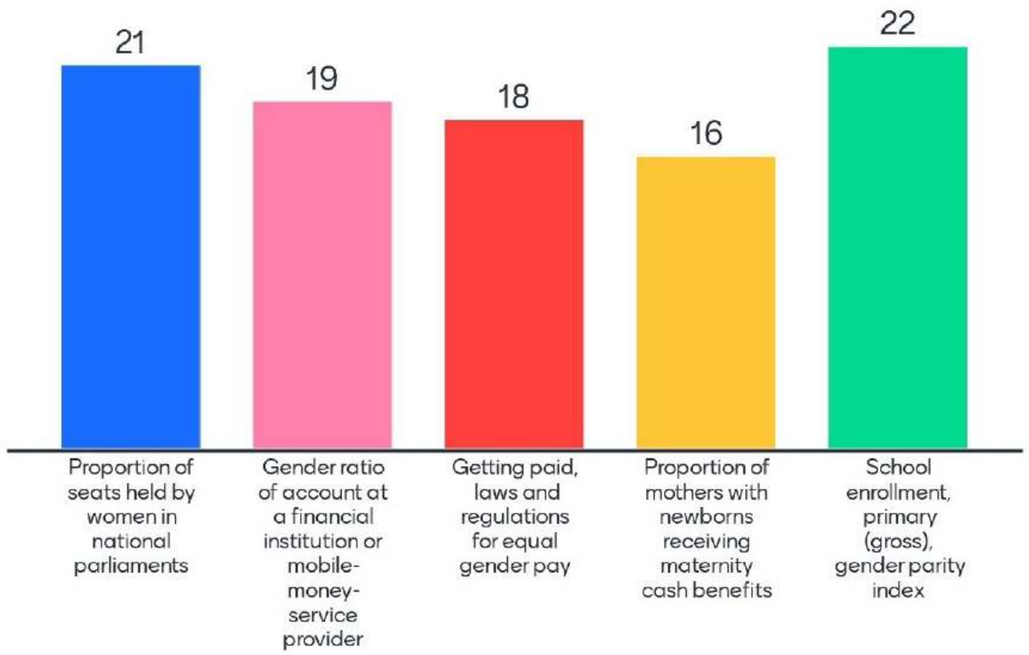
Survey 2: Access to basic services and resources



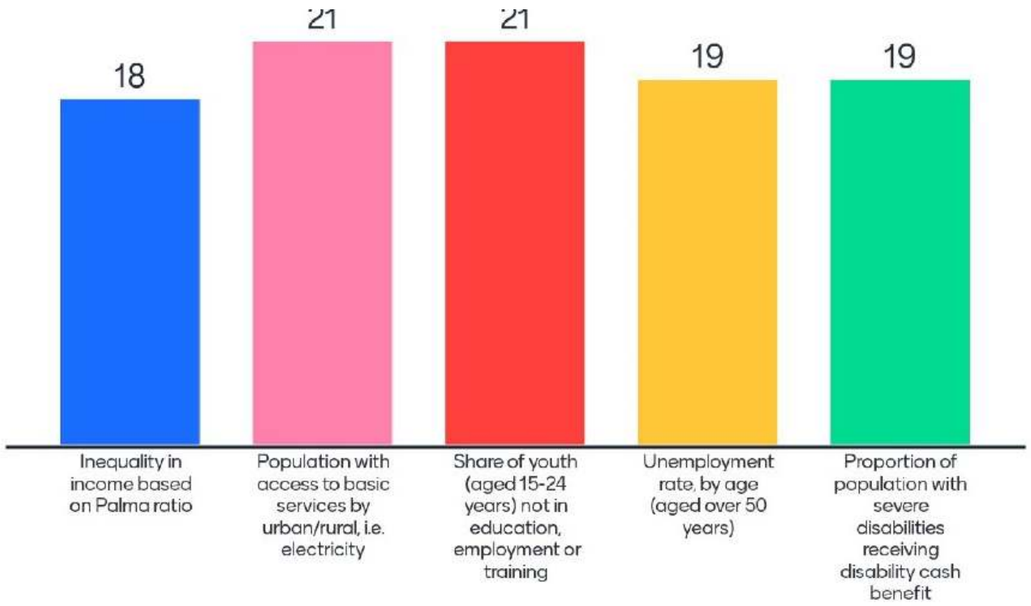
Survey 2: Cultural and Social Value



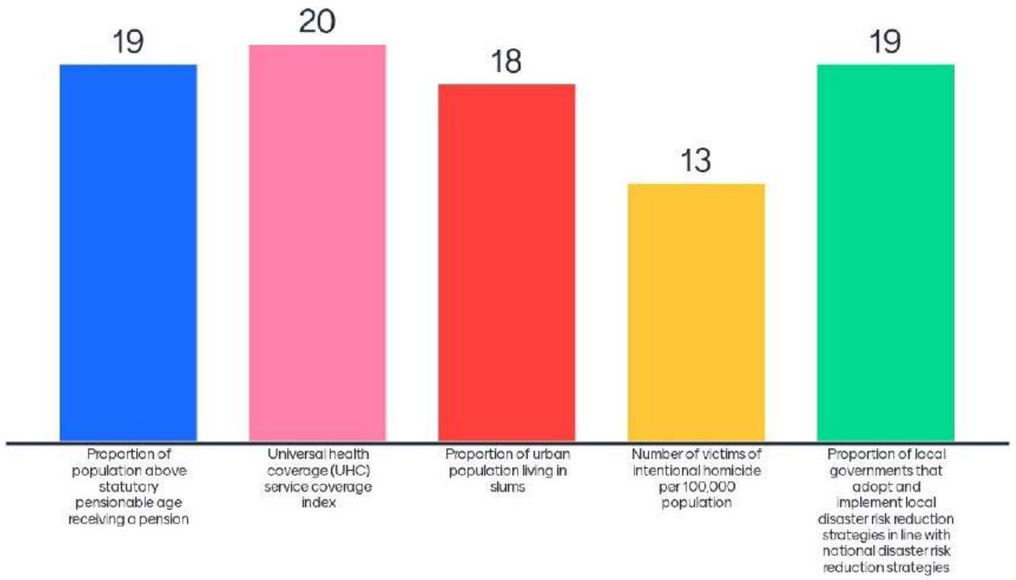
Survey 2: Gender Balance



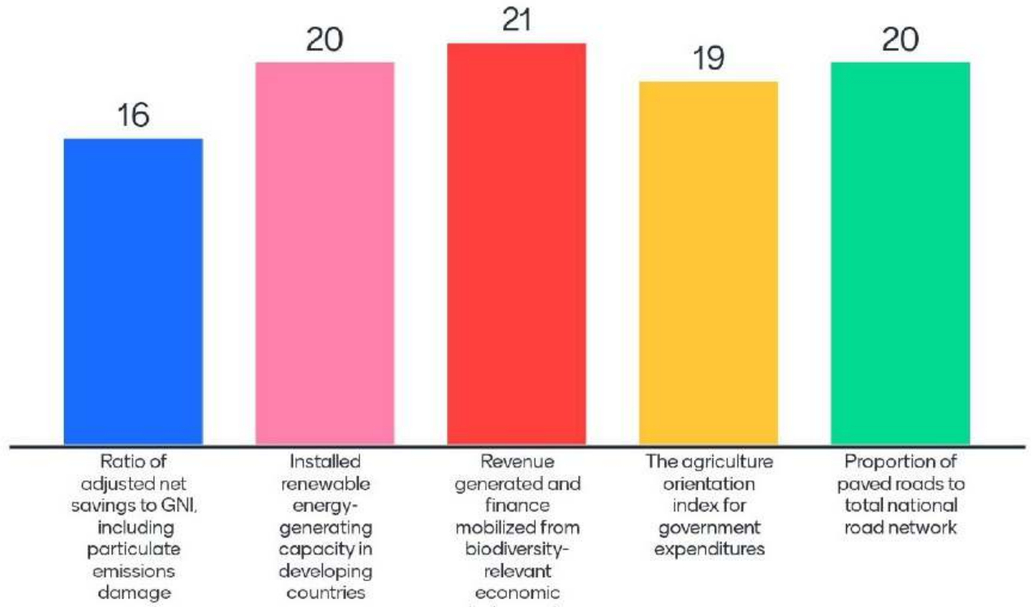
Survey 2: Social Equity



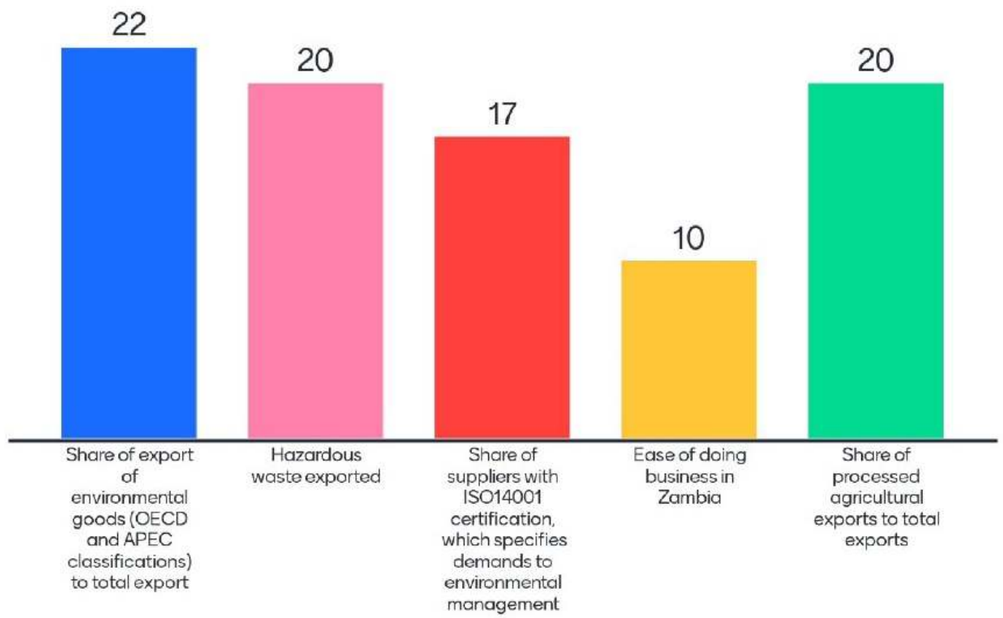
Survey 2: Social Protection



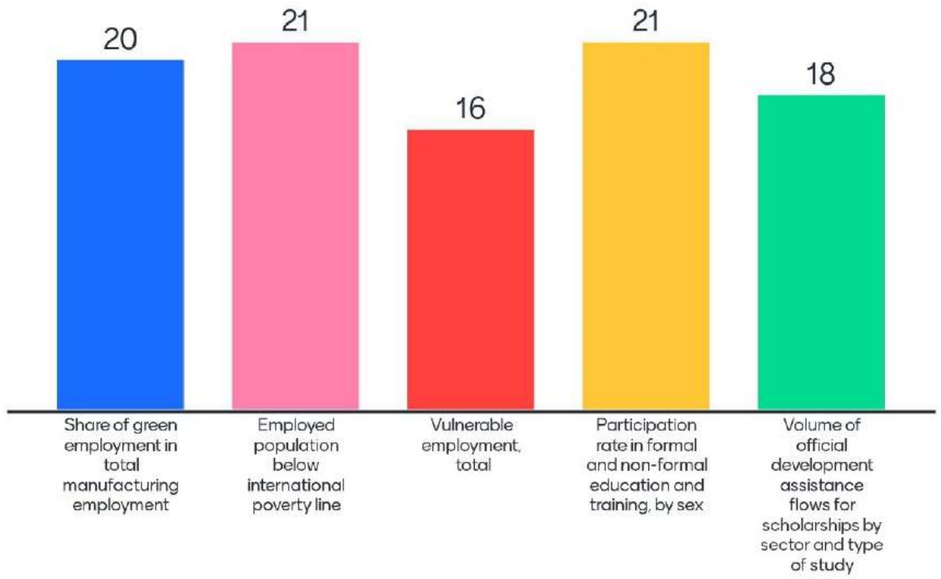
Survey 2: Green Investment



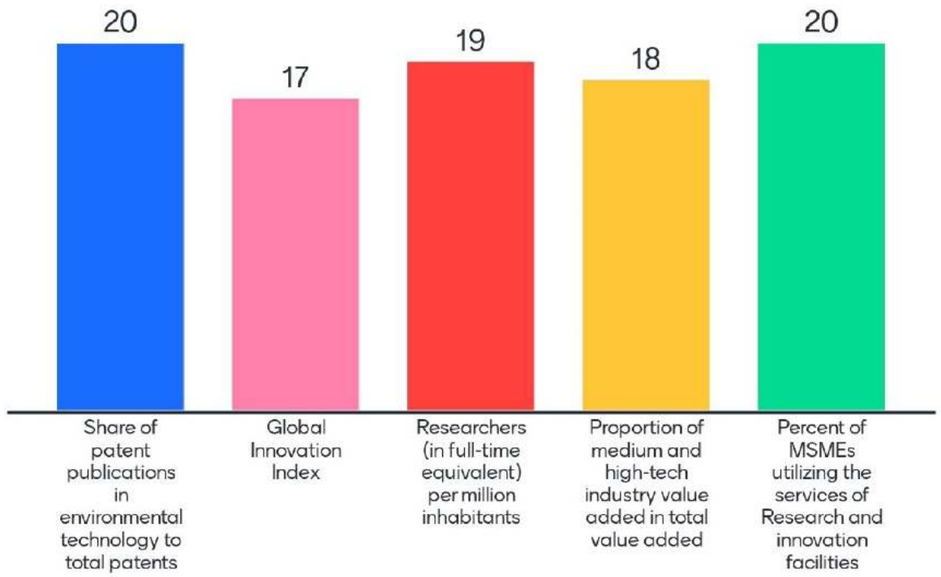
Survey 2: Green Trade



Survey 2: Green Employment

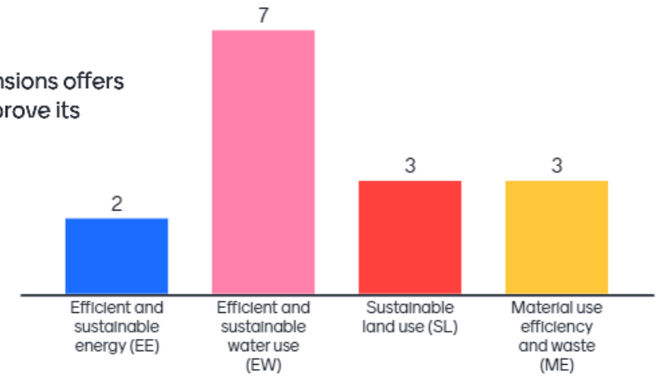


Survey 2: Green Innovation

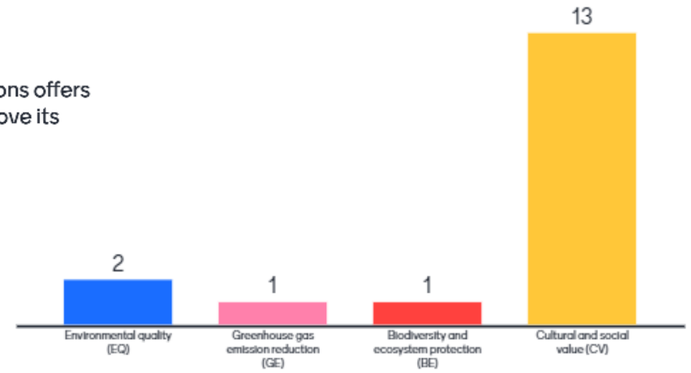


Mentimeter votings on the scores of the green growth indicators

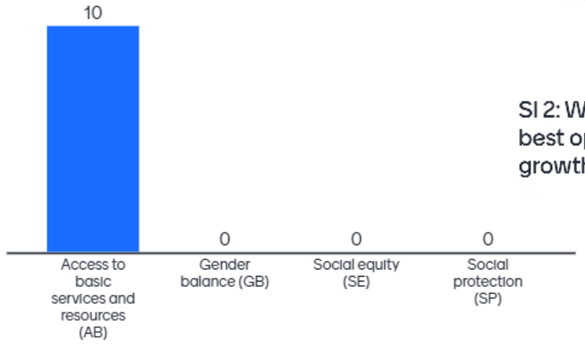
ESRU 2: Which of the four green growth dimensions offers the best opportunity for Zambia to further improve its green growth performance?



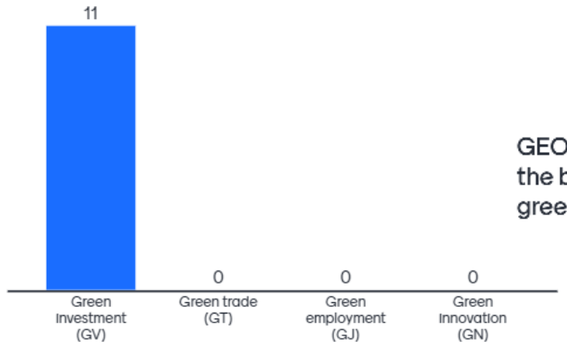
NCP 2: Which of the four green growth dimensions offers the best opportunity for Zambia to further improve its green growth performance?



SI 2: Which of the four green growth dimensions offers the best opportunity for Zambia to further improve its green growth performance?



GEO 2: Which of the four green growth dimensions offers the best opportunity for Zambia to further improve its green growth performance?



Annex D

Survey on Proxy Indicator Selection

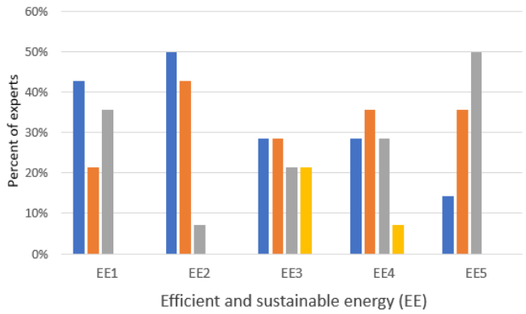
Indicator	Percent of survey respondents			Number of survey respondents			Total
	%Yes	%No	% I don't know	Yes	No	I don't know	
Efficient and Sustainable Resource Use (ESRU)							
EW3: Sustainable fisheries as a proportion of GDP	89.5%	5.3%	5.3%	17	1	1	19
EW4: Type of irrigation used in farms by technology	88.2%	0.0%	11.8%	15	0	2	17
EW5: Proportion of bodies of water with good ambient water quality	88.2%	5.9%	5.9%	15	1	1	17
SL3: Production levels to meet food security and products for export	94.7%	5.3%	0.0%	18	1	0	19
SL5: Proportion of farmers using mechanized farming systems	63.2%	10.5%	26.3%	12	2	5	19
ME4: Municipal solid waste recycled	84.2%	15.8%	0.0%	16	3	0	19
ME5: Proportion of wastewater treated including reuse/recycling	94.7%	0.0%	5.3%	18	0	1	19
Natural Capital Protection (NCP)							
EQ4: Share of Municipal solid waste disposed off safely	63.2%	21.1%	15.8%	12	4	3	19
EQ5: Percentage of waste reused or disposed through proper methods	72.2%	22.2%	5.6%	13	4	1	18
GE5: Reduced emissions from renewable energy	84.2%	0.0%	15.8%	16	0	3	19
BE4: Proportion of forest area within legally established protected areas	63.2%	10.5%	26.3%	12	2	5	19
CV3: Number of tourists visiting Eco-tourism, Cultural and Historical sites	89.5%	5.3%	5.3%	17	1	1	19
CV4: Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding	78.9%	5.3%	15.8%	15	1	3	19
CV5: annual Growth rate of Handicraft production	63.2%	10.5%	26.3%	12	2	5	19
Green Economic Opportunities (GEO)							
GV5: Proportion of paved roads to total national road network	78.9%	5.3%	15.8%	15	1	3	19
GT2: Hazardous waste exported	78.9%	15.8%	5.3%	15	3	1	19

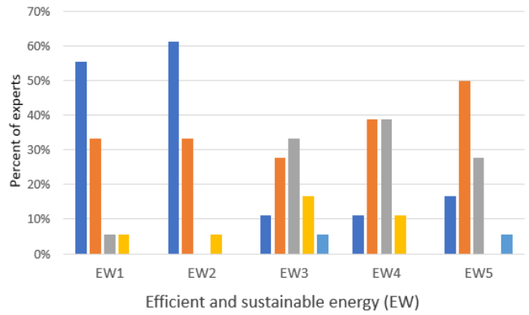
Indicator	Percent of survey respondents			Number of survey respondents			Total
	%Yes	%No	% I don't know	Yes	No	I don't know	
GT3: Share of suppliers with ISO14001 certification, which specifies demands to environmental management	68.4%	15.8%	15.8%	13	3	3	19
GT5: Share of processed agricultural exports to total exports	100.0%	0.0%	0.0%	19	0	0	19
GJ4: Participation rate in formal and non-formal education and training, by sex	78.9%	10.5%	10.5%	15	2	2	19
GN1: Share of patent publications in environmental technology to total patents	94.7%	0.0%	5.3%	18	0	1	19
GN3: Researchers (in full-time equivalent) per million inhabitants	72.7%	0.0%	27.3%	8	0	3	11
GN5: Percent of MSMEs utilizing the services of Research and innovation facilities	73.7%	15.8%	10.5%	14	3	2	19
Social Inclusion (SI)							
AB4: Universal access to sustainable transport	58.8%	17.6%	23.5%	10	3	4	17
AB5: Proportion of people with secure tenure rights to land out of total adult population	82.4%	0.0%	17.6%	14	0	3	17
GB4: Proportion of mothers with newborns receiving maternity cash benefit	82.4%	5.9%	11.8%	14	1	2	17
SE3: Share of youth (aged 15-24 years) not in education, employment or training	89.5%	5.3%	5.3%	17	1	1	19
SE5: Proportion of population with severe disabilities receiving disability cash benefit	100.0%	0.0%	0.0%	19	0	0	19
SP5: Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	84.2%	5.3%	10.5%	16	1	2	19

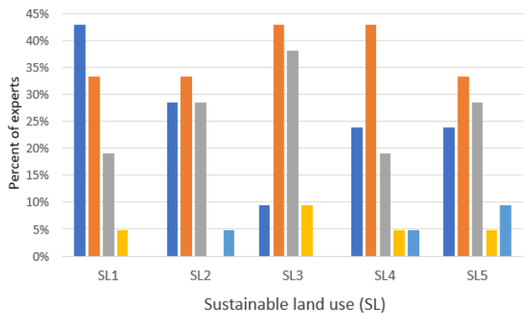
Annex E

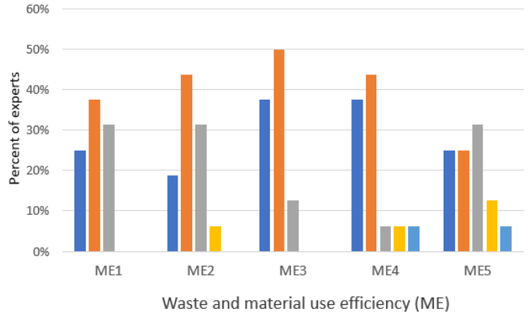
International experts' ratings on the selected indicators

Efficient and sustainable resource use



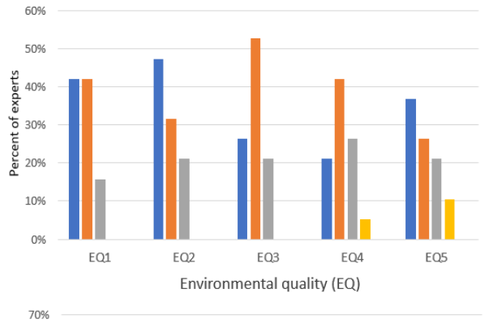


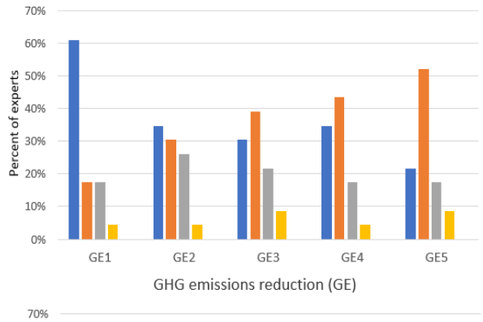


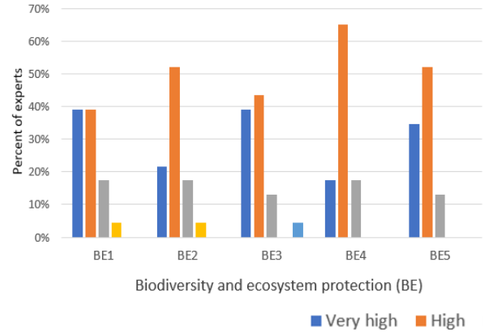


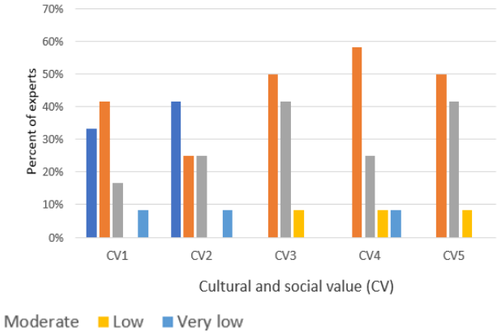
EE1 – energy intensity, EE2 – renewable energy share, EE3 – efficient transport, EE4 – low-carbon electricity, EE5 – per capita electricity consumption
EW1 – water use efficiency, EW2 – level of water stress, EW3 – capture fisheries, EW4 – agriculture water use efficiency, EW5 – renewable water resources per capita
SL1 – nutrient balance, SL2 – organic agriculture area, SL3 – cereal yield, SL4 – agricultural productivity, SL5 – natural capital productivity
ME1 – domestic material consumption, ME2 – material footprint, ME3 – food loss and food waste, ME4 – sanitation coverage, ME5 – sewer, septic and latrine coverage

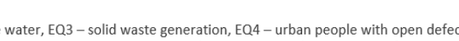
Natural capital protection





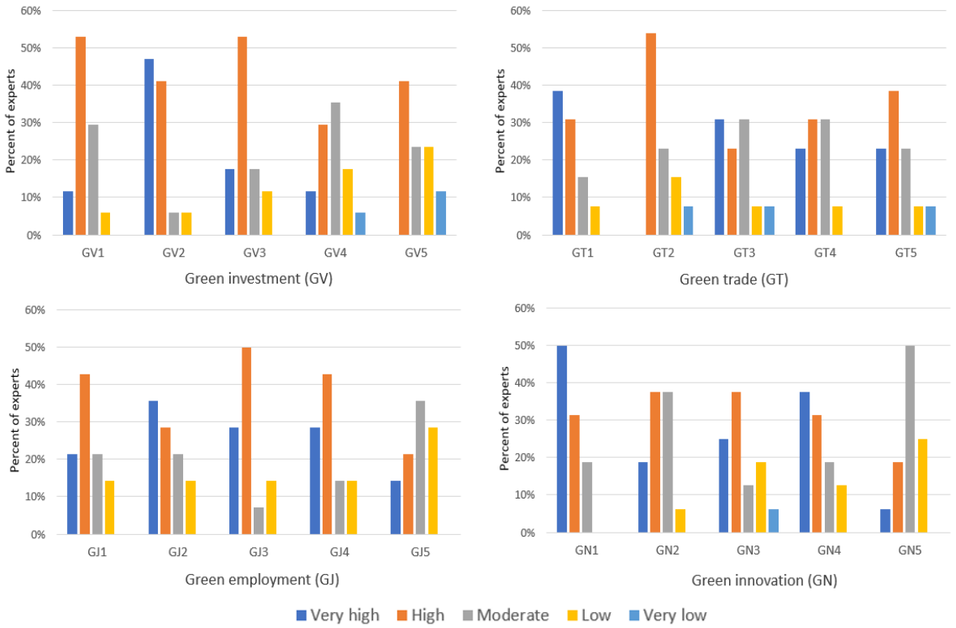






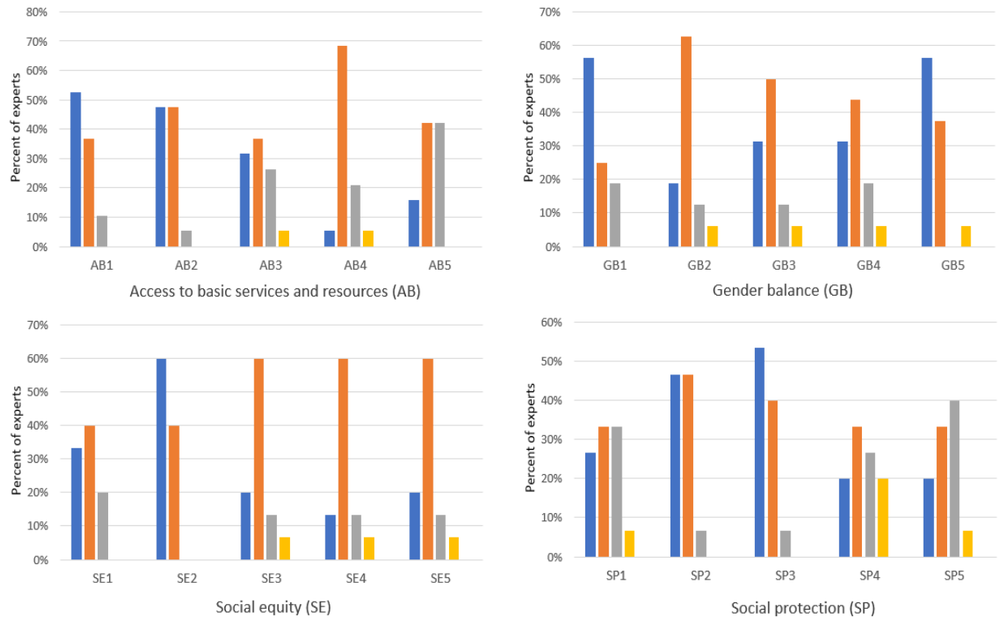
EQ1 – PM2.5 air pollution, EQ2 – DALY rate from unsafe water, EQ3 – solid waste generation, EQ4 – urban people with open defecation, EQ5 – people with basic handwashing facilities
GE1 – CO2 emissions per capita, GE2 – Non- CO2 per capita, GE3 – CO2 emissions growth rate, GE4 – carbon intensity of energy production, GE – carbon intensity of electricity
BE1 – protected key biodiversity areas, BE2 – share of forest areas, BE3 – forest area with management plan, BE4 – annual forest area change, BE5 – change in extent of water ecosystems
CV1 – red list index, CV2 – terrestrial protected area, CV3 – international tourism arrivals, CV4 – share of employment in services, CV5 – share of exports of cultural goods

Green economic opportunities



GV1 – adjusted net savings, GV2 – renewable electricity capacity, GV3 – revenue from biodiversity economic instruments, GV4 – agriculture orientation index, GV5 – transport productive capacity
GT1 – exports of environmental goods, GT2 – ores and metals exports, GT3 – medium and high-tech exports, GT4 – new business density, GT5 – exports of manufactured goods
GJ1 – renewable energy employment, GJ2 – employed below poverty line, GJ3 – vulnerable employment, GJ4 – youth not in education, employment, training, GJ5 – ODA flows for scholarships
GN1 – environmental technologies, GN2 – collaboration in R&D, GN3 – share education expenditure, GN4 – medium/high-tech manufacturing value added, GN5 – intellectual property charges

Social inclusion



AB1 – access to safe water and sanitation, AB2 – access to electricity and clean fuels, AB3 – prevalence of children stunting, AB4 – mobile broadband penetration, AB5 – property rights
GB1 – women in national parliaments, GB2 – gender account in financial institution, GB3 – equal gender pay, GB4 – maternal mortality ratio, GB5 – school enrollment gender parity
SE1 – inequality in income, SE2 – rural/urban access to electricity, SE3 – youth unemployment disparity, SE4 – old people unemployment disparity, SE5 – unemployment disabled disparity
SP1 – share old people receiving pension , SP2 – universal health coverage, SP3 – population living in slums, SP4 – victims of intentional homicides, SP5 – displacement related to disasters

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