GGGI Technical Report No. 5

GREEN GROWTH INDEX

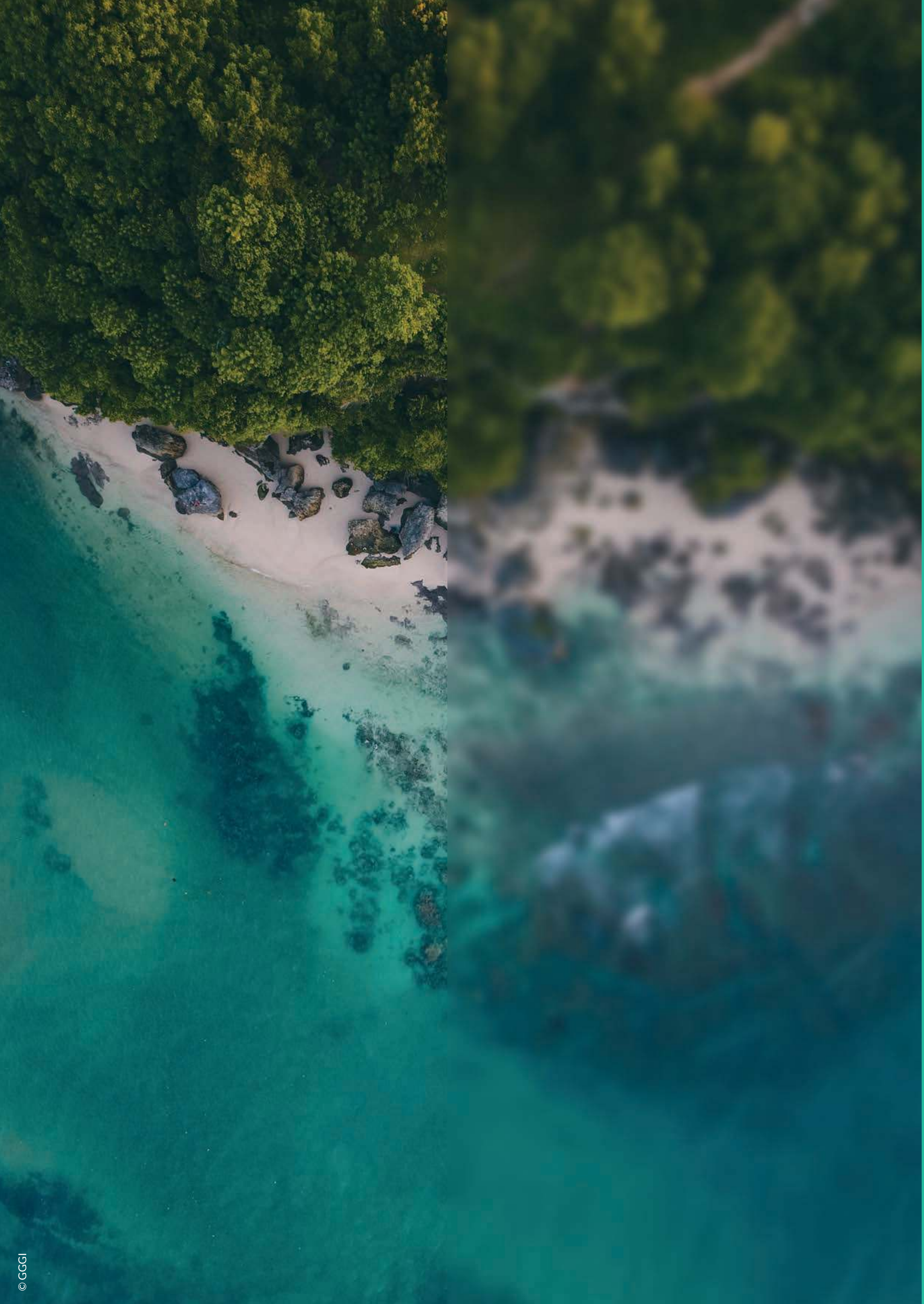
Concept, Methods and Applications

OCTOBER 2019

Green Growth Index

PARTNERS

Global Green Growth Institute
Jeongdong Building 19F
21-15 Jeongdong-gil
Jung-gu, Seoul 04518
Republic of Korea



Coordinating Lead Author:

Lilibeth A. Acosta

Lead Authors:

Prapti Maharjan, Hugo Peyriere, Ludovica Galotto, Rusyan Jill Mamiit, Carrie Ho, BenJeMar Hope Flores, and Orestes Anastasia

Contributing Authors:

International Expert Group: Aastha Sharma (TERI), Arun Jacob (UN ESCAP), Beibei Liu (Nanjing University), Chris Hopkins (Green Economy Coalition), Cornelia Krug (University of Zurich), Fabio Eboli (ENEA), Francesco Tubiello (FAO), Fulai Sheng (UN Environment), Guillaume Lafortune (SDSN), Guillermo Montt (ILO), John-Norville (OECS), John Maughan (GGKP), Jose Gregorio Pineda (University of British Columbia), Luca Farnia (FEEM), Ndaya Beltchika (IFAD), Nicola Cantore (UNIDO), Rick Hogeboom (WFN), Robert Hamwey (UNCTAD), Romina Cavatassi (IFAD), Ronal Gainza Carmenates (UN Environment), Sandrine Koissy-Kpein (UN Women), Steffen Felix (GIZ), Shun Chonabayashi (WB), Usman Ali Iftikhar (UNDP), Valentin Todorov (UNIDO), and Ziga Zarnic (OECD)

Technical Support:

Elena Eugenio, Jemily Sales and Maria Victoria Espaldon (UP Los Banos); Andisa Dewi and Asmaa Haja (TU Berlin)

Publication Coordinator:

Nera Mariz Puyo

Expert Reviewers:

GGGI Expert Group (HQ):
Anna Schulz*, Annawati van Paddenburg, Dereje Senshaw, Donovan Storey, Feelgeun Song, Frank Rijsberman, Ian Gunderson*, Ingvild Solvang, Jan Stelter, Peter Vos, Pranab Jyoti Baruah, Sakiusa Tuisolia, and Stelios Grafakos

GGGI Country Offices:
Adam Ward (Vietnam), Aaron Drayer (Peru), Aaron J. M. Russell (Myanmar), Ahmed Al Amra (Jordan), Chiden Balmes (UAE), Doreen Erfe (Philippines), Francina Phakamea (Mozambique), Fredrick Barasa (Uganda), George Asiimwe (Uganda), Hanh Nguyen (Vietnam), Innocent Kabenga (Ethiopia), Jaeseung Lee (Lao PDR), Julie Godin (Hungary), Jung Bin Park (South Korea), Katerina Syngellakis (Fiji), Khan Ram-Indra (Thailand), Kurnya Roesad (Indonesia), Lamine Ouedraogo (Burkina Faso), Malle Fofana (Senegal), Mamadou Konate (Senegal), María Clemencia Castellanos Forero (Colombia), Maricor Muzones (Philippines), Nicole Perkins (Morocco), Nontaya Krairiksh (Thailand), Norma Rivera (Kiribati), Okechukwu Daniel Ogbonnaya (Rwanda), Pablo Martinez (Mexico), Romain Brillie (Mongolia), Rowan Fraser (Nepal), Shantanu Gotmare (India), and Xiaoxin Xie (China)

Regional Experts:

Asia-Pacific

Akhanda Sharma, Amphayvan Chanmany, Aqira Bhatchayutmaytri, Arief Yusuf Anshory, Chittinee Charoenchitt, Christian Mortelliti, Ganzorig Gonchigsumlaa, Gao Dongfeng, Hellen Tom Wilson, Hitomi Rankine, Jarunee Nugranad, Jiranut Silamut, Mary Descery Joy B. Bongcac, Minh Hue Tran, Montri Chamnanrot, Nanik Supriyani, Nattanich Asvapoositkul, Nidatha Martin, Nyo Mar Htwe, Panisa Vishuphong, Pathom Chaiyapruksaton, Puji Lestari, Sarena Grace L. Quiñones, Sasiwimon Wichadee, Saykham Voladet, Sirikanda Watcharathai, Suttinee Jingjit, Turbadrakh Tumenjargal, and Vannakreth San

Middle East and Northern Africa

Abdel Aleem Khan, Abeer Al-Aysah, Ali Saad, Amna Alsuwaidi, Ayad Hamzah, Ayman Halawa, Bilal Jabr, Jihad Alsawair, Fatima Al Habshi, Fatima Kokhardi, Fatmah AlHantoubi, Humaid Kanji, Hussein Hamed, Jehan Haddad, Jihad Alsawair, Maha AlMa'ayta, Mashael Al-Ansari, Mouza Alghfeli, Mouza Al Zaabi, Mubasak Al-Jaeedi, Naoko Machiba, Peter Farrington, Roda Al Haj Naser, Roudha Taha, Shahd Ali, Tala AbuShuqair, and Tomoo Machiba

Africa

Aaron Werikhe, Aboubacry Diallo, Achraf Lachkar, Belaynesh Beru, Dawit Woubishet Mulatu, Eden Seyoum, Gelila Abebe, Hicham Makkaoui, Ibrahima Sall, Kebour Ghenna, Magecha Mamuye, Mikyas Sime, Mohammed Andoshe Faynet, Mustefa Abu Kufa, Pouahoulabou Joel Korahire, Ribka Teklu, Ronald Kaggwa, Salvo Cossine, Feliciano Tchamo, Samuel Abera, Selam Tarekegn, Sisay Nune Hailemariam, Wagayehu Bekele, William Mugabo, Wondimu Abeje, Yitatek Yitbarek, Yizengaw Yitayih, Zerihun Estifanos, and Zoure David Marcel Koussoyi

Latin America and the Caribbean

Alfredo Cisneros, Andrea Cruz Angón, Cintia Amezcua, Claudia Arely Sánchez Castro, Eduardo Garza Pasalagua, Enrique Lendo, Felipe Cortes Labra, Francisco Javier Turrent Cobo, Gavin Bovell, José Federico Gonzalez Medrano, Julieta Anabel Leo Lozano, Lina Correa, Maria Zorrilla Ramos, Marisol Rivera, Neydi Cruz, Rocio Ruelas Fimbres, Rodolfo Garza Castro, Rosi Amerena, Sandra Fernandez, and Silvia Rojas

Other regions and organizations

Jia Hua, Kinga Csontos, Rosi Amerena, Shimelis Fekadu, Thorsten Arndt, Gerald Esambe Njume, and Jieun Seong

Please cite this publication as:

Acosta, L.A., P. Maharjan, H. Peyriere, L. Galotto, R.J. Mamiit, C. Ho, B.H. Flores, and O. Anastasia. (2019). Green Growth Index: Concepts, Methods and Applications, GGGI Technical report No. 5, Green Growth Performance Measurement (GGPM) Program, Global Green Growth Institute, Seoul. [Contributors: B.H. Flores, A. Sharma, A. Jacob, B. Liu, C. Hopkins, C. Krug, F. Eboli, F. Tubiello, F. Sheng, G. Lafortune, G. Montt, J. Norville, J. Maughan, J.G. Pineda, L. Farnia, N. Beltchika, N. Cantore, R. Hogeboom, R. Hamwey, R. Cavatassi, R.G. Carmenates, S. Koissy-Kpein, S. Felix, S. Chonabayashi, U.A. Iftikhar, V. Todorov, Z. Zarnic, D. Eaton, E. Eugenio, J. Sales, M.V. Espaldon, A. Dewi, A. Haja, and N.M. Puyo]

* Former team members of Thought Leadership Department

Preface

This report presents the methodology that underlies GGGI's Green Growth Index, which measures the performance of 115 countries in four green growth dimensions: (1) efficient and sustainable resource use, (2) natural capital protection, (3) green economic opportunities, and (4) social inclusion. The Green Growth Index and its dimensions draw on 36 indicators, all of which are highly relevant metrics for tracking implementation of the Sustainable Development Goals (SDGs), the Paris Climate Change Agreement, and the Aichi Biodiversity Targets.

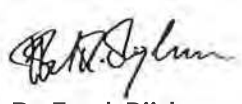
The index, and its underlying indicators, are a product of more than two years of intensive and constructive consultations with more than 300 experts globally. Recognizing the complexity and multidimensionality of the green growth concept, we consulted with experts from various disciplines, from international organizations, government agencies, nonprofit institutions, academia, and other stakeholders. We would like to thank all of those who contributed through the workshops and through reviews of early drafts. We also acknowledge the contribution of Vivid Economics and The Economist Intelligence Unit, which developed an early version of the Green Growth Index in 2017 under contract with GGGI. GGGI's Green Growth Performance Measurement (GGPM) team led by Dr. Lilibeth Acosta subsequently took this initial work forward starting in 2018.

GGGI developed the Green Growth Index at the request of GGGI Member countries. The index primarily aims to provide the Member countries with a concept-driven and evidence-based tool to assess impacts of green growth policy implementation and investments in their countries and compare their performance with peers in their respective regions and over time. Its indicators align with the key elements of GGGI's six strategic outcomes, which provide key summary information related to the state of Member countries' transition toward a green growth development model that concurrently promotes poverty reduction, social inclusion, environmental sustainability, and economic growth. In 2020, GGGI plans to pilot the Green Growth Index-related "Policy Simulation Tool," which will serve to explore ways and means by which a government can take policy and investment actions to improve its green growth performance.

The SDGs, Paris Agreement, and Aichi Targets are a manifestation of the critical global challenges confronting humanity — poverty and inequality, global warming, and biodiversity loss. Green growth emphasizes achieving these goals and targets without losing momentum in economic growth. As a new model of growth, "greening" the productive economic sectors entails innovative policy strategies and investment schemes. GGGI is supporting its Member countries to evaluate, develop, and implement green growth policies and investments toward achieving the SDGs, Paris Agreement, and Aichi Targets. In accordance with this mission, the Green Growth Index was designed to benchmark green growth performance against these sustainability goals and targets. GGGI's Green Growth Index is the first composite index of green growth that directly integrates sustainability metrics and assesses performance through a comparison of the current state with target values for each of the component indicators.

The GGPM team has identified additional policy-relevant indicators for green growth, but many of these cannot yet be integrated into the current framework due to the absence of satisfactory data. The index also includes many SDG indicators, allowing the use of measurable sustainability targets, even though some indicators still lack commonly agreed global targets, particularly those related to the Paris Agreement. GGGI intends to further develop and improve the Green Growth Index in years to come, taking advantage of the work to improve indicators, targets, and underlying data for the SDGs by various international organizations; development of the Nationally Determined Contributions (NDCs) under the Paris Agreement by national governments; and improved knowledge and data on biodiversity by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

GGGI's GGPM Program is dedicated to using the index not only as part of GGGI's other knowledge products, including the Policy Simulation Tool, but also to foster collaboration with other international organizations that advocate the green model of economic growth. GGGI is presently collaborating with the African Development Bank (AfDB) to apply the index to the African socio-economic and institutional contexts and the United Nations Environment Programme to link green growth baseline performance to scenarios of progress. The GGPM team prepared this technical report to lay the conceptual and methodological groundwork for the applications of the Green Growth Index.



Dr. Frank Rijsberman
Director General
Global Green Growth Institute

Acknowledgements

This Report was prepared by the Green Growth Performance Measurement (GGPM) team, including the consultants and interns, with the support from the GGGI Country teams, and in close collaboration with the international expert group, whose members are experts and practitioners on metrics and indicators from international organizations, research institutions, and knowledge networks. It has benefitted from comments from the GGGI expert group at the headquarters. Special thanks also to Kajsa Hartmann who helped to prepare the list of references and Yuka Otsuki Estrada, visualization specialist, who designed most of the graphics in this report.

The authors express their appreciation of the support given by a large number of expert reviewers mentioned in this report, and also to those who participated in the first international expert workshop in South Korea, in-country stakeholder workshops in Vietnam, Indonesia and the Philippines, and stakeholder consultation in Ethiopia. There were at least a hundred participants in these events whose names have not been mentioned in this report.

Colleagues in the GGGI country offices deserve special thanks for not only participating in the expert reviews of the draft report, but also supporting the preparation of the four regional workshops in 2018 by identifying and inviting the experts who participated in the workshops. Moreover, the colleagues in Thailand, United Arab Emirates, Ethiopia and Mexico supported the preparation of all necessary logistical arrangements for the workshops. The authors also acknowledge other partners for these workshops – the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) in Thailand, the Ministry of Climate Change and Environment (MOCCAE) in Dubai, and the Ministry of Environment in Mexico. For the international expert meetings, we would like to thank the Green Growth Knowledge Partnership (GGKP) in Switzerland and the Food and Agriculture Organization of the United Nations (FAO) in Italy for their support. The support of Aqira Bhatchayutmaytri in UN ESCAP and Sylvaine Thomas in FAO was particularly helpful for the success of these collaborative workshops.

Finally, the authors wish to thank Francesco Tubiello of FAO, Kumi Kitamori of Organisation for Economic Co-operation and Development (OECD), Guido Schmidt-Traub of UN Sustainable Development Solutions Network (SDSN), Prajal Pradhan of Potsdam Institute for Climate Impact Research (PIK), and Maheswar Rupakheti of Institute for Advanced Sustainability Studies (IASS) for granting our request for expert consultations on sustainability targets despite the very short notice. Several experts have participated in these consultations including Giorgia DeSantis, Lorenzo G. Bellù, Riccardo Biancalani, Wanner Nathan, Piero Conforti, Yusuf Yigini, and Marc Mueller of FAO; Kumi Kitamori, Michal Shinwell, and Myriam Linster of OECD; Guillaume Lafortune of SDSN; Prajal Pradhan, Matthias Lüdeke and Amsalu Woldie Yalew of PIK; and Maheswar Rupakheti and S.

Dr. Lilibeth Acosta
Program Manager, Green Growth Performance Measurement
Specialist, Thought Leadership Department
Global Green Growth Institute

Contents

Figures

Tables

Appendices

Acronyms and Abbreviations

AB	Access to Basic Services and Resources
ADB	Asian Development Bank
AfDB	African Development Bank
AFOLU	Agriculture, Forestry, and Other Land Use
AHP	Analytic Hierarchy Process
APEC	Asia-Pacific Economic Cooperation
BE	Biodiversity and Ecosystem Protection
CO_2	Carbon Dioxide
CV	Cultural and Social Value
DALY	Disability-Adjusted Life Year
DC	Dual Citizen LLC
DMC	Domestic material consumption
EE	Efficient and Sustainable Energy
EEA	European Environment Agency
EIU	Economist Intelligence Unit
ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EQ	Environmental Quality
EW	Efficient and Sustainable Water Use
FAO	Food and Agriculture Organization of the United Nations
FEEM	Fondazione Eni Enrico Mattei
GB	Gender Balance
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GE	GHG Emissions Reduction
GEP	Green Economy Progress
GGGI	Global Green Growth Institute
GGKP	Green Growth Knowledge Partnership
GGPM	Green Growth Performance Measurement
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GJ	Green Employment
GN	Green Innovation
GNI	Gross National Income
GT	Green Trade
GV	Green Investment
IASS	Institute for Advanced Sustainability Studies
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IQR	Interquartile range
JRC	Joint Research Centre
LAC	Latin America and the Caribbean
ME	Material Use Efficiency
MENA	Middle East and North Africa
MF	Material Footprint
MJ	Megajoule
MOCCAE	Ministry of Climate Change and Environment
MSW	Municipal Solid Waste
NDCs	Nationally Determined Contributions
OECD	Organisation for Economic Co-operation and Development
OECS	Organisation of Eastern Caribbean States
PAGE	Partnership for Action on Green Economy
PCA	Principal Component Analysis
PES	Payment for Ecosystem Services
PIK	Potsdam Institute for Climate Impact Research
PM2.5	Particulate matter with a diameter of less than 2.5 micrometers
PPP	Purchasing Power Parity
SDG	Sustainable Development Goals
SDSN	Sustainable Development Solutions Network
SE	Social Equity
SE4ALL	Sustainable Energy for All (or SEforALL)
SL	Sustainable Land Use
SP	Social Protection
TERI	The Energy and Resources Institute
TU Berlin	Technical University of Berlin
UAE	United Arab Emirates
UN	United Nations
UN DESA	United Nations Department of Economic and Social Affairs
UN ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UN Women	United Nations Entity for Gender Equality and the Empowerment of Women
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UP Los Baños	University of the Philippines Los Baños
USD	United States Dollar
WB	The World Bank
WFN	Water Footprint Network
WHO	World Health Organization

01 Introduction

Designing policies to achieve green growth requires effective measurement frameworks and indicators to track progress against key development challenges (Narloch, Kozluk, & Lloyd, 2016). Having the ability to measure performance allows policymakers to identify the problems or gaps and design and plan policies as well as sustainably use resources that will lead to better green growth outcomes. The measurement of green growth performance can also enhance the understanding of how the policy changes at the sectoral level can affect overall growth. Green growth policies require evidence-based frameworks, one that can assess and communicate whether these policies have achieved goals and targets and allows countries to monitor development and progress (GGKP, 2013).

Through its Green Growth Performance Measurement (GGPM) Program, the Global Green Growth Institute (GGGI) has developed a composite index that will provide policymakers with a metric on which to base their decisions. The 2019 Green Growth Index covers 115 countries and builds on 36 indicators for four green growth dimensions, including efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. The indicators are benchmarked against sustainability targets including SDGs, Aichi Targets and Paris Agreement. The Index and its underlying indicators can contribute significantly to the quantitative dimension of the green growth concept, fostering a scientific, rigorous, and data-driven approach to policy and project implementation. It is meant to demonstrate GGGI's thought leadership in the area of green growth and showcase its capacity to design and execute a major analytic undertaking while making a valuable addition to the global stock of green growth knowledge.

Composite indices, also called composite indicators, are increasingly used to compare performance and display ranks of countries (Freudenberg, 2003; Saisana, Saltelli, & Tarantola, 2005; OECD, 2008; Nardo & Saisana, 2008; Greco, Ishizaka, Tasiou, & Torrisi, 2018). Their popularity can be attributed, among other things, to their ability to summarize multidimensional issues and combine information on a set of indicators into a single score (OECD, 2008; Nardo & Saisana, 2008). At the same time, indices can convey misleading policy messages if the process to develop the Index lacks transparency and the indicators chosen to be combined in the index lack sound conceptual foundation (ibid.). GGGI adopted the steps suggested in OECD's Handbook on Constructing Composite Indicators (OECD, 2008), which guides users on practical approaches to make index development more transparent. Moreover, the handbook emphasizes the significance of involving experts and stakeholders in selecting and combining indicators based on a sound conceptual framework.

To date, there have been no uniform or harmonized approaches to measure green growth, largely as a result of varying definitions and understanding of the concept in recent years. This is evident in different dimensions, or sub-components, and indicators used in other related green growth indices, including the African Development Bank's African Green Growth Index (AfDB, 2014, 2015), United Nations Environment Programme's Green Economy Progress Index (PAGE, 2017a, 2017b), the Asian Development Bank's Inclusive Green Growth (Jha, Sandhu, & Wachirapunyanont, 2018), and the Dual Citizen LLC's Global Green Economy Index (Tamanini & Valenciano, 2016).

GGGI has initiated important steps toward developing a common understanding of green growth and indicators that can operationalize its concept. Beginning in 2017, GGGI has collaborated with over 300 experts from various fields, including social development, climate change, biodiversity and ecosystems, renewable energy and efficient resource use, water, and land use, and different types of organizations, including international organizations, non-government organizations, development banks, government agencies, and academic institutions, to support the development of GGGI's Green Growth Index. The process in developing the index follows a systematic approach involving expert consultations, feedback assessments, and revisions to the framework to ensure an inclusive and collaborative process, create a platform for transparent development, and enhance policy relevance of the Index.

This technical report discusses the conceptual and methodological frameworks of the Green Growth Index, the process for developing these frameworks, and the rationale for pursuing an inclusive and collaborative process. It also presents key results highlighting differences in green growth performance across dimensions and top-ranking countries in different regions. The structure of the report is as follows:

Chapter 2 briefly presents the key findings of the Green Growth Index at the global level based on the set of indicators used to operationalize the conceptual framework.

Chapter 3 discusses the inclusive and collaborative process for designing the conceptual framework and identifying indicators that are most policy-relevant. The chapter also explains how the framework evolved through a series of consultations with different groups of experts.

Chapter 4 describes the conceptual framework for developing the Green Growth Index, including the different concepts that underlie green growth and the relevance of the green growth dimensions to these concepts.

Chapter 5 explains the stepwise methods for developing the Green Growth Index, including data selection, preparation, and validity check, which cover scaling, imputation, and outliers, as well as normalization, weighting, and aggregation of indicators. The chapter also discusses the steps and targets used for benchmarking the index.

Chapter 6 illustrates selected results on the application of the concepts and methods at the regional and country levels.

Chapter 7 highlights current concerns surrounding the index in terms of indicators, data availability, and sustainability targets. It also discusses aspects that need attention in updating and improving the index.

Chapter 8 compares the Green Growth Index with related indices with the aim of finding synergies and potential opportunities for collaboration.

Chapter 9 presents expected applications of the Green Growth Index at GGGI and with other partners.

greengrowthindex.gggi.org

02 Key purpose, issues and findings

Green Growth Index measures country performance in achieving sustainability targets including Sustainable Development Goals, Paris Climate Agreement, and Aichi Biodiversity Targets for four green growth dimensions – efficient and sustainable resource use, natural capital protection, green economic opportunities and social inclusion.

The four dimensions of green growth are closely interlinked. Efficient and sustainable resource use entails more productive use of natural resources and more cumulative economic value with less resources (ECN, 2013:p.3) and without endangering needs of future generations. It focuses on physical resources, such as water, energy, land, and materials but also on ecosystem services (ECN, 2013; Flachenecker & Rentschler, 2018). These are natural capital, which consists of living and nonliving components of ecosystems that people use to produce goods and services (Guerry et al., 2015). Natural capital provides basic conditions, such as fertile soil, multifunctional forests, productive land and seas, good quality freshwater and clean air, and pollination (EEA, 2015). Without natural capital protection, these conditions that support ecosystem services are at risk. Green growth emphasizes the role of natural capital in generating new sources of growth and expanding economic opportunities in the form of green investment and jobs, among other opportunities (OECD, 2011). This new model of growth focuses on people (Bass et al., 2016), where social inclusion becomes a key mechanism to ensuring people's contribution to, sustaining opportunities, and distributing benefits from economic growth. Chapter 4 discusses further details on the relevance of the dimensions to green growth.

Figure 1 Indicator Framework for the Green Growth Index

	Dimensions [Goals]	Indicator categories [Pillars]	Indicators [metrics]	
Green Growth Index	Efficient and sustainable resource use	Efficient and sustainable energy	EE1	Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)
			EE2	Share of renewables to total final energy consumption (Percent)
		Efficient and sustainable water use	EW1	Water use efficiency (USD per m³)
			EW2	Share of freshwater withdrawal to available freshwater resources (Percent)
		Sustainable land use	SL1	Average soil organic carbon content (Tons per hectare)
			SL2	Share of organic agriculture to total agricultural land area (Percent)
		Material use efficiency	ME1	Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)
			ME2	Total material footprint (MF) per capita (MF tons per capita)
	Natural capital protection	Environmental quality	EQ1	PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m³)
			EQ2	DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)
			EQ3	Municipal solid waste (MSW) generation per capita (Tons per year per capita)
		Greenhouse gas emissions reductions	GE1	Ratio of CO_2 emissions, excluding AFOLU to population (Metric tons per capita)
			GE2	Ratio of non-CO_2 emissions excluding AFOLU to population (Tons per capita)
			GE3	Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1,000 persons)
		Biodiversity and ecosystem protection	BE1	Average proportion of Key Biodiversity Areas covered by protected areas (Percent)
			BE2	Share of forest area to total land area (Percent)
			BE3	Soil biodiversity, potential level of diversity living in soils (Index)
		Cultural and social value	CV1	Red list index (Index)
			CV2	Tourism and recreation in coastal and marine areas (Score)
			CV3	Share of terrestrial and marine protected areas to total territorial areas (Percent)
	Green economic opportunities	Green investment	GV1	Adjusted net savings, minus natural resources and pollution damages (Percent GNI)
		Green trade	GT1	Share of export of environmental goods (OECD and APEC class.) to total export (Percent)
		Green employment	GJ1	Share of green employment in total manufacturing employment (Percent)
		Green innovation	GN1	Share of patent publications in environmental technology to total patents (Percent)
	Social inclusion	Access to basic services and resources	AB1	Population with access to safely managed water and sanitation (Percent)
			AB2	Population with access to electricity and clean fuels/technology (Percent)
			AB3	Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)
		Gender balance	GB1	Proportion of seats held by women in national parliaments (Percent)
			GB2	Ratio of female to male with account in financial institution, age 15+ (Percent)
			GB3	Getting paid, covering laws and regulations for equal gender pay (Score)
		Social equity	SE1	Inequality in income based on Atkinson (Index)
			SE2	Ratio of urban to rural, access to safely managed water/sanitation and electricity (Percent)
			SE3	Share of youth not in education, employment or training, aged 15-24 years (Percent)
		Social protection	SP1	Proportion of population above statutory pensionable age receiving pension (Percent)
			SP2	Healthcare access and quality index (Index)
			SP3	Proportion of urban population living in slums (Percent)

Figure 1 presents the indicator framework of the Green Growth Index, summarizing the indicator categories and indicators utilized in each green growth dimension. The framework is structured based on four levels: the Index as an overarching measure of green growth performance; the four dimensions as intermediate goals for achieving green growth; the four indicator categories serving as sustainability pillars in each dimension; and the different indicators that provide policy-relevant metrics for measuring green growth performance and distance to sustainability targets. Definitions of the indicator categories are presented in Box 1 below.

Box 1 Definitions of the indicator categories in Figure 1

1. **Efficient and sustainable energy** refers to delivering more services or products per unit of energy used and meeting present needs by using renewable sources to ensure sustainability of energy for future use. (IRENA and C2E2, 2015; Kutscher, Milford, & Keith, 2018).
2. **Efficient and sustainable water use** refers to delivering more services or products per unit of water used, reducing environmental impact resulting from water scarcity and pollution, and improving water allocation among competing uses. (UNEP, 2014b; Wang, Yang, Deng, & Lan, 2015).
3. **Sustainable land use** refers to delivering more services or products for a fixed amount of land used and without compromising many ecosystem services provided by land. (Auzins, Geipele, & Geipele, 2014; Smith, 2018).
4. **Material use efficiency** refers to delivering more services or products per unit of raw material used and reducing material demand through increased recycling, longer-lasting products, and component re-use, among others. (Allwood, Ashby, Gutowski, & Worrell, 2011; Lifset & Eckelman, 2013).
5. **Environmental quality** refers to properties and characteristics of the environment which may affect the health of human beings and other organisms, including air, water and noise pollution, access to open space, and visual impacts of buildings. (EEA, 2015, 2017).
6. **Greenhouse gas (GHG) emission reduction** refers to the reduction and removal of CO_2 and non-CO_2 emissions from the atmosphere in order to address climate change. (IPCC, 2013; Symon, 2013).
7. **Biodiversity and ecosystem protection** refers to the protection of species, habitats, and ecosystems as well as the services they provide, with protected areas as an important measure to achieve biodiversity conservation. (UNEP-WCMC and IUCN, 2016; IPBES, 2018).
8. **Cultural and social value** refers to the societal value given to natural capital due to its importance to communities and their local culture which encourages sustainable use and protection of natural resources. (Small, Munday, & Durance, 2017; Rocha, Almassy, & Pinter, 2017).
9. **Green investment** refers to public and private investment that promotes in a direct or indirect manner sustainable resource use, including material, water, energy, and land, and natural capital protection, such as environmental protection and climate action, advancing sustainable development and green growth. (Eyraud, Zhang, Wane, & Clements, 2011; Obradović, 2019).
10. **Green trade** refers to the competitiveness of a country to produce and export environmental goods that can contribute to environmental protection, climate action, green growth, and sustainable development. (PAGE, 2017a; European Parliament, 2019).
11. **Green employment** refers to employment created and sustained by economic activities that are more environmentally sustainable; contribute to protecting the environment and reduce people's environmental footprint; and offer decent working conditions. (UNEP, ILO, IOE, & ITUC, 2008; ILO, 2015).
12. **Green innovation** refers to product, process, and service innovations, such as energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management that yields environmental benefits. (Schiederig, Tietze, & Herstatt, 2011; Gao et al., 2018).
13. **Access to basic services** refers to the general availability of services, such as telecommunications, financial, water and sanitation, and energy services, to people regardless of income and location, and which requires an effective governance at multiple scales due to the local nature of these services. (OECD and WB, 2006; UCLG, 2014).
14. **Gender balance** refers to equality based on gender in terms of rights, resources, opportunities, and protection, and the ability to use them to make strategic choices and decision. Women's social and economic empowerment at work, home, and communities increases inclusive growth and reduces poverty. (UNICEF, 2011; UN Women, 2018).
15. **Social equity** refers to a fair and equitable public and social policy, giving equal opportunities to all by a fair allocation of and access to resources that take into account social inequalities. Addressing and embedding equity issues in the design of a policy will lead to sustainable economic growth over the long term. (Clench-Aas & Holte, 2018; OECD, 2018).
16. **Social protection** refers to programs designed to provide benefits to ensure income security and access to social services, contributing to social equity and inclusive society and reducing poverty and exposure to risks. (UNRISD, 2010; ESCWA, 2015).

The scores for the Green Growth Index and its dimensions range from 1 to 100, with 1 having the lowest or very low performance and 100 having highest or very high performance (Figure 2 and Figure 3). Because the indicators are benchmarked against sustainability targets, namely the SDGs, other globally agreed targets, and top country performers, a score of 100 in the index, dimensions, and indicator categories means that a country has reached a given target. The scores are classified in a given range and can be interpreted as follows:

- 80–100 are very high scores, having reached or almost reached the target.
- 60–80 are high scores, taking a strategic position to completely reach the target.
- 40–60 are moderate scores, finding the right balance to move forward to and avoid moving away from the target.
- 20–40 are low scores, identifying the right policies to align development toward achieving the target.
- 1–20 are very low scores, requiring significant actions to improve position relative to the target.

Several countries, albeit mainly developed ones, have reached the goals for social inclusion (Figure 2). Many countries in Africa have low scores and thus continue to lag behind other regions in achieving targets for this dimension, which include indicators on access to basic services, gender balance, social equity, and social protection. Performance in achieving targets in natural capital protection is relatively better for many countries across regions, including Africa, with scores ranging from moderate to high. This dimension covers indicators on environmental quality, GHG emissions reduction, biodiversity and ecosystem protection, and cultural and social value. Only very few countries perform well on efficient and sustainable resource use, which include the Congo Republic, Gabon, and Chad in the African region (see chapter 6.3). These African countries have high to very high scores on the share of renewable to total final energy consumption and share of freshwater withdrawal to available freshwater resources, reaching the sustainability targets of 51.4 percent (Sachs, Schmidt-Traub, Kroll, Lafortune, & Fuller, 2019) and 25 percent (FAO, 2017), respectively. Their scores on total domestic material consumption per unit of GDP and total material footprint per capita are likewise very high. Among European countries, Sweden has high scores for efficient and sustainable resource use which is attributed to it reaching its targets for three indicators, including share of renewable to total final energy consumption, water use efficiency (265.76 USD per m^3, OECD, 2019a) and share of organic agriculture to total agricultural land area (11.9 percent, OECD, 2017b). Among the four green growth dimensions, performance in achieving targets in green economic opportunities is the poorest, with only three countries, namely Denmark, Czech Republic, and Germany, achieving scores between 60 and 64. Scores of other European countries range from moderate to very low. The green economic opportunities include indicators on green investment, green trade, green jobs, and green innovation. Due to the dearth of data for the indicators, no scores can be calculated for many countries, particularly in the African region.

Figure 3 presents overall Green Growth Index results for countries that received scores for all four green growth dimensions. Non-substitutability among dimensions is assumed, so the Index is not computed if the score for one dimension is missing. See chapter 5.8 for further details.

There are 115 countries with complete scores for all dimensions, with 18 percent in Africa, 18 percent in the Americas, 28 percent in Asia, 33 percent in Europe, and only 3 percent in Oceania. The lowest overall score in the Green Growth Index is 16.96 (Sudan) and highest score is 75.32 (Denmark). The scores range from very low to high; no countries have reached a very high score. The 23 countries with high scores are all in Europe. Fifty-four countries have moderate scores in green growth performance, and 36 countries have low scores. A large number of countries in the Americas have moderate green growth performance. The low performing countries are mainly in Africa (14 countries) and Asia (15 countries). Four countries have very low scores for the Green Growth Index including Nigeria, Algeria, and Sudan in Africa, and Iraq in Asia. The top-ranking countries in each region include Botswana in Africa; the Dominican Republic in the Americas; Singapore in Asia; Denmark in Europe; and New Zealand in Oceania. Detailed results for all countries are presented in the statistical tables in Appendix 1 (Table A1.13).

Figure 4 presents a green growth dashboard summarizing performance in the different indicator categories for each dimension by region. The performance in natural capital protection, particularly environmental quality (EQ) and GHG emissions reduction (GE) is high to very high in almost all the regions. In contrast, performance in green economic opportunities, particularly in green trade (GT) and green innovation (GN), is low to very low in many regions. Europe performs notably better in all indicator categories as compared to the rest of the regions. Many countries in Africa, the Americas and Asia have rather low performance in sustainable land use (SL). Presentation of more detailed results are discussed in chapter 6.

Figure 2 Sub-indices of the green growth dimensions for different countries, by region

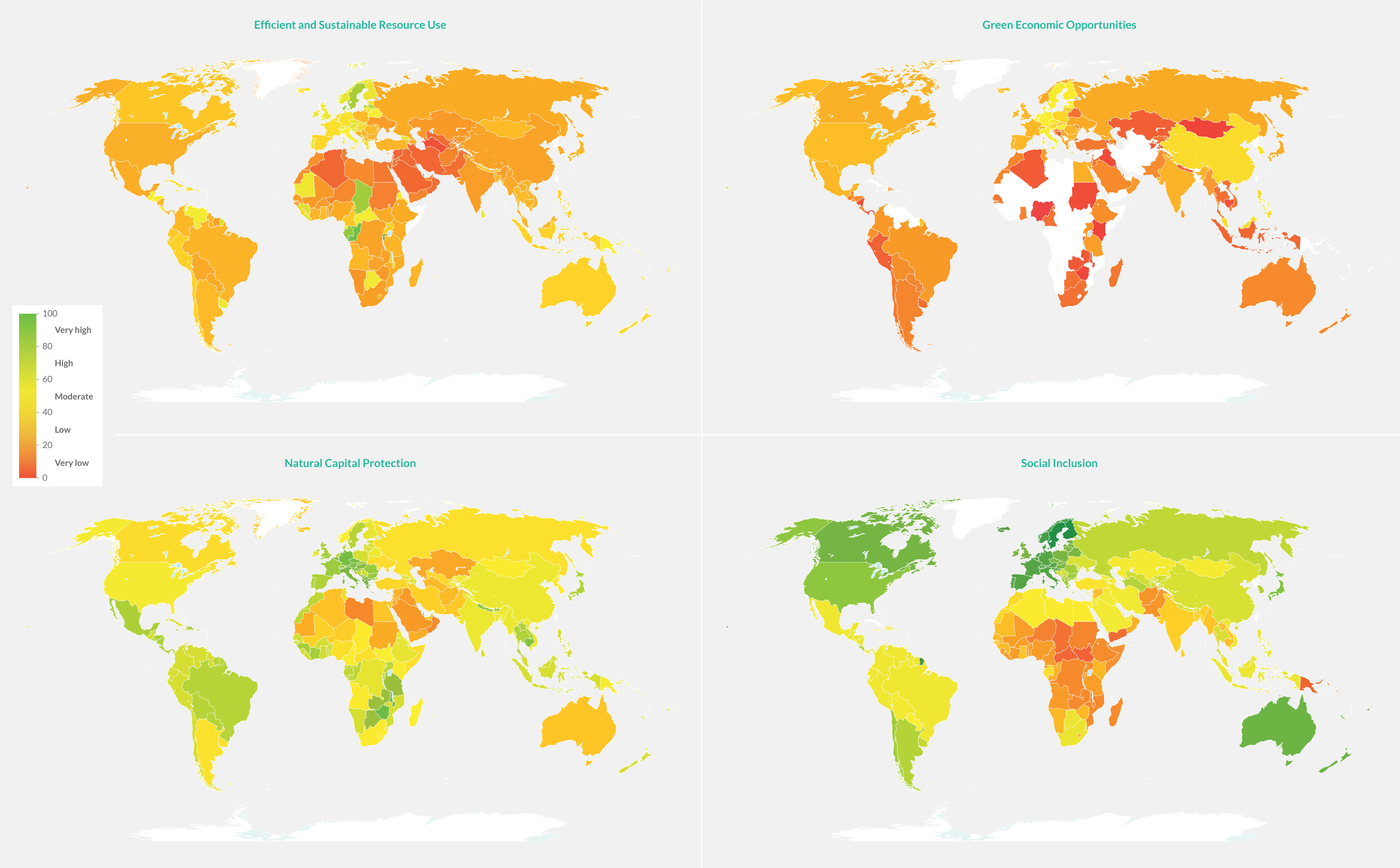
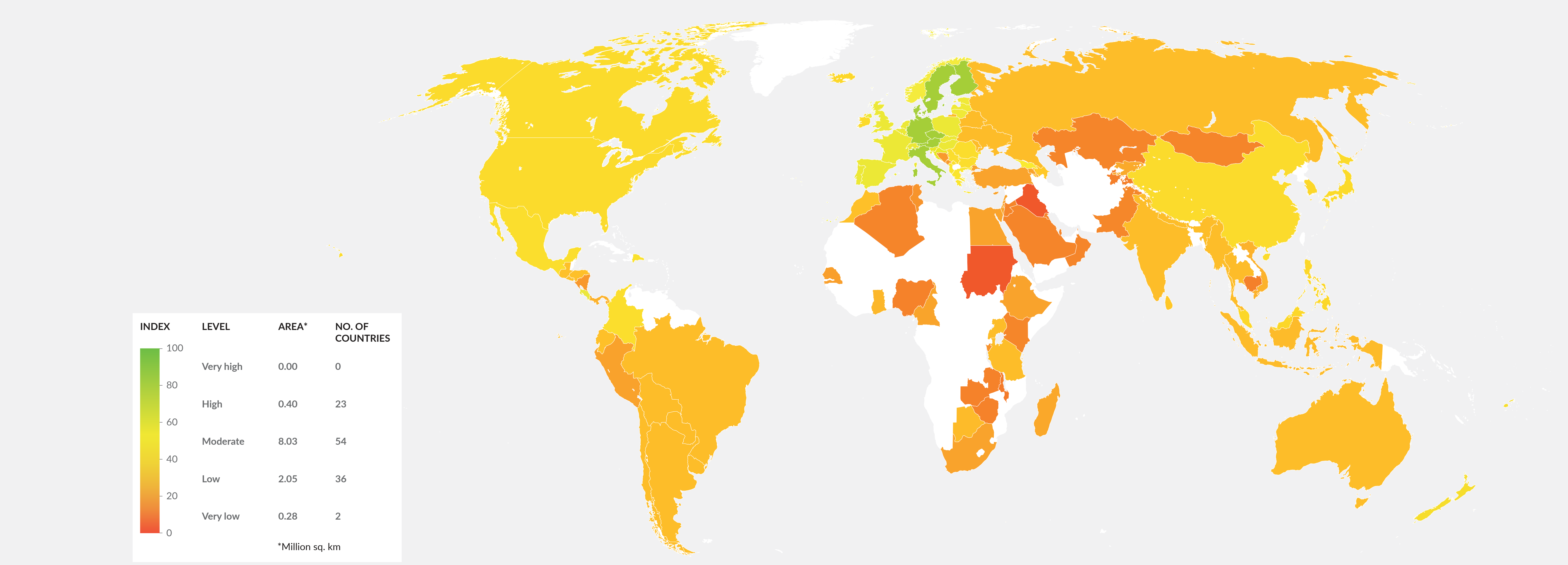


Figure 3 Index and rank of the countries on the Green Growth Index, by region



INDEX	LEVEL	AREA*	NO. OF COUNTRIES
100–80	Very high	0.00	0
80–60	High	0.40	23
60–40	Moderate	8.03	54
40–20	Low	2.05	36
20–0	Very low	0.28	2

*Million sq. km

Region	COUNTRY	RANK	INDEX
Africa	Botswana	1	45.88
Africa	Tanzania	2	44.32
Africa	Mauritius	3	42.63
Africa	Morocco	4	42.61
Africa	Ghana	5	42.42
Africa	Uganda	6	40.96
Africa	Tunisia	7	38.88
Africa	Senegal	8	38.17
Africa	Ethiopia	9	37.48
Africa	Egypt	10	36.74
Africa	South Africa	11	36.62
Africa	Cameroon	12	35.30
Africa	Madagascar	13	33.79
Africa	Malawi	14	29.43
Africa	Zambia	15	26.89
Africa	Kenya	16	26.19
Africa	Zimbabwe	17	25.71
Africa	Burundi	18	25.22
Africa	Nigeria	19	22.84
Africa	Algeria	20	22.36
Africa	Sudan	21	16.96

Region	COUNTRY	RANK	INDEX
The Americas	Dominican Republic	1	55.10
The Americas	United States	2	54.22
The Americas	Canada	3	54.04
The Americas	El Salvador	4	53.94
The Americas	Mexico	5	52.71
The Americas	Colombia	6	50.77
The Americas	Costa Rica	7	50.63
The Americas	Brazil	8	49.82
The Americas	Ecuador	9	48.87
The Americas	Guatemala	10	46.77
The Americas	Chile	11	46.58
The Americas	Bolivia	12	46.10
The Americas	Argentina	13	45.21
The Americas	Paraguay	14	43.72
The Americas	Honduras	15	43.08
The Americas	Uruguay	16	42.99
The Americas	Bahamas	17	41.36
The Americas	Peru	18	39.55
The Americas	Panama	19	38.29
The Americas	Nicaragua	20	32.74
The Americas	Trinidad and Tobago	21	29.99

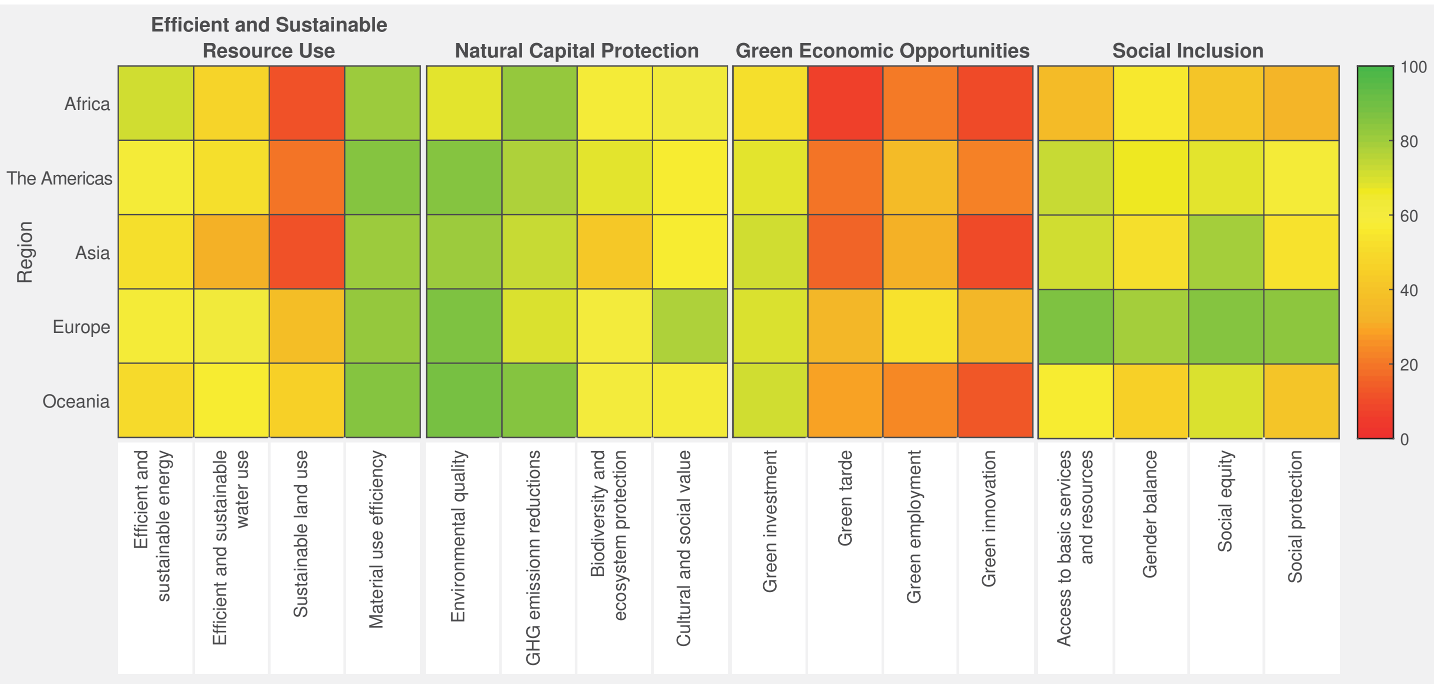
Region	COUNTRY	RANK	INDEX
Asia	Singapore	1	58.43
Asia	Malaysia	2	55.88
Asia	Philippines	3	55.54
Asia	Georgia	4	55.45
Asia	China	5	55.41
Asia	Republic of Korea	6	54.31
Asia	Japan	7	53.86
Asia	Sri Lanka	8	52.74
Asia	India	9	45.58
Asia	Azerbaijan	10	44.98
Asia	Myanmar	11	44.55
Asia	Thailand	12	44.36
Asia	Cyprus	13	44.03
Asia	Nepal	14	43.54
Asia	Israel	15	42.14
Asia	Indonesia	16	40.81
Asia	Lebanon	17	39.45
Asia	Turkey	18	39.22
Asia	Viet Nam	19	39.05
Asia	Kyrgyzstan	20	36.74
Asia	Armenia	21	35.55

Region	COUNTRY	RANK	INDEX
Asia	Qatar	22	34.73
Asia	Cambodia	23	30.13
Asia	Pakistan	24	29.08
Asia	Kazakhstan	25	28.10
Asia	Saudi Arabia	26	27.92
Asia	Mongolia	27	27.33
Asia	Jordan	28	26.71
Asia	Oman	29	26.25
Asia	Tajikistan	30	25.00
Asia	Kuwait	31	24.62
Asia	Iraq	32	17.32
Europe	Denmark	1	75.32
Europe	Sweden	2	75.09
Europe	Austria	3	72.32
Europe	Finland	4	71.69
Europe	Czech Republic	5	71.29
Europe	Italy	6	70.22
Europe	Germany	7	70.04
Europe	Estonia	8	68.50
Europe	Latvia	9	68.24
Europe	Slovakia	10	67.60

Region	COUNTRY	RANK	INDEX
Europe	Portugal	11	66.32
Europe	Belgium	12	64.94
Europe	Hungary	13	64.82
Europe	France	14	64.66
Europe	Croatia	15	64.49
Europe	Slovenia	16	64.00
Europe	Spain	17	63.67
Europe	Lithuania	18	63.65
Europe	Netherlands	19	63.38
Europe	United Kingdom	20	63.30
Europe	Switzerland	21	62.72
Europe	Norway	22	62.10
Europe	Poland	23	61.67
Europe	Romania	24	59.41
Europe	Ireland	25	58.69
Europe	Luxembourg	26	58.64
Europe	Greece	27	57.42
Europe	Bulgaria	28	56.87
Europe	Iceland	29	54.42
Europe	Serbia	30	52.43
Europe	Albania	31	51.66

Region	COUNTRY	RANK	INDEX
Europe	Russia	32	49.60
Europe	Ukraine	33	46.56
Europe	Belarus	34	44.78
Europe	Montenegro	35	40.41
Europe	Republic of Moldova	36	38.68
Europe	Bosnia and Herzegovina	37	34.98
Europe	Malta	38	28.13
Oceania	New Zealand	1	52.17
Oceania	Australia	2	47.89
Oceania	Fiji	3	45.48

Figure 4 Dashboard of indicator categories in each green growth dimension, by region



GGGI

03 Design process

Through its GGPM Program, GGGI adopted one of the most thorough processes available to design the Green Growth Index. It went through a series of revisions to improve the conceptual and methodological frameworks through multiple iterative steps, including expert consultations, assessment of expert feedback, and index development and improvement (Figure 5).

GGGI's GGPM team pursued two complementary strategies to enhance the practical utility of the Green Growth Index in policy decision-making: a stepwise scientific approach and a consultative process involving experts and stakeholders. 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. Three types of consultations were conducted in the process of developing the Green Growth Index: in-country stakeholder workshops, regional consultation workshops, and international expert meetings (Figure 5). Each of these consultations had different objectives and groups of participants.

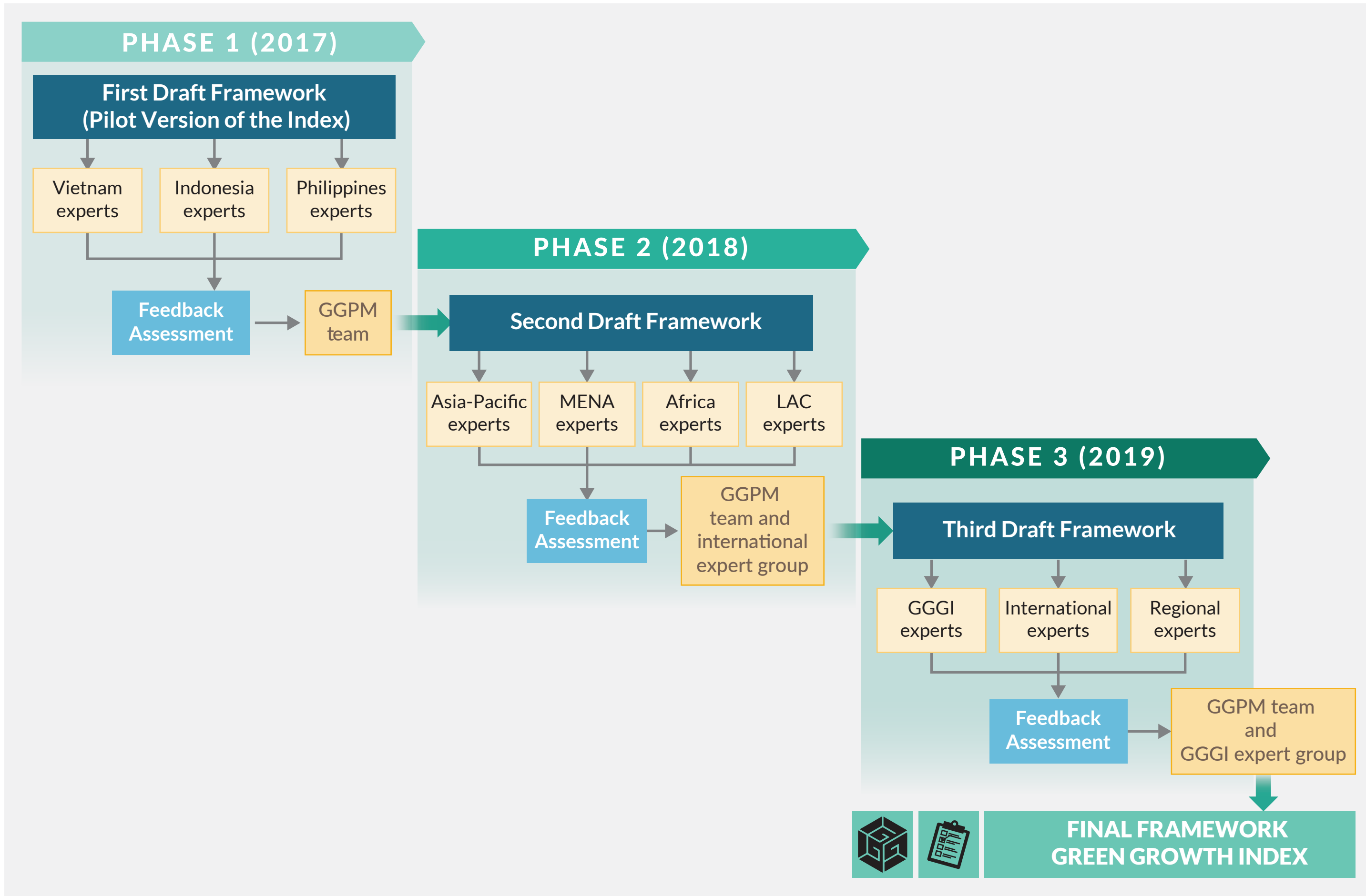
Compared to other green growth-related indices, such as the Asian Development Bank's (ADB) Inclusive Green Growth Index, African Development Bank's (AfDB) African Green Growth Index, the United Nations Environment Programme's (UNEP) Green Economy Progress Index, and the Dual Citizen LLC's (DC) Global Green Economy Index), GGGI has arguably conducted one of the most systematic and wide-reaching consultations to ensure the policy relevance of the indicators and targets included in the frameworks for the index.

GGGI kicked off the design process in 2016 and its activities were completed in early 2019 (Figure 5), with the final framework for the Green Growth Index planned as the final output of the process. Consultants from Vivid Economics and the Economist Intelligence Unit (EIU) developed the initial or first draft frameworks for the Green Growth Index, with significant scientific inputs from GGGI and other international experts. The chronicle of activities and the different levels of consultations conducted with different groups of experts since 2017 can be grouped into three phases (Figure 6), of which highlights are presented below. A detailed discussion of the results of the expert consultations are available elsewhere (Acosta et al., 2019; Peyriere & Acosta, 2019).

Figure 5 Chronicle of activities in developing the Green Growth Index

Phase 1 (2017): GGGI applied the initial frameworks on a pilot version of the Green Growth Index and Simulation Tool, covering 34 GGGI member and partner countries. The concept was framed using a matrix that defined green growth according to five dimensions — resource efficiency, optimal utilization of natural assets, resilience to risks, economic opportunities, and social inclusion — and six sectors or thematic areas, namely energy, transport, cities, industry, water, and agriculture, forestry and other land use (AFOLU). The matrix at the time represented 39 green growth indicators (Acosta et al., 2019). A set of sectoral models formed the basis for the methods that allows an interactive link between the Index and Simulation Tool. The Tool allows the Index users to enhance their knowledge on how implementing different policy options influences a country's green growth performance. GGGI built the frameworks on both scientific evidence and expert judgement. The pilot version runs in Excel.

Figure 6 Process for developing the framework of the Green Growth Index



Both the index and the tool were presented in an international expert workshop, three in-country stakeholder workshops, and an international stakeholder consultation during GGGI's Global Green Growth Week in Addis Ababa, Ethiopia, in October 2017. The in-country workshops were held in Hanoi, Vietnam, on July 6; in Jakarta, Indonesia, on July 11; and in Palawan, Philippines, on July 27. These consultative activities aimed to inform GGGI member countries about ongoing initiatives to develop and collect feedback on the concepts and methods of index and the tool. Although GGGI's initiatives were highly commended during the workshops and consultation, the feedback suggested the need to improve the frameworks. Concerns were raised regarding missing indicators for social inclusion, the lack of subindices for green growth dimensions, and limited country coverage.

Phase 2 (2018): The assessment of feedback from stakeholder workshops revealed two major revisions that were necessary to improve the initial conceptual and methodological frameworks of the Index: to revise the matrix approach and to decouple the index from the tool. The first revision allowed the inclusion of indicators that cut across different sectors and shifted the focus of the concept from economic sectors to green growth dimensions (Acosta et al., 2019). The total number of indicators became 36. As in the first draft, the selection of additional indicators for the Green Growth Index in the second draft framework was based on both scientific evidence and expert judgement. The second revision entailed applying a separate method to the Green Growth Index to allow the addition of countries using national-level indicators that are available online. It was determined that adding countries to the Simulation Tool would require a longer transition due to the time required to collect a large number of model parameters and policy data for the new indicators. Thus, in 2018, GGGI emphasized revisions to the Green Growth Index. A major development of the Simulation Tool is envisaged for 2020.

GGGI presented the second draft framework for the Green Growth Index at two international expert meetings and four regional consultation workshops. These presentations aimed not only to gather feedback on the policy relevance of the indicators and on setting priorities and targets for those indicators, but also to provide a platform for dialogue and interaction that ensured a transparent process for improving the concept and methods of the index. The first international expert meeting was conducted 7-8 June in Geneva, Switzerland, in partnership with the Green Growth Knowledge Platform (GGKP) Working Group on Metrics and Indicators.

In the regional workshops, the main participants were government officials who are working on or have expertise in green growth issues, many of whom have a working relationship with GGGI country offices. Experts from other international organizations and research institutions that are supporting green growth knowledge generation, planning, policy development, and investment in GGGI member countries and partners also participated in the workshops. GGGI held the regional workshops 23-24 August in Bangkok, Thailand, for the Asia-Pacific region; 16-17 September in Dubai, UAE, for the Middle East and North Africa (MENA) region; 20-21 September in Addis Ababa, Ethiopia, for the Africa region; and 4-5 October in Mexico City, Mexico, for the Latin America and the Caribbean (LAC) region. These workshops were conducted in close collaboration with several partner organizations, including the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in Bangkok, and the Ministry of Climate Change and Environment in Dubai, and the Ministry of Environment in Mexico City, respectively. Eighty-six experts from 28 countries participated in the workshops, about 74 percent of whom work for the government. Other invited experts from 14 countries were not able to participate mainly due to scheduling conflicts or other competing government priorities at the time of the workshops.

A systematic assessment of the feedback given on indicator relevance and priorities during the regional workshops revealed five key challenges to address in order to enhance the policy relevance of the green growth conceptual framework. These challenges include the (i) lack of direct relationships of indicators to green growth; (ii) overlaps of the frameworks with other multidimensional concepts; (iii) diversity in institutional, economic, and environmental conditions across regions; (iv) insufficient coverage in thematic dimensions; and (v) concerns on the quality of data and their methodologies (Acosta et al., 2019).

The results of the assessment of the regional expert feedback were presented and discussed 4-6 December during the second international expert meeting in Rome, Italy, which was conducted in partnership with the Food and Agriculture Organization of the United Nations. The outcomes of the discussion during this meeting were considered in developing the third draft framework of the Green Growth Index. The main revisions to the second draft framework included the modifications of indicators in all green growth dimensions and the removal of the dimension on resilience and risks (Acosta et al., 2019). The main reasons for the latter were the lack of relevant indicators for this dimension; an overlap with other indices on vulnerability, such as the Notre Dame Global Adaptation Initiative or ND-Gain; and the complex interpretation of the Green Growth Index because resilience is by itself a multidimensional concept. The international experts suggested removing resilience and risks from the green growth framework and conduct a separate analysis to establish links to resilience and risks for the index in the future.

International and regional experts who participated in the consultations in 2018

Asia-Pacific Regional Experts

MENA Regional Experts

LAC Regional Experts

International and regional experts who participated in the consultations in 2018 *(continued)*

African Regional Experts

GGPM International Expert Group

Phase 3 (2019): The third draft framework was presented in a draft technical report on the concept, methods, and applications of the Green Growth Index prepared in May 2019. To collect expert feedback and allow systematic assessments of the conceptual and methodological frameworks, the GGPM team prepared a semi-structured questionnaire to guide the experts in reviewing the report. The questionnaire, which was circulated to the expert reviewers as an online survey from April to June, was divided into six parts:

- **Part 1** Personal information of the expert reviewers to be used for analysis of feedback
- **Part 2** Comments on the indicators of the Green Growth Index, focusing on policy relevance
- **Part 3** Comments on the sustainability targets used to benchmark the index
- **Part 4** Comments on the aggregation methods of the index (i.e., linear versus geometric)
- **Part 5** Forthcoming applications of the index to identify potential collaboration
- **Part 6** Specific comments on the different chapters of the draft technical report

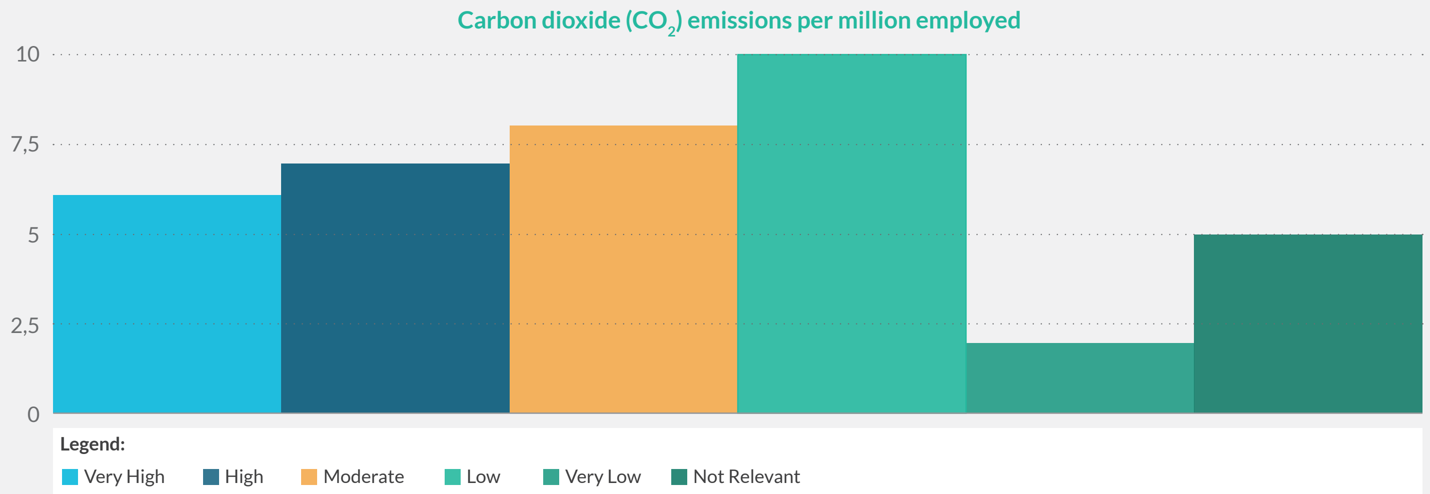
The expert reviewers consisted of international and regional experts who participated in the international meetings and regional workshops in 2018, other experts who were invited but not able to attend these meetings and workshops, and GGGI experts at headquarters and country offices. In addition to the online survey, the GGPM team conducted two types of consultations:

- From April to May 2019, a series of consultations with the GGGI thematic experts in sustainable energy, sustainable landscapes, water and sanitation, and green cities to ensure that the indicators are aligned to the work of the Institute; and
- June 2019, a series of consultations with experts from research institutions including the Institute for Advanced Sustainability Studies (IASS) and the Potsdam Institute for Climate Impact Research (PIK) as well as international organizations including the Food and Agriculture Organization of the United Nations (FAO), the Sustainable Development Solutions Network (SDSN), and the Organisation for Economic Co-operation and Development (OECD) to validate the sustainability targets that were used to benchmark the green growth indicators.

The consultations in June were an important step in finalizing the framework of the Green Growth Index because the intermediate assessment of the online survey revealed that many experts were not knowledgeable on the sustainability targets used in the draft technical report.

The final framework presented in Figure 1 and discussed in detail in Chapter 4 was based on the results of the assessments of the expert feedback on the draft technical report and consultations with experts on GGGI thematic areas and sustainability targets. A comparison of the indicators in the final framework to the draft frameworks in phases 1, 2 and 3 of the index development process is available in Peyriere and Acosta (2019). Many of the indicators in the third draft framework were adopted in the final framework because they were highly rated by the experts (Peyriere & Acosta, 2019). Only few indicators were excluded from the final framework due to very low ratings as in the case of CO_2 emissions per million people employed (Figure 7); others were replaced by indicators from the United Nations Statistics on SDG indicators[1] and have information on targets, such as the ratio of total primary energy supply to GDP and share of renewable to total final energy consumption). Some were added due to relevance of the indicator to GGGI's thematic areas, such as soil organic carbon content, and soil biodiversity. An important improvement of the final framework is the addition of a fourth indicator category in the natural capital protection and social inclusion dimensions, namely cultural and social value to align to the goals of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and gender balance to align to GGGI's emphasis on this issue in its country programs, respectively (Figure 1).

Figure 7 Ratings of the experts on the relevance of CO_2 emissions per million employed as an indicator for green employment



Note: The above rating is based on the response to "Please rate the indicators based on their relevance to policy decision-making and development contexts in your country." The values are the percentage of the experts who think that the indicator is very high, high, moderate, low, very relevant, and not relevant to green employment.

[1] https://unstats.un.org/sdgs/indicators/database/

GGGI

04 Conceptual framework

4.1 Underlying concepts and goals

The conceptual framework for the Green Growth Index builds on GGGI's definition of green growth:

> *Green growth is 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 emphasizes four closely interlinked concepts that support green growth and sustainable development: low carbon economy, ecosystem health, resilient society, and inclusive growth.

The concept of **low carbon economy**, which the United Kingdom's Department of Environment, Food and Rural Affairs (DEFRA) introduced through its energy white paper, "Our energy future - creating a low carbon economy," in 2003, emphasizes "higher resource productivity — producing more with fewer natural resources and less pollution" (DEFRA, 2003: p.6). It has become a widely used strategy for transitioning from a high-carbon to a low-carbon production structure, with a particular focus on energy efficiency as well as clean and renewable energy (Xin, Yuding, & Jianzhong, 2011; Yuan, Zhou, & Zhou, 2011; EFFECT, 2013). Low carbon as a pathway to growth has also been instrumental in the climate change negotiations, with low carbon emissions as a key measure for climate change mitigation (Goerild et al., 2016). Investment, innovation, and skilled labor requirements are important challenges in transitioning to sustainable low carbon economy (Foxon, 2010; ILO, 2011; Nelson, Hervé-Mignucci, Goggins, Szambelan, & Zuckerman, 2014; Goerild et al., 2016), and governments are increasingly promoting these through incentive programs and supportive policies (NRTEE, 2012), thus helping to transform challenges into opportunities.

The role of a low carbon economy in creating business, employment, and other new economic opportunities is now widely recognized (CCICED, 2009; Xin et al., 2011; Worrall, Roberts, & Whitley, 2018). In addition to an increase in climate change impacts, energy costs, and population growth – "growing understanding of limitations to ecosystem health to create increasingly favourable conditions … to invest in and develop markets for clean or green technologies" – contribute to global transition to low carbon economy (NRTEE, 2012). More recently, however, debates on the transition to low carbon economy have not only focused on how to conserve ecosystem health, but also on "how to address the adverse impacts on specific vulnerable industry sectors, groups of people and communities" (Gambhir, Gree, & Pearson, 2018). A "just transition" to low carbon economy is a new concept that aims to minimize unemployment risk, create decent employment (Popp et al 2018), and avoid other unintended outcomes that can result in excluding segments of society.

In the last decades, **ecosystem health** has become increasingly relevant due to degradation of natural resources, such as land, minerals, water, air, and forest, and their services to the people in the form of food, energy, raw materials, culture, and wellbeing, among other issues. Rapport (1995) emphasizes that ecosystem health is a normative concept, so that desired sustainable conditions are subject to societal perceptions. Because it is a useful concept for setting new goals and providing new integrative models for environmental management (Fu-Liu & Shu, 2000; Gaudet, Wong, Brady, & Kent, 2008), ecosystem health has become widely relevant for forming national and international management programs to protect and conserve forest, rangeland, coastal, marine, and freshwater ecosystems (Rapport et al., 1999). Thus, indicators for ecosystem health should, inter alia, be aligned with ecosystem protection and management goals (Lu et al., 2015), for instance, better environmental quality, reduced GHG emissions, and biodiversity conservation.

Ecosystem management involves applying knowledge and technology to achieve the desired conditions of ecosystems (Salwasser, 1995), including efficiency in using these natural resources to reduce environmental stress. An ecosystem is considered healthy when it is free from distress and degradation, resilient to stress (Costanza, 1992; Rapport, Costanza, & McMichael, 1998), and able to sustain services to people (Tett et al., 2013). Because of the interdependence between ecosystems and society, the resilience of society depends very much on ecosystem resilience: "Conditions necessary to sustain the capacity of an ecosystem are very much dependent on society, and yet in turn, society is dependent on these very ecosystems for their own health and development" (Hearnshaw, Cullen, & Hughey, 2005).

The concept of social or societal resilience, which underpins a **resilient society**, draws from the social-ecological perspective of resilience. It is "the capacity of social-ecological systems to absorb recurrent disturbances ... so as to retain essential structures, processes and feedbacks" (Adger, Hughes, Folke, Carpenter, & Rockström, 2005: p.1036). The definitions of social resilience generally refer to the capacities of society to "tolerate, cope with, and adjust to environmental and social threats of various kinds" (Keck & Sakdapolrak, 2013: p.8). While scientific debates on practical utility of resilience and its linkages to vulnerability continue (Birkmann, 2006; Bach et al., 2013; Miller et al., 2010), policymakers increasingly use the concept of social resilience to respond to climate change and manage disaster risk and as instruments to implement post-2015 international agendas, including the Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction, and the Paris Agreement under the United Nations Framework Convention on Climate Change (de Bruijn, Buurman, Mens, Dahm, & Klijn, 2017). In the context of climate change, social resilience has been considered the inverse of vulnerability (Birkmann, 2006; Sapountzaki, 2007; Gaillard, 2007); thus, vulnerable social-ecological systems are those that have lost resilience (Folke, 2006). In this case, adaptation of "humans in nature" becomes a relevant consideration in social resilience (Keck & Sakdapolrak, 2013), where capacity for adaptation is facilitated through assets, resources, and environment (Windle, 2011).

Five forms of capital are considered to provide enabling conditions for building a resilient society: natural, including water, land, forests, and minerals; financial, including savings, income, and pensions;, human, including knowledge, skills, and health; social, including networks, trust, and mutual exchange; and physical, including shelter, water, sanitation, and energy (Sapountzaki, 2007; Sapountzaki, 2007; Jermalaviius & Parmak, 2012). Adger (2000:p.352) suggests that "social resilience is ... observed by examining positive and negative aspects of social exclusion, marginalization," implying that enhancing social inclusion and reducing marginalization are key to building a resilient society.

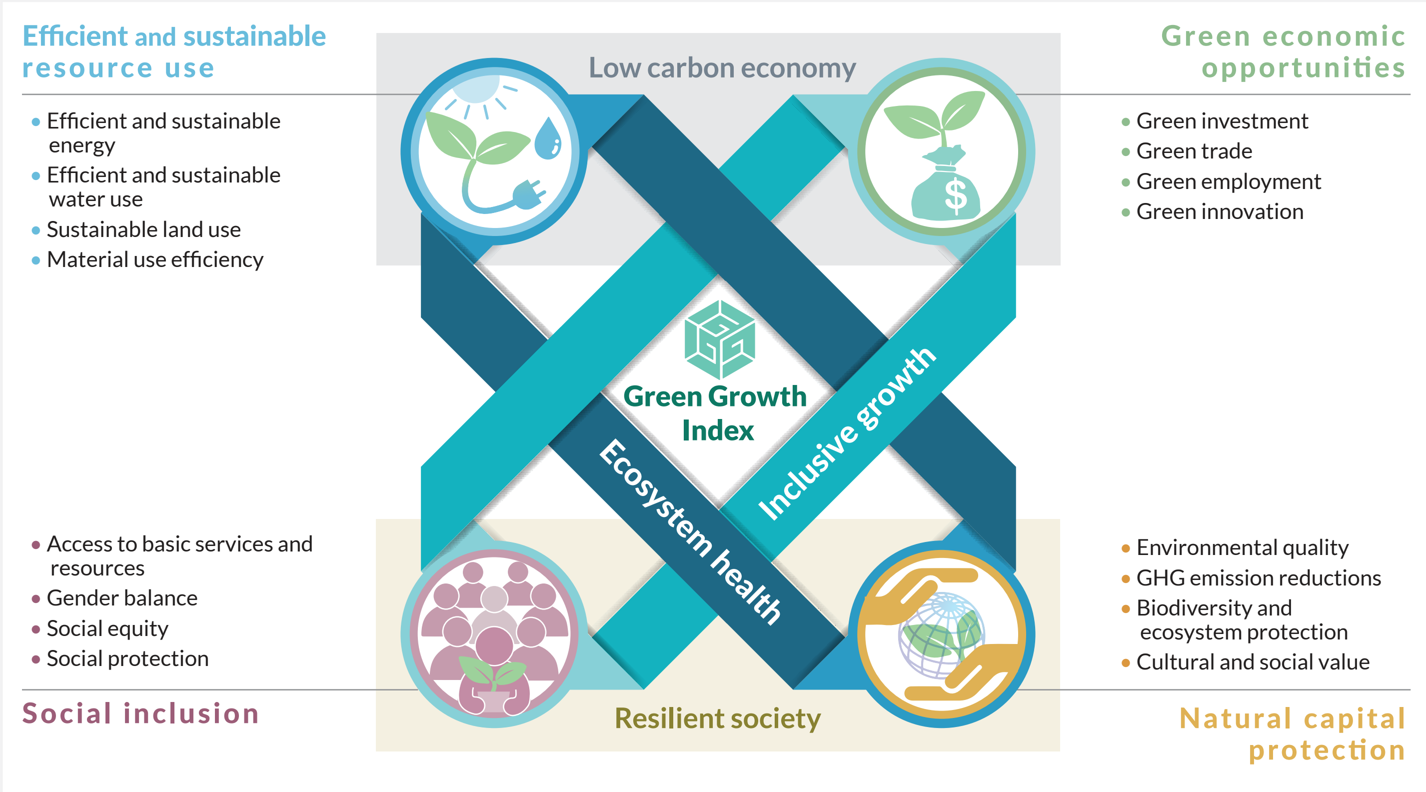
The concept of **inclusive growth** has evolved as a response to growing social inequalities and exclusions, particularly since the financial crisis in 2008 (Dutz, Kessides, O'Connell, & Willig, 2011; Haan, 2015). There is so far no universal definition for inclusive growth (Dutz et al., 2011; Ranieri & Ramos, 2013b, 2013a; Alexander, 2015; IMF, 2017; Lee, 2019), allowing room for different interpretations (Burch & McInroy, 2018). Although it has some overlaps with the concepts of human rights, inequality, redistribution, rural development, entitlements, and capabilities concepts (i.e., broad-based growth, shared growth, and pro-poor growth; Dutz et al., 2011; Gupta & Vegelin, 2016; IMF, 2017), inclusive growth suggests a more progressive pathway. Unlike other related concepts, inclusive growth does not focus on direct redistribution of income or benefits (Dinda, 2011; Haan, 2015), but on conditions that will enable the poor, vulnerable, disadvantaged, or excluded segments of society to participate in economic activities, contribute to growth process, and benefit from economic growth (Dinda, 2011; Haan, 2015; Lee, 2019).

Inclusive growth thus emphasizes equal access to economic opportunities within the society which are created through growth in investment, innovation, entrepreneurship, and employment (Dutz et al., 2011; Dinda, 2011; George, Mcgahan, & Prabhu, 2012). The concept emphasizes a growth strategy that builds on the economy and society (Walby, 2018), with the economy capable of creating new opportunities for the society and the society capable of taking part in sustaining economic growth. The latter suggests that "expanding human capabilities (e.g., through productive employment) are ... regarded as instrumental in improving economic outcomes" (Alexander, 2015: p.5). This interpretation of inclusive growth emphasizes the need to invest in basic services (Dinda, 2011; Dinda 2011), invest in human capital to empower the poorest, and reduce social vulnerability by reducing exposure to risks and disasters (Gupta & Vegelin, 2016; Gupta and Vegelin 2016). Walby (2018) defines such public spending as social investment as opposed to welfare because social investment means that "inclusion and economic growth are co-produced, not trade-offs." This is a broader interpretation of inclusive growth, where "non-income measures of human capabilities and well-being are valued as human development outcomes, rather than solely as instruments to accelerate economic growth" (Alexander, 2015). Because "inclusive growth does not sufficiently consider or address environmental degradation," (Burch & McInroy, 2018: p.5) creation of economic opportunities should be guided by a "just transition" to low carbon economy, which could enhance social equality and sustainable development (Worrall et al., 2018; Worall et al. 2018).

4.2 Policy relevance of dimensions

The Green Growth Index comprise four dimensions: efficient and sustainable resource use, green economic opportunities, natural capital protection, and social inclusion (Figure 8). The indicators for **efficient and sustainable resource use** represent the use of major natural resources including energy, water, land, and material. The indicators for **green economic opportunities** include investment, trade, employment, and innovation. These two dimensions and their indicators are relevant to the concept of low carbon economy. The indicators for **natural capital protection** include environmental quality, GHG emission reductions, and biodiversity and ecosystem conservation. The indicators for **social inclusion** include access to basic services and resources, social equality, and social protection. These two dimensions and their indicators are relevant to the concept of resilient society.

Figure 8 Conceptual framework for the Green Growth Index



The concept of ecosystem health suggests that environmental management, in this case the efficient use of resources, could lead to desired goals or outcomes, such as protection of the natural resources. But resource efficiency and natural capital protection dimensions can be considered a connected system, that is they have inherent feedback mechanisms, because conservation and restoration of natural capital are also key drivers in transitioning to a low carbon or green economy (ten Brink, Mazza, Badura, Kettunen, & Withana, 2012). Similarly, the concept of inclusive growth emphasizes the co-production of social inclusion and economic growth, such as from innovative green opportunities (Walby, 2018). The economic, social, and environmental challenges that necessitate policy actions and decisions in the four green growth dimensions are discussed below.

4.2.1 Efficient and sustainable resource use

In recent years, there has been a significant increase in demand for resources, such as energy, water, land, and materials, due to an increase in population and living standards as well as in unsustainable production and consumption. Global population is growing at a rate of 1.07 percent per year (Worldometers, 2019) and projected to reach 9.8 billion in 2050 (UN DESA, 2017). Current trends in consumption will increase food requirements by 60 percent and water use by 40 percent by 2030 (UNEP, 2017; UNEP, 2018), and crop production by up to 55 percent by 2050 (UNEP, 2014a; UNEP, 2018). Natural resources, the very foundation of socio-economic development (EEA, 2015), are depleting at a fast rate and threatening global sustainability. Almost half of the nine planetary boundaries have been exceeded, which could lead to irreversible damage on Earth, including the climate system (UNEP, 2018). While meeting the basic needs of growing populations is necessary, the Earth's limit to generate resources and absorb waste should not be ignored (EEA, 2016). A change in production and consumption patterns is necessary to meet the increase in the demand and generate less wastes and pollution in the future. An economy-wide transformation is necessary if the carrying capacity of Earth and planetary boundaries are not to be exceeded.

The main objective of resource efficiency is to decouple economic growth from resource use. A study revealed that resource efficiency could reduce resource use by 17 percent by 2050 (Hatfield-Dodds et al., 2017). A four- to 10-fold increase in resource efficiency will be needed by 2050 (European Commission, 2011) to sustain economic growth. Evidence shows the existence of relative decoupling, where economic growth increases at a rate higher than resource use. However, absolute decoupling, where resource use declines in absolute terms, has not yet occurred. This is in part due to efficiency gains being often accompanied by a rebound effect, where such gains are invested in further activities entailing additional resource use (Shao & Rao, 2018; Bringezu, Schütz, Steger, & Baudisch, 2004). Addressing these issues is of the utmost significance, especially for public policy measures in many countries which are required to achieve absolute decoupling of resource use and ideally of environmental impact (UNEP, 2017b).

One of the core principles of green growth is the efficient use and management of natural resources and stocks (European Commission, 2019). UNEP calls for a resource-efficient economy (UNEP, 2011), while the World Bank states that green growth is one that is efficient in its use of natural resources (WB, 2012). According to OECD, green growth strategies should include well-designed and executed policies that maximize the efficient allocation of resources in such a way that is good for the environment and the economy and that provides incentives to use natural resources efficiently (OECD, 2011).

4.2.2 Natural Capital Protection

Natural capital is considered the most fundamental form of capital as it provides the basic conditions and provisions for human existence (EEA, 2015). It is composed of resources used in production processes (biotic or abiotic), but also englobes ecosystem services provided by nature (Milligan, Terama, Jimenez-Aybar, & Ekins, 2014). Ecosystems provide provisioning, regulating, and cultural and supporting services through the natural functioning and interaction of ecosystems which are beneficial to life and specifically to humans (Milligan et al., 2014; Costanza et al., 2017). The ecosystem services provided to humans were valued at approximately USD 125 trillion in 2011 (Costanza et al., 2014). Biodiversity is important for sustainable ecosystem services (Cleland, 2011) but its overall state is declining. As widely reported, "the world is already facing the mass extinction of species" (Earth Day Network, 2018).

Biodiversity loss is evident in every region of the world and is reducing nature's capacity to regenerate and contribute to people's well-being (Suzuki, 2018). Such a decline coupled with climate change will only accelerate and intensify the deterioration of natural assets, making the earth considerably less habitable for human beings and large numbers of other living organisms. An evident increase in global GHG emissions was notable in 2017 after two years of almost no growth. Carbon dioxide emissions rose by 1.2 percent in 2017 (Olivier & Peters, 2018). Air quality around the world is declining (CCAC, 2018) and overfishing is considered one of the biggest threats to the marine ecosystem, where "world's marine fisheries had 33.1 percent of stocks classified as overfished in 2015" (FAO, 2018: p.45).

Natural capital protection is considered especially relevant for green growth given the level of dependence societies have on natural capital for its goods and services. OECD (2011) states that green growth entails that natural assets continue to provide environmental services on which our well-being relies, while the UN ESCAP (2013) identifies green growth as needing to enhance the earth's natural capital. Natural capital exists independently but the benefits can only be derived from the interference of human beings (Committee, 2014). Historically, most countries around the world have exploited natural capital for the sole purpose of economic growth with limited considerations of environmental impacts. This has resulted in significant adverse impacts on biodiversity and in aggregated resource depletion. This directly jeopardizes the very objective of green growth, which is to recouple environmental protection with the economy (Vazquez-Brust, Smith, & Sarkis, 2014).

4.2.3 Green Economic Opportunities

Green growth strategies create new economic opportunities by accelerating investments and innovation that reinforce the foundations of sustainability (Bowen & Fankhauser, 2011). The objective of green growth is to identify cost-effective measures to reduce pressure on the environment, maximize the benefits of the cleaner sources of growth, and transform the conventional sectors into green sectors (OECD, 2011). These objectives, however, require large investments (Bowen & Fankhauser, 2011). More than USD 300 billion was invested globally in clean energy in 2018 (BloombergNEF, 2019), helping to generate jobs in the renewable energy sector. Currently, the total number of employees in renewables are 11 million (IRENA, 2019). Clean sources of energy were developed as well as new jobs were created improving the standard of living. OECD has identified the sectors that have the potential to create green jobs if adequate policies are to be implemented. These sectors include green agriculture, renewable energy, sustainable forestry, clean industry, public transport, recycling and waste management, and federal government activities (OECD, 2017a).

However, the shift of investments from conventional to the green sectors means a shift in the task profile and nature of the jobs (Lehr, Lutz, & Edler, 2012). Almost 1.5 billion people are expected to be affected by the transition to a greener economy (ILO, 2012). This could also mean loss of jobs in carbon-intensive industries (WB, 2012; OECD, 2017a). Therefore, it is essential to address the implications caused by the green transition to the labor market. Studies have shown that skill shortages are accounted for as one of the main barriers to the growth and development of the green industries (WB, 2012). Hence, effective measures should be embedded in environmental and labor policies to facilitate the efficient re-training of the workforces (Pestel, 2014).

Recognizing both the importance and limitations of sustainability, green growth focuses on multiple objectives, which are to enhance economic growth while simultaneously increasing social cohesion and environmental protection (Kasztelan, 2017). The green growth narrative turns the current environmental crisis that stems from the impacts of climate change into opportunities and serves as a practical measure to achieve sustainable development (OECD, 2011). Going beyond low-carbon growth and measures to tackle climate change, green growth strategies construct the cost-effective pathways to develop environmentally friendly technologies and cultivate a fair environment resulting in a resilient society (Kasztelan, 2017). Moreover, these strategies enhance opportunities for trade through green certified products and related services as well as through green international supply chains (UNEP, 2013). Green trade, in turn, creates opportunities for specialization, competition, economies of scale and innovation (WTO & UNEP 2018).

4.2.4 Social Inclusion

Inequality at present is persistent and self-evident. At least 900 million people are still living on less than USD 1.90 per day (WB, 2015). Just under one billion people are still living without access to electricity (SEforAll, 2017) and 2.8 billion people without access to clean cooking (IEA, 2017), while 2.1 billion people do not have access to safe drinking water (WHO, 2017). Lack of access to basic services and resources is directly related to the absence of income. Further, lack of income translates to people strongly depending on nature and ecosystem services to earn their livelihood. The level of degree to which an individual rely on the environment depends immensely on their economic circumstances and many other structural conditions and constraints. An economy that is very dependent on the environment also relies on social welfare for its growth (Bouma & Berkhout, 2015). The recent work of IMF suggested that economic growth would be unsustainable if inequality were disregarded. Economic growth generally tends to be higher in countries where equality is higher (Ostry, Berg, & Tsangarides, 2014).

Access to basic resources should be accompanied by social equity and social security if the social performance is to be measured adequately and inequality is to be reduced. A society can only be inclusive when every member of the society has not only equal access to resources, but also opportunities to participate fully in social processes irrespective of the individual abilities, ethnic and social background, gender, or age. For example, large-scale green investments can create jobs for disadvantaged groups and decrease inequality gaps particularly in the developing countries (Euro Cities, 2015). Employment opportunities for socially fragile groups can help to alleviate poverty, which in turn is considered an important hurdle for social inclusion (Eyraud et al., 2011). However, policies need to ensure that jobs created through green growth are decent jobs, which are productive, secure, offer social protection, and include social dialogue (UNEP, 2012). They also need to ensure that women have equal access to green job opportunities, particularly in energy and transportation sectors where women are traditionally not part of the workforce (Baruah, 2018).

4.3 Links to relevant sustainability issues

4.3.1 GGGI's priority areas

GGGI's engagement to support transformation of countries' economies cut across different economic sectors and development issues. However, to maximize the impact of its products and services, GGGI's intervention emphasizes change in four priority (or thematic) areas including sustainable energy, water and sanitation, sustainable landscapes, and green cities, which are defined as follows:

- **Sustainable Energy** refers to expanding access to affordable and sustainable energy services, improving sustainable energy generation mix and enhancing and integrating energy efficiency;
- **Water and Sanitation** aims to address issues impacting sustainable water resources management by encouraging reuse of water, increased access of water services (including sanitation) for all and water related innovation in industries, agriculture and households, and through policy reforms that support the strengthening of the water sector;
- **Sustainable Landscapes** centers on sustaining natural capital, reducing deforestation and ecosystem degradation, while pursuing green growth, sustainable trade and ensuring food and livelihood security. Priority areas include forests, agrarian landscapes, wetlands, coastal and marine ecosystems, including peatlands and mangroves; and
- **Green Cities** focuses on mainstreaming and localizing green growth into urban planning and management; supporting low-carbon, smart, and climate resilient cities; solid waste management particularly focusing on waste-to-resource approaches; and green mobility and non-motorized transport, linked to clean urban transportation, with a direct link to improving air quality.

Figure 9 presents the link of the green growth indicators to these priority areas. Two of the indicators, (1) the ratio of total primary energy supply to GDP and (2) the share of renewable energy to total final energy consumption are directly linked to **sustainable energy**. Other indicators such as the (1) ratio of CO_2 emissions to population excluding AFOLU and (2) ratio of non-CO_2 emissions to population excluding AFOLU have sectoral data that provides a measure in the performance on sustainable energy. For **water and sanitation**, there are three indicators that are very relevant such as (1) water use efficiency, (2) share of freshwater withdrawal to available freshwater resources, and (3) population with access to safely managed water and sanitation. Covering major types of ecosystems (i.e., terrestrial, freshwater, coastal, marine) and economic sectors (i.e., agriculture, forest and other land use), the **sustainable landscapes** are linked to 25 percent of the 36 green growth indicators. The indicator for freshwater withdrawal to available freshwater resources can be further disaggregated by sectors including agriculture, albeit data for most countries are presently not available. The three indicators, (1) air pollution, (2) mean annual population-weighted exposure (PM2.5), municipal solid waste (MSW) generation per capita, and (3) proportion of urban population living in slums are directly linked to **green cities**. The indicator on population with access to safely managed water and sanitation are available for urban and rural areas, which can be used to measure green growth performance for green cities.

Figure 9 Green growth indicators by thematic areas

Dimensions	Code	Indicators	Cross-cutting	Sustainable energy	Water and sanitation	Sustainable landscapes	Green cities
Efficient and sustainable resource use	EE1	Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)		■			
	EE2	Share of renewables to total final energy consumption (Percent)		■			
	EW1	Water use efficiency (USD per m^3)			■		
	EW2	Share of freshwater withdrawal to available freshwater resources (Percent)			■	▲	
	SL1	Average soil organic carbon content (Tons per hectare)				■	
	SL2	Share of organic agriculture to total agricultural land area (Percent)				■	
	ME1	Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)	■				
	ME2	Total material footprint (MF) per capita (MF tons per capita)	■				
Natural capital protection	EQ1	PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m^3)					■
	EQ2	DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)	■				
	EQ3	Municipal solid waste (MSW) generation per capita (Tons per year per capita)					■
	GE1	Ratio of CO_2 emissions, excluding AFOLU to population (Metric tons per capita)	■	▲			
	GE2	Ratio of non-CO_2 emissions excluding AFOLU to population (Tons per capita)	■	▲			
	GE3	Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1,000 persons)				■	
	BE1	Average proportion of Key Biodiversity Areas covered by protected areas (Percent)				■	
	BE2	Share of forest area to total land area (Percent)				■	
	BE3	Soil biodiversity, potential level of diversity living in soils (Index)				■	
	CV1	Red list index (Index)				■	
	CV2	Tourism and recreation in coastal and marine areas (Score)				■	
	CV3	Share of terrestrial and marine protected areas to total territorial areas (Percent)				■	
Green economic opportunities	GV1	Adjusted net savings, minus natural resources and pollution damages (Percent GNI)	■				
	GT1	Share of export of environmental goods (OECD and APEC class.) to total export (Percent)	■				
	GJ1	Share of green employment in total manufacturing employment (Percent)	■				
	GN1	Share of patent publications in environmental technology to total patents (Percent)	■				
Social inclusion	AB1	Population with access to safely managed water and sanitation (Percent)			■		
	AB2	Population with access to electricity and clean fuels/ technology (Percent)	■				
	AB3	Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)	■				
	GB1	Proportion of seats held by women in national parliaments (Percent)	■				
	GB2	Ratio of female to male with account in financial institution, age 15+ (Percent)	■				
	GB3	Getting paid, covering laws and regulations for equal gender pay (Score)	■				
	SE1	Inequality in income based on Atkinson (Index)	■				
	SE2	Ratio of urban to rural, access to safely managed water/ sanitation and electricity (Percent)	■				▲
	SE3	Share of youth not in education, employment or training, aged 15-24 years (Percent)	■				
	SP1	Proportion of population above statutory pensionable age receiving pension (Percent)	■				
	SP2	Healthcare access and quality index (Index)	■				
	SP3	Proportion of urban population living in slums (Percent)					■

■ Currently linked to the priority areas ▲ Indicators can be disaggregated for the specific priority areas

4.3.2 SDGs and other global sustainability targets

Sustainable Development Goals (SDGs) are an excellent framework for transition towards a green growth pathway for GGGI members and the planet (GGGI, 2017). Given that the Green Growth Index measures and tracks the green growth performance of countries worldwide, it is crucial to integrate SDG indicators in its framework. Currently, 232 indicators are covered in the 17 SDGs. SDG indicators are a reliable and comprehensive dataset which provide an excellent source for the construction of the Green Growth Index. Furthermore, as all UN member governments have agreed to reach specific targets in SDGs, it is necessary for the Green Growth Index to be aligned with the SDGs in order to make it relevant to national policy worldwide. It will enable countries to visualize easily their level of performance in achieving the SDGs, similar to the OECD's Measuring Distance to the SDG Targets (OECD, 2019b). The Green Growth Index, building upon a highly participatory global initiative engaging hundreds of experts in all parts of the world, uses the foundations of the SDGs to construct a new balanced and unbiased index on green growth. During the regional workshops (Chapter 3), experts indicated their preference to benchmark the Index against SDGs.

Figure 10 and Acosta (2019) presents the relationship of the green growth indicators that were used in the Index to the SDG indicators. The 21 green growth indicators are SDG indicators, and the remaining contributes not only to the SDGs but also other international agreements. For example, CO_2 emissions per capita, excluding AFOLU (GE1), non-CO_2 emissions per capita, excluding AFOLU (GE2), and non-CO_2 emissions in agriculture per capita (GE3) have a large impact on the Paris agreement's objective to keep global average temperature to well below 2 °C above pre-industrial levels. Average soil organic carbon content (SL1) and share of organic agriculture to agricultural land area (SL2) contributes to Aichi Strategic Goal B to reduce the direct pressures on biodiversity and promote sustainable use, while soil biodiversity, potential level of diversity (BE3) Aichi Strategic Goal C to improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

While the indicators for green economic opportunities have no direct link to the targets of the SDGs and other international agreements, they generally have contribution to sustainable development. For green investment, adjusted net savings minus natural resources depletion (GV1) was a relevant indicator in the United Nations Commission for Sustainable Development (UN DESA, 2007). For green trade, the share of environmental goods to total export (GT1) was used as an indicator by UNEP (PAGE, 2017a, 2017b). The share of green employment in manufacturing (GJ1) was a pertinent indicator for green jobs, which was used by Bowen & Kuralbayeva (2015) and the June 2017 OECD report for the G7 Environment Ministers (OECD, 2017a). Finally, for Green Innovation, the share of environmental technology to total patents (GN1) was considered by the OECD for cross-country comparisons of technology output (Dernis & Guellec, 2001).

GGGI's indicators for the Green Growth Index provide a comprehensive vision of sustainable development, taking into consideration the SDGs and other relevant international agreements' targets. It thus provides a useful metric for evaluating performance in achieving these targets as well as the objectives of green growth. So far, only the SDSN's SDG index (Sachs et al., 2019) and the OECD's Measuring Distance to the SDG Targets (OECD, 2019b) show the distance of countries' performance to SDG targets. The Green Growth Index emphasizes measuring performance in achieving not only SDG but also other sustainability targets. It is the first composite indicator for green growth to make explicit links to the SDGs and sustainable development. It gives a comprehensive vision of green growth and is intended to support policy directed towards achieving sustainable development targets.

Figure 10 Links of Green Growth Index to Sustainable Development Goals (SDGs)

A Sustainable Development Goals (SDG) indicators used in the Green Growth Index

Dimensions	Indicators		Sustainable Development Goals (SDGs)*		
			Goal	Target	Indicator
Efficient and sustainable resource use	EE1	Ratio of total primary energy supply to GDP	Affordable and clean energy	7.3	7.3.1
	EE2	Share of renewables to total final energy consumption	Affordable and clean energy	7.2	7.2.1
	EW1	Water use efficiency	Clean water and sanitation	6.4	6.4.1
	EW2	Share freshwater withdrawal to available freshwater	Clean water and sanitation	6.4	6.4.2
	ME1	Total domestic material consumption per GDP	Decent work and economic growth	8.4	8.4.2
			Responsible consumption and production	12.2	12.2.2
	ME2	Total material footprint per capita	Decent work and economic growth	8.4	8.4.1
			Responsible consumption and production	12.2	12.2.1
Natural capital protection	EQ1	PM2.5, mean annual population-weighted exposure	Sustainable cities and communities	11.6	11.6.2
	EQ2	DALY rate as affected by unsafe water sources	Good health and well-being	3.9	3.9.2
	BE1	Proportion of KBAs covered by protected areas	Life below water	14.5	14.5.1
			Life on land	15.1 15.4	15.1.2 15.4.1
	BE2	Share of forest area to total area	Life on land	15.1	15.1.1
	CV1	Red list index	Life on land	15.5	15.5.1
	CV3	Share of terrestrial and marine PA's to territorial areas	Life below water	14.5	14.5.1
Social inclusion	AB1	Access to safely managed water and sanitation	Clean water and sanitation	6.1 6.2	6.1.1 6.2.1
	AB2	Access to electricity and clean fuels/technology	Affordable and clean energy	7.1	7.1.1 7.1.2
	AB3	Internet broadband and mobile cellular subscriptions	Partnerships to achieve the goal	17.6	17.6.2
			Industry, innovation and infrastructure	9.c	9.c.1
	GB1	Seats held by women in national parliaments	Gender equality	5.5	5.5.1
	GB2	Ratio of female to male with financial account	Decent work and economic growth	8.10	8.10.2
	SE2	Ratio urban-rural, safe water/sanitation and electricity	Affordable and clean energy	6.1 6.2	6.1.1 6.2.1
			Clean water and sanitation	7.1	7.1.1
	SE3	Youth not in education, employment or training	Decent work and economic growth	8.6	8.6.1
	SP1	Proportion of population receiving pension	No poverty	1.3	1.3.1
	SP3	Proportion of urban population living in slums	Sustainable cities and communities	11.1	11.1.1

* Details on SDG targets and indicators are available on these links: https://unstats.un.org/sdgs/indicators/database/; https://unstats.un.org/sdgs/metadata/

Figure 10 Links of Green Growth Index to Sustainable Development Goals (SDGs) *(continued)*

B Link of green growth indicators to SDGs and other sustainability targets

Dimensions	Indicators		Link to SDGs and other targets		
			Sustainable Development Goals (SDGs)*		Other targets
Efficient and sustainable resource use	SL1	Average soil organic carbon content	Life on land	15.3.1	Aichi
	SL2	Share of organic agriculture to agricultural area	Zero hunger	2	Aichi
			Responsible consumption and production	12	
Natural capital Protection	EQ3	Municipal solid waste generation per capita	Sustainable cities and communities	11.6.1	
	GE1	CO_2 emissions per capita, excluding AFOLU	Climate action	13	Climate
	GE2	Non-CO_2 emissions per capita, excluding AFOLU	Climate action	13	Climate
	GE3	Non-CO_2 emissions in agriculture per capita	Climate action	13	Climate
	BE3	Soil biodiversity, potential level of diversity	Life on land	15.3.1	Aichi
	CV2	Tourism and recreation in coastal and marine areas	Responsible consumption and production	12.B	
	CV3	Share of terrestrial and marine PA's to territorial areas	Life on land	15.1	Aichi
Green economic opportunities	GV1	Adjusted net savings	Responsible consumption and production	12	
	GT1	Share of environmental goods to total export	Responsible consumption and production	12	
	GJ1	Share of green employment in manufacturing	Industry, innovation and infrastructure	9	
	GN1	Share of environmental technology to total patents	Responsible consumption and production	12	
Social inclusion	GB2	Ratio of female to male with financial account	Gender equality	5.1	
	GB3	Laws and regulations for equal gender pay	Gender equality	5.c	
			Reduced inequality	10.2	
	SE1	Inequality in income based on Atkinson	No poverty	1.1.1 1.2.1	
			Reduced inequality	10.1.1	
	SP2	Healthcare access and quality index	Good health and well-being	3.8.1	

* Details on SDG targets and indicators are available on these links: https://unstats.un.org/sdgs/indicators/database/; https://unstats.un.org/sdgs/metadata/

05 Methodology

"Composite [indices] involve a long sequence of steps that need to be followed meticulously" (Greco et al., 2018). The GGPM team applied a stepwise approach to enhance the transparency, replicability, and credibility of the Green Growth Index (Figure 11). This approach conforms to "good practices" in developing composite indices (Nardo, Saisana, Saltelli, & Tarantola, 2005; OECD & JRC, 2008). After concept building (chapter 4), the second step was an empirical application to systematically address methodological issues, such as data selection and statistical tests as well as normalization, weights, and aggregation of indicators. This chapter explains details of these methods. The third step, which aimed to check the robustness of the Green Growth Index, measured the explanatory power of the indicators and dimension subindices as well as the sensitivity and uncertainty levels of the index. The fourth step, which focused on the presentation of the indicators, dimension subindices, and the Green Growth Index, required attention to enhance the comprehensibility and policy relevance of the results. This step considered not only the illustration of the results in maps, diagrams, and tables but also their assessments using benchmarks and ranks. This report, however, presents only selected results because most of the analyses will be discussed in GGGI's forthcoming Global Green Transformation Report (see chapter 9.1). It is a flagship report that will serve as a core part of GGGI's initiative to promote the model of green growth and showcase successful country experiences and approaches, supplemented by data, analysis, and stakeholder engagement.

Figure 11 Stepwise approach for developing the Green Growth Index

Steps	Activities	Rationale and description	Chapter
Concept building	• Objectives and purpose	• Guide development of the concept and inform purpose of the global index	1
	• Concept and definition	• Present underlying concepts for the Green Growth Index and its dimensions	4.1
	• Dimensions and indicators	• Asses policy relevance of indicators and data for each green growth dimension	4.2
Empirical application	• Data selection and statistical tests	• Set criteria for data selection, conduct correlation analysis, check for outliers	5.1–5.5
	• Normalization and benchmarking	• Identify lower/upper bounds for normalization and sustainability targets	5.6, 5.9
	• Aggregation and weights	• Assess weights and define aggregation methods (i.e. arithmetic, geometric)	5.7–5.8
Robustness check	• Sensitivity analysis	• Check the sensitivity of the global index to changes in indicators and targets	5.10.1
	• Uncertainty analysis	• Analyze impacts of changes in the framework and aggregation methods	5.10.2
	• Consistency check	• Correlate the Index to other green growth related indices	8.2
Presentation	• Global pattern of Index and dimensions	• Present green growth dimensions and global index on maps and tables	2, App. 1
	• Regional and dimension structure	• Compare Green Growth Index and dimension sub-indices across regions	6.1
	• Country and indicator specifics	• Analyze results for top performing countries and underlying indicators	6.2–6.3

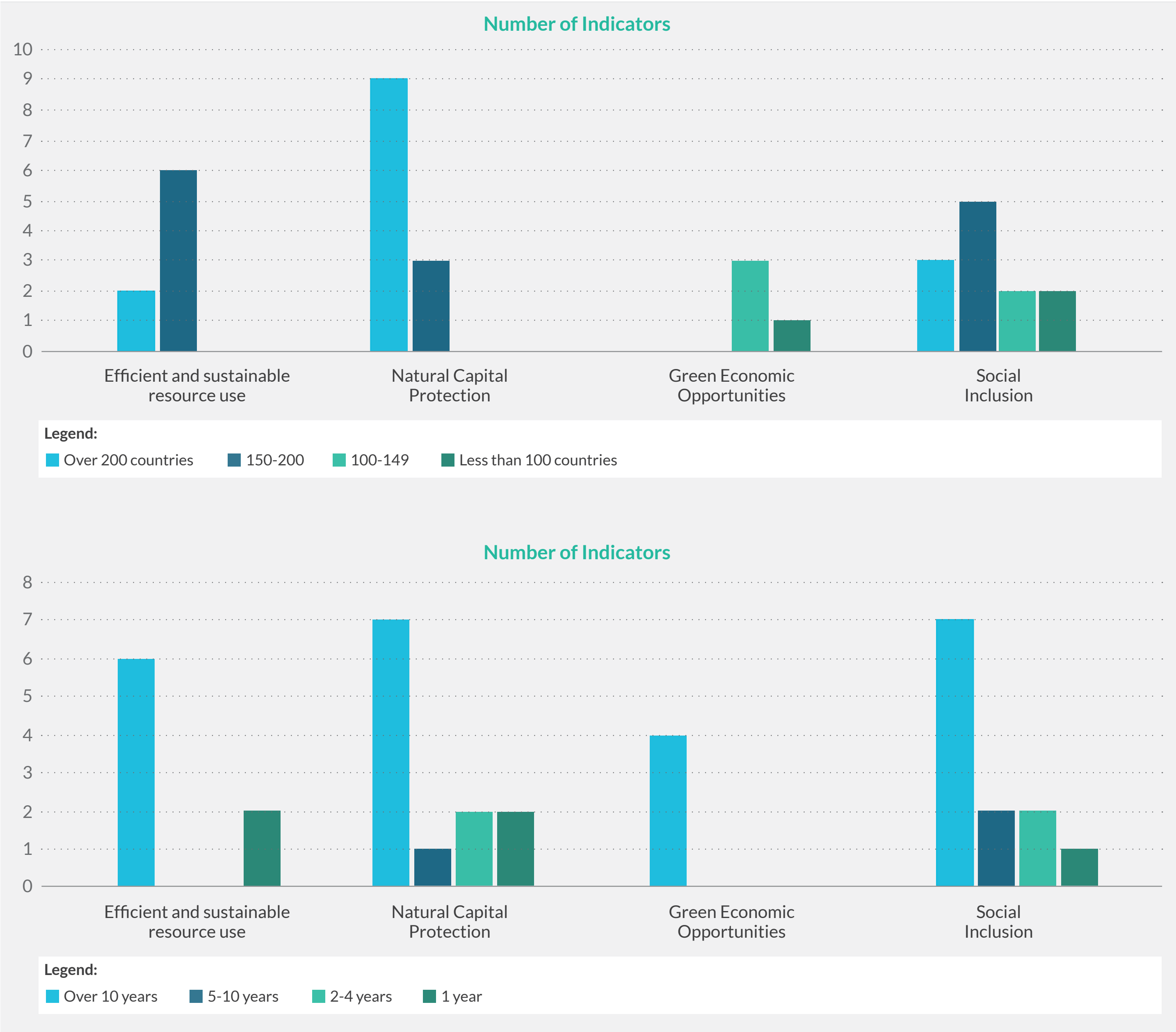
5.1 Indicator selection

The conceptual framework should provide guidance on the choice of indicators (chapter 4.2), but the metrics or data to be selected to measure these indicators can be subjective, particularly when the "desired data" are not available (OECD & JRC, 2008). The selection criteria should thus be consistent with the objectives and purpose of developing the index. Because the Green Growth Index aims to measure green growth performance across countries and regions this year and the succeeding ones, GGPM used the following criteria in selecting indicators:

- Relevance of the indicator to the green growth dimensions based on conceptual and empirical evidence;
- Coverage of more than 140 countries, which include a large number of GGGI member and partner countries;
- Availability of time series data to allow updates of the index on a regular interval; and
- Accessibility of the data to allow replication of methods and check the credibility of their sources to enhance data acceptability.

Literature review was conducted to provide evidence on the relevance of the indicators to the green growth dimensions and pillars (chapter 4.2; Acosta, 2019). Some of the indicators are, however, "proxy variables" because the desired indicators are either not available or there was a dearth of relevant data (see discussion in chapter 7.1 on indicators and proxy variables). Although the GGPM team aimed to have a wide data coverage in terms of the number of countries and years, some of the more relevant indicators did not meet these criteria. For example, there was data for less than 100 countries on one indicator for green economic opportunities, which is the share of patent publications in environmental technology to total patents, and two indicators for social inclusion, namely the share of youth (aged 15-24 years) not in education, employment, or training as well as the proportion of urban population living in slums (Figure 12). No alternative proxy variables are currently available for these indicators. Indicators for social inclusion, however, are expected to improve in the coming years because they are SDG indicators. Also, there was data for only one year for two indicators for efficient and sustainable resource use, specifically water use efficiency and average soil organic carbon content; for two indicators for natural capital protection, specifically the municipal solid waste (MSW) generation per capita and soil biodiversity, or the potential level of diversity living in soils; and for one indicator for social inclusion, specifically the proportion of population above statutory pensionable age receiving a pension. Most of these indicators are proxy variables and expected to be replaced by more desired data in the next few years. For example, FAO is currently finalizing its database for soil nutrients, which would be an alternative data source for soil organic content and soil biodiversity. Further improvements are also expected in data for water use efficiency and statutory pensions because they are SDG indicators.

Figure 12 Characteristics of the indicators based on country coverage and years of data availability



Data for all indicators included in the Green Growth Index are publicly available online. The data were mainly collected from international organizations; this offers important advantages for measuring performance across countries. For example, collecting data from national agencies for more than 100 countries will be cumbersome, whereas data from international organizations are collected from national agencies and have undergone consistency checks. The United Nations coordinates statistical activities "to guarantee integrated systems of collection, processing and dissemination of data" (Eurostat, n.d.). Nonetheless, during the regional consultation workshops, some regional experts expressed concerns over using data from international organizations (Acosta et al., 2019). To address these concerns, GGGI will encourage regional experts to undertake additional consistency check of the data once the data used in the development of the Green Growth Index become available online. Moreover, GGGI will help to communicate any concerns on the correctness and validity of the data to the international organizations that are responsible for producing and publishing the data.

5.2 Data scaling

"To have an objective comparison across small and large countries, scaling of variables by an appropriate size measure, e.g., population, income, trade volume, and populated land area, etc. is required" (OECD and JRC, 2008b: p.23). More than 70 percent of the 36 indicators are scaled data. They mainly use denominator data on gross domestic product (GDP) or gross national income (GNI), such as for primary energy supply, domestic material consumption, and adjusted net savings; area, such as for water use efficiency, PM2.5 air pollution, soil organic carbon content, organic agriculture, key biodiversity areas, terrestrial and marine biodiversity, and forest area; available resources or size of sector, such as for freshwater withdrawal, environmental export, green employment, and environment technology patent; and population, such as for material footprint, DALY rate as affected by unsafe water, municipal solid waste, GHG emissions, access to safe water and sanitation, access to electricity and clean fuels, and mobile and fixed broadband.

Three composite indices, which by default are scaled, were used as indicators, including the Red List Index, inequality in income based on the Atkinson Index, and the Healthcare Access and Quality Index. The Red List Index measures the variation in total extinction across species groups. The income inequality measure developed by Atkinson is based on the proportion of the total income that a given society would have to forego to allow equal income shares among the population (Afonso, LaFleur, & Alarcón, 2015). The Healthcare Access and Quality Index is based on the study of the Global Burden of Diseases (GBD), which used 32 causes from which death should not occur in the presence of effective care (Fullman et al., 2018). It is not uncommon to use indices in developing a composite index. Indices are particularly useful when one indicator is not sufficient to measure different issues that equally need attention or when one indicator only partially captures the problem or its solutions. Acosta (2019) provides detailed descriptions of the indicators to enhance comprehensibility of these indices.

5.3 Data imputation

A direct and most common approach to address missing data is to simply exclude or omit them (Gelman & Hill, 2007; He, 2010; Kang, 2013). The Green Growth Index partly adopts this approach. This is applied to indicators with time series data, where indicators are excluded when they have missing data for two consecutive years prior to the baseline year, which refers to the year that was used in computing the index. Examples of sustainability indices that do not apply data imputation include the Environmental Vulnerability Index of the South Pacific Applied Geoscience Commission, the UNEP Green Economy Progress Index, and ADB's Inclusive Green Growth Index. Kang (2013) emphasized the problems with missing data, including reduction in statistical power, bias in estimation of parameters, reduced representativeness of the samples, and increased complexity of analysis. While these are very relevant for complex modelling analysis, using simple and transparent aggregation methods to generate the Green Growth Index can reduce these problems (Chapter 5.8). Moreover, He (2010) explained that when data are missing completely at random (MCAR), analysis with missing data is unbiased. In most cases, there are no clear basis on whether data are missing at random, which is a prerequisite in most imputation methods (Nardo et al., 2005). Gelman & Hill (2007) also pointed out that excluding indicators with missing data will reduce the number of samples in the analysis.

Imputation methods, such as mean imputation, linear interpolation, regression analyses, maximum likelihood, multiple imputation, are widely used to fill in missing data (Horton & Kleinman, 2007; OECD & JRC, 2008; Kang, 2013; Wicklin, 2017). Examples of sustainability indices that apply data imputation include the Global Green Economy Index of DC, which uses the mean of the five closest countries; the African Green Growth Index of AfDB, which uses the mean of normalized indicators; the Ecological Footprint of the Global Footprint Network, which uses inter- or extrapolation; the Environmental Performance index of the Yale University and Columbia University, which imputes the closest data points and uses extrapolation; the Sustainable Society Index of the Sustainable Society Foundation, which uses expert judgment; and the Happy Planet Index of the New Economics Foundation, which imputes data from the closest years. He (2010) categorized the methods of mean imputation and of treating missing data as a separate category as ad hoc because imputation is based on implausible assumptions, noting that "these methods impute the missing data only once and then proceed to the completed data analysis" (He, 2010: p.3). Single imputation methods are known to underestimate variance and standard errors because they assume to know the unobserved value with certainty (He, 2010; OECD & JRC, 2008). As far as the computation of composite indices is concerned, there are serious statistical problems associated with these imputation methods, which can affect the reliability of the analysis. For example, mean imputed data will not only reduce the variance but also change the correlation between the indicators (Wicklin, 2017). Both are problematic because a good variance is important to capture differences in scores across countries and, as discussed in Chapter 5.5, correlation is important to identify redundant indicators. In short, there are trade-offs when using data imputation, and decisions often depend on subjective judgement. The motivations for using, and not using, imputation methods should thus be justified because "[n]o imputation model is free of assumptions" (OECD & JRC, 2008:p.25). In order to minimize the statistical implications of various imputation methods, the GGPM team adopted the simplest approach of the Happy Planet Index, which imputed data only from the closest years; for instance, missing data for 2017 was imputed by data from 2016. In very few cases, the mean of the closest years was used when there was a lack of time series data to observe the trend, and only two data points were available.

Table 1 provides information on data availability for the indicators and which indicators that were subjected to imputation. Out of the 36 indicators, 12 required imputations. However, four out of 10 indicators only needed imputation for one country. The indicators with the largest number of countries subjected to imputation include GJ1 Share of green employment in total manufacturing employment (GT1) and share of youth (aged 15-24 years) not in education, employment or training (SE3). Data for GJ1 were estimated by the United Nations Industrial Development Organization (UNIDO) based on the methods developed by Moll de Alba & Todorov (2018, 2019 in press). SE3 is an SDG indicator. Data for both indicators are expected to improve in the next years.

Table 1 Characteristics of the indicators in terms of data availability and required imputation

Indicator	Available Data	Baseline data	Number countries	Required imputation	Number of countries imputed	Type of imputation
Efficient and sustainable resource use						
EE1	1990–2015	2015	191	Yes	3	Data from 2014
EE2	1990–2015	2015	212	No	-	-
EW1	2015	2015	165	No	-	-
EW2	1998–2007, 2014	2014	184	No	-	-
SL1	2019	2019	243	No	-	-
SL2	2004–2016	2016	162	Yes	1	Data from 2015
ME1	1970–2015	2015	186	No	-	-
ME2	1990–2015	2015	174	No	-	-
Natural Capital Protection						
EQ1	1990–2016	2016	194	No	-	-
EQ2	2000–2017	2017	195	No	-	-
EQ3	2018	2018	216	No	-	-
GE1	1960–2014	2014	201	Yes	1	Data from 2013
GE2	1990–2010	2010	203	No	-	-
GE3	1961–2016	2016	226	No	-	-
BE1	2000–2018	2018	225	No	-	-
BE2	1990–2016	2016	208	Yes	1	Data from 2015
BE3	2016	2016	218	No	-	-
CV1	1993–2016	2016	223	No	-	-
CV2	2014–2017	2017	184	No	-	-
CV3	2016, 2017	2017	210	No	1	Data from 2016
Green Economic Opportunities						
GV1	1990–2017	2016	126	Yes	7	Closest data from 2012 to 2015
GT1	2000–2017	2016	148	Yes	15	Data from 2014 or 2015**
GJ1	2000–2015	2015	119	No	-	-
GN1	1980–2017	2016	93	Yes	10	Data from 2015**
Social Inclusion						
AB1	2000–2015	2015	117	No	-	-
AB2	2000–2017	2015	214	No	-	-
AB3	2000–2017	2017	203	No	-	-
GB1	1990, 1997–2017	2018	193	No	-	-
GB2	2011, 2014, 2017	2017	144	Yes	7	Data from 2014
GB3	2009–2018	2018	187	No	-	-
SE1	2010–2017	2017	156	Yes	5	Data from 2016
SE2	2000–2016	2016	203	No	-	-
SE3	1990–2018	2016	88	Yes	23	Data from 2015 or 2017
SP1	2015	2015	175	No	-	-
SP2	1990–2015	2015	194	No	-	-
SP3	2000, 2005, 2010, 2014, 2016	2016	118	Yes	8	Data from 2014

*Refers to Figure 1 for the definition of the indicator codes
**Few datapoints were imputed using mean of data from 2015 and 2017

5.4 Distribution and outliers

An outlier is an observed value that has an "abnormal distance," whether extremely large or small value, from other values of a dataset (NIST-SEMATECH, 2013). Outliers can "distort mean, standard deviation and the covariance structure of the indicator" and alter correlation between indicators (Mishra, 2008). They also affect the normalized values of the indicators and thus need to be identified and accounted for (Nardo et al., 2005; OECD & JRC, 2008). Boxplots of the indicators were computed to show the distribution of numerical data and identify extreme values or outliers in the indicators. Figure 13 illustrates the boxplot for the ratio of the total primary energy supply to GDP, showing the presence of extreme outliers. It also shows the interpretation of the boxplots of the indicators.

Figure 13 Illustration and interpretation of the boxplots for the ratio of the total primary energy supply to GDP

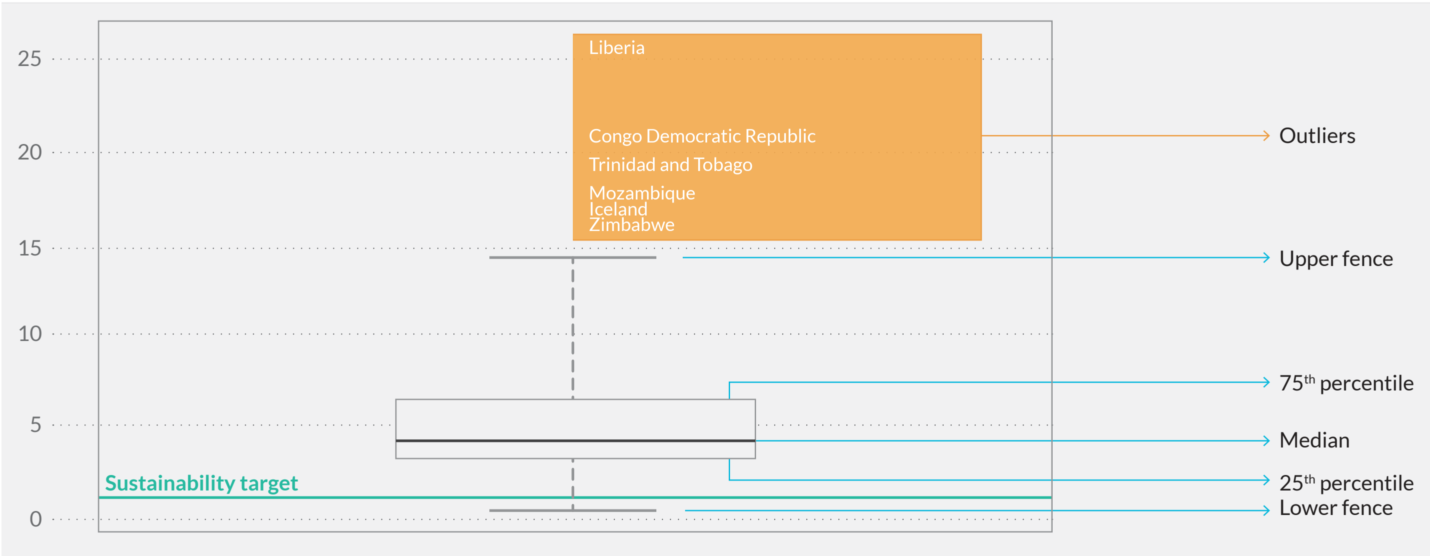


Table 2 summarizes the information from the boxplots, which were used to identify the outliers and the indicators that needed capping, where:

IQR = 75th percentile - 25th percentile
Lower fence = 25th percentile - μ x IQR
Upper fence = 75th percentile + μ x IQR

With μ = 3.0 the multiplier.

Although 2.2 is the recommended multiplier (Hoaglin & Iglewicz, 1987; Iglewicz & Banerjee, 2001), the GGPM team used a relatively higher multiplier to avoid generating too many extreme outliers and capping the data of many countries. Moreover, 3.0 is mostly applied in many standard statistical software to compute for extreme outliers. In some cases, the normalization approach that was used to compute the Green Growth Index allowed capping of the outliers through benchmarking. As explained in detail in Chapter 5.6.2, this will depend on the relationship of the indicator to green growth, whether negative or positive, and value of the indicators relative to the sustainability targets, whether above or below. When extreme outliers cannot be capped through benchmarking, they were capped prior to normalization. This is the case for the following indicators. Table 2 presents the number of capped values.

- **EE1:** Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)
- **EW2:** Share of freshwater withdrawal to available freshwater resources (Percent)
- **ME2:** Total material footprint (MF) per capita (MF tons per capita)
- **EQ1:** PM2.5 air pollution, mean annual population weighted exposure (Micrograms per m^3)
- **EQ2:** DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)
- **EQ3:** Municipal solid waste (MSW) generation per capita (Tons per year per capita)
- **GE1:** Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita)
- **GE2:** Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita)
- **GE3:** Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1,000 persons)
- **GV1:** Adjusted net savings minus natural resources and pollution damages (Percent of GNI)
- **SE2:** Ratio of urban-rural access to basic services, such as water, sanitation, and electricity (Percent)

Capping outliers implies replacing extreme values with other values that more or less correspond to the structure of the rest of the dataset or the normal distribution. For the Green Growth Index, the GGPM team used the values of the lower and upper fences depending on whether the extreme outliers are beyond lower or upper fences as shown in Appendix 2. Except for the adjusted net savings minus natural resources and pollution damages (GV1), all other indicators with extreme outliers took the upper fence as their capped values.

Table 2 Summary of information for identifying and capping outliers

Indicator codes	25th Percentile	75th Percentile	IQR	Lower Fence	Upper Fence	Sustainability Targets*	Number Outliers**
Efficient and Sustainable Resource Use							
EE1	3.49	6.36	2.88	-5.15	15.00	1.09	6
EE2	5.08	46.91	41.83	-120.40	172.39	51.40	0
EW1	4.00	32.30	28.30	-80.90	117.20	265.76	0
EW2***	1.96	30.10	28.14	-82.46	114.52	25.00	11
SL1	37.75	108.26	70.51	-173.79	319.79	289.34	0
SL2	0.14	3.20	3.06	-9.04	12.38	11.90	0
ME1	1.02	5.08	4.06	-11.15	17.25	0.17	0
ME2	3.55	20.89	17.34	-48.47	72.91	5.00	3
Natural Capital Protection							
EQ1	15.28	46.25	30.97	-77.62	139.14	10.00	4
EQ2	33.52	1085.98	1052.47	-3123.88	4243.38	0.00	7
EQ3	0.17	0.48	0.32	-0.78	1.43	0.00	1
GE1	0.81	6.19	5.38	-15.32	22.32	0.05	6
GE2	0.14	0.56	0.42	-1.13	1.82	0.00	17
GE3	0.22	0.93	0.71	-1.91	3.06	0.00	9
BE1	25.19	65.78	40.59	-96.58	187.55	100.00	0
BE2	10.93	48.06	37.13	-100.46	159.45	17.00	0
BE3	0.48	0.93	0.45	-0.86	2.27	1.16	0
CV1	0.78	0.94	0.16	0.30	1.42	1.00	0
CV2	25.00	80.00	55.00	-140.00	245.00	100.00	0
CV3	1.81	18.45	16.64	-48.11	68.37	13.50	0

Table 2 Summary of information for identifying and capping outliers *(continued)*

Indicator codes	25th Percentile	75th Percentile	IQR	Lower Fence	Upper Fence	Sustainability Targets*	Number Outliers**
Green Economic Opportunities							
GV1	1.02	14.73	13.71	-40.11	55.86	32.44	2
GT1	0.48	3.80	3.32	-9.48	13.76	13.52	0
GJ1	0.01	0.08	0.07	-0.20	0.29	0.14	0
GN1	0	0.02	0.02	-0.06	0.08	0.08	0
Social Inclusion							
AB1	51.93	92.88	40.95	-70.91	215.71	100.00	0
AB2	50.76	100.00	49.25	-96.98	247.74	100.00	0
AB3	43.82	78.44	34.62	-60.03	182.28	100.00	0
GB1	12.60	29.50	16.90	-38.10	80.20	50.00	0
GB2	1.03	1.26	0.23	0.36	1.93	1.00	0
GB3	50.00	100.00	50.00	-100.00	250.00	100.00	0
SE1	17.25	28.23	10.98	-15.68	61.15	7.96	0
SE2	1.00	1.36	0.36	-0.08	2.44	1.00	31
SE3	10.88	27.38	16.50	-38.62	76.88	0.00	0
SP1	16.87	98.55	81.68	-228.17	343.59	100.00	0
SP2	49.70	76.60	26.90	-31.00	157.30	100.00	0
SP3	12.33	53.08	40.75	-109.93	175.33	0.00	0

*Refers to Table 4 for details of the sustainability targets.
**Refers to outliers that were capped prior to normalization.
*** The share of freshwater withdrawal to available freshwater resources has a lower bound (25 percent) and an upper bound (75 percent). The extreme outliers refer to the upper bound, so the capped outliers assumed the values of the upper fence.

5.5 Correlation of indicators

Bivariate correlation was used to analyze the strength of the association between the indicators in each dimension. Pearson correlation was the appropriate technique to use for the Green Growth Index because its indicators are continuous, and only a few of them have extreme outliers (chapter 5.4). Chok's (2008) study reveals that the correlation coefficient generated from this technique could improve statistical power even for distributions with moderate skewness. Its coefficient can take values from -1 to +1, where -1 shows perfectly linear but with negative relationship, +1 shows perfectly linear and with positive relationship, and 0 shows no linear relationship between the indicators (Bolboaca & Jäntschi, 2006). In the case of the Green Growth Index, the absolute values of the coefficients are more important than their signs. The aim of the correlation analysis is twofold: the first is to identify redundant indicators with very strong correlation, inducing double counting on the weights or the coefficient values; and the second is to verify whether indicators have acceptable levels of association in their respective dimensions or the p-value.

There are no clear rules on how to rate the values of the coefficients. According to Schober, Boer, & Schwarte (2018), many studies agree that "a coefficient of less than 0.1 indicates a negligible and more than 0.9 a very strong relationship, values in between are disputable" (Schober, Boer, & Schwarte, 2018: p.1765). In order to validate our indicators, it is necessary to have an acceptable significant correlation between 0.1 and 0.9. However, some experts consider these values very low and very high, respectively. The GGPM team thus interpreted the coefficient values according to a different range: 1 to 0.9 as very high; 0.89 to 0.7 and 0.1 to 0.29 as acceptable; 0.69 to 0.3 as ideal; and less than 0.1 as very low. The significance level of the correlation coefficient is represented by the p-value. When the p-value is below 0.01, then confidence in the correlation is 99 percent, or a 1 percent level of significance. When the p-value is between 0.01 and 0.05, then confidence is 95 percent, or a 5 percent level of significance, and when it is between 0.05 and 0.10, then confidence is 90 percent, or a 10 percent level of significance. Here the GGPM team investigated the absolute values of the correlation coefficients, only considering those with levels of significance that are equal or greater than 10 percent. Table 3 summarizes the results of the correlation analysis for each dimension, presenting those coefficients whose levels of significance are 10 percent or higher. Appendix 3 presents detailed results of the correlation analysis.

Table 3 Summary of the results of the correlation analysis between indicators in each dimension, in percent

Interpretation of the coefficient values	Efficient & sustainable resource use	Natural capital protection	Green economic opportunities	Social inclusion
1 – 0.9 (very high)	0	0	0	0
0.89 – 0.7 (acceptable)	0	0	0	10
0.69 – 0.3 (ideal)	29	41	0	43
0.1 – 0.29 (acceptable)	71	59	100	48
Less than 0.1 (very low)	0	0	0	0

Note: The numbers refer to the percentage of correlation coefficients with significance levels of 10 percent, 5 percent, and 1 percent (2-tailed). These values were drawn from the results presented in Appendix 3.

The correlation coefficients with significance levels of 10 percent or higher fall in the interval between 0.9 and 0.1 for all dimensions (Table 3), which means that no indicator has a very high level of correlation with another indicator. Many coefficients fall at an ideal level, between 0.3 and 0.7. However, a larger number of the coefficients are at an acceptable low level, between 0.1 and 0.3, particularly for indicators for green economic opportunities and efficient and sustainable resource use. About 10 percent of the correlation coefficients for social inclusion indicators are between 0.7 and 0.9, which is at an acceptable high level. The results of the correlation analysis reveal that there are no redundant indicators in our dataset, although many indicators have low, yet acceptable, levels of correlation. The only indicator with no statistically significant correlation with other indicators is the share of patent grants in environmental technology to total patent grants (GN1), one of the four indicators under the green economic opportunities dimension. This can be attributed to the small number of data points for this indicator, having the lowest number even after imputation (Table 1). Overall, the correlation analysis confirms the validity and soundness of the model.

It is worth mentioning, however, that the indicators in the final framework are a result of an iterative process of statistical validation of the indicators. Other indicators were also considered in the framework but excluded and replaced with other indicators due to a very high correlation. These indicators include lower secondary completion rate, total (percentage of relevant age group); mean years of schooling (number of years); student-teacher ratio, primary school; gender inequality index; poverty headcount ratio at $1.90 per day; universal health coverage (UHC) service coverage index; wage and salaried workers, total (percentage of total employment); and share of GHG emissions and removals to population for AFOLU (Gigagrams per 1,000 persons).

5.6 Normalization of indicators

Normalization is a key method when developing a composite index, particularly when the index builds on multidimensional concepts and covers a large number of indicators. It helps to transform indicators with different units into uniform scales and unitless numbers that allow meaningful comparisons (Nardo et al., 2005; Pollesch & Dale, 2016); align indicators with positive and negative relationships to the phenomenon, which, in the case of this report, is green growth (Mazziotta & Pareto, 2013); and reduce uneven influence of indicators with extreme values on the index (Talukder, Hipel, & VanLoon, 2017). The most common methods for normalization include ranking; distance to target, or the best performer; standardization, or z-scores; re-scaling, or min-max transformation; and proportionate normalization (Nardo et al., 2005; Saisana & Saltelli, 2011; Mazziotta & Pareto, 2013; Talukder et al., 2017). There are no general rules for selecting appropriate normalization methods, so they are commonly based on subjective or expert judgement (Böhringer & Jochem, 2006; Hsu, Johnson, & Lloyd, 2013). But the choice of methods should consider properties of the indicators and objectives for constructing the composite index (Nardo et al., 2005; OECD, 2018).

Rescaling method, also known as min-max transformation, was chosen to normalize the indicators in the Green Growth Index for the following reasons:

- It is simple and the most widely used method, which will allow replication of the Green Growth Index by governments at the national and subnational levels.
- It can integrate upper and lower bounds in the method, which will reduce the problems of extreme values and partially correct for outliers.
- It allows application of targets in the method, which will represent benchmarking of sustainability targets.

5.6.1 Rescaling (min-max)

Generally, the method rescales a given indicator xi into different intervals with an identical range between 0 and 1 based on a minimum (X_{min}) and a maximum (X_{max}) *(Equation 1).*

Equation 1

$$X^i_{norm} = \frac{x_i - X_{min}}{X_{max} - X_{min}}$$

where: X_i^{norm} = normalised *i*th indicator
$X = (x_1, x_2 ..., x_n)$
$n = 1, 2 ...,$ n number of countries

Many sustainability, environmental, and governance indices are using the rescaling method to normalize indicators. They include the Human Development Index of the United Nations Development Programme (UNDP), the Inclusive Green Growth Index of ADB, the Sustainable Society Index of the Sustainable Society Foundation (SSF), the Worldwide Governance Index of the World Bank (WB), the E-Government Development Index of the UN Public Administration Network, and the Democracy Index of the Economist Intelligence Unit (EIU). The range of the indices, however, is often not [0,1] because the rescaling method offers the advantage of setting boundaries (Talukder et al., 2017).

5.6.2 Benchmarking (lower/upper bounds)

Equation 2 presents a more general mathematical function of the rescaling method in Equation 1 to include information on lower bound ***a*** and upper bound ***b***. The values of these boundaries are assigned arbitrarily and often depend on the objectives of the index. For example, ADB's Inclusive Green Growth Index has a range of 1 to 6 with the objective of aligning the scores with those of the World Bank's Worldwide Governance Index (Jha et al., 2018). The Green Growth Index used the range [1,100]. The lower bound of 1 is used instead of 0 because during the regional workshops (Chapter 3), some experts suggested avoiding using 0 in the index because it provides a negative notion and discourages performance improvement. Although the rescaling method generates unitless numbers with the objective of facilitating comparison across not only indicators but also years and countries, scores of zero could be misinterpreted to mean the lack of capacity to perform in a given indicator on green growth. The upper bound of 100 is used to imply achievement of the sustainability target for a given indicator (Chapter 5.6.3).

Equation 2

$$X^i_{norm} = a + \left(\frac{x_i - X_{min}}{X_{max} - X_{min}}\right)(b - a)$$

where: a = lower bound
b = upper bound

By integrating the targets into the rescaling method, the distance to sustainability targets can be directly measured from the scores of the indicators, or benchmarking (chapter 5.8). This approach is also referred to as the benchmarking normalization function, which "depends on indicator values each being mapped to some value based on a qualitative valuation of their level of sustainability" (Pollesch & Dale, 2016: p.198). OECD's Measuring Distance to the SDG Targets (OECD, 2019b, 2019a) and SDSN's SDG Index (Lafortune, Fuller, Moreno, Schmidt-traub, & Kroll, 2018; Sachs et al., 2019) applied this approach to measure country performance relative to the SDG targets. Pollesch & Dale (2016) compared how this approach was used in various studies to assess sustainability (e.g. Krajnc and Glavic, 2005; Castoldi and Bechini, 2010; Hayashi et al., 2014; Maxim, 2014; Pinar et al., 2014). In these studies, the boundaries were referred to as sustainability "thresholds," which were defined as either internal or external. Internal thresholds can refer to values that are specific to the system and the environmental or socio-economic sensitivities of the system being studied (Pollesch & Dale, 2016). The study of Pinar, et al. (2014) provided an example for using external thresholds, which were derived from outside sources, such as literature and international legislations.

The GGPM team used both internal and external thresholds, which, in the context of green growth, refer to the sustainability targets. In line with the study of Pinar et al. (2014), the external thresholds in the Green Growth Index are targets derived from literature. Specifically, these are targets that are explicitly agreed for the SDGs; implicit SDG targets based on the interpretations of OECD (2017b, 2019b, 2019a) and/or SDSN (Sachs, Schmidt-Traub, Kroll, Lafortune, & Fuller, 2018; Sachs et al., 2019); or targets identified by experts for other international agreements, such as the air quality guidelines (WHO, 2005), Aichi targets (Leadley et al., 2014), and material resources (Bringezu, 2015). Meanwhile, the internal thresholds are targets derived from the mean values of the top county performers for specific indicators (Chapter 5.6.3).

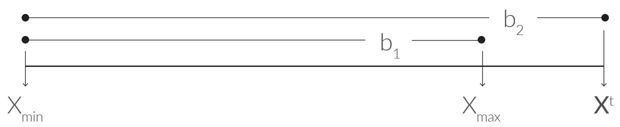
The methods for integrating the boundaries or thresholds in the normalization function varied among different studies, mostly depending on the characteristics of the indicators used to measure these boundaries. In the case of the Green Growth Index, five different cases were identified for computing the upper bound b and integrating in the rescaling normalization method. Each case is elaborated below.

Case 1 was applied to indicators with a positive relationship to green growth and maximum values (X_{max}) that were less than the sustainability target (**X**^{t}). In this case, the upper bound ***b*** was based on the ratio between the difference of the maximum from the minimum value and the difference of the sustainability target from the minimum value (*Equation 3*). The reference point for both the maximum value and the sustainability target should be the minimum value of the indicator, which, in many cases, was not equivalent to zero. Case 1 assumed that none of the countries has reached the sustainability target of 100.

Case 1 assumptions

Equation 3

(i) positive relationship between the indicator and green growth
(ii) $X_{max} < \mathbf{X}^t$



$$X^i_{norm} = a + \left(\frac{x_i - X_{min}}{X_{max} - X_{min}}\right)(b - a)$$

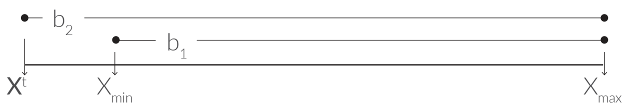
where: $a = 1,\ b = \left(\frac{b_1}{b_2}\right) 100$
$b_1 = X_{max} - X_{min},\ b_2 = \mathbf{X}^t - X_{min}$

Case 2 was applied to indicators with a negative relationship to green growth and minimum values (X_{min}) that were greater than the sustainability target (**X**^{t}). Since the indicators have a negative relationship to green growth, the normalization function in Equation 4 was inverted. In this case, upper bound ***b*** was based on the ratio between the difference of the minimum from the maximum value and the difference of the sustainability target from the maximum value. The reference point for both the maximum value and the sustainability target should be the maximum value of the indicator. Similar to Case 1, Case 2 assumed that none of the countries has reached the sustainability target of 100.

Case 2 assumptions

Equation 4

(i) negative relationship between the indicator and green growth
(ii) $X^t < X_{min}$



$$X^i_{norm} = a + \left(\frac{x_i - X_{max}}{X_{min} - X_{max}}\right)(b - a)$$

where: $a = 1,\ b = \left(\frac{b_1}{b_2}\right) 100$

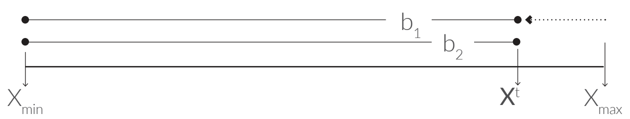
$$b_1 = X_{min} - X_{max},\ b_2 = X^t - X_{max}$$

Case 3 was applied to indicators with a positive relationship to green growth and some maximum values (X_{max}) that were greater than or equal to the sustainability target (**X**^{t}). The rescaling normalization function was modified, using the sustainability target as reference rather than the maximum value. For countries with values (x_i) that were greater than the sustainability target, their values for the indicator were modified by taking the value of the sustainability target. This assumed that they already met the target. This rescaling normalization method hence allowed the capping of any extreme values or outliers using the target value. Since upper bound ***b*** was based on the ratio between the difference of the maximum, which was capped using sustainability target, from the minimum value and the difference of sustainability target from the minimum value (*Equation 5*), b = 100. Case 3 assumed that some countries have reached the sustainability target of 100.

Case 3 assumptions

Equation 5

(i) positive relationship between the indicator and green growth
(ii) $X_{max} \geq X^t$



If $x_i > X^t$ then $x_i = X^t$

$$X^i_{norm} = a + \left(\frac{x_i - X_{min}}{X^t - X_{min}}\right)(b - a)$$

where: $a = 1,\ b = \left(\frac{b_1}{b_2}\right) 100$

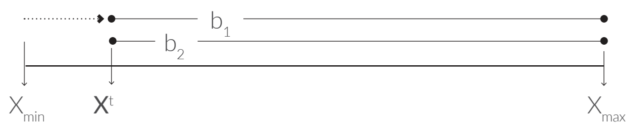
$$b_1 = X_{max} - X_{min},\ b_2 = X^t - X_{min}$$

Case 4 was applied to indicators with a negative relationship to green growth and some minimum values (X_{min}) that were less than or equal to the sustainability target (**X**^{t}). Because the indicators have a negative relationship to green growth, the normalization function in Equation 6 was inverted. Moreover, the function was modified, using the sustainability target as reference rather than the minimum value. For countries with values (x_i) that were less than the sustainability target, their values for the indicator were modified by taking the value of the sustainability target. Similar to Case 3, the countries were assumed to have already met the target and any extreme values or outliers were capped using the target value. Since upper bound ***b*** was based on the ratio between the difference of minimum, which was capped using sustainability target, from the maximum value, and the difference of the sustainability target from the maximum value (*Equation 6*), b = 100. Case 4 assumed that some countries have reached the sustainability target of 100.

Case 4 assumptions

Equation 6

(i) negative relationship between the indicator and green growth
(ii) $X^t \geq X_{min}$



If $x_i > X^t$ then $x_i = X^t$

$$X^i_{norm} = a + \left(\frac{x_i - X_{max}}{X^t - X_{max}}\right)(b - a)$$

where: $a = 1,\ b = \left(\frac{b_1}{b_2}\right) 100$

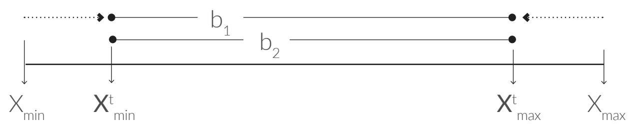
$$b_1 = X_{min} - X_{max},\ b_2 = X^t - X_{max}$$

Case 5 is a special case where there are both lower and upper bounds, which correspond to two sustainability targets: one at the minimum level and the other at the maximum level. This case was only applied to the share of freshwater withdrawal to total available freshwater, which has values lower than the minimum sustainability target and higher than the maximum sustainability target. For countries that met these conditions, their values for the indicator were modified by taking the values of the sustainability targets. Any extreme values or outliers were capped using these target values. Since upper bound b was based on the ratio of the same values, b = 100. This indicator has a negative relationship to green growth, so the normalization function in Equation 7 was inverted. Case 5 assumed that some countries have reached the sustainability target of 100.

Case 5 assumptions

Equation 7

(i) both lower and upper bounds for the indicator
(ii) negative relationship between the indicator and green growth
(iii) $X_{min} < X^t_{min}$ and $X^t_{max} < X_{max}$



If $x_i > X^t_{max}$ then $x_i = X^t_{max}$
If $x_i < X^t_{min}$ then $x_i = X^t_{min}$

$$X^i_{norm} = a + \left(\frac{x_i - X^t_{max}}{X^t_{min} - X^t_{max}}\right)(b - a)$$

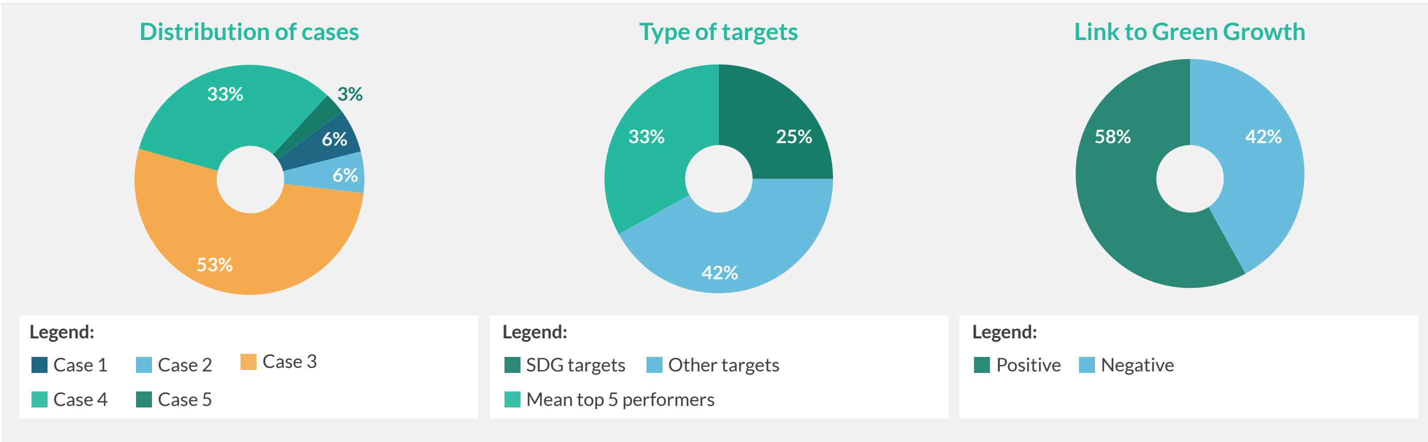
where: $a = 1,\ b = \left(\frac{b_1}{b_2}\right) 100$

$$b_1 = X_{min} - X^t_{max},\ b_2 = X^t_{min} - X^t_{max}$$

5.6.3 Sustainability Targets

Figure 14 and Table 4 present the characteristics of the sustainability targets that were used to compute upper bound ***b*** in Chapter 5.6.2. Case 3 applied for more than half of the targets, and Case 4 applied to about a quarter of them. The former indicates that the indicators have a positive relationship to green growth and maximum values that were greater than the targets, while the latter suggests that indicators have a negative relationship to green growth and minimum values that were less than the targets. The number of indicators with a positive relationship to green growth is slightly higher than those with a negative relationship. The targets were grouped into three types: SDG targets; other targets, whose sources are not from the SDG indicators; and the mean of the top five performers. Where targets are not available from the SDG indicators and other reliable literature, they were computed based the average values of the top five performing countries (bottom 5 performing countries for negative relationship to green growth). This approach was adopted from SDSN's Sustainable Development Report, which presents the SDG Index and Dashboards (Lafortune et al., 2018; Sachs et al., 2018, 2019). The targets in the Green Growth Index were aligned as much as possible with the SDG targets. Reference were thus made to those studies that identified targets for the SDGs, mainly OECD (2019a, 2019b) and SDSN (Sachs et al., 2018, 2019). For the SDG targets, the reference year was 2030, except for the share of marine biodiversity, which is 2020. Many countries have already achieved the 2030 targets for the SDG indicators (Table 4).

Figure 14 Characteristics of the sustainability targets used to benchmark the normalization functions



To sum up, the criteria for selecting the sustainability targets are based on the following:

1. For SDG indicators, SDG targets, both explicit and implicit, which were suggested in the OECD and SDSN reports were used. If the interpretation of implicit targets is different, the SDSN values, which are applied on a global context, were adopted.
2. For non-SDG indicators, targets suggested in scientific literature and reports from international organizations were used.
3. For SDG indicators not included in the OECD and SDSN reports, the mean of the top five performers was used.
4. For non-SDG indicators with no available information from the literature and reports, the mean of the top five performers was used.

Table 4 Details on the sustainability targets used to benchmark the normalization functions

Indicators	Link to green growth	Case	Min Max	Unstat sdg indicator	Targets	Countries reaching targets	Type of target	Source of data	Source of targets
Resource efficiency									
EE1: Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)	negative	4	0.41 25.99	Yes	1.092 MJ per GDP	3	Mean top 5 performers	SE4ALL[i]	Method based on Sachs et al. (2019)
EE2: Share of renewables to total final energy consumption (Percent)	positive	3	0.00 95.82	Yes	51.4 percent	50	Other targets	SE4ALL	Sachs et al. (2019)[ii]
EW1: Water use efficiency (USD per m³)	positive	3	0.10 1157.90	Yes	265.7579346 USD per m3	5	Other targets	FAO	OECD (2019)
EW2: Share of freshwater withdrawal to available freshwater resources (Percent)	negative	5	0.00 2603.49	Yes	25 and 75 percent	130	Other targets	FAO	FAO 2017[iii]
SL1: Average soil organic carbon content (Ton per hectare)	positive	3	10.86 384.59	No	289.338 ton per hectare	2	Mean top 5 performers	FAO	Method based on Sachs et al. (2019)
SL2: Share of organic agriculture to total agricultural land area (Percent)	positive	3	0.00 81.14	No	11.90 percent	11	Other targets	FAO	OECD 2017b[iv]
ME1: Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)	negative	4	0.02 15.76	Yes	0.169685364 kg per USD	5	Other targets	IRP	OECD (2019)
ME2: Total material footprint (MF) per capita (MF tons per capita)	negative	4	0.40 116.73	Yes	5.0 MF tons per capita	60	Mean top 5 performers	IRP[v]	Stefan Bringezu (2015)
Natural capital protection									
EQ1: PM2.5 air pollution. mean annual population-weighted exposure (Micrograms per m³)	negative	4	3.76 203.74	Yes	10 micrograms per m³	23	Other targets	Brauer et al. 2016	WHO 2005; OECD (2019)
EQ2: DALY rate due to unsafe water sources (DALY lost per 100,000 persons)	negative	2	0.81 10961.17	Yes	0 in every 100,000 population	0	SDG Target (explicit)	IHME[vi]	OECD (2019)

Table 4 Details on the sustainability targets used to benchmark the normalization functions *(continued)*

Indicators	Link to green growth	Case	Min Max	Unstat sdg indicator	Targets	Countries reaching targets	Type of target	Source of data	Source of targets
Natural capital protection									
EQ3: Municipal solid waste (MSW) generation per capita (Tons per year per capita)	negative	4	0.00 1.59	No	0.001752675 ton per year per capita	1	Other targets	WB	Sachs et al. (2019)
GE1: Ratio CO_2 emissions to population, excluding AFOLU (Metric tons per capita)	negative	4	0.04 45.42	No	0.054 Metric tons per capita	3	Mean top 5 performers	CDIAC[vii]	Method based on Sachs et al. (2019)
GE2: Ratio non-CO_2 emissions to population, excluding AFOLU (Ton per capita)	negative	4	0.00 22.42	No	0 ton per capita	8	Mean top 5 performers	FAOSTAT	Method based on Sachs et al. (2019)
GE3: Ratio non-CO_2 emissions in Agriculture to population (Gigagrams per 1000 persons)	negative	4	0.00 8.45	No	0 gigagrams per 1000 persons	13	Mean top 5 performers	FAOSTAT	Method based on Sachs et al. (2019)
BE1: Average proportion of Key Biodiversity Areas covered by protected areas (Percent)	positive	3	0.00 100.00	Yes	100 percent	1	SDG target (implicit)	IUCN, UNEP-WCMC	Sachs et al. (2019)[viii]
BE2: Share of forest area to total land area (Percent)	positive	3	0.00 98.26	Yes	17 percent	137	Other targets	FAOSTAT	OECD (2019)
BE3: Soil biodiversity. potential level of diversity living in soils (Index)	positive	3	0.22 1.22	No	1.156 index	2	Mean top 5 performers	JRC-ESDAC[ix]	Method based on Sachs et al. (2019)
CV1: Red list index (Index)	positive	1	0.41 0.99	Yes	1 index	0	Other targets	BirdLife International and IUCN	OECD (2019); Sachs et al. (2019)
CV2: Tourism and recreation in coastal and marine areas (Score)	positive	3	0.00 100.00	No	100 score	20	Other targets	Ocean Health Index	Sachs et al. (2019)[x]
CV3: Share of terrestrial and marine protected areas to total territorial areas (Percent)	positive	3	0.00 99.46	Yes	13.5 percent for both terrestrial and marine	77	SDG Target (explicit) for marine; Other targets for terrestrial	UNEP-WCMC	(Leadly et. al., 2014) [xiii]

Table 4 Details on the sustainability targets used to benchmark the normalization functions *(continued)*

Indicators	Link to green growth	Case	Min Max	Unstat sdg indicator	Targets	Countries reaching targets	Type of target	Source of data	Source of targets
Green economic opportunites									
GV1: Adjusted net savings. minus natural resources and pollution damages (Percent GNI)	positive	3	-84.71 37.48	No	32.438 percent GNI	3	Mean top 5 performers	WB	Method based on Sachs et al. (2019)
GT1: Share of export of environmental goods (OECD and APEC class.) to total export (Percent)	positive	3	0.00 49.78	No	13.52 Percent	4	Mean top 5 performers	UN-COMTRADE	Method based on Sachs et al. (2019)
GJ1: Share of green employment in total manufacturing employment (Percent)	positive	3	0.00 0.14	No	0.136 percent	3	Mean top 5 performers	Moll de Alba and Todorov (2018, 2019 in press)	Method based on Sachs et al. (2019)
GN1: Share of patent publications in environmental technology to total patents (Percent)	positive	3	0.00 0.20	No	0.076 percent	3	Mean top 5 performers	WIPO [xiii]	Method based on Sachs et al. (2019)
Social inclusion									
AB1: Population with access to safely managed water and sanitation (Percent)	positive	3	6.44 100.00	Yes	100 percent for both water and sanitation	5	SDG Target (explicit)	WHO/ UNICEF[xiv]	OECD (2019); Sachs et al. (2019)
AB2: Population with access to electricity and clean fuels/technology (Percent)	positive	3	4.04 100.00	Yes	100 percent for both	57	SDG Target (explicit)	SE4ALL	Sachs et al. (2019)
AB3: Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)	positive	3	6.87 179.34	Yes	100 subscriptions per 100 people	5	SDG Target (explicit for mobile, implicit for internet)	ITU[xvi]	Sachs et al. (2019)
GB1: Proportion of seats held by women in national parliaments (Percent)	positive	3	0.00 61.30	Yes	50 percent for parliament	3	SDG Target (explicit)	IPU [xviii]	OECD (2019); Sachs et al. (2019)
GB2: Share of female to male with account in financial institution, age 15+ (Percent)	negative	4	1.00 1.85	Yes [xix]	1 equality ratio	14	Other targets	WB	Normative

Table 4 Details on the sustainability targets used to benchmark the normalization functions *(continued)*

Indicators	Link to green growth	Case	Min Max	Unstat sdg indicator	Targets	Countries reaching targets	Type of target	Source of data	Source of targets
Social inclusion									
GB3: Getting paid, covering laws and regulations for equal gender pay (Score)	positive	3	0.00 100.00	No	100 percent	53	Other targets	WB	Normative
SE1: Inequality in income based on Atkinson (Index)	negative	4	5.80 56.40	No	7.96 Index	2	Mean top 5 performers	UNDP	Method based on Sachs et al. (2019)
SE2: Ratio urban-rural access to basic services (water, sanitation and electricity) (Percent)	negative	4	1.00 94.83	Yes	1 equality ratio	119	Other targets	WHO/ UNICEF, SE4ALL	Normative
SE3: Share of youth (aged 15-24 years) not in education, employment or training (Percent)	negative	2	1.29 46.89	Yes	0 percent	0	SDG Target (explicit)	ILO	OECD (2019)[xxi]
SP1: Proportion of population above statutory pensionable age receiving a pension (Percent)	positive	3	0.00 100.00	Yes	100 percent	41	SDG Target (explicit)	ILO	OECD (2019)
SP2: Healthcare access and quality index (Index)	positive	1	32.50 94.60	No	100 percent	0	Other targets	GBD[xxii]	GBD 2018
SP3: Proportion of urban population living in slums (Percent)	negative	4	0.00 97.50	Yes	0 percent	3	Other targets	UN-Habitat	Normative

Note: Details on data sources are availabile in Acosta (2019).

[i] Sustainable Energy for All (SE4ALL) database from the SE4ALL Global Tracking Framework led jointly by the World Bank, International Energy Agency, and the Energy Sector Management Assistance Program
[ii] Alternative target is 58.62368011 percent based on OECD report (2019)
[iii] Alternative targets are 10 percent and 12.5 percent based on OECD (2019) and Sachs et al. (2019), respectively
[iv] OECD (2017) metadata, based on Share of agricultural land area under certified organic farm management
[v] UN Environment: Secretariat of the International Resource Panel (IRP), website: resourcepanel@unep.org
[vi] Institute for Health Metrics and Evaluation (IHME)
[vii] Carbon Dioxide Information Analysis Center (CDIAC), Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States.
[viii] Alternative targets are 92.69 and 37.73 percent for mountain and terrestrial/freshwater based on OECD (2019)
[ix] Joint Research Centre, European Soil Data Centre (JRC-ESDAC)
[x] Based on scores for other OHI indicators
[xi] World Database on Protected Areas (WDPA) where the compilation and management is carried out by United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) in collaboration with governments, non-governmental organizations, academia and industry. The data is available online through the Protected Planet website (protectedplanet.net).
[xii] Average value for 17 percent terrestrial and 10 percent marine
[xiii] World Intellectual Property Organization (WIPO)
[xiv] WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply, Sanitation and Hygiene (washdata.org).
[xv] Alternative targets are 100 percent for electricity and 95 percent for clean fuels based on OECD (2019)
[xvi] International Telecommunication Union (ITU), World Telecommunication/ICT Development Report and database
[xvii] Alternative targets are 40.37400055 percent for total fixed broadband subscriptions per 100 inhabitants and 100 percent for proportion of population covered by a mobile network, by technology, based on OECD (2019)
[xviii] Inter-Parliamentary Union (IPU)
[xix] Refers to the actual indicator and not to the ratio between female and male
[xx] Refers to the actual indicator and not to the ratio between urban and rural
[xxi] Alternative target is 8.1 percent based on Sachs et al. (2019)
[xxii] GBD (2015) Global Burden of Disease Study 2015

5.7 Weights of indicators and dimensions

Weights determine the relative importance of the indicators to each other. It entails the use of expert or subjective judgement that can become complicated in case of a multidimensional concept (OECD & JRC, 2008; Michaela Saisana & Saltelli, 2011). Gan et al. (2017) broadly categorized methods for weighting indicators into three: statistic-based weighting, public/expert opinion-based weighting, and equal weighting.

Statistic-based weighting uses quantitative methods to identify explicit weights, such as the principal component analysis, the data envelopment analysis, and the conjoint analysis (Nardo et al., 2005; OECD & JRC, 2008; Greco et al., 2018). The principal component analysis (PCA) is widely used to transform data into fewer dimensions and provides summaries of characteristics of high-dimensional data (Lever, Krzywinski, & Altman, 2017; Lever et al. 2017), but it can also be used to generate weights for the indicators based on the factor loadings (Chao & Wu, 2017; Hong-jun & Jin-feng, 2013). The GGPM team used PCA to compute the weights for the indicators (Appendix 4). The PCA weights, however, were not used in computing the Green Growth Index for two reasons: first, properties of the data influence the weights, which are expected to change when a new dataset with different structures are added to the composite index (Chapter 7.1); second, according to OECD & JRC (2008), this weight construction method is not valid and can be misleading for policy-guiding indicators. The weights from the PCA were used for the robustness check (see chapter 5.10).

The analytic hierarchy process (AHP) and the budget allocation process are examples of public or expert opinion-based weighting (Hudrliková, 2013). AHP is a participatory and multicriteria decision-making approach that informs about the relative importance of indicators based on their pairwise comparisons (Dedeke, 2013; Pakkar, 2014). In AHP, the subjective judgment of the experts influences the weights. To facilitate the participation of the experts in identifying weights for the indicators, a survey questionnaire on AHP was developed for the Green Growth Index and distributed during the regional consultation workshops. The results of AHP revealed that there is a large divergence in consensus not only across regions but also across dimensions of green growth (Appendix 4). For this reason, it makes it difficult to use the AHP results to assign weights to the indicators. A higher level of consensus would be needed to identify the appropriate weights for the indicators.

The GGPM team used equal weighting for the Green Growth Index. Equal weighting is the most commonly used method in composite indices (Gan et al., 2017; Greco et al., 2018). Equal weights, which are often based on normative assumptions or based on understanding of the underlying concepts, are applied in composite indices, such as the Human Development Index, the Ecological Footprint, the Genuine Saving Index, the Environmental Vulnerability Index, the Sustainable Society Index, and the Corruption Perception Index. By not using weights from either AHP or PCA, the GGPM team assumed implicitly that the indicators have equal weights. Explicitly, however, the indicators do not have equal weights because the dimensions have a different number of indicators. This is clearly revealed by the PCA results in Figure A4.1 (see Appendix 4), where more weights are estimated for dimensions with the least number of indicators.

5.8 Aggregation of indicators and dimensions

Aggregation reduces dimensionality and provides a single holistic value (Pollesch & Dale, 2016) to measure performance. The two most common and simple methods include linear aggregation using arithmetic mean and geometric aggregation using geometric mean (Santeramo, 2016), with the former being more widely applied than the latter (Greco et al., 2018). For example, the Environmental Vulnerability Index and the Corruption Perception Index use linear aggregation, while the Human Development Index and the Sustainable Society Index use the geometric aggregation. The choice of aggregation methods should consider the properties of data, level of compensability, and implications on policy (Table 5). Both methods were used at the different levels of aggregation of the Green Growth Index (Figure 15).

At level 1, the indicators were linearly aggregated into indicator categories using the arithmetic mean. An important consideration here is the compensability of the individual indicators in each indicator category. This allows countries with poor performance in one indicator, for instance, due to lack of resources, to be compensated by another indicator in the same indicator category. In most cases, the level of correlation between indicators in the same category is not negligible (Chapter 5.5), which can be assumed that they have some degree of substitution. Moreover, at level 1 of aggregation, a rule on missing value for a category with more than four indicators was applied: Countries with more than 25 percent of missing values were dropped. This method was adopted from Jha et al. (2018) in developing ADB's Inclusive Green Growth Index, which allowed indicators with missing values to be "substituted" by other indicators. This rule was not applied for the indicators in resource efficiency and green economic opportunities, which have less than three indicators in each category.

At level 2, geometric aggregation was applied to the indicator categories to allow only partial compensability between indicators in each dimension. Similar to level 1, the 25 percent rule on missing values was applied to dimensions with more than four indicator categories, such as in the case of resource efficiency and green economic opportunities. This rule was not applied for the indicator categories under natural capital protection and social inclusion, which have only three categories each.

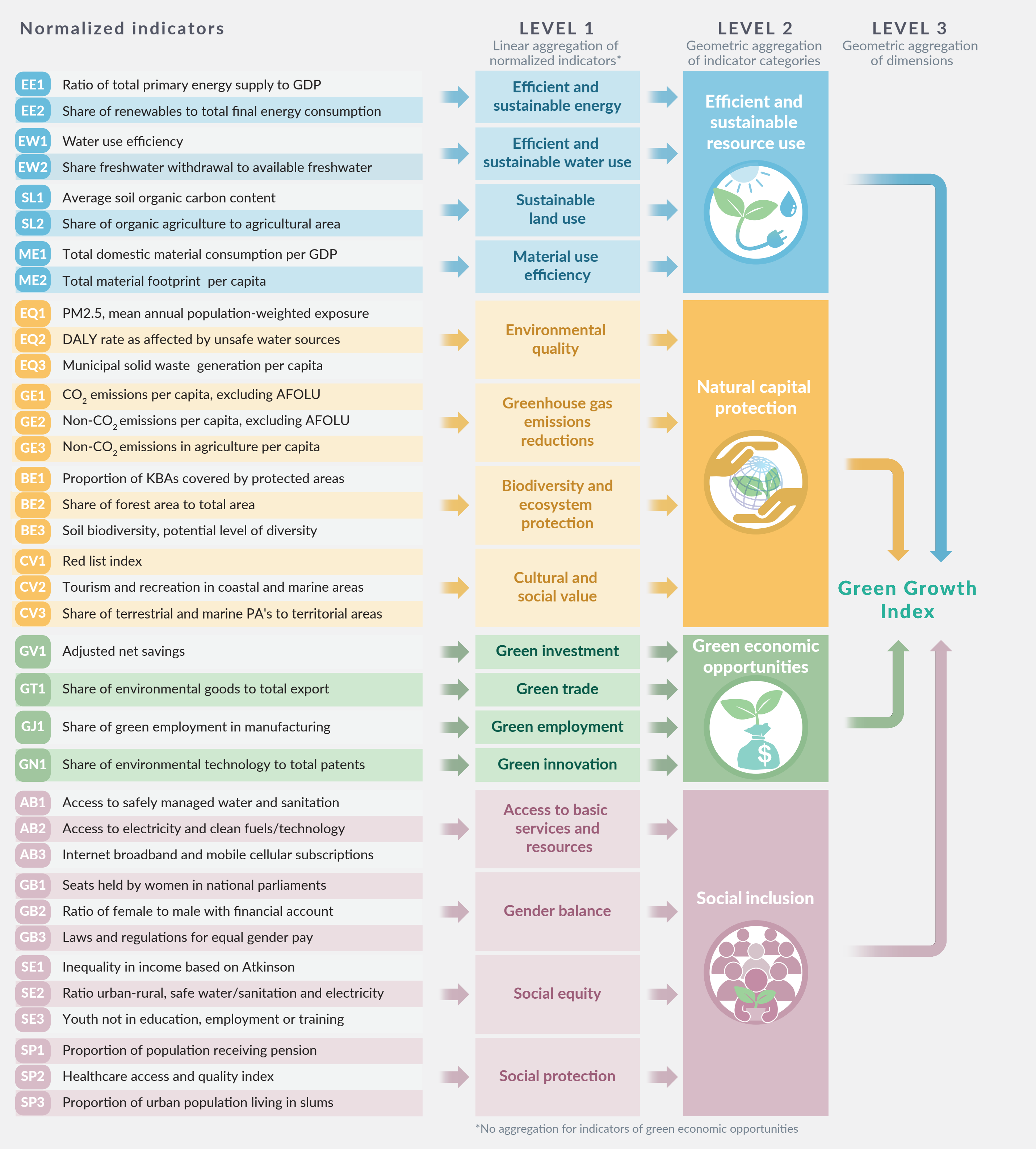
At level 3, geometric aggregation was applied to the dimensions, and the 25 percent rule on missing values was not applied. At this level of aggregation, no dimension was allowed to easily substitute for the other dimensions to improve the Green Growth Index. Thus, as the level of aggregation increases, the level of substitutability decreases.

Table 5 Comparison of linear and geometric aggregations

Characteristics	Types of aggregation methods	
	Linear/Additive	Geometric/Multiplicative
Data properties	A useful method when all individual indicators have the same measurement units, and further ambiguities due to the scale effects have been neutralized.	An appropriate method when noncomparable and strictly positive individual indicators are expressed in different ratio scales.
	It is useful when the underlying indicators are correlated.	It is useful in the presence of minor outliers.
Compensability	Full and constant compensability is allowed, such that deficits in one dimension can be traded off or substituted with surplus in another. Weights are substitution rates and depend on the trade-off value.	Partial compensability, limiting the ability of indicators with very low scores to be fully compensated for by indicators with high scores. No indicator's range dominates the mean values.
Policy implications	Priority will be to continue specializing in sectors where country has a comparative advantage.	Priority will be to increase in performance in sectors with the lowest score to improve overall ranking.

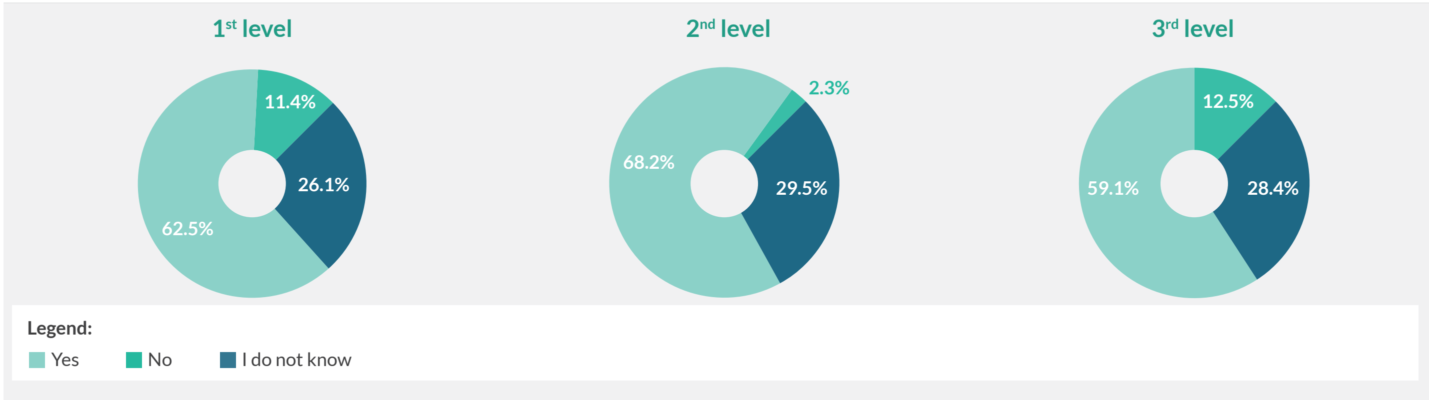
Sources: (OECD & JRC, 2008; Nardo & Saisana, 2008; Munda & Nardo, 2005; Saisana & Saltelli, 2011; Hudrliková, 2013; Gan et al., 2017; Greco et al., 2018).

Figure 15 Methods of aggregation at the indicator, indicator category, and dimension levels



During the third phase of consultations, the expert reviewers were asked as to whether or not they agree on the aggregation methods used at different levels. This was important because when measuring performance relative to the SDGs, the choice of not only the indicators but also the methods influence countries' ranks (Miola & Schiltz, 2019). More than half of them agreed on the methods used to aggregate the Green Growth Index (Figure 16). However, the level of agreement slightly declined for the third level of aggregation. More than a quarter of the expert reviewers could not provide an answer to the question. The number of those who did not agree was small compared to those who agreed and who were not knowledgeable of the methods.

Figure 16 Percentage of experts who agree on the methods used for the different levels of aggregation



5.9 Ranks and benchmarks

Ranks and benchmarks are useful methods to measure green growth performance. During the regional consultation workshops, which constitute the second phase of consultations, the experts' opinions on how to rank the countries and which targets to use to benchmark the indicators were collected (Chapter 3). These topics need careful attention because they can influence the acceptability of any composite indices by policymakers, the public, and other stakeholders. Recognizing the continuous debates on the utility and credibility of composite indices, Saisana & Saltelli (2011: p.268) emphasize that indices "should never be seen as a goal, per se, regardless of their quality, [but] … as a starting point for initiating discussion and attracting public interest and concern".

"Rankings can be powerful tools of both branding and influence" (The Economist, 2014), but they also create controversies (Michaela Saisana & Saltelli, 2011; Chowdhury & Sundaram, 2016; Seth & McGillivray, 2018). Many popular indices, such as the Human Development Index, Environmental Performance Index, Corruption Perception Index, and Doing Business, use ranks to compare performance across countries. While the experts agreed on the usefulness of ranks to measure performance, they suggested avoiding the use of global ranks. They preferred using ranks only for groups of countries, by region or level of development, for instance, through which performance is more or less comparable.

"[A] set of indicators may have effect only when seen through a relevant benchmarking system that will give meaning to the produced measurements" (Benetatos, 2008: p.3). The methods and parameters require careful consideration when making decisions on benchmarking. The benchmarking method in the Green Growth Index was integrated in the normalization of indicators (Chapter 5.6). Benchmarking normalization is commonly applied in global sustainability indices, for instance, those developed by UNDP and OECD. The benchmarking parameters, specifically sustainability targets (chapter 5.6.3), were based on SDG targets as well as targets defined by other international organizations. Many experts suggested using SDGs and other internationally agreed targets, which the countries have to fulfil and achieve based on their international commitments, to benchmark the Index.

5.10 Robustness check

Composite indicators have faced criticism because such can be misleading if constructed poorly, and thus may be prone to misinterpretation (Saisana & Tarantola, 2002). Misinterpretation is prevented by conducting the final and essential step in the development of a composite index - evaluation of the confidence in the model as well as coming up with assumptions to support it.

Sensitivity and uncertainty analyses are standard procedures to evaluate the robustness of an index. These analyses increase the index transparency and evaluate which countries are advantaged or disadvantaged, thus permitting a necessary debate around the index (OECD & JRC, 2008). Sensitivity analysis measures the relative contribution to the output variance of individual sources of uncertainty on the input. Uncertainty analysis measures the impact on the output variance of uncertainty on the assumptions, method, and overall structure of the model. Both are closely linked and their combined approach shows a more robust evaluation of the index confidence (Saisana et al., 2005). Results of the Monte Carlo models for the sensitivity and uncertainty analyses are presented below. More detailed results are available in other literatures (Flores, Acosta, Maharjan, & Peyriere, 2019).

5.10.1 Sensitivity analysis

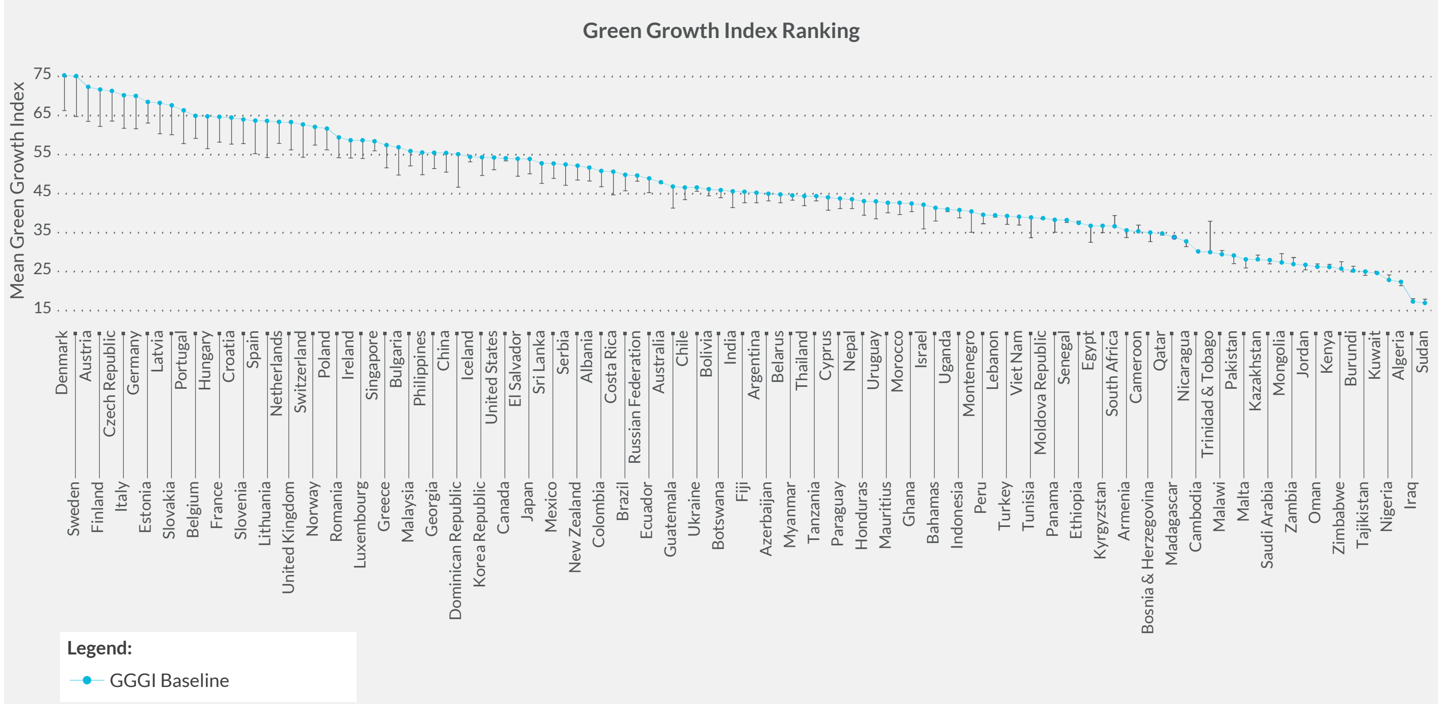
The sensitivity analysis evaluates the impact on the Index of variations on the input. Two sources of uncertainty on the input exist: indicators and sustainability targets. The GGPM team manually and individually modifies the values of these inputs in a specific range and evaluates the impact on the Index. The six models used for the sensitivity analysis are described in Table 6.

Table 6 Assumptions used in the six models for sensitivity analysis of the Green Growth Index

Types of sensitivity	Model assumptions	Baseline model
Change in values of indicators	**Model A1.1** Increased values of indicators by intervals of 20 percent to 100 percent	Values of the indicators are based on baseline year (Table 1)
	Model A1.2 Decreased values of indicators by intervals of 20 percent to 100 percent	
Change in values of sustainability targets	**Model A2.1** Instead mean of top 5 performers, used 90 percentiles for indicators with positive and 10 percentiles for negative relationship to green growth	Sustainability targets are mainly based on SDGs and other global targets (Table 4)
	Model A2.2 Increased values of sustainability targets by 50%, which is assumed to be target for 2050, except for targets which values are already 100	
Change in set of indicators	**Model A3.1** Used indicators based on the 3rd draft framework (as described in Peyriere & Acosta)	Indicators are based on the framework with acceptable level of correlations (Figure 1)
	Model A3.2 Used indicators that were excluded from the final framework due to correlation analysis (see chapter 5.5)	

All in all, the sensitivity analysis based on the six models passed the robustness tests with good results (Flores et al., 2019). In this report, results of Monte Carlo analysis for Models A1.1 and A1.2 are presented. The input values were selected randomly within the specified range of change in indicator values (-100 and +100, at 20 percent interval). The values for the indicators were changed simultaneously at each iteration so that the interaction effects between the indicators were taken into consideration. This analysis enabled identification on how the scores and ranks of countries have changed within the specified range. The iteration was carried out over 1,000 times and a sequence of scores for the Green Growth Index was generated. Figure 17 summarizes the results of the sensitivity analysis after randomizing the input values within ±20 percent. The results show that input variations caused only minimal changes on the scores of the Green Growth Index. Moreover, many countries maintained their rankings. There is an average change of 3.7 units in the index values among all 115 countries which resulted to 90 percent of the countries having a change in rank fewer than 8 places. The countries show an average change in ranks of 3.5 and with the top 30 countries shifting only by 2.4 places. In addition, results of the sensitivity analysis show that changes in the input values to a certain amount have minimal impacts on countries with higher ranks than those with lower ranks.

Figure 17 Results of Monte Carlo model for the sensitivity analysis (1,000 iterations), Mean Green Growth Index scores



Note: The blue dots show the baseline scores of the Green Growth Index and the corresponding countries which are ranked from highest to lowest. The black bars show the average scores of the Index generated from the Monte Carlo analysis, which caused changes in ranks of the countries.

5.10.2 Uncertainty analysis

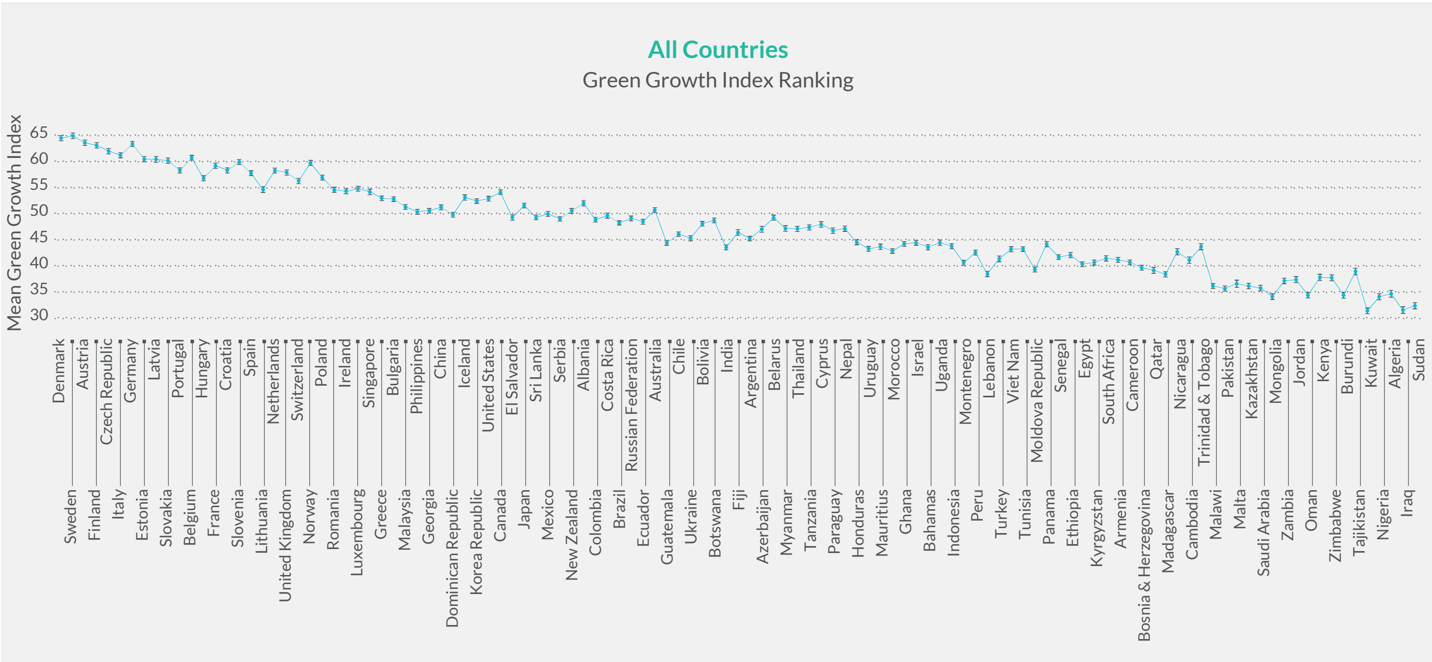
The uncertainty analysis evaluates the impact of changing the assumptions made and methods used to build the model of the Green Growth Index. There are four assumptions selected: aggregation, normalization, outliers and weights. These were easily measurable and had a high potential impact on the results and rankings of the index. The eight models for uncertainty analysis are described in Table 7.

Table 7 Assumptions used in the eight models for uncertainty analysis of the Green Growth Index

Sources of uncertainty	Model assumptions	Baseline model
Aggregation	**Model B1.1** Used linear in all levels of aggregation	Aggregation methods were combined linear and geometric methods (chapter 5.8)
	Model B1.2 Used geometric in all levels of aggregation	
Normalization	**Model B2.1** Applied standardization method using the sustainability targets	Normalization method was rescaling using sustainability targets (chapter 5.6)
	Model B2.2 Applied rescaling (min-max) method using b=100 as upper bound instead of the sustainability targets	
Outliers	**Model B3.1** For all indicators, capped bottom values by 2.5 percentiles and top values by 98 percentiles	Outliers were capped based on lower and upper fences (chapter 5.4)
	Model B3.2 Used average of extreme outliers as value for capping (i.e., instead of upper fence)	
Weights	**Model B4.1** Used weights based on estimates from Principal Component Analysis (see Appendix 4)	Weights were based on implicit values (i.e., no weights were assigned) (chapter 5.7)
	Model B4.2 Used weights based on mathematical distribution of the number of indicators	

Overall, the uncertainty analysis reveals that the impacts of changing model assumptions are acceptable and the model for the Green Growth Index is robust (Flores et al., 2019). To evaluate the overall impact of simultaneously applying the eight uncertainty models above, the GGPM team also applied a Monte Carlo analysis. Like in the sensitivity analysis, the aim was to analyze the changes in countries' scores and ranks for the Green Growth Index relative to the baseline model. Here, the assumptions were also randomized 1,000 times, building new scores and ranks for the Green Growth Index for each country each time. Figure 18 summarizes the results of the Monte Carlo analysis which reveal that the uncertainty is overall quite low and rankings are significantly maintained. About 48 percent of the countries show confidence intervals of three places or less, while 87 percent of the countries have a change in ranking of less than 10 places. On average, the countries show a change in ranks of 4.7, which is acceptable when ranking 115 countries. Results of the Monte Carlo analysis also show that changes in the assumptions on aggregation, normalization, outliers, and weights have lesser impacts on countries with higher ranks than those with lower ranks (Figure 18). This can be attributed to the larger divergence in the scores across indicators and indicator categories and dimensions in low ranking countries.

Figure 18 Results of Monte Carlo analysis for the uncertainty analysis (1,000 iterations), Mean Green Growth Index scores with 95 percent confidence intervals



06 Results and discussion

6.1 Dimensions by regions

Green Growth Index rankings are provided for countries within five geographic regions — Africa, the Americas, Asia, Europe, and Oceania — several of which include subregions. Table 8 presents the country groups by region and subregion which were used in this report. The United Nations' "geoscheme" (UN Secretariat Statistics Division, n.d.) serves as the basis for the grouping. Across all regions, scores for green growth dimensions are generally the highest for natural capital protection and social inclusion, and the lowest for green economic opportunities (Figure 19).

Europe performs significantly better than the rest of the regions, with an overall score of 80. This implies that many countries in this region have almost reached sustainability targets for social inclusion. The largest discrepancies in scores are evident for social inclusion, with Africa scoring the lowest, with below 40.

The regional scores for natural capital protection are relatively close, at around 60, with only Asia scoring below 60. Oceania slightly performs better than Europe in efficient and sustainable resource use. It is worth noting, however, that only six countries in Oceania have scores for this dimension (Table A1.5).

The scores for African and American regions are at par at 40, which are significantly lower than for Oceania and Europe. The lowest performing region for this dimension is Asia. Only Europe performs relatively well in green economic opportunities, albeit the score is still low, at 40. The Americas, Asia, and Oceania also score low for this dimension, at about 20. The score of about 17 percent for green economic opportunities in Africa is the lowest across not only regions but also dimensions.

Figure 19 Performance in green growth dimensions by region

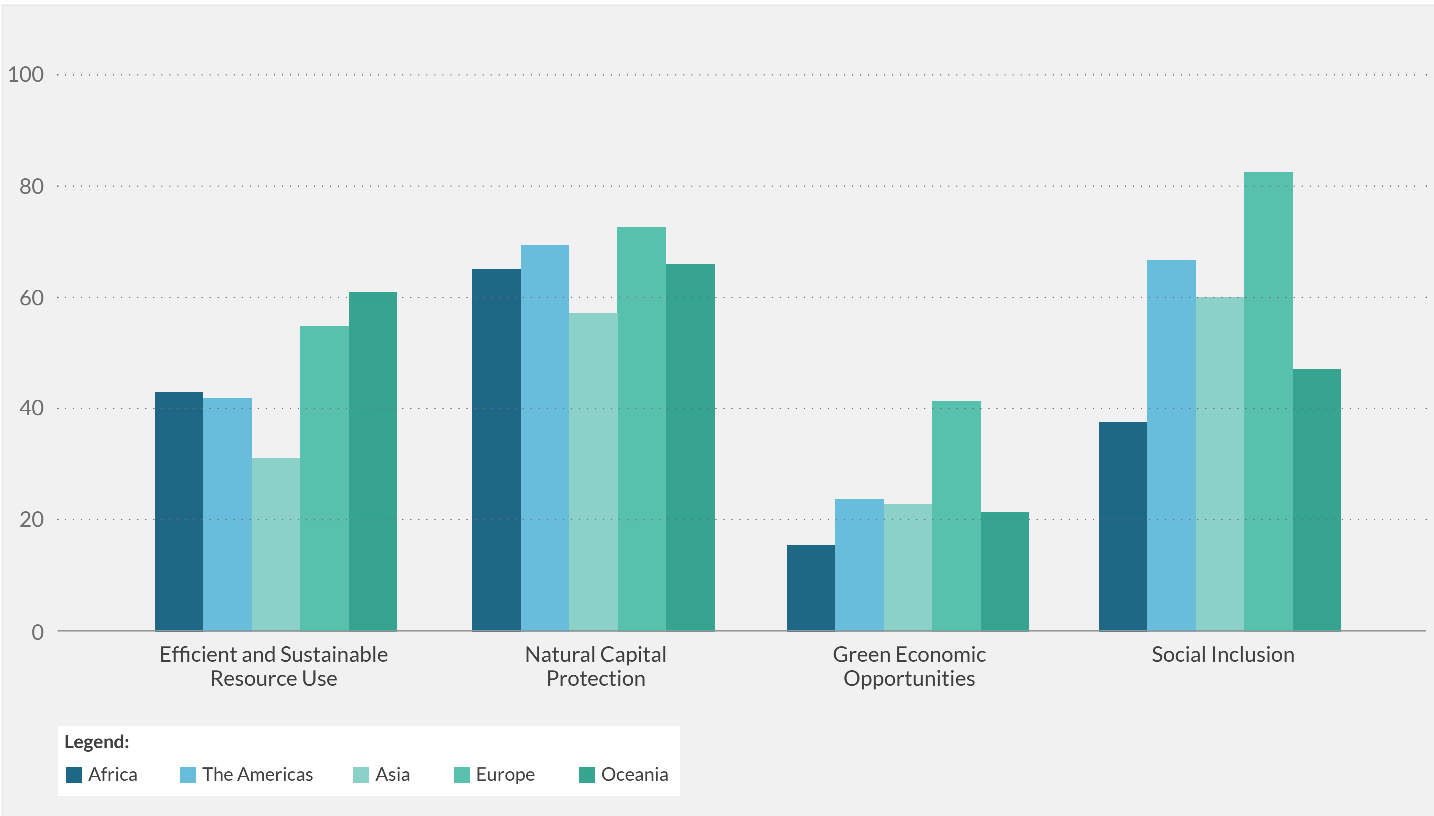


Table 8. Country groups by region and subregion

Region	Subregion	Countries/territories*
Africa	Eastern Africa	Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Seychelles, Somalia, Sudan South, Tanzania, Uganda, Zambia, Zimbabwe
	Middle Africa	Angola, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Republic of Congo, Equatorial Guinea, Gabon, Sao Tome and Principe
	Northern Africa	Algeria, Egypt, Libya, Morocco, Sudan, Tunisia
	Southern Africa	Botswana, Eswatini, Lesotho, Namibia, South Africa
	Western Africa	Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo
The Americas	Caribbean	Antigua and Barbuda, Aruba, Bahamas, Barbados, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, British Virgin Islands, U.S. Virgin Islands
	Central America	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama
	Northern America	Bermuda, Canada, Greenland, United States of America
	South America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
Asia	Central Asia	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
	East Asia	China, Hong Kong China SAR, Japan, Democratic People's Republic of Korea, Republic of Korea, Macao China SAR, Mongolia
	Southeastern Asia	Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar Philippines, Singapore, Thailand, Timor-Leste, Viet Nam
	South Asia	Afghanistan, Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, Sri Lanka
	Western Asia	Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen
Europe	Eastern Europe	Belarus, Bulgaria, Czechia, Hungary, Moldova, Poland, Romania, Russian Federation, Slovakia, Ukraine
	Northern Europe	Denmark, Estonia, Faeroe Islands, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, United Kingdom
	Southern Europe	Albania, Andorra, Bosnia and Herzegovina, Croatia, Gibraltar, Greece, Italy, North Macedonia, Malta, Montenegro, Portugal, Serbia, Slovenia, Spain
	Western Europe	Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Netherlands, Switzerland
Oceania	Australia and New Zealand	Australia, New Zealand
	Melanesia	Fiji, New Caledonia, Papua New Guinea, Solomon Islands, Vanuatu
	Micronesia	Guam, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Northern Mariana Islands, Palau
	Polynesia	American Samoa, French Polynesia, Samoa, Tonga

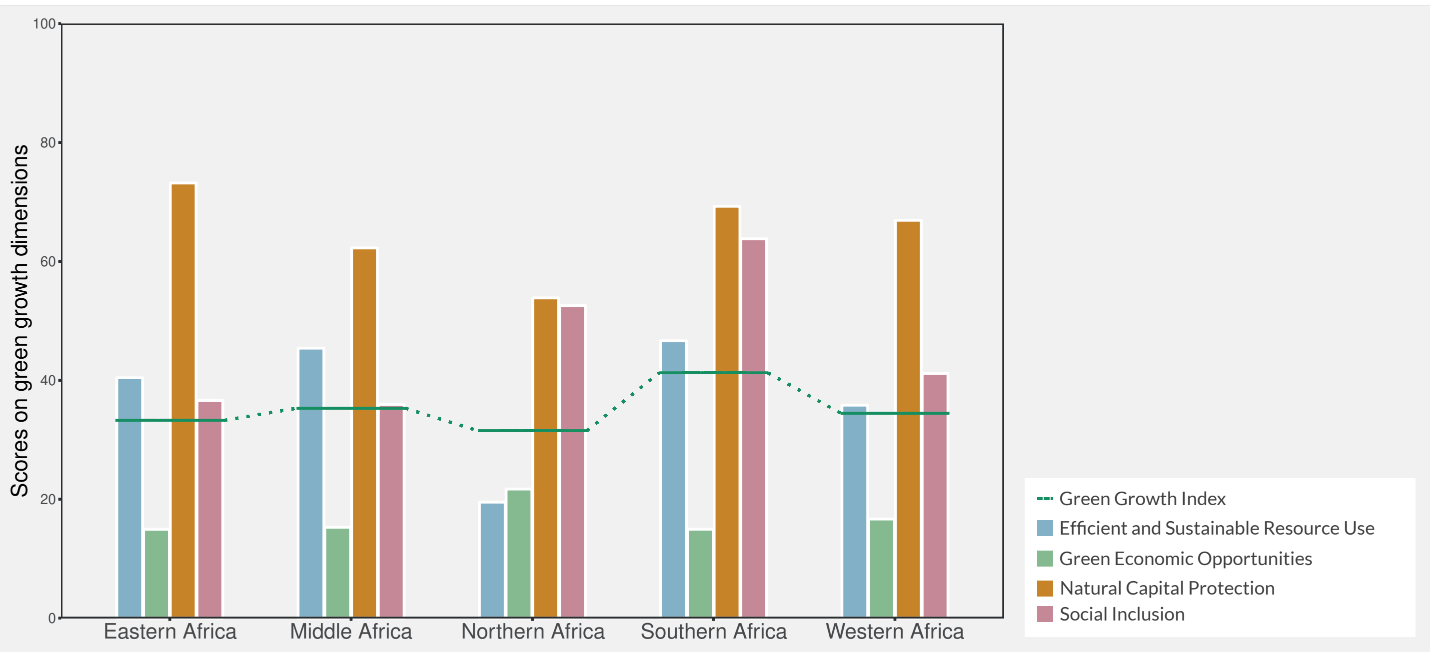
Source: https://unstats.un.org/unsd/methodology/m49/
**Only includes countries/territories with scores for at least one green growth dimension.*

To better understand the estimated Green Growth Index results for each of the five regions, the sections below provide a more in-depth discussion on the scores related to resource efficiency, natural capital protection, green economic opportunities, and social inclusion at the subregional level.

6.1.1 Africa

The Green Growth Index includes results for five subregions in Africa — Eastern, Middle, Northern, Southern, and Western Africa (Figure 20) — and includes 21 countries for which data are sufficient across all dimensions (Table A1.5 in Appendix 1). Africa's countries score from very low to moderate, with Eastern African countries representing half of the ranked countries. Except for Southern Africa, the average Green Growth Index scores for the African subregions are below 40. Both natural capital protection and social inclusion contribute to the relatively better green growth performance in Southern Africa. Its score for social inclusion is highest in Africa, at over 60, which is mainly attributed to high performance in gender balance (Table A1.9). The high score for social inclusion in Southern Africa is not able to offset the low scores in other subregions, particularly Eastern and Middle Africa (Figure 20), resulting in Africa having the lowest score for social inclusion globally (Figure 19). Similar to most other African subregions, Southern Africa has a very low score for green economic opportunities.

Figure 20 Green Growth Index and dimension subindices in the African subregions



For Eastern Africa, natural capital protection is the main contributing dimension to its subregional Green Growth Index performance. It has the highest score for this dimension in the African region, of over 70 (Figure 20). Similar to many parts of Africa, the Eastern subregion has a rich natural resource base. For instance, Zambia in Eastern Africa scores 78 in natural capital protection, the fourth highest score in the region (Table A1.7). Zambia ranks as one of the global leaders in biodiversity and habitat protection. It has 635 protected areas covering nearly 38 percent of its territory (Wendling & Levy, 2018). A large part of these protected areas covers key biodiversity areas.

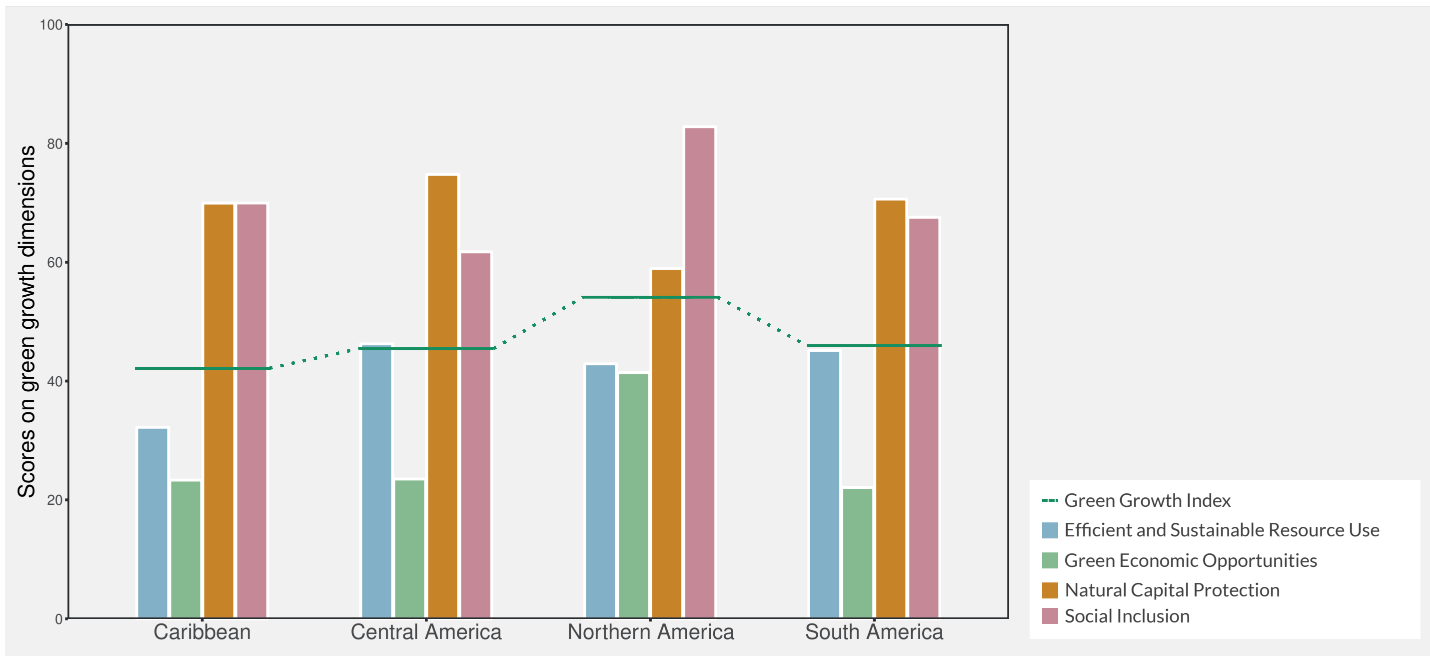
In contrast, Northern Africa lags behind the other subregions with the lowest score for natural capital protection (Figure 20). The United Nations Economic Commission for Africa reported that the Northern subregion has limited natural resources compared to other African subregions (UNECA, 2015), and most countries in the subregion remain natural resource-dependent (AfDB, 2018). Northern Africa has also the lowest performance in efficient and sustainable resource use, with an average score of less than 20. This is mainly attributed to the very low scores for this dimension in Northern African countries, such as Algeria and Egypt (Table A1.1). Not only in the Northern subregion, but generally Africa as a continent has a high resource use intensity. To produce USD1 of GDP, for example, most African countries need seven kilograms of domestic resources, about five times the global average (Giljum & Polzin, 2009). There is significant room to improve resource efficiencies across the continent, such as with respect to low-efficiency technologies being used in resource-intensive activities, such as agriculture and mining.

In almost all African subregions, performance in green economic opportunities is the lowest among the four green growth dimensions (Figure 20). In North Africa, the slightly higher score for green economic opportunities is mainly due to high green investment in Egypt and Morocco (Table A1.8). In many Northern African countries, however, not only the scarcity of natural resources but also the "limited funding capacity, lack of expertise, poor access to technology, ineffective innovation systems, and the diminutive scope of the domestic market" constrain the scale-up of green economic opportunities in the subregion (UNECA, 2015: p.ix). Northern Africa has low levels of local skills as well as limited physical infrastructure to support green economic initiatives. To accelerate green economic opportunities, and increased its Green Growth Index score, the subregion will require enhancement of local skills and improvement to infrastructure.

6.1.2 The Americas

The Americas have four subregions – the Caribbean, Central America, Northern America, and South America. With an average index score of above 50, Northern America has the highest green growth performance in the Americas (Figure 21). This can be attributed to the United States and Canada leading the region in the social inclusion dimension with scores of over 80 (Table A1.2 in Appendix 1). Both Canada and the United States mainstream social inclusion in their policy priorities. In the region, the United States ranks first in GDP share spent on social programs as well as in promoting financial inclusion and empowerment by gender (Americas Quarterly, 2016). But Northern America's performance in natural capital protection lags behind the other subregions, due mainly to low scores in GHG emission reductions (Table A1.7). Meanwhile, its overall performance in efficient and sustainable resource use is comparable to other subregions, except for the Caribbean, which has a low score for this dimension.

Figure 21 Green Growth Index and dimension subindices in the American subregions



Central America is the region's frontrunner in the natural capital protection with a score of over 70 and, together with South America, has the highest score in efficient and sustainable resource use (Figure 21). Considered one of the world's biological hotspots, it is no surprise that Central America leads the region in natural capital protection. One of the forerunners in the subregion is Costa Rica, which pioneered the implementation of the payment for ecosystem services (PES) scheme to conserve its forest and water resources (Barton, 2013). The current set of indicators for green economic opportunities does not cover PES due to a lack of data. The score for this dimension is thus currently low for Costa Rica at about 23 (Table A1.2). In the last four years, however, it is important to note that Costa Rica also generates at least 95 percent of its electricity from renewable energy resources (Rodriguez, 2019). Costa Rica's score for efficient and sustainable energy is 81 (Table A1.6).

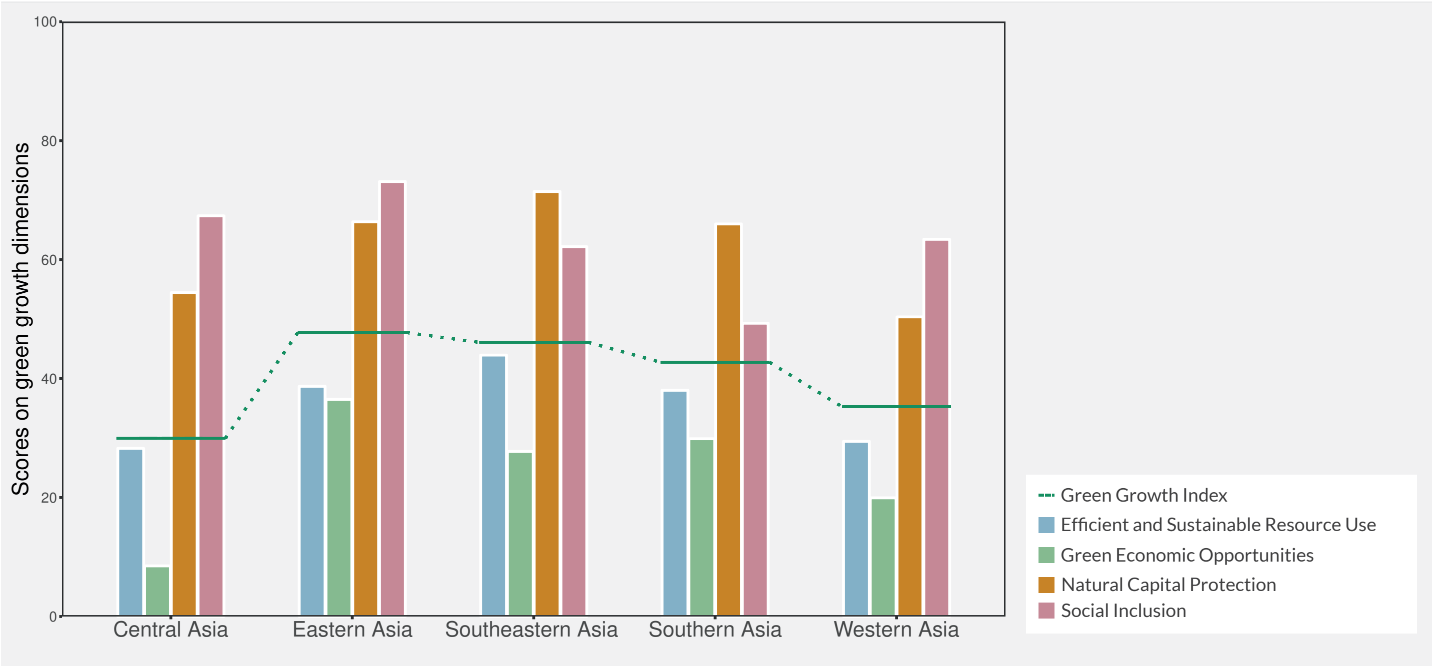
The Caribbean has the lowest score for efficient and sustainable resource use which, together with a low score in green economic opportunities, makes it the least performing subregion in the Americas. The low score for efficient and sustainable resource use in the Caribbean is mainly due to the very low score of Trinidad and Tobago, with only 19 (Table A1.2). The Dominican Republic, meanwhile, has a score of 55, which is higher than that of the United States and Canada. In recent years, the Dominican Republic introduced aggressive policies and initiatives for higher energy efficiency. For example, in 2018, UNEP reported that the Dominican Republic had set out a plan to be the first all-LED lighting island nation, an initiative that may result in approximately USD 120 million annual savings in electricity costs (UNEP, 2018a).

Excluding the scores for efficient and sustainable resource use, South America's scores are comparable to the Caribbean. The score for this dimension for South America is higher than that for the Caribbean and almost the same level as those for Central America and Northern America (Figure 21). Uruguay is one of the forerunners in efficient and sustainable resource use in South America and ranks the highest in efficient and sustainable energy, where the country scores very high, at 93 (Table A1.6). About 80 percent of the country's power system is based on renewables and, similar to Costa Rica, almost all its electricity is generated through renewable energy (IRENA, 2018). In 2018, Uruguay invested 3 percent of its GDP in the renewable energy sector, creating over 11,000 jobs (Proaño, 2018). Uruguay's score for green investment is 70, while for green employment is only 8 (Table A1.8). The Green Growth Index currently lacks an indicator for employment in renewable energy due to lack of data, hence the very low score for green employment for Uruguay.

6.1.3 Asia

Asia consists of five subregions — Central Asia, Eastern Asia, Southeastern Asia, Southern Asia, and Western Asia. East Asian countries dominate the Asian region in the social inclusion dimension (Figure 22), with Japan scoring 83, the highest in the region after Singapore (Table A1.3 in Appendix 1). Despite this, the overall green growth performance in Eastern Asia is comparable to Southeastern Asia due to the higher scores for efficient and sustainable resource use and natural capital protection in the latter subregion. On the one hand, East Asian countries, including China and Japan, have very low scores for sustainable land use, mainly due to a very low share of organic agriculture to total agricultural land area (Table A1.6 and Table A1.10). On the other hand, Southeastern Asian countries have the highest score for the natural capital dimension, mainly due to the subregion's rich biological diversity.

Figure 22 Green Growth Index and dimension subindices in the Asian subregions



The ASEAN Centre for Biodiversity has reported that Southeastern Asia has the highest mean proportion of country-endemic bird and mammal species, at 9 and 11 percent, respectively, compared to other world regions (Sodhi, et al. 2010). This high species diversity and endemicity partly brought about the high natural capital protection score for Southeast Asia. Almost half of the 10 best performers in natural capital protection are countries from the Southeastern subregion which can be attributed to comparatively higher GHG emission reductions and biodiversity and ecosystem protection, with scores of at least 75 and 70, respectively (Table A1.7). Scores for these natural capital protection indicators in East Asia are lower: below 75 for GHG emission reductions and below 60 for biodiversity and ecosystem protection in countries such as China, the Republic of Korea, and Mongolia.

After Eastern Asia, Central Asia has the second highest score for social inclusion in Asia (Figure 22). Central and Eastern Asia's high social inclusion ratings are commensurate to the public policies and initiatives implemented in countries such as the Republic of Korea, Japan, and Kazakhstan. The three countries provide 100 percent access to basic services, such as electricity. The population of the Republic of Korea also has 100 percent access to fiber Internet subscriptions, demonstrating full accessibility of information, communication, and technology services (Schwab, 2018).

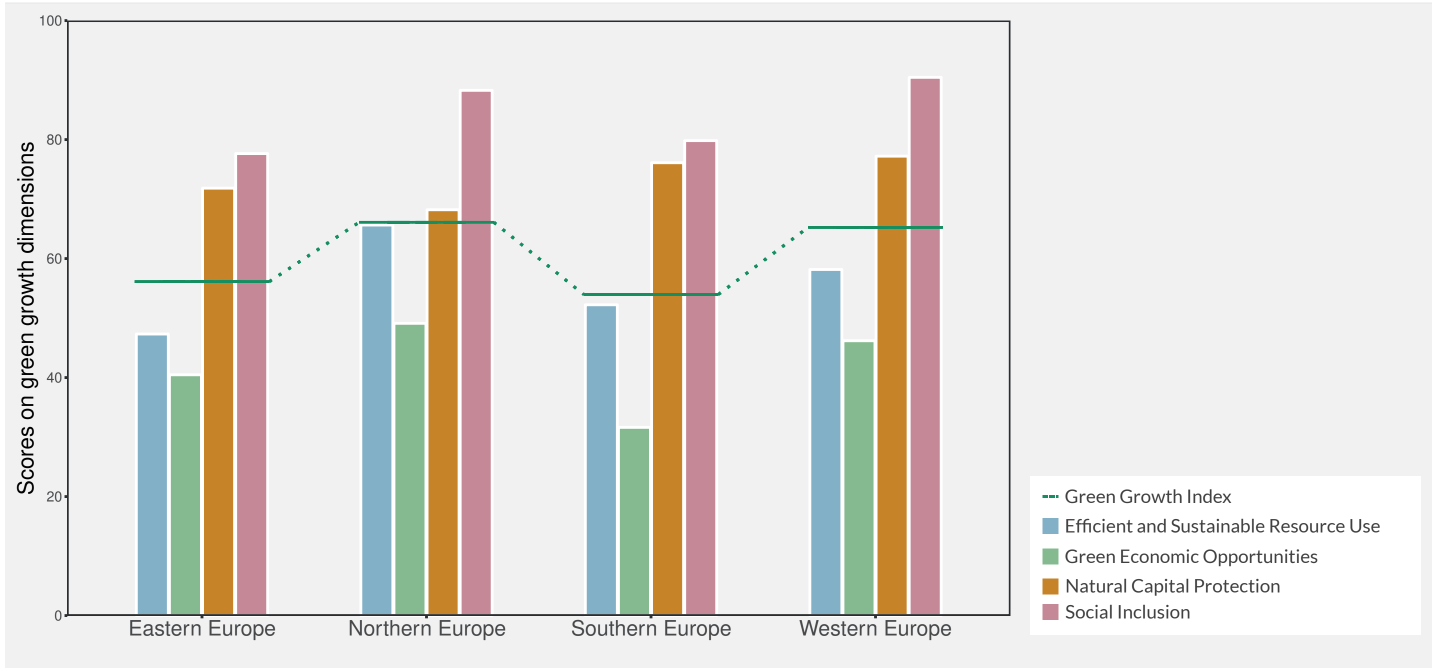
While Central Asia shows promising scores for the social inclusion dimension, it is performing worse in green economic opportunities compared to other subregions. The same pattern is apparent in Western Asia, with only a low score for green economic opportunities. The lack of patents supporting green investment and trade in countries such as Qatar, Iraq, and Jordan contributed to the low green economic opportunities score for Western Asia (Schwab, 2018). Except for Georgia and Oman, the scores for green economic opportunities in the subregion are lower than 30 (Table A1.8), which is mainly due to a very low share of export of environmental goods (Table A1.12)

The Southern subregion has the lowest score for social inclusion. This is attributed to a very low performance in gender balance and social protection in many South Asian countries (Table A1.9). Except for Nepal, the scores for the proportion of seats held by women in national parliaments are less than 50 (Table A1.13). Moreover, Afghanistan, India, and Pakistan have the lowest scores of only 1 for gender-equal employment payment. The "patriarchal values and social norms keep gender inequalities alive" in the Southern Asia subregion, where "discriminatory practices begin even before birth" (UNICEF, n.d.). Except for Sri Lanka scoring 60 in access to health care, many other countries in South Asia have scores below 30 for this indicator (Table A1.13). Sri Lanka's government provides universal health coverage (Perera, 2015).

6.1.4 Europe

As a region, Europe has the strongest overall performance, with scores that are mostly high (Table A1.4 in Appendix 1). The four subregions — Eastern, Northern, Southern, and Western Europe — have scores for natural capital protection and social inclusion dimensions ranging from high to very high (Figure 23). Scores for social inclusion are very high in Northern and Western Europe. Most countries in both subregions are welfare state economies, where governments ensure the socio-economic well-being of the population. Countries implement programs and initiatives supporting social and economic inclusiveness, including the provision of free health care services for all. Although reforms are still underway, social inclusion is at the heart of national priorities. Countries such as Sweden and Germany have been expanding social policies related to work-life balance, wages, and education, contributing to the high social inclusion score for Europe (Bonoli & Natali, 2012).

Figure 23 Green Growth Index and dimension subindices in the European subregions



Intensive resource use has propelled economic development in Europe. Although members of the European Union support resource efficiency through the Europe 2020 strategy (European Commission, 2011), the overall score for efficient and sustainable resource use is only high in Northern Europe. Scores for this dimension remain at a moderate level in other subregions, inlcuding Western Europe (Figure 23). Except for Austria, which scores 72 for efficient and sustainable resource use, the rest of the subregion have scores below 60 for this dimension due to low performance in sustainable land use (Table A1.6). Although the share of organic farming in the food market has increased in Western Europe and stimulated organic agriculture exports to the subregion (Skrodzka, 2017), agricultural production in Western European countries remains predominantly intensive. The main reason for poor performance in sustainable land use is low soil organic carbon content resulting from intensive agriculture. Environmental issues related to air and water have been addressed through environmental regulations, but those "associated with soil degradation have been given marginal consideration" (Virto et al., 2015: p.334). The scores for sustainable land use are only 30 for the Netherlands and Austria; 25 for Germany and Belgium; and 21 for France (Table A1.10).

All the subregions, except for Southern Europe, have moderate ratings for green economic opportunities. (Figure 23). The low performance for this dimension in Southern Europe is due to the scores of below 10 for Montenegro, Bosnia and Herzegovina, and Malta (Table A1.8). The lack of green innovation and little opportunities for green employment are the main reasons for these very low scores. Unlike other European Union countries from the South, Malta performs very low on both indicators, with scores of 1, and thus has the lowest index rank in Europe. Although Malta's Eco-Innovation Index has improved, it continues to face challenges that affect its green innovation, including the lack of space and local resources, energy dependency, water scarcity, and waste management (European Commission, 2019a).

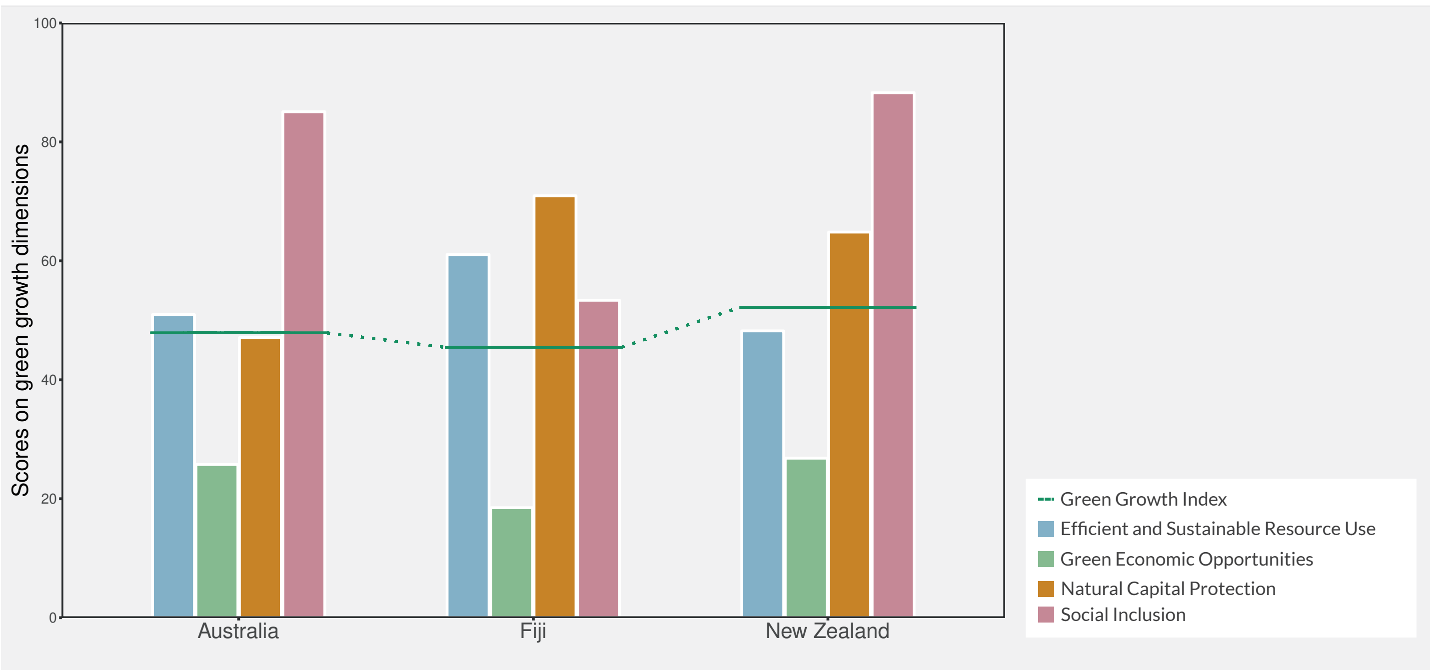
Eastern Europe's performance as a whole is only slightly better than Southern Europe's. Its score on green economic opportunities is more comparable to those for Western Europe (Figure 23). On social inclusion, its score is slightly lower than Southern Europe's. This is caused by only moderate scores for gender balance in Ukraine, Russian Federation, and Moldova (Table A1.9). Ukraine has the lowest score for gender balance in Europe. Although Ukraine is committed to adhering to international frameworks on gender equality and women empowerment, it continues to face challenges in implementing them. These include not only patriarchal attitudes and stereotypes but also governance issues, such as weak rule of law and low institutional capacity to support gender equality (United Nations, n.d.).

6.1.5 Oceania

Oceania comprises four subregions — Australia and New Zealand, Melanesia, Micronesia, and Polynesia. While subregional analyses are possible for the other world regions, data limitations in Oceania confines the subregional assessment to Australia, Fiji, and New Zealand. As a result, the presentation of the scores for the Green Growth Index and the four dimensions are at the country levels.

Although the trend for Australia and New Zealand is consistent with the other world regions in terms of social inclusion, that for Fiji shows the opposite (Figure 24). One reason for this apparent difference is the economic performance of the countries. Similar to most of the countries in the other Oceania subregions, Fiji is a developing country, while Australia and New Zealand are developed nations that follow the welfare state model, which supports social inclusion. This explains the lower score for social inclusion in Fiji.

Figure 24 Green Growth Index and dimension subindices in the Oceania countries

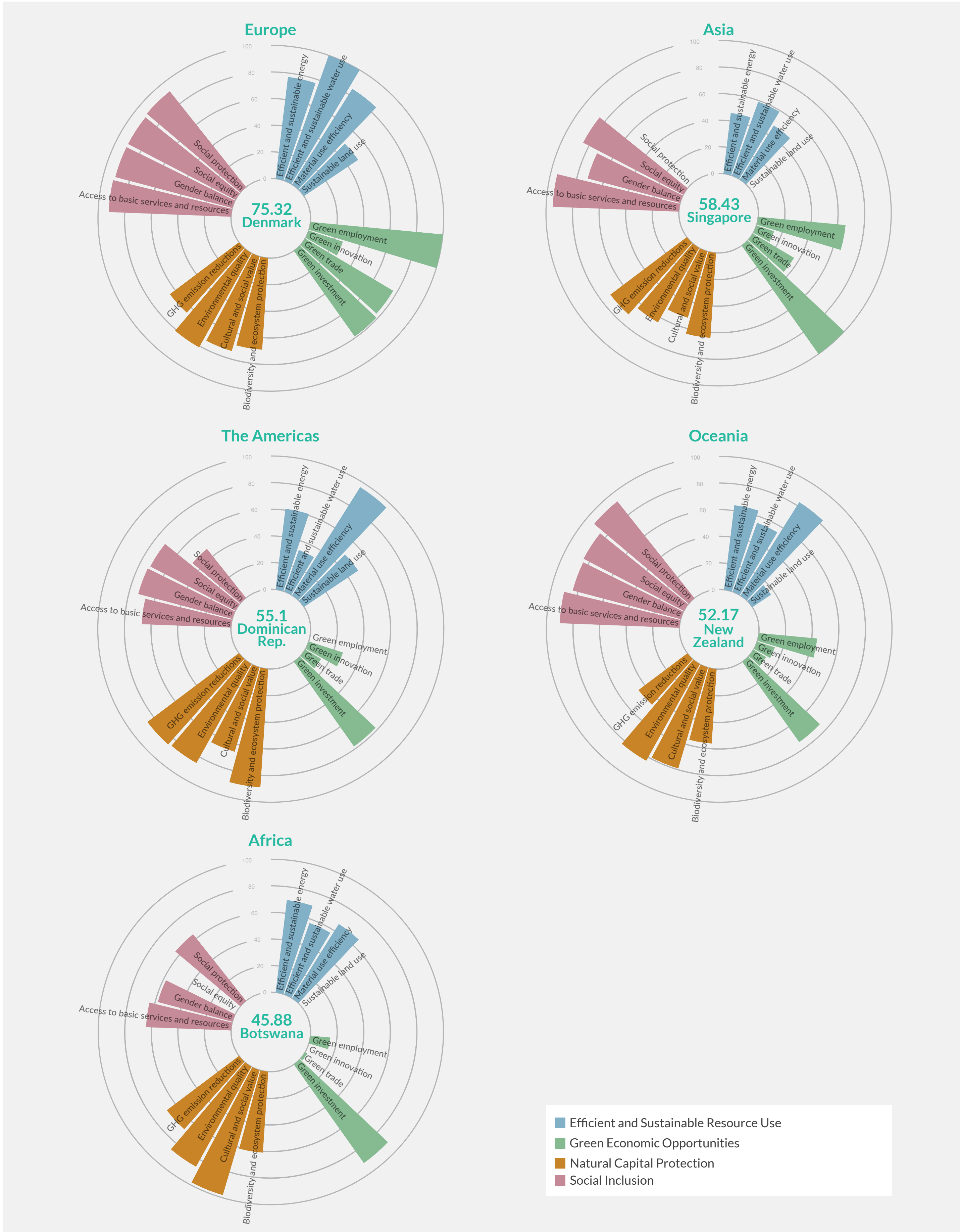


Fiji and the other countries in Melanesia, Micronesia, and Polynesia have higher ratings in the natural capital dimension than Australia and New Zealand. Palau, American Samoa, and Northern Marianas have the highest scores, above 75 (Table A1.5 in Appendix 1). The Pacific islands and territories have unique and diverse ecosystems, which are traditionally integrated into the ways of living of the local and indigenous communities (Jupiter et al., 2014). In terms of green economic opportunities, Australia and New Zealand are the region's leaders, while Fiji, Samoa, Vanuatu, and Papua New Guinea outperform Australia and New Zealand in resource efficiency, with scores above 55 (see Appendix A, Table 5). Land area and population are factors that likely contribute to the difference in scores, as Fiji's land area is 15 times smaller than New Zealand's and its population is one-twenty-seventh that of Australia (WB, 2016).

6.2 Top Country Performance

The top-ranking countries by region are Denmark in Europe, with an index score of 75.32; Singapore in Asia, with an index score of 58.53; the Dominican Republic in the Americas, with an index score of 55.10; New Zealand in Oceania, with an index score of 52.17; and Botswana in Africa, with an index score of 45.88 (Figure 25). Figure 25 shows the scores of the indicator categories used to compute the Green Growth Index for these five countries. The integration of the benchmarking method in the normalization process allows for measuring the distance of the indicators to the sustainability targets, that is, that a score of 100 means the target was reached (chapter 5.6.2). Note that many of the targets refer to the SDG targets for 2030 (Table 4). Moreover, other targets are not based on the SDGs but on mean values of top five performers for a given indicator; this implies that at least three countries have already reached the targets.

Figure 25 Distance to targets of green growth indicators in top performing countries by region



Denmark has reached targets for efficient and sustainable water use and green employment (Figure 25). Denmark has made significant improvements in its water consumption, consuming an average of only 104 liters of water per person a day in 2016 and decreasing further to 103 liters in 2017 (DANVA, 2017; Christian, 2018). Green jobs are rapidly increasing in Denmark, particularly in the industrial sector (State of Green, 2018). Denmark also performs well in all four pillars of social inclusion, almost reaching the targets, with scores higher than 80. With a score of 92 for social inclusion, Denmark comes close to the top performer globally, Sweden, which scores almost 94 (Table A1.4 in Appendix 1). Sweden holds the second highest score for the Green Growth Index, with score only slightly lower than Denmark's.

Singapore has reached the target for green investment (Figure 25), which is represented by adjusted net savings minus natural resources and pollution damages. As one of the few economically developed countries in Asia, it also performs well in providing access to basic services and resources to its population, with a score of 84. However, its performance in efficient and sustainable resource use is the lowest compared to the top countries in the other regions. Singapore's manufacturing industry is responsible for about half of its electricity consumption, which is causing challenges in the adoption of energy-efficient practices and technologies (Sioshansi, 2013). A low score for efficient and sustainable resource use, however, may also be attributed to the lack of data on sustainable land use.

The Dominican Republic almost reached the targets for material use efficiency as well as for biodiversity and ecosystem protection (Figure 25). The country is considered unique as far as protection of natural resources is concerned, with protected areas making up 25 percent of its land area and 54 percent of its territorial seas (Dudley, Boucher, Cuttelod, & Langhammer, 2014). The Dominican Republic also excels in other pillars for natural capital protection, including GHG emission reductions and environmental quality. However, performance in green economic opportunities is not very promising, with very low and low scores for green trade and innovation, respectively. The government has so far allocated 0.03 percent of its GDP to innovation (Dominican Today, 2019). Innovation on green products could help the country promote green exports. The Dominican Republic lacks data on green employment, which also affects its score for green economic opportunities.

New Zealand has very high scores for all pillars of social inclusion, particularly for social protection (Figure 25). The need to promote equal opportunity for indigenous peoples has driven the country's social policy (Humpage, 2006). When it comes to natural capital protection, the country, although on its way to achieving targets for environmental quality and cultural and social value, has only moderate scores for biodiversity and ecosystem protection and for GHG emission reductions. Agriculture contributes significantly to GHG emissions, and industrial practices contribute to biodiversity degradation (Smith, 2015). New Zealand also receives very low scores for sustainable land use in connection with agricultural practices.

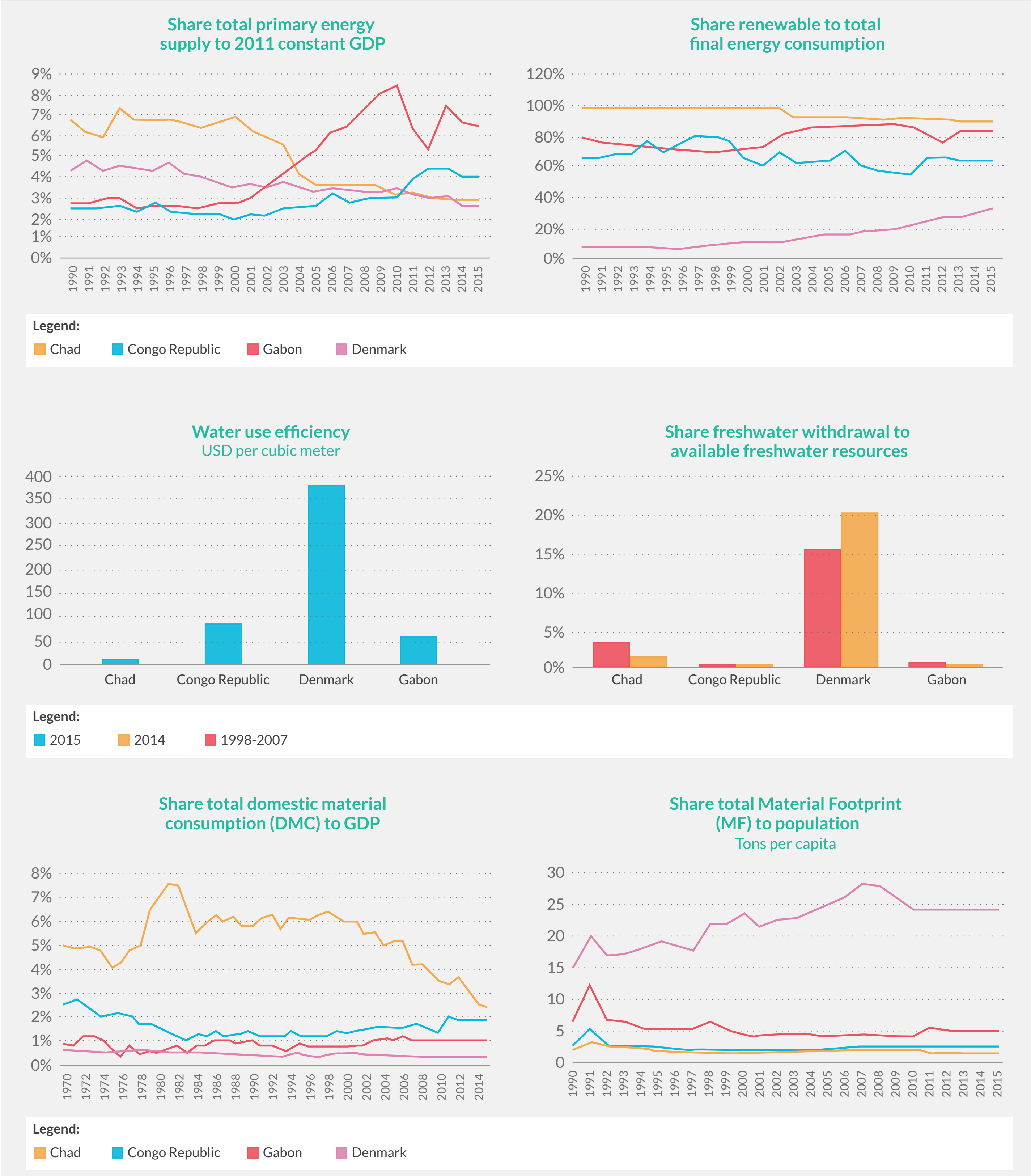
Botswana performs very well in most pillars for natural capital protection, particularly for cultural and social value and environmental quality (Figure 25). The government is actively taking part in preserving wildlife and habitats as part of a strategy for sustainable tourism (Ledger, 2017). Going forward, it is possible that the government's recent decision to lift its ban on hunting elephants to address impacts of the high elephant population on agricultural livelihoods (Burke, 2019) will lead to reduced scores in this area. Botswana scores very high on green investment but very low on green employment and green trade. The country's trade performance in nontraditional commodities is weak and low-tech (Baker, 2019), indicating opportunities for strengthening green trade.

It is worth noting that among the five top-ranking countries, Botswana has the largest data gap (7 indicators or 19 percent), mainly on indicators for social inclusion (Table A1.14 in Appendix 1). Dominican Republic and Singapore have missing data for only two and three indicators, respectively. Data for all indicators for Denmark and New Zealand are available.

6.3 Exceptional country performance

The results of the subindex for efficient and sustainable resource use have shown few exceptional performances for the region in Africa (Figure 2). Countries such as Chad (76), the Congo Republic (84), and Gabon (79) have high to very high scores for this dimension (Table A1.6 in Appendix 1). Their scores are higher than those for Denmark, which is the top-ranking country with the highest global score in the Green Growth Index. Figure 26 shows that the three African countries perform better than Denmark in most of the indicators for efficient and sustainable resource.

Figure 26 Indicators for efficiency and sustainable resource use for countries with exceptional performance



Note: Sources of the data are described in Acosta (2019).

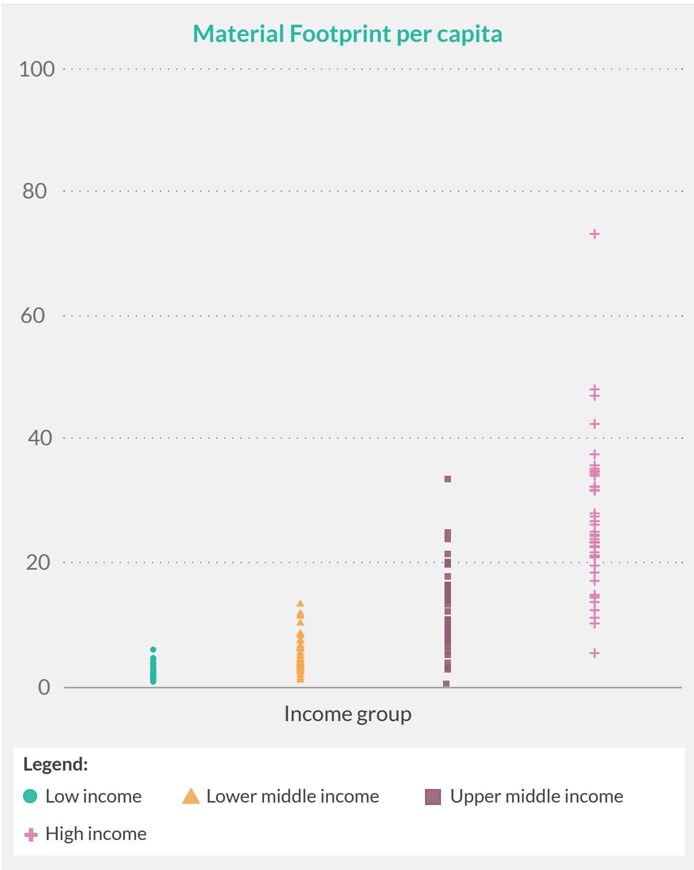
Except for Gabon, where the share of total primary energy supply to GDP has been increasing, the trend in the other countries shows either a significant decline, such as in the case of Chad, or relatively stable over time, such as in the case of the Congo Republic and Denmark (Figure 26). By 2015, Chad had reached the same level as Denmark. Chad has also the highest share of renewable energy to final energy consumption as compared to the other two African countries. Although Denmark has shown an increasing trend in share of renewable energy from 1990 to 2015, it continued to have much lower share than the African countries. It is worth noting here that the indicator on renewable energy, representing SDG Indicator 7.2.1 of the SDG Indicator, includes hydro, solid biofuels, wind, solar, liquid biofuels, biogas, geothermal, marine, and waste (UNSTATS, 2019). This very high renewable energy share of energy consumption is due to two main factors. In Gabon and the Congo Republic, a large share of net electric generation comes from hydropower, usually large dams (UNEP, 2017a). In the Congo Republic, this share is 53 percent, and in Gabon 43 percent in 2015 (IEA, 2015). A second major phenomenon is the inadequacy of the electric sector, leading to the use of biomass, such as charcoal and wood, as the major energy source. In Gabon, this is less the case; in the Congo Republic, only 66 percent of the population had access to electricity in 2017, while in Chad as low as 11 percent in 2017 (WB, 2019a). This implies biofuels dominate the energy mix, but they are not used in a sustainable way or respecting natural capital.

Although water use efficiency is very high in Denmark, it has a much higher share of freshwater withdrawal to available freshwater resources than the three African countries (Figure 26). Gabon and the Congo Republic have a very large amount of freshwater available due to climatic and geographic conditions. Both countries have extensive surface and groundwater, including rivers and aquifers (UN, 1989). Chad has a very large aquifer — Lake Chad Basin — but most groundwater use is done through small-scale shallow wells with very little quantity. Thus, the share of freshwater withdrawal to available freshwater resources is comparatively quite low. Nevertheless, the Lake Chad Basin aquifer is very sensible to climate change, and in recent years, a significant drop in groundwater recharge has been detected (GWP, 2013).

With regard to material use efficiency, the share of total domestic material consumption (DMC) to GDP is very low not only in Denmark but also in the Congo Republic and Gabon (Figure 26). Chad has a higher level because of its low GDP and dependence on the primary sector (e.g. farming, grazing, mining, forestry, fishing, etc.), which is 45 percent of the GDP in 2018 (WB, 2019b). Nevertheless, the value of this indicator was one-third below the world average in 2015. This could be attributed to low development and inefficient use of materials in industries, and the dependence of the economies on agriculture and/or oil production.

In Denmark, the share of material footprint to population is high and increasing, while in African countries, this has remained relatively stable at a low level. Material consumption correlates to the standard of living. Chad has the lowest material footprint and has a GDP per capita of USD1,745 (constant 2011 PPP) in 2017 (WB, 2019c). The Congo Republic has a slightly higher material footprint and had a GDP per capita of USD5,024 in 2018. Finally, Gabon, which had a much higher GDP per capita of USD15,922 in 2018, has more than thrice the material footprint of Chad. Figure 27 shows that low material footprint per capita is not a distinct characteristic of these three African countries, which have low-income levels. Many other low-income countries have low material footprint (MF) per capita. And as income level increases, the values for this indicator also increases.

Figure 27 Scatter plot of material footprint (MF) per capita according to income group



All in all, these values for Chad, Gabon, and the Congo Republic on the efficient and sustainable resource use can be explained by the nature of the indicators for this dimension. These countries have high renewable energy use because of their use of hydropower and biomass. Their energy efficiency is high because of low electric production and connection to an electric grid, usually concentrated in cities. Low water use with high freshwater stocks raises the subindex even more, with low material footprint on the production and consumption side further contributing to high values for this green growth dimension.

GGGI

07 Challenges and way foward

7.1 Indicators and proxy variables

A big challenge in applying the conceptual framework of the Green Growth Index has been finding appropriate indicators to directly measure performance in different green growth dimensions. Desired data or data with high or moderate relevance represented 67 percent of the 36 indicators; the rest are considered "proxy variables" (Table 9). Although proxy variables are not a direct measure of the indicators, they capture underlying relationships between the green growth indicators and dimensions and include a sufficient number of countries to build a global index (Miola, Paccagnan, Papadimitriou, & Mandrici, 2015).

According to OECD & JRC (2008), correlation and sensitivity analyses can be used to check the accuracy of proxy variables. These analyses were done for the Green Growth Index (see Chapters 5.5 and 5.10), and results showed that the index is relatively robust despite the use of proxy variables. In addition, the GGPM team conducted a literature review to find empirical evidence on the relevance of not only the desired data but also proxy variables to green growth dimensions (Chapter 4.2 and Appendix 1). The proxy variables are expected to be replaced by desired data as data become available. Likewise, the GGPM team envisaged to include additional indicators for efficient and sustainable resource use as well as for green economic opportunities as data become available in order to provide a balance in the number of indicators across all dimensions. This will address the issue of implicitly assigning more weights to the indicators in dimensions with a lesser number of indicators (see Appendix 4).

Table 9 Relevance of indicators for the Green Growth Index and desired improvements for proxy variables

Codes	Baseline Indicators	Relevance	Desired Improvement
EE1	Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)	High	-
EE2	Share of renewables to total final energy consumption (Percent)	High	-
EE3	-	-	Additional indicator to measure energy productivity
EW1	Water use efficiency (USD per m^3)	Moderate	Can be replaced with water footprint indicators; to be made available by the Water Footprint Network
EW2	Share of freshwater withdrawal to available freshwater resources (Percent)	High	Improvement of time series data
EW3	-	-	Additional indicator to measure water treatment; data currently scanty
SL1	Average soil organic carbon content (Tons per hectare)	Proxy	Can be replaced with soil nutrients; to be made available by FAO
SL2	Share of organic agriculture to total agricultural land area (Percent)	Moderate	Improvement of time series data
SL3	-	-	Additional indicator to measure sustainable land management; to be made available by FAO
ME1	Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)	High	-
ME2	Total material footprint (MF) per capita (MF tons per capita)	High	-
ME3	-	-	Additional indicator to measure material and waste recycling
EQ1	PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m^3)	Moderate	To be combined with PM10 as data availability improves
EQ2	DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)	Proxy	Can be replaced with water pollution; no identified sources yet
EQ3	Municipal solid waste (MSW) generation per capita (Tons per year per capita)	Moderate	Improvement of time series data
GE1	Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita)	Moderate	Improvement of time series data

Table 9 Relevance of indicators for the Green Growth Index and desired improvements for proxy variables *(continued)*

Codes	Baseline Indicators	Relevance	Desired Improvement
GE2	Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita)	Moderate	Improvement of time series data
GE3	Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1000 persons)	High	-
BE1	Average proportion of key biodiversity areas covered by protected areas (Percent)	High	-
BE2	Share of forest area to total land area (Percent)	Proxy	Can be replaced with indicator that measures quality and type of forests; inclusion of mangrove forest
BE3	Soil biodiversity, potential level of diversity living in soils (Index)	Proxy	Can be replaced by soil biodiversity related to land use; to be made available by FAO
CV1	Red list index (Index)	Proxy	Can be replaced by species of relevance to tourism, local, and indigenous communities
CV2	Tourism and recreation in coastal and marine areas (Score)	Proxy	Can be replaced by sustainable eco-tourism in different ecosystems; no identified sources yet
CV3	Share of terrestrial and marine protected areas to total territorial areas (Percent)	Proxy	Can be replaced by protected areas managed by indigenous and local communities
GV1	Adjusted net savings, minus natural resources and pollution damages (Percent GNI)	Proxy	Can be replaced by investment in renewable energy or green technology
GV2	-	-	Additional indicator to measure investment in key biodiversity areas or protected areas will be useful, no identified sources yet
GV3	-	-	Additional indicator to measure investment in human skills in green jobs; no identified sources yet
GT1	Share of export of environmental goods (OECD and APEC class.) to total export (Percent)	Moderate	Improvement in the classification of environmental goods
GT2	-	-	Additional indicator to measure sustainable trade in certified products, to be made available by certification organization; data currently scanty
GT3	-	-	Additional indicator to measure trade in waste materials; no identified sources yet
GJ1	Share of green employment in total manufacturing employment (Percent)	Moderate	Improvement in the indicator to measure green employment in different economic sectors
GJ2	-	-	Additional indicator to measure skills generated in green employment; no identified sources yet
GJ3	-	-	Additional indicator to measure wage gap in green and standard employment; no identified sources yet
GN1	Share of patent publications in environmental technology to total patents (Percent)	Moderate	Improvement in data availability for more countries
GN2	-	-	Additional indicator to measure green innovation in entrepreneurships; no identified sources yet
GN3	-	-	Additional indicator to measure green innovation
AB1	Population with access to safely managed water and sanitation (Percent)	High	-
AB2	Population with access to electricity and clean fuels/technology (Percent)	Moderate	Improvement of the indicator to measure renewable electricity
AB3	Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)	High	-

Table 9 Relevance of indicators for the Green Growth Index and desired improvements for proxy variables *(continued)*

Codes	Baseline Indicators	Relevance	Desired Improvement on Indicators
GB1	Proportion of seats held by women in national parliaments (Percent)	Moderate	Can be combined with an indicator on positions held by women in managerial positions; data currently scanty
GB2	Share of female to male with account in financial institution, age 15+ (Percent)	High	-
GB3	Getting paid, covering laws and regulations for equal gender pay (Score)	Proxy	Can be replaced by an indicator measuring gender parity in salary and benefits
SE1	Inequality in income based on Atkinson (Index)	Proxy	It can be replaced by the indicator on Palma ratio; data currently scanty
SE2	Ratio of urban to rural, access to safely managed water/sanitation & electricity (Percent)	Moderate	Improvement of the indicator to measure renewable electricity
SE3	Share of youth not in education, employment or training, aged 15-24 years (Percent)	Moderate	Improvement in time series data
SP1	Proportion of population above statutory pensionable age receiving a pension (Percent)	Moderate	Improvement in time series data
SP2	Healthcare access and quality index (Index)	Proxy	Can be replaced by an indicator that directly measures health protection; no identified sources yet
SP3	Proportion of urban population living in slums (Percent)	Proxy	Can be replaced by indicator on inadequate housing, including homelessness; to be made available by UN-Habitat

7.2 Data availability

Availability of data is another important challenge that affects the relevance of the indicators. The GGPM team considered indicators to be of high relevance for the framework if they are not only conceptually relevant but also publicly available. The completeness or lack of the data influences scores of the Green Growth Index. For example, a country with complete data for all indicators for green economic opportunities will have lower scores if one of the four indicators have a value of zero, thus pulling values of other indicators down. In contrast, another country with incomplete data will have a higher score because the fourth indicator, which may also have a value of zero but missing and unknown, will be excluded by default. The lack of data thus causes some level of uncertainty in the results of the Green Growth Index. Allowing missing values is, however, necessary for two reasons: first, to allow substitutability of indicators that represent the same concept as represented by the indicator category; second, to maintain a larger number of countries until the last level of aggregation. Not allowing for substitutability at the first and second levels of aggregation will exclude countries with missing values. Table 10 provides information on data gaps for indicators in the Green Growth Index by region and their implications on the number of countries.

If there were no missing values, the index could be computed for about 207 countries globally. Due to data gaps, however, the current index has been computed only for 115 countries (Figure 3). The data gap is the largest for the indicators for green economic opportunities, with Oceania and Africa having as high as 83 percent and 61 percent missing values, respectively. There are no data gaps for the indicators for natural capital protection in any of the regions. Data gaps for each country are presented in Table A1.14 (Appendix 1).

Table 10 Summary of data gaps for indicators in Green Growth Index and its dimensions by region

Region	Number of countries	Green Growth Dimensions				Green Growth Index
		Resource efficiency	Natural capital protection	Green economic opportunities	Social inclusion	
Africa	54	9%	0%	61%	2%	61%
The Americas	43	28%	0%	51%	23%	51%
Asia	49	10%	0%	31%	2%	35%
Europe	43	9%	0%	12%	9%	12%
Oceania	18	67%	0%	83%	33%	83%
Global	207	18%	0%	43%	11%	44%

Note: The percentage refers to the proportion of countries without data for the indicators in their respective regions. Countries with no data for all dimensions were excluded from the count.

7.3 Sustainability targets

Sustainability targets provide critical information to benchmark the Green Growth Index. The scores depend on the reliability of these targets. A quarter of the targets for the index are currently based on mean values of the top five performing countries (Chapter 5.6.3), which allow countries to already reach the targets regardless of their performance on a given indicator. For example, the target for the indicator for green innovation, which is the share of export of environmental goods to total export, was based on the top five performing countries. The maximum value for this indicator is only 20 percent, hence limiting the space for increasing performance for green exports because the target is very low. Similarly, the maximum value for the indicator for green employment, which is the share of green employment in total manufacturing employment, is only 14 percent, allowing some countries to have a score of 100, although green employment has not significantly contributed to the economy. Moving forward, sustainability targets for the indicators not included in the SDG should have valid and sufficient bases. The producer or publisher of data will be requested to recommend targets for the indicator.

Finally, SDG targets are either explicit or implicit. Because implicit SDG targets leave room for interpretation, different targets were given to the same SDG indicator (Table 4). For the Green Growth Index, the GGPM team did not attempt to interpret the SDG targets but used available interpretation, such as that suggested by (OECD, 2019a, 2019b) and by SDSN Sachs et al. (2018, 2019). Whenever the suggestions on the targets diverge, the team adopted the SDSN targets because, as with the Green Growth Index, the SDSN methodology was developed based on the global context. In the future, alignment with the SDG targets will continue to be important to provide consistent policy recommendations to the countries.

GGGI

08

Comparison with other green growth indices

8.1 Frameworks and design

The objective of this analysis is to understand similarities and differences between major global and regional green growth concepts. The focus of the analysis refers to the frameworks and design process for green growth concepts (Table 11). Below offers a brief description of the focus of the analysis.

Table 11 Focus of analysis of global green growth concepts

Thematic focus	Focus of analysis	Guidance for analysis	Relevant literature
Frameworks	Conceptual	Build a framework that clearly defines the phenomenon and its sub-components; and weighs subcomponents according to their relative importance	Nardo et al., 2005
	Institutional	Adopt the UN principles as guiding framework	United Nations, 2012
Design processes	Internal or in-house	Select indicators based on the principle of fitness for purpose	Nardo et al., 2005
	Consultative	Involve other stakeholders to identify relevant issues on the indicators; develop a sound analytical design for policy-relevant indicators	UNEP, 2014b

Frameworks:

Two types of frameworks are relevant for the comparative assessment of green growth concepts – theoretical and institutional.

The structure of the indicators needs to be selected carefully according to a given theoretical framework. The OECD and JRC Handbook (2008: p.22) emphasizes that "[t]he framework should clearly define the phenomenon to be measured and its sub-components, selecting individual indicators and weights that reflect their relative importance and the dimensions of the overall composite. This process should ideally be based on what is desirable to measure and not on which indicators are available." It also suggests further dividing multiple dimensions into several subgroups, which should not be independent of each other, and that existing linkages should be described theoretically or empirically to the greatest extent possible. GGKP (2013) emphasizes the relevance of a theoretical framework that enables the measurement of substitutability among dimensions and indicators, reflecting how strong the necessary balance is among the social, economic, and environmental pillars of green growth. The comparative assessment involved looking, on the one hand, at the categories of the indicators and their linkages to the indicators and dimensions, and, on the other hand, at the weights assigned to the indicators and thus the degree of substitutability among them.

The policy relevance of green growth frameworks will be enhanced by benchmarking the indicators to specific global institutional agreements. Article 57 of the declaration "The Future We Want!" proposes the adoption of the U.N. principles as guiding framework by stating (UNEP, 2014b: p.10), "We affirm that policies for green economy in the context of sustainable development and poverty eradication should be guided by and in accordance with all the Rio Principles, Agenda 21 and the Johannesburg Plan of Implementation and contribute towards achieving relevant internationally agreed development goals, including the Millennium Development Goals." Many international organizations built their concept using SDG indicators, with the aim of targeting to achieve the same goals and enhancing comparability among the measures. The comparative assessment identified the linkages of the indicators to the SDGs and other green growth-related international agreements, such as the Aichi targets for biodiversity, the Paris Agreement for climate action, and the Sendai framework for disaster reduction.

Design processes:

The design processes focus on steps undertaken to develop and apply the framework, such as in the form of an index and/or dashboards, and the range of institutions included in the development process. There are two general processes for designing green growth conceptual frameworks: based on the fit-for-purpose principle and on stakeholder consultations. The OECD and JRC Handbook (2008) suggests the adoption of a fit-for-purpose principle when selecting indicators that aim to target end users' needs. Because it entails a process that is entirely internal to organizations, developing the framework depends on a strong theoretical foundation, a well-defined narrative, and a scientifically driven set of indicators. UNEP proposes the involvement of a broad set of stakeholders to support the design and implementation of a coherent and inclusive green economy strategy (UNEP, 2014b). This is particularly relevant for conceptual frameworks that use cross-sectoral indicators and are based on policy-driven sets of indicators. The comparative assessment identified the process that was ultimately followed in developing the frameworks for green growth indices.

The criteria for selecting green growth frameworks for the above-mentioned comparative assessments are related to their practical application, such as being global in scope, developed/updated recently, and composite indices and dashboards (Galotto & Acosta, 2019). Only four of them met the criteria: ADB's Inclusive Green Growth Index (Jha et al., 2018), AfDB's African Green Growth Index (AfDB, 2014), UNEP's Green Economy Progress Index (PAGE, 2017a, 2017b), and DC's Global Green Economy Index (Tamanini, Bassi, Hoffman, & Valenciano, 2014).

8.1.1 Overlaps in and diversities on concepts

The green growth frameworks of ADB, AfDB, UNEP, and DC were considered for the comparative assessments with the Green Growth Index. ADB's concept was designed to develop a regional green growth index and measure green growth performance of developing countries in the Asia-Pacific region, but it can be applied to all countries and regional settings and for all levels of development. AfDB's concept of green growth was piloted to support its 2013-2022 strategy, which focuses on inclusive growth and the transition to green growth across Africa. DC's concept of green economy was also applied in a global index that is updated every two years. UNEP's concept was also developed to measure green economy progress at the global level, using both an index and a dashboard of sustainability indicators. Finally, the OECD concept of green growth was designed only using dashboards and without a composite index.

Conceptual framework

The indicators in the frameworks of ADB and UNEP are mainly grouped according to a three-pillar structure representing economic development, environmental sustainability, and social inclusion. In addition to the three pillars of sustainability, the frameworks of GGGI and AfDB include indicators related to institutions. DC's framework has indicators for the environment, the economy, and institutions, but none address social considerations.

GGGI's framework is structured into four dimensions, where two out of four represent the environmental pillar, namely efficient and sustainable resource use and natural capital protection. These two separate dimensions on the environment emphasize the different pathways to achieve green growth — efficiency and protection, which require different policy strategies. The "green" aspects of growth are also reflected in the economic dimension, specifically green economic opportunities, with indicator categories referring to green investment, green trade, green employment, and green innovation. The green economic opportunities are expected to not only support resource efficiency and natural capital protection but also enhance social inclusion. The choice and structure of the indicators clearly reflect GGGI's definition of green growth as presented in Chapter 4.1 of this report. The GGGI framework has a total of 36 indicators that capture the multiple dimensions of green growth.

UNEP's Green Economy Progress Measurement framework includes 13 indicators that are linked to the three challenges given in its definition of green growth: "An Inclusive Green Economy is a pathway designed to address three main global challenges, namely: (a) persistent poverty; (b) overstepped planetary boundaries; and (c) inequitable sharing of growing prosperity" (PAGE, 2017b: p.3). The narrative proposed by UNEP suggests that progress achieved in the social, environmental, and economic indicators promotes the creation of a new generation of capital — natural, physical, human, and social, which will serve as input in the production of environment-friendly goods and services — through consumption, investment, trade, and public spending. The indicators are intended to capture the multidimensionality of green growth. Unlike GGGI's framework, however, the indicators are not grouped into dimensions or subcategories. Similar to GGGI's framework, the economic pillar of UNEP's also includes green indicators, such as green trade and environmental patents. Although many of UNEP's indicators are included in GGGI's framework, the concepts behind UNEP's framework are different: UNEP deals with progress, while GGGI deals with performance.

ADB's framework has a total of 28 indicators that are organized into three pillars: seven for environmental sustainability, 14 for social equity, and seven for economic growth. ADB's definition of green growth is more straightforward than the definitions GGGI and UNEP: The Inclusive Green Growth Indicator (IGGI) "was designed to measure progress on inclusive and environmentally sustainable growth at the national level" (Jha et al., 2018: p.20). The three pillars are assumed to be supportive of green growth independently as there are no defined interlinkages between them. There are few overlaps in the environmental and social indicators in the frameworks of GGGI and ADB, but none in terms of economic indicators. ADB's economic indicators are mainly related to overall economic growth. Thus, unlike those by GGGI and UNEP, the economic pillar in ADB's framework does not strongly emphasize "green" aspects of growth.

AfDB's framework includes five dimensions: socio-economic context and characteristics of growth; environmental and resource productivity; monitoring the natural asset base; gender; and governance. There are 48 indicators, which are grouped unequally among the dimensions, with socio-economic context and characteristics of growth having the largest number of indicators. Because economic and social considerations are integrated into one dimension, it was not intended to include "green" aspects of economic growth. The choice of the dimensions or structure of the indicators do not reflect AfDB's definition of green growth: "the promotion and maximization of opportunities from economic growth through building resilience, managing natural assets efficiently and sustainably, including enhancing agricultural productivity, and promoting sustainable infrastructure" (AfDB, 2014: p.1). AfDB's framework has a dimension related to institutions which focuses on governance issues that hinder green growth in Africa.

Finally, DC's framework is structured into four dimensions: leadership and climate change; efficiency sectors; market and investment; and environment. It has a structure that departs from the classic green growth narratives, in particular, by excluding social inclusion indicators. When DC first published its Global Green Economy Index in 2010, it did not explicitly offer a definition of green growth or any concept to inform about the choices of indicators. Only in its report in 2014, an explanation was provided on what guides the DC framework: "We first published the Global Green Economy Index in 2010 guided by a belief that the environment, climate change and green, low carbon growth would rapidly become defining issues for national policy makers and the global reputation of countries." (Tamanini et al., 2014: p.5). The latter part of this definition somehow reflects the indicators chosen for the dimension on leadership and climate change, for example, media coverage and climate change performance. Similar to the frameworks of GGGI and UNEP, the economic dimension of DC's framework considers the "green" aspects of economic growth.

Institutional framework

GGGI, UNEP, and ADB explicitly considered the links of their frameworks' indicators to the SDGs. AfDB and DC have not specifically linked their indicators to the SDGs.

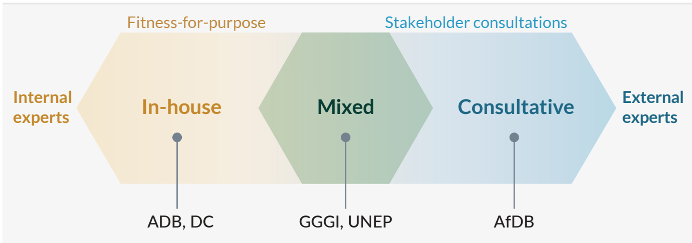
GGGI's index was designed to address the SDGs. Supporting the GGGI member governments to achieve the commitments expressed in their nationally determined contributions (NDCs) and SDGs is one of the main goals of the GGGI Refreshed Strategic Plan 2015-2020 (GGGI 2017). In the index structure, this intention is reflected in the choice of indicators, which cover 16 of the 17 SDGs. UNEP developed its measurement framework with the specific goal of monitoring the SDGs and supporting the measurement and implementation of the 2030 Sustainable Development Agenda. The 13 variables included in the UNEP's index cover 14 SDGs. Similarly, ADB considered measuring the SDGs as one of its foremost goals: "The [index] can track country performances on many SDGs. Most countries have calibrated their development priorities to SDG targets. … The IGGI can be used to track country performances on many SDGs at the national level." (Jha et al., 2018: p.xii). ADB's 28 indicators, however, only cover 12 of the 17 SDGs.

Finally, GGGI and UNEP are using scientific evidence to support the narrative of their institutional frameworks, referring to internationally recognized sources to define the thresholds or targets for the indicators. Unlike the other indices considered in the comparative assessments, the indices of GGGI and UNEP measure not only country performance toward the intended direction of growth but also the indicators' distance from a target, for instance, the SDGs. This gives both the Green Growth Index and the GEP Index the opportunity to increase their policy relevance by including the SDGs or other preferred frameworks at the country level explicitly within their methodologies. While GGGI applied a simple benchmarking normalization method, UNEP used a complex method that weights the indicators differently according to the initial distance from the critical threshold (PAGE, 2017b).

8.1.2 Design processes

The design processes used by the international organizations in building green growth concepts and their application are relatively diverse, with ADB and DC using in-house processes, AfDB using consultative processes, and GGGI and UNEP using a combination of processes (Figure 28).

Figure 28 Design process used by international organizations



Although both GGGI and UNEP adopted a mixed process, the former placed greater emphasis on the consultative process and the latter on the definition of the principles of green economy. As mentioned in the introduction of this paper, GGGI followed two complementary strategies to enhance policy relevance of the Green Growth Index: a stepwise scientific approach and a consultative process with experts. GGGI's index is a result of a long consultation process that started in the development of a pilot version in 2016. The consultation process aimed to validate the choice of indicators, which were initially identified from a systematic literature review of green growth-related theories and case studies. In particular, the involvement of external experts in designing GGGI's green growth framework was significantly expanded in 2018 and 2019, with the participation of more than 300 experts from international organizations as well as government agencies, non-government organizations, and academic institutes. Moreover, by forming an international expert group for the Green Growth Index, GGGI made collaboration with other international organizations with expertise in developing green growth concepts as an integral part of its design process. These international organizations include UNEP, OECD, the World Bank (WB), the International Labour Organization (ILO), the United Nations Industrial Development Organization (UNIDO), the United Nations Development Programme (UNDP), the United Nations Conference on Trade and Development (UNCTAD), the Food and Agriculture Organization of the United Nations (FAO), and the International Fund for Agricultural Development (IFAD).

In a different yet comparable way to that of GGGI, UNEP's framework and its applications followed an intense theoretical and methodological effort from experts within UNEP and from academia which resulted in a relatively complex index design. The selection of indicators and methods for aggregation are based on analytical assumptions. Before finalizing the index, however, UNEP did conduct some consultations. The report itself is published as part of the U.N. Partnership for Action on Green Economy (PAGE), a joint initiative by UNEP, ILO, UNDP, UNIDO, and the United Nations Institute for Training and Research. Moreover, a wide group of experts, including representatives from the GGKP Metrics and Indicators Working Group, the Organization for Economic Co-operation and Development, and other non-governmental organizations, were invited to propose comments and suggestions during two workshops. Those were taken into account and, where appropriate, translated into structural modification and addition of indicators (PAGE, 2017a, 2017b).

AfDB followed a consultative process as shown in the publication of the pilot version of its index. "Although simplicity is a key attribute in the development of green growth indicators, it must also be able to capture the imagination of users/stakeholders, in this case the African governments, development agencies (including banks), industry, labour and many others" (Kararach et al., 2018: p.433). AfDB's choice of indicators and weights for the indicators were very much dependent on the suggestions of a group of qualified experts and panelists (AfDB, 2015). The weights were also intended to be further refined through consultations with various stakeholders "to capture the diverse context and priorities among member states" (Kararach et al., 2018).

ADB's index followed an in-house process, where indicators were chosen by internal expert economists. The methods were very rigorous and constructed based on a well-defined narrative. The

ADB report states clearly the principle followed for each step of the design process (Jha et al., 2018). The included variables were selected according to policy relevance, data availability, country coverage, and access to data. Equal weighting was chosen for its simplicity, transparency, and broad acceptance. More importantly, each procedural step was supported by a careful reporting of the scientific literature used to select the indicators.

Similar to ADB's index, the DC index has followed an entirely in-house process. A group of internal experts built the version proposed in the first edition which was then regularly revised by adding new indicators without involving external experts. But unlike ADB, DC does not provide a detailed description on the background of its methods, which may imply the use of expert judgement without scientific support from the literature.

8.2 Correlation of indices

Table 12 presents the results of the correlation analysis of the Green Growth Index and other green growth indices, namely ADB's Inclusive Green Growth Index, AfDB's African Green Growth Index, UNEP's Green Economy Progress Index, and DC's Global Green Economy Index. Three correlation statistics were employed to increase the robustness of the results and offer a wider interpretation. The Pearson's correlation coefficients measure the degree of similarity between the scores, while the Kendall's tau and Spearman's rho are rank correlation coefficients, which measure association on the order of the country rankings.

The results reveal statistically significant and positive correlation of the Green Growth Index with the indices of DC and AfDB, and no significant correlation with those of UNEP and ADB. The level of correlation is slightly higher with AfDB's as compared to the DC's index. A possible reason for the correlation between GGGI's Green Growth Index and AfDB's African Green Growth Index is the wider range of indicators in the AfDB index, which encompasses indicators correlated to indicators included in the Green Growth Index. This induces a higher possibility of partial alignment between the indices of AfDB and GGI. The correlation between the Green Growth Index and DC's Global Green Economy Index could be attributed to the similarity in indicators for some green growth dimensions, particularly for natural capital and green markets and investments.

Table 12 Correlation of Green Growth Index to other related indices

International Organizations	Coverage	Number of countries	Correlation Coefficients		
			Pearson	Kendall's tau_b	Spearman's rho
UNEP	Global	95	0.138	0.048	0.094
			(0.20)	(0.52)	(0.38)
DC	Global	77	0.513**	0.327**	0.459**
			(0.00)	(0.00)	(0.00)
AfDB	Africa	17	0.656*	0.644**	0.818**
			(0.04)	(0.01)	(0.01)
ADB	Asia-Pacific	22	0.484*	0.127	0.226
			(0.03)	(0.44)	(0.22)

*Notes: Values in parentheses are level of significance where ** correlation is significant at the 0.01 level (2-tailed) and * correlation is significant at the 0.05 level (2-tailed).*

ADB's Inclusive Green Growth Index has a different focus than that of GGGI's Green Growth Index, hence the lack of or low correlation between the two. ADB's index does not take into account green growth and only takes into account global economic growth, contrasting with GGGI's Green Growth Index. Finally, the lack of significant correlation with the values and ranking of UNEP's Green Economy Progress Index is not surprising given some of the methodological differences between both frameworks. In fact, while the Global Green Growth Index measures the countries' current performance in green growth — as it is for the DC, AfDB, and ADB indices — the UNEP Index calculates them in in terms of 10-year changes, capturing progress toward achieving a greener economy. In addition, it is important to consider that the low correlation could also be due to the differences in indicators across indices, although both frameworks have some common indicators.

GGGI

09 Forthcoming applications

9.1 GGGI's Achieving Global Green Transformation Report

Through its forthcoming report, Achieving Global Green Transformation, GGGI plans to share practical examples of successful approaches to green growth across the GGGI value chain and in multiple thematic areas. The report will also serve as the main vehicle for publishing and promoting the results of GGGI's global Green Growth Index and country-level analysis for priority areas, which GGGI conducted to assists countries in policy and investment decision-making. It will provide a high-level platform for explaining, promoting, and, ultimately, advancing the model of green growth, and that is built on a foundation of practical experience and robust, data-driven, and evidence-based analysis.

Through both print and web-based content, the report will illustrate the current state of green growth adoption and progress within GGGI's partner countries on an annual basis. In contrast to the Green Growth Index tool, which requires guidance and interaction, the report will use narrative text, maps, infographics, and other illustrative designs to cater to a broad audience. This approach will lend itself to communicating the impact of GGGI's programmatic interventions to its current and potential donors and to partner governments through persuasive messaging and logical impact pathway narratives.

9.2 AfDB's African Green Growth Index

Building on the pilot version of the African Green Growth Index developed in 2015, AfDB and GGGI are collaborating to develop the second phase of the African Green Growth Index by applying GGGI's conceptual framework for green growth. The GGGI-AfDB collaborative project on the African Green Growth Index aim to apply GGGI's conceptual and methodological frameworks for green growth (Figure 7) to the African context and encourage the use of the index to measure green growth performance across the region. Specifically, the collaborative project seeks to:

- Conduct a scoping study to identify the most important green growth issues in the region and determine the extent to which green growth indicators capture these issues.
- Collect data that are not available online and identify sustainability targets for benchmarking green growth in the region.
- Further develop the Green Growth Index using updated datasets and targets, and conduct subregional consultation workshops to collect feedback on the index.
- Assess feedback from African subregional workshops and use assessment results to revise and finalize the African Green Growth Index.

The scoping study will aim to answer these questions: Which green growth issues are specific to the African region? Are these issues well represented in GGGI's green growth framework? If not, which indicators are missing in the framework that are very relevant to the African context?

The objectives of the GGGI-AfDB collaborative project can be further supported by conducting consultations to collect from relevant government agencies data that are not available online and enhance awareness and acceptability on the African Green Growth Index, such as through a launch event. The project started in 2019 and will be completed in 2020.

9.3 A complement to UNEP's GEP Index

UNEP's Green Economy Progress (GEP) Index aims to inspire policy change and inform policymaking. The methodology is designed for global comparison but takes into account that policies are implemented at the national level and consider the local context. Also, weights are targets that are specifically tailored to individual country contexts. The selection criteria consider mapping with the inclusive green economy narrative, data coverage, transparency and comparability, and linkages with SDGs. Progress is measured as change that happened relative to change that one envisioned would happen.

GGGI and UNEP identified interesting complementarities arising between the Green Growth Index and the GEP Index despite their different foci: The GEP Index focuses more on progress, while the Green Growth Index focuses more on performance. The progress index works with weighting related to working toward specific thresholds, using international standards and conventions within a relative peer group. The Green Growth Index also uses standards and conventions as targets for its benchmarking approach; in some particular cases, it even uses the same standards. Some of the indicators in the Green Growth Index and GEP Index are the same, but because progress in the GEP Index is based on narratives on future green growth pathways, it does not duplicate the performance measurement of the Green Growth Index, which is based on the baseline or the current year and past trends.

In view of the complementarities, GGGI and UNEP have identified two important opportunities for collaboration. First, GGGI and UNEP will continue to collaborate to enhance the complementarity of the Green Growth Index and Green Economy Progress Index, particularly in terms of the indicators. Second, GGGI and UNEP propose to jointly prepare and publish a report discussing the differences and complementarities between the two frameworks, while doing an application of the Green Growth Index and GEP Index for a common selected group of indicators, focusing on one or two countries with the support from the GGKP Metrics and Indicators Working Group. These case studies take place at the end of 2019.

9.4 Proposed GGGI Green Growth Simulation Tool

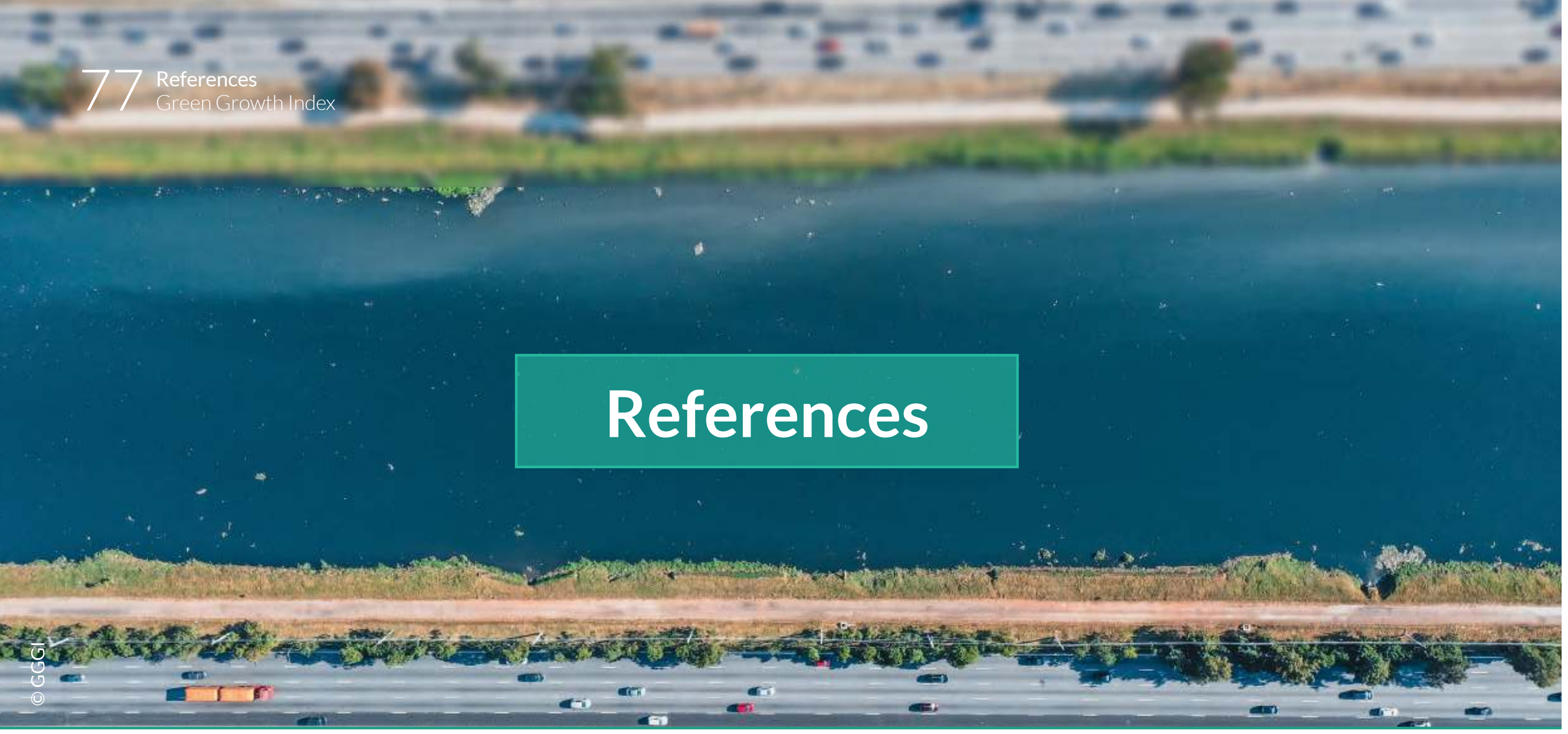
GGGI is developing both the Green Growth Index and Simulation Tool to support an integrated assessment of green growth policies and their impacts on green growth performance. The index measures country-level performance based on a common set of metrics in five green growth dimensions. The Simulation Tool allows users to enhance their knowledge on how different policy options not only within these dimensions but also across sectors influence a country's green growth performance. The validity of the underlying models and assumptions of the Simulation Tool depend on the policy relevance of indicators that frame the Green Growth Index.

This Simulation Tool not only enhances users' understanding of green growth but also allows for an interactive learning experience. Users can manipulate input indicators, experiment with different policy choices, and simulate the impacts of their choices on green growth performance through their projected effects on output indicators. This user interactivity not only improves the tool but also adds sensitivity checks to its methodology because user inputs can reflect country or sectoral priorities and strategies.

Studies on green growth recognize the importance to account for country context when considering a country's green growth potential. Although historic performance and policy decisions are important, other contextual factors, such as geography and climate, can also have a major bearing on future trends. By incorporating different types of indicators, the Green Growth Performance Measurement framework can reflect a contextualized view of green growth performance when modelling the results and ranking of each country. In addition, the approach is expected to allow users to better understand the underlying factors that affect performance, especially at a sectoral level, thus providing users with better knowledge of green growth and the links between policies and performance. The alignment of the pilot version of the Simulation Tool to the Green Growth Index and its application to the context of GGGI member and partner countries is proposed to begin in 2020.

9.5 National and subnational green growth indices

During the in-country and regional consultation workshops, several GGGI member countries expressed their interest to apply the frameworks of the Green Growth Index and its performance measurement framework at national and subnational levels. The goal is to build on the indicators of the main index, identify new and alternate indicators and targets that are useful for national planning and policymaking, and apply GGGI's consultative process of developing the Index. GGGI seeks to support such initiatives at the request of member countries.



References

Acosta, L. A. (2019). Metadata: Green Growth Index Concept, Methods and Applications. Green Growth Performance Measurement (GGPM) Program, Global Green Growth Institute, Seoul, Republic of Korea. [Contributors: C.K. Gregorio, E. Eugenio, H. Peyriere, and J. Sales]

Acosta, L. A., Mamiit, R. J., Ho, C., Gunderson, I., Anastasia, O., Angawi, M., … Shrestha, C. (2019). Assessment of feedback from regional expert consultations on the Green Growth Index (Phase 2). In Technical Report. Seoul, South Korea.

Adger, W. Neil, Hughes, T. P., Folke, C., Carpenter, S. R., & Rockström, J. (2005). Social-ecological resilience to coastal disasters. Science, 309, 1036–1039. https://doi.org/10.1126/science.1112122

Adger, W.N. (2000). Social and ecological resilience: Are they related? Progress in Human Geography, 24(3), 347–364. https://doi.org/10.1191/030913200701540465

AfDB. (2014). Transitioning towards Green Growth: A Framework for the African Development Bank. In Report. Retrieved from http://www.greengrowthknowledge.org/resource/transitioning-towards-green-growth-framework-african-development-bank

AfDB. (2015). Greening the African Economy: Towards a Green Growth Index for African Countries. In Unpublished Draft Report, Statistics Department (ESTA). Abidjan, Côte d'Ivoire.

AfDB. (2018). North Africa Economic Outlook 2018. Retrieved from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2018AEO/African-Economic-Outlook-2018-North-Africa.pdf

Afonso, H., LaFleur, M., & Alarcón, D. (2015). Inequality Measurement (pp. 1–2). pp. 1–2. https://doi.org/10.1016/B978-0-08-097086-8.44078-X

Dominican Today. (2019). The Dominican Republic only dedicates 0.03% of its GDP to innovation. Retrieved from Dominican Today website: https://dominicantoday.com/dr/business-pleasure/2019/04/18/the-dominican-republic-only-dedicates-0-03-of-its-gdp-to-innovation/

Alexander, K. (2015). Inclusive Growth: Topic Guide (pp. 1–27). pp. 1–27. Retrieved from http://www.gsdrc.org/docs/open/inclusivegrowth.pdf

Allwood, J. M., Ashby, M. F., Gutowski, T. G., & Worrell, E. (2011). Material efficiency: A white paper. Resources, Conservation and Recycling, 55, 362–381. https://doi.org/10.1016/j.resconrec.2010.11.002

Americas Quarterly. (2016). The Americas Quarterly Social Inclusion Index. Americas Quarterly: Politics, Business & Culture in Our Hemisphere, 10(4), 1–15. Retrieved from https://www.as-coa.org/sites/default/files/AQSIindex_Sept2016.pdf

Auzins, A., Geipele, S., & Geipele, I. (2014). New Indicator System for Evaluation of Land Use Efficiency. Proceedings of the 2014 International Conference on Industrial Engineering and Operations Management, January 7-9, 2285–2293. Retrieved from https://pdfs.semanticscholar.org/697a/24716e8bd69e2cb7e924179e02f59d2865ce.pdf

Bach, C., Bouchon, S., Fekete, A., Birkmann, J., Duchemin, E., Barroca, B., & Serre, D. (2013). Adding value to critical infrastructure research and disaster risk management: the resilience concept. 6(1), 1–12. Retrieved from http://sapiens.revues.org/1626

Baker, P. (2019). Assessing Botswana's Trade Performance. In International Economics: Strategic Analysis for Growth & Development. Retrieved from https://www.tradeeconomics.com/wp-content/uploads/2019/07/Assessing-Botswanas-Trade-Performance-min.pdf

Barton, D. N. (2013). Payments for Ecosystem Services: Costa Rica's recipe. Retrieved from International Institute for Environment and Development (IIED) website: https://www.iied.org/payments-for-ecosystem-services-costa-rica-s-recipe

Baruah, B. (2018). How to promote gender equity in the green economy. Behavioural Sciences, 1–4. Retrieved from https://researchoutreach.org/articles/gender-equity-green-economy/?cn-reloaded=1

Bass, S., Steele, P., Toulmin, C., Greenfield, O., Hopkins, C., Chung, I., & Neilsen, T. (2016). Pro-poor, Inclusive Green Growth: Experience and a New Agenda. Global Green Growth Institute. Retrieved from https://pubs.iied.org/pdfs/G04050.pdf

Benetatos, T. S. (2008). Benchmarking Sustainability: The Use of Indicators (pp. 1–7). pp. 1–7. Retrieved from http://faculty.wwu.edu/~zaferan/Ithaca Curriculum/agriculture/3.4 Benchmarking Sustainability.pdf

Birkmann, J. (2006). Measuring vulnerability to promote disaster-resilient societies: Conceptual frameworks and definitions. Measuring Vulnerability to Natural Hazards; Towards Disaster Resilient Societies, pp. 9–54. https://doi.org/10.1111/j.1539-6975.2010.01389.x

BloombergNEF. (2019). Clean Energy Investment Exceeded $300 Billion Once Again in 2018. Retrieved October 9, 2019, from Bloomberg New Energy Finance (BloombergNEF) website: https://about.bnef.com/blog/clean-energy-investment-exceeded-300-billion-2018/

Böhringer, C., & Jochem, P. E. P. (2006). Measuring the immeasurable - A survey of sustainability indexes. In Discussion Paper 06-073. https://doi.org/10.1016/j.ecolecon.2007.03.008

Bolboaca, S. D., & Jäntschi, L. (2006). Pearson versus Spearman, Kendall's tau correlation analysis on structure-activity relationships of biologic active compounds. Leonardo Journal of Sciences, (9), 179–200. Retrieved from https://www.researchgate.net/publication/26449176%0APearson

Bonoli, G., & Natali, D. (2012). The Politics of the New Welfare States: Analysing Reforms in Western Europe. Oxford: Oxford University Press. Retrieved from https://global.oup.com/academic/product/the-politics-of-the-new-welfare-state-9780199645251?cc=kr&lang=en&

Bouma, J., & Berkhout, E. (2015). Inclusive Green Growth. A reflection on the meaning and implications for the policy agenda of the Dutch Directorate-General of Foreign Trade and Development Cooperation. In Technical Report. https://doi.org/10.1596/978-0-8213-9551-6

Bowen, A., & Fankhauser, S. (2011). The green growth narrative: Paradigm shift or just spin? Global Environmental Change, 21(4), 1157–1159. https://doi.org/10.1016/j.gloenvcha.2011.07.007

Bowen, A., & Kuralbayeva, K. (2015). Looking for green jobs: the impact of green growth on employment. Retrieved from http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/03/Looking-for-green-jobs_the-impact-of-green-growth-on-employment.pdf

Bringezu, S. (2015). Possible target corridor for sustainable use of global material resources. Resources, 4(1), 25–54. https://doi.org/10.3390/resources4010025

Bringezu, S., Schütz, H., Steger, S., & Baudisch, J. (2004). International comparison of resource use and its relation to economic growth: The development of total material requirement, direct material inputs and hidden flows and the structure of TMR. Ecological Economics, 51(1–2), 97–124. https://doi.org/10.1016/j.ecolecon.2004.04.010

Burch, D., & McInroy, N. (2018). We need an Inclusive Economy not Inclusive Growth (pp. 1–10). pp. 1–10. Retrieved from https://cles.org.uk/publications/we-need-an-inclusive-economy-not-inclusive-growth/

Burke, J. (2019). Botswana condemned for lifting ban on hunting elephants. Retrieved September 7, 2019, from The Guardian website: https://www.theguardian.com/world/2019/may/23/botswana-lifts-ban-on-hunting-elephants

CCAC. (2018). World Health Organization releases new global air pollution data. Retrieved September 10, 2019, from Climate Clean Air & Coalition website: https://ccacoalition.org/en/news/world-health-organization-releases-new-global-air-pollution-data

CCICED. (2009). China's Pathway Towards a Low Carbon Economy. In Policy Research Report. Retrieved from http://www.cciced.net/ccicedPhoneEN/Events/AGMeeting/2009_3973/meetingplace_3974/201609/P020160922381047979521.pdf

Chao, Y. S., & Wu, C. J. (2017). Principal component-based weighted indices and a framework to evaluate indices: Results from the Medical Expenditure Panel Survey 1996 to 2011. PLoS ONE, 20p. https://doi.org/10.1371/journal.pone.0183997

Chok, N. S. (2008). Pearson's versus Spearman's and Kendall's Correlation coefficients for continuous data (University of Pittsburgh). Retrieved from http://d-scholarship.pitt.edu/8056/

Chowdhury, A., & Sundaram, J. K. (2016). Stop worrying about 'Doing Business' ranking (p. 2p). p. 2p. Retrieved from http://www.ipsnews.net/2016/12/stop-worrying-about-doing-business-ranking

Christian W. (2018). Danish household water consumption hits an all-time low. Retrieved from The Copenhagen Post website: cphpost.dk/news/danish-household-water-consumption-hits-an-all-time-low.html

Cleland, E. E. (2011). Biodiversity and ecosystem stability. Nature Education Knowledge, 03(10), 14. https://doi.org/10.17520/biods.1995006

Clench-Aas, J., & Holte, A. (2018). Measures that increase social equality are effective in improving life satisfaction in times of economic crisis. BMC Public Health, 18, 1–11. https://doi.org/10.1186/s12889-018-6076-3

Costanza, R. (1992). Toward an Operational Definition of Ecosystem Health. In Science and Policy (pp. 240–256). Retrieved from http://www.robertcostanza.com/wp-content/uploads/2017/02/1992_C_Costanza_EcosystemHealth.pdf

Costanza, R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., … Grasso, M. (2017). Twenty years of ecosystem services: How far have we come and how far do we still need to go? Ecosystem Services, 28, 1–16. https://doi.org/10.1016/j.ecoser.2017.09.008

Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., … Turner, R. K. (2014). Changes in the global value of ecosystem services. Global Environmental Change, 26(1), 152–158. https://doi.org/10.1016/j.gloenvcha.2014.04.002

DANVA. (2017). Danes' Water Consumption the Lowest Ever Recorded. Retrieved September 7, 2019, from State of Green website: https://stateofgreen.com/en/partners/state-of-green/news/danes-water-consumption-the-lowest-ever-recorded/

de Bruijn, K., Buurman, J., Mens, M., Dahm, R., & Klijn, F. (2017). Resilience in practice: Five principles to enable societies to cope with extreme weather events. Environmental Science and Policy, 70, 21–30. https://doi.org/10.1016/j.envsci.2017.02.001

Dedeke, N. (2013). Estimating the Weights of a Composite Index Using AHP: Case of the Environmental Performance Index. British Journal of Arts and Social Sciences, 11(2), 199–221. Retrieved from http://www.bjournal.co.uk/BJASS.aspx%0AEstimating

DEFRA. (2003). Our energy future - creating a low carbon economy. In Energy White Paper. Retrieved from http://webarchive.nationalarchives.gov.uk/+/http:/www.berr.gov.uk/files/file10719.pdf

Dernis, H., & Guellec, D. (2001). Using Patent Counts for Cross-Country of Technology Output. OECD. Retrieved from https://www.oecd.org/sti/inno/21682515.pdf

Dinda, S. (2011). Inclusive Growth Through Creation of Human and Social Capital. In Munich Personal RePEc Archive. https://doi.org/10.1227/01.NEU.0000349921.14519.2A

Dudley, N., Boucher, J. L., Cuttlelod, A., Brooks, T. M., & Langhammer, P. F. (2014). Applicaitons of Key Biodiversity Areas: End-user consultations. Retrieved from https://portals.iucn.org/library/sites/library/files/documents/2014-051.pdf

Dutz, M. A., Kessides, I., O'Connell, S., & Willig, R. D. (2011). Competition and innovation-driven inclusive growth (No. Policy Research Working Paper 5852). Retrieved from https://www.semanticscholar.org/paper/Competition-and-Innovation-Driven-Inclusive-Growth-Dutz-Kessides/d7d7dcc7729a0d9881b1bb7355bdd0144c8afe85

Earth Day Network. (2018). Fact Sheet: Global Species Decline. Retrieved October 9, 2019, from https://www.earthday.org/2018/05/18/fact-sheet-global-species-decline/

ECN. (2013). Resource Efficiency : What does it mean and why is it relevant ? Policy brief. In Policy Brief.

EEA. (2015). The European environment - state and outlook 2015: Protecting, Conserving and Enhancing Natural Capital. Retrieved from https://www.eea.europa.eu/soer-2015/synthesis/report/3-naturalcapital

EEA. (2016). Why is resource efficiency important. In Resource efficiency and waste. Copenhagen, Denmark.

EEA. (2017). Glossary: List of environmental terms used by EEA. Retrieved from https://www.eea.europa.eu/help/glossary#c4=10&c0=all&b_start=10&c2=environmental+quality

EFFECT. (2013). Low Carbon Economy Policy and Project Review: Background Paper I. In EFFECT – Dialogue Platform on Energy and Resource Efficiency in the Baltic Sea Region. Retrieved from http://www.cbss.org/wp-content/uploads/2015/06/EFFECT_Low_Carbon_Economy.-background-paper-1.pdf

ESCWA. (2015). Inclusive social development. In Regional Conference on Social Development in Latin America and the Caribbean. Retrieved from https://socialprotection-humanrights.org/wp-content/uploads/2015/07/Inclusive-Social-Development-2015-ESCWA.pdf

Euro Cities. (2015). Green jobs for social inclusion. Retrieved from https://citiesatwork.eu/images/green_jobs_for_social_inclusion_FINAL.pdf

European Commission. (2011). Analysis associated with the Roadmap to a Resource Efficient Europe. Retrieved from https://ec.europa.eu/environment/resource_efficiency/pdf/working_paper_part1.pdf

European Commission. (2019a). Eco-Innovation at the heart of European policies: Malta. Retrieved October 1, 2019, from European Commission website: https://ec.europa.eu/environment/ecoap/malta_en

European Commission. (2019b). Green and circular economy. Retrieved September 9, 2019, from Environment website: https://ec.europa.eu/environment/green-growth/index_en.htm

European Parliament. (2019). Plurilateral Environmental Goods Agreement (EGA). Retrieved from http://www.europarl.europa.eu/legislative-train/api/stages/report/current/theme/a-balanced-and-progressive-trade-policy-to-harness-globalisation/file/environmental-goods-agreement-(ega)

Eurostat. (n.d.). Why is co-operation with International organizations so important. Retrieved from https://ec.europa.eu/eurostat/web/international-statistical-cooperation/international-organisations

Eyraud, L., Zhang, C., Wane, A. A., & Clements, B. J. (2011). Who's Going Green and Why? Trends and Determinants of Green Investment. IMF Working Papers, 11(296), 39p. https://doi.org/10.5089/9781463927301.001

FAO. (2017). Step-By-Step Monitoring Methodology for Indicator 6.4.2. Retrieved from http://www.fao.org/elearning/Sites/ELC/SampleLessons/en/SDG642/story_content/external_files/Step-by-step Methodology for indicator 6 4 2 V20170719.pdf

FAO. (2018). The State of World Fisheries and Aquaculture: Meeting the sustainable development goals. In Nature and Resources. Retrieved from http://www.fao.org/3/i9540en/i9540en.pdf%0AThis

Flachenecker, F., & Rentschler, J. (2018). Investing in Resource Efficiency: The Economics and Politics of Financing the Resource Transition (F. Flachenecker & J. Rentschler, Eds.). https://doi.org/10.1007/978-3-319-78867-8

Flores, B. H., Acosta, L. A., Maharjan, P., & Peyriere, H. (2019). Green Growth Index: Robustness check of concept and methods. In Technical Report. Seoul, South Korea.

Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. Global Environmental Change, 16(3), 253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Foxon, T. J. (2010). A coevolutionary framework for analysing a transition to a sustainable low carbon economy (No. 22). https://doi.org/10.1016/j.ecolecon.2011.07.014

Freudenberg, M. (2003). Composite Indicators of Country Performance: A Critical Assessment. https://doi.org/10.1787/405566708255

Fu-Liu, X., & Shu, T. (2000). On the study of ecosystem health: State of the art. Journal of Environmental Sciences, Vol. 12, pp. 33–38. https://doi.org/10.1007/s11769-000-0054-1

Fullman, N., Yearwood, J., Abay, S. M., Abbafati, C., Abd-Allah, F., Abdela, J., … Lozano, R. (2018). Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories and selected subnational locations: A systematic analysis from the Global Burden of Disease Study 2016. Lancet, 391(10136), 2236–2271. https://doi.org/10.1016/S0140-6736(18)30994-2

Gaillard, J. C. (2007). Resilience of traditional societies in facing natural hazards. Disaster Prevention and Management: An International Journal, Vol. 16, pp. 522–544. https://doi.org/10.1108/09653560710817011

Galotto, L., & Acosta, L. A. (2019). GGGI's concept for the Green Growth Index: Comparative assessment of relevant global green growth indices. Seoul, South Korea.

Gambhir, A., Gree, F., & Pearson, P. J. G. (2018). Towards a just and equitable low-carbon energy transition (No. Briefing Paper No. 26). Retrieved from https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/26.-Towards-a-just-and-equitable-low-carbon-energy-transition.pdf

Gan, X., Fernandez, I. C., Guo, J., Wilson, M., Zhao, Y., Zhou, B., & Wu, J. (2017). When to use what: Methods for weighting and aggregating sustainability indicators. Ecological Indicators, 81, 491–502. https://doi.org/10.1016/j.ecolind.2017.05.068

Gao, Y., Tsai, S. B., Xue, X., Ren, T., Du, X., Chen, Q., & Wang, J. (2018). An empirical study on green innovation efficiency in the green institutional environment. Sustainability, 10(3), 1–13. https://doi.org/10.3390/su10030724

Gaudet, C. L., Wong, M. P., Brady, A., & Kent, R. (2008). How Are We Managing? The Transition from Environmental Quality to Ecosystem Health. Ecosystem Health, 3(1), 3–10. https://doi.org/https://doi.org/10.1111/j.1526-0992.1997.00702.pp.x

Gelman, A., & Hill, J. (2007). Chapter 25: Missing-data imputation in Data Analysis using Regression and Multilevel/Hierarchical Models (pp. 529–543). pp. 529–543. Retrieved from http://www.stat.columbia.edu/~gelman/arm/missing.pdf

George, G., Mcgahan, A. M., & Prabhu, J. (2012). Innovation for Inclusive Growth: Towards a Theoretical Framework and a Research Agenda. Journal of Management Studies, 49(4), 661–683. https://doi.org/10.1111/j.1467-6486.2012.01048.x

GGGI. (2017). Accelerating the Transition to a New Model of Growth: GGGI Refreshed Strategic Plan 2015 – 2020. Retrieved from https://www.gggi.org/

GGKP. (2013). Moving towards a Common Approach on Green Growth Indicators. Green Growth Knowledge Platform Scoping Paper. Retrieved from Global Green Growth Institute (GGGI), Organisation for Economic Co-operation and Development (OECD), United Nations Environment Programme (UNEP), and World Bank website: https://www.greengrowthknowledge.org/node/4620/

Giljum, S., & Polzin, C. (2009). Resource efficiency for sustainable growth: global trends and European policy scenarios. Retrieved from https://www.greengrowthknowledge.org/resource/resource-efficiency-sustainable-growth-global-trends-and-european-policy-scenarios

Goerild, S. K., Manish, H., Ji, A. Z., Yao, W., Nishant, Z. Q., & Jain. (2016). Low Carbon Development in China and India: Issues and Strategies. Retrieved from http://www.teriin.org/projects/locci/pdf/Book_China-India_LCD.pdf

Greco, S., Ishizaka, A., Tasiou, M., & Torrisi, G. (2018). On the Methodological Framework of Composite Indices: A Review of the Issues of Weighting, Aggregation, and Robustness. Social Indicators Research, 141(1), 61–94. https://doi.org/10.1007/s11205-017-1832-9

Green Jobs Initiative. (2008). Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World. In Report. https://doi.org/10.1016/B978-0-08-097086-8.94025-X

Green Jobs Initiative. (2012). Working Towards Sustainable Development: Opportunities for Decent Work and Social Inclusion in a Green Economy. Retrieved from International Labour Office (ILO) website: https://www.ilo.org/global/publications/books/WCMS_181836/lang--en/index.htm

Guerry, A. D., Polasky, S., Lubchenco, J., Chaplin-Kramer, R., Daily, G. C., Griffin, R., … Vira, B. (2015). Natural capital and ecosystem services informing decisions: From promise to practice. Proceedings of the National Academy of Sciences of the United States of America, 112(24), 7348–7355. https://doi.org/10.1073/pnas.1503751112

Gupta, J., & Vegelin, C. (2016). Sustainable development goals and inclusive development. International Environmental Agreements: Politics, Law and Economics, 16(3), 433–448. https://doi.org/10.1007/s10784-016-9323-z

GWP. (2013). The Lake Chad Basin Aquifer System. In Transboundary Groundwater Fact Sheet (Vol. 46). Retrieved from https://www.gwp.org/globalassets/global/toolbox/references/lake_chad_fact_sheet.pdf

Haan, A. de. (2015). Inclusive Growth: Beyond Safety Nets? European Journal of Development Research, 27(4), 606–622. https://doi.org/10.1057/ejdr.2015.47

Hatfield-Dodds, S., Schandl, H., Newth, D., Obersteiner, M., Cai, Y., Baynes, T., … Havlik, P. (2017). Assessing global resource use and greenhouse emissions to 2050, with ambitious resource efficiency and climate mitigation policies. Journal of Cleaner Production, 144, 403–414. https://doi.org/10.1016/j.jclepro.2016.12.170

He, Y. (2010). Missing Data Analysis using Multiple Imputation: Getting to the Heart of the Matter (Harvard Medical School, Boston, MA; Vol. 3). https://doi.org/10.1161/CIRCOUTCOMES.109.875658

Hearnshaw, E. J. S., Cullen, R., & Hughey, K. F. D. (2005). Ecosystem health demystified: an ecological concept determined by economic means. 1–30. Retrieved from http://researcharchive.lincoln.ac.nz/dspace/handle/10182/3728

Hoaglin, D. C., & Iglewicz, B. (1987). Fine-tuning some resistant rules for outlier labeling. Journal of the American Statistical Association, 82(400), 1147–1149. https://doi.org/10.1080/01621459.1987.10478551

Hong-jun, C., & Jin-feng, B. (2013). Weight determination method based on principal component analysis coking. Advanced Materials Research, 712–715, 2469–2473. https://doi.org/10.4028/www.scientific.net/AMR.712-715.2469

Horton, N. J., & Kleinman, K. P. (2007). Much ado about nothing: A comparison of missing data methods and software to fit incomplete data regression models. Communications International (London), 61(1), 1–24.

Hsu, A., Johnson, L. A., & Lloyd, A. (2013). Measuring Progress: A Practical Guide from the Developers of the Environmental Performance Index (EPI). Retrieved from https://issuu.com/yaleepi/docs/ycelp_measuring_progress_manual

Hudrliková, L. (2013). Composite Indicators as a useful tool for international comparison: The Europe 2020 Example. Prague Economic Papers, 4, 459–473. https://doi.org/10.18267/j.pep.462

Humpage, L. (2006). An "inclusive" society: a "leap forward" for M?ori in New Zealand? Critical Social Policy, 26(1), 220–242. https://doi.org/10.1177/0261018306059773

IEA. (2017). Energy Access Outlook 2017: Executive Summary. https://doi.org/10.1787/9789264285569-en

IEA, UNSD, & IRENA. (2019). Goal 7 ensure access to affordable energy (Metadata-07-02-01).pdf (pp. 1–5). pp. 1–5. Retrieved from https://unstats.un.org/sdgs/metadata/files/Metadata-07-02-01.pdf

Iglewicz, B., & Banerjee, S. (2001). A simple univariate outlier identification procedure. Proceedings of the Annual Meeting of the American Statistical Association, (August 5-9), 4p. https://doi.org/10.1080/03610910601161264

ILO. (2011). Anticipating skill needs for the low carbon economy? Difficult, but not impossible (pp. 1–8). pp. 1–8. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_168352.pdf

ILO. (2015). Two defining challenges for the twenty-first century. In Decent Work, Green Jobs and the Sustainable Economy (pp. 1–182). Retrieved from https://www.ilo.org/global/publications/books/WCMS_373209/lang--en/index.htm

IMF. (2017). Fostering Inclusive Growth. Hamburg, Germany.

IPBES. (2018). The regional assessment report on Biodiversity and Ecosystem Services for Asia and the Pacific. In Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Bonn, Germany.

IRENA. (2018). Uruguay power system flexibility assessment. Retrieved from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Nov/IRENA_FlexTool_Uruguay_2018.

IRENA. (2019). Renewable Energy and Jobs Annual Review 2019. https://doi.org/http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=585

IRENA, & C2E2. (2015). Synergies Between Renewable Energy and Energy Efficiency, A Working Paper Based on Remap 2030. Copenhagen, Denmark.

Jermalavi?ius, T., & Parmak, M. (2012). Towards a resilient society, or why Estonia does not need 'psychological defence'. International Centre for Defence Studies. Retrieved from http://eprints.hud.ac.uk/id/eprint/21718/

Jha, S., Sandhu, S. C., & Wachirapunyanont, R. (2018). Inclusive Green Growth Index: A new benchmark for quality of growth. https://doi.org/http://dx.doi.org/10.22617/TCS189570-2

Kang, H. (2013a). The prevention and handling of the missing data. Korean Journal of Anesthesiology, 64(5), 402–406. https://doi.org/10.4097/kjae.2013.64.5.402

Kang, H. (2013b). The prevention and handling of the missing data. Korean Journal of Anesthesiology, 64(5), 402–406. https://doi.org/10.4097/kjae.2013.64.5.402

Kararach, G., Nhamo, G., Mubila, M., Nhamo, S., Nhemachena, C., & Babu, S. (2018). Reflections on the Green Growth Index for developing countries: A focus of selected African countries. Development Policy Review, 36, O432–O454. https://doi.org/10.1111/dpr.12265

Kasztelan, A. (2017). Green growth, green economy and sustainable development: Terminological and relational discourse. Prague Economic Papers, 26(4), 487–499. https://doi.org/10.18267/j.pep.626

Keck, M., & Sakdapolrak, P. (2013). What is social resilience? lessons learned and ways forward. Erdkunde, 67(1), 5–19. https://doi.org/10.3112/erdkunde.2013.01.02

Kutscher, C. F., Milford, J. B., & Keith, F. (2018). Principles of Sustainable Engery Systems. Retrieved from https://www.crcpress.com/Principles-of-Sustainable-Energy-Systems-Third-Edition/Kutscher-Milford-Kreith/p/book/9781498788922

Lafortune, G., Fuller, G., Moreno, J., Schmidt-traub, G., & Kroll, C. (2018). SDG Index and dashboards: Detailed methodological paper. Retrieved from Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN) website: https://sdgindex.org/reports/sdg-index-and-dashboards-2018/

Leadley, P. W., Krug, C., Alkemade, R., Pereira, H. M., Sumaila, U. R., Walpole, M., … Mumby, P. J. (2014). Progress towards the aichi biodiversity targets: An assessment of biodiversity trends, policy scenarios and key actions. In Technical Report. Retrieved from http://www.cbd.int/doc/publications/cbd-ts-78-en.pdf

Ledger, E. (2017). How Botswana is shaping the future of sustainable travel. Retrieved September 7, 2019, from The Independent website: https://www.independent.co.uk/voices/campaigns/GiantsClub/Botswana/how-botswana-is-shaping-the-future-of-sustainable-travel-a8098731.html

Lee, N. (2019). Inclusive Growth in cities: a sympathetic critique. Regional Studies, 53(3), 424–434. https://doi.org/10.1080/00343404.2018.1476753

Lehr, U., Lutz, C., & Edler, D. (2012). Green jobs? Economic impacts of renewable energy in Germany. Energy Policy, 47, 358–364. https://doi.org/10.1016/j.enpol.2012.04.076

Lever, J., Krzywinski, M., & Altman, N. (2017). Points of Significance: Principal component analysis. Nature Methods, 14(7), 641–642. https://doi.org/10.1038/nmeth.4346

Lifset, R., & Eckelman, M. (2013). Material efficiency in a multi-material world. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 371, 1–30. https://doi.org/10.1098/rsta.2012.0002

Obradović, L. S. (2019). Environmental investments. In L. F. W., A. A., B. L., Ö. P., & W. T. (Eds.), Climate Action. Encyclopedia of the UN Sustainable Development Goals (pp. 1–12). https://doi.org/10.1007/978-3-319-71063-1

Lu, Y., Wang, R., Zhang, Y., Su, H., Wang, P., Jenkins, A., … Squire, G. (2015). Ecosystem health towards sustainability. Ecosystem Health and Sustainability, 1(1), 1–15. https://doi.org/10.1890/EHS14-0013.1

Mazziotta, M., & Pareto, A. (2013). Methods for constructing composite indicators: one for all or all for one? Rivista Italiana Di Economia Demografia e Statistica, 67(2), 67–80. Retrieved from http://www.sieds.it/listing/RePEc/journl/2013LXVII_N2_10_Mazziotta_Pareto.pdf

Miller, F., Osbahr, H., Boyd, E., Thomalla, F., Bharwani, S., Ziervogel, G., … Nelson, D. (2010). Resilience and vulnerability: Complementary or conflicting concepts? Ecology and Society, 15(3), 25p. https://doi.org/10.5751/ES-03378-150311

Milligan, B., Terama, E., Jimenez-Aybar, R., & Ekins, P. (2014). 2nd GLOBE Natural Capital Accounting Study. Retrieved from https://pdfs.semanticscholar.org/29ec/73e69094a3a22a4bae7d101b65cc751aeb56.pdf

Miola, A., Paccagnan, V., Papadimitriou, E., & Mandrici, A. (2015). Climate resilient development index: theoretical framework, selection criteria and fit-for-purpose indicators. In JRC Science and Policy Reports. https://doi.org/10.2788/07628

Miola, A., & Schiltz, F. (2019). Measuring sustainable development goals performance: How to monitor policy action in the 2030 Agenda implementation? Ecological Economics, 164, 1–10. https://doi.org/10.1016/j.ecolecon.2019.106373

Mishra, S. K. (2008). Construction of Composite Indices in Presence of Outliers. SSRN Electronic Journal, 1–5. https://doi.org/10.2139/ssrn.1137644

Moll de Alba, J. and Todorov, V. (2019 in press) Measurement of green industrial performance: an enhanced GIP index, Int. J. Environment and Sustainable Development.

Moll de Alba, J. and Todorov, V. (2018) Measuring green industrial performance: the GIP index, World Review of Science, Technology and Sustainable Development, Vol.14, No.2/3, pp.266–293 [online] https://doi.org/10.1504/WRSTSD.2018.093223

Munda, G., & Nardo, M. (2005). Constructing consistent composite indicators: the issue of weights. Institute for the Protection and Security of the Citizen, pp. 1–11. Retrieved from https://core.ac.uk/download/pdf/38619689.pdf

Nardo, M., & Saisana, M. (2008). OECD/JRC Handbook on constructing composite indicators. Putting theory into practice. Retrieved from https://www.semanticscholar.org/paper/OECD-%2F-JRC-Handbook-on-constructing-composite-.-Nardo-Saisana/33eb3485d310454e9874c3a05dabd3d4b33623b5

Nardo, M., Saisana, M., Saltelli, A., & Tarantola, S. (2005). Tools for Composite Indicators Building. European Commission. Retrieved from http://farmweb.jrc.cec.eu.int/ci/bibliography.htm

Narloch, U., Kozluk, T., & Lloyd, A. (2016). Measuring Inclusive Green Growth at the Country Level (No. working paper 02). Retrieved from http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Measuring_Inclusive_Green_Growth_at_the_Country_Level.pdf

Natural Capital Committee. (2014). Towards a Framework for Defining and Measuring Change in Natural Capital (No. Working Paper No. 1). Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/516946/ncc-working-paper-measuring-framework.pdf

Nelson, D., Hervé-Mignucci, M., Goggins, A., Szambelan, S. J., & Zuckerman, J. (2014). Moving to a Low-Carbon Economy: The Financial Impact of the Low-Carbon Transition. CPI Energy Transition Series, 1–16. Retrieved from https://climatepolicyinitiative.org/wp-content/uploads/2014/10/Moving-to-a-Low-Carbon-Economy-The-Financial-Impact-of-the-Low-Carbon-Transition.pdf

NIST-SEMATECH. (2013). e-Handbook of Statistical Methods. Retrieved from https://www.itl.nist.gov/div898/handbook/index.htm

NRTEE. (2012). Framing the future: embracing the low-carbon economy. Retrieved from http://nrt-trn.ca/wp-content/uploads/2012/10/framing-the-future-report-eng.pdf

OECD. (2011). Towards Green Growth: A summary for policy makers (pp. 1–24). pp. 1–24. https://doi.org/10.1787/9789264111318-en

OECD. (2017a). Employment Implications of Green Growth: Linking jobs, growth, and green policies. Retrieved from https://www.oecd.org/environment/Employment-Implications-of-Green-Growth-OECD-Report-G7-Environment-Ministers.pdf

OECD. (2017b). Measuring Distance to the SDG Targets 2017: An Assessment of Where OECD Countries Stand. https://doi.org/10.1787/e0f4d2ac-en

OECD. (2018). The Framework for Policy Action on Inclusive Growth. https://doi.org/10.1787/9789264064553-en

OECD. (2019a). Measuring distance to the SDG targets: Metadata. https://doi.org/10.1787/ffde6358-en

OECD. (2019b). Measuring Distance to the SDG Targets 2019: An Assessment of Where OECD Countries Stand. In Discussion Paper. https://doi.org/10.1787/a8caf3fa-en

OECD and JRC. (2008). Handbook on constructing composite indicators: methodology and user guide. Retrieved from http://www.oecd.org/std/42495745.pdf

OECD, & WB. (2006). Liberalisation and Universal Access to Basic Services: Telecommunications, Water and Sanitation, Financial Services, and Electricity. https://doi.org/https://doi.org/10.1787/9789264028685-en

Olivier, J., & Peters, J. (2018). Trends in global CO2 and total greenhouse gas emissions 2018 report. PBL 3125. Retrieved from www.pbl.nl/en.

Ostry, J. D., Berg, A., & Tsangarides, C. G. (2014). Redistribution, Inequality, and Growth (No. 14). Retrieved from https://www.imf.org/external/pubs/ft/sdn/2014/sdn1402.pdf

PAGE. (2017a). The Green Economy Progress Measurement Framework Application. Retrieved from https://www.un-page.org/files/public/green_economy_progress_measurement_framework_application.pdf

PAGE. (2017b). The Green Economy Progress Measurement Framework Methodology. Retrieved from https://www.un-page.org/files/public/gep_methodology.pdf

Pakkar, M. S. (2014). Using data envelopment analysis and analytic hierarchy process to construct composite indicators. Journal of Applied Operational Research, 6(3), 174–187.

Perera, S. (2015). Chapter 10 Primary Health Care Reforms in Sri Lanka: Aiming at Preserving Universal Access to Health. In A. Medcalf, S. Bhattacharya, H. Momen, & et al. (Eds.), Health For All: The Journey of Universal Health Coverage. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK316262/

Pestel, N. (2014). Employment effects of green energy policies. IZA World of Labor, 76, 1–10. https://doi.org/10.15185/izawol.76

Peyriere, H., & Acosta, L. A. (2019). Assessment of feedback from global expert consultations on the Green Growth Index (Phase 3). In Technical Report. Seoul, Korea.

Pinar, M., Cruciani, C., Giove, S., & Sostero, M. (2014). Constructing the FEEM sustainability index: A Choquet integral application. Ecological Indicators, 39, 189–202. https://doi.org/10.1016/j.ecolind.2013.12.012

Planton, S. (2013). IPCC, 2013: Annex III: Glossary. In S. Planton (Ed.), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 1447–1466). Retrieved from https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_AnnexIII_FINAL.pdf

Pollesch, N. L., & Dale, V. H. (2016). Normalization in sustainability assessment: Methods and implications. Ecological Economics, 130, 195–208. https://doi.org/10.1016/j.ecolecon.2016.06.018

Proaño, M. (2018). What's next for the energy transition in Uruguay? Retrieved from Energy Transition - The Global Energiewende website: https://energytransition.org/2018/11/whats-next-for-the-energy-transition-in-uruguay/

Ranieri, R., & Ramos, R. A. (2013a). After All, What is Inclusive Growth? In International Policy Centre for Inclusive Growth (IPC-IG).

Ranieri, R., & Ramos, R. A. (2013b). Inclusive growth: Building A Concept. Working Paper Number 104, pp. 1–22. International Policy Centre for Inclusive Growth (IPC-IG).

Rapport, Costanza, R., & McMichael, A. J. (1998). Assessing ecosystem health. Trends in Ecology and Evolution, 13(10), 397–402. https://doi.org/10.1016/S0169-5347(98)01449-9

Rapport, D.J., Bohm, G., Buckingham, D., Cairns, J., Costanza, R., Karr, J. R., … Whitford, W. G. (1999). Ecosystem Health: The concept, the ISEH, and the important tasks ahead. Ecosystem Health, 5(2), 82–90. https://doi.org/10.1046/j.1526-0992.1999.09913.x

Rapport, David J. (1995). Ecosystem services and management options as blanket indicators of ecosystem health. Journal of Aquatic Ecosystem Health, 4, 97–105. https://doi.org/10.1007/BF00044793

Rocha, S. M. da, Almassy, D., & Pinter, L. (2017). Social and cultural values and impacts of nature-based solutions and natural areas. Deliverable 1.3 Part IV. https://doi.org/10.1007/978-3-642-17396-7

Rodriguez, S. (2019). Despite drought, Costa Rica's electricity stays clean - but not cheap. Retrieved October 1, 2019, from Reuters website: https://www.reuters.com/article/us-costa-rica-electricity-drought-analys/despite-drought-costa-ricas-electricity-stays-clean-but-not-cheap-idUSKCN1TK1VZ

Sachs, J., Schmidt-traub, G., Kroll, C., Lafortune, G., & Fuller, G. (2018). Global Responsibilities: Implementing the goals. Bertelsmann Stiftung and Sustainable Development Solutions Network. https://doi.org/10.2307/j.ctv3znzm0.10

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., & Fuller, G. (2019). Sustainable Development Report 2019: Transformations to achieve the Sustainable Development Goals. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). Retrieved from https://www.sdgindex.org/

Saisana, M., Saltelli, A., & Tarantola, S. (2005). Uncertainty and sensitivity analysis techniques as tools for the quality assessment of composite indicators. Journal of the Royal Statistical Society. Series

A: Statistics in Society, 168(2), 307–323. https://doi.org/10.1111/j.1467-985X.2005.00350.x

Saisana, M., & Saltelli, A. (2011). Rankings and ratings: Instructions for use. Hague Journal on the Rule of Law, 3, 247–268. https://doi.org/10.1017/S1876404511200058

Saisana, M., & Tarantola, S. (2002). State-of-the-art report on current methodologies and practices for composite indicator development. European Commission, pp. 1–72. https://doi.org/10.13140/RG.2.1.1505.1762

Salwasser, H. (1995). Factors influencing the context and principles of ecosystem management. Ecosystems Management of Natural Resources in the Intermountain West, 5, 1–11. Retrieved from https://digitalcommons.usu.edu/nrei/vol5/iss1/2/

Santeramo, F. G. (2016). Methodological challenges in building composite indexes: Linking theory to practice. In Munich Personal RePEc Archive. https://doi.org/10.1227/01.NEU.0000349921.14519.2A

Sapountzaki, K. (2007). Social resilience to environmental risks: A mechanism of vulnerability transfer? Management of Environmental Quality: An International Journal, 18(3), 274–297. https://doi.org/10.1108/14777830710731743

Schiederig, T., Tietze, F., & Herstatt, C. (2011). What is Green Innovation - A quantitative literature review. In ECONSTOR (No. 63). Retrieved from https://www.econstor.eu/bitstream/10419/55449/1/684531526.pdf

Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation coefficients: Appropriate use and interpretation. Anesthesia and Analgesia, 126(5), 1763–1768. https://doi.org/10.1213/ANE.0000000000002864

Schwab, K. (2018). The Global Competitiveness Report 2018. In Report. https://doi.org/ISBN-13: 978-92-95044-73-9

SEforAll. (2017). Electrification - Just under one billion people lack access to electricity. Retrieved from https://www.seforall.org/data-stories/electrification

Seth, S., & McGillivray, M. (2018). Composite indices, alternative weights, and comparison robustness. Social Choice and Welfare, 51, 657–679. https://doi.org/10.1007/s00355-018-1132-6

Shao, Q., & Rao, L. (2018). The rebound effect of dematerialization and decoupling: a case of energy efficiency. Chinese Journal of Population Resources and Environment, 1–15. https://doi.org/10.1080/10042857.2018.1544755

Sioshansi, F. P. (2013). Energy Efficiency: Towards the End of Demand Growth. https://doi.org/10.1002/ente.201405004

Skrodzka, V. (2017). Organic agricultural products in Europe and USA. Management, 21(2), 151–164. https://doi.org/10.1515/manment-2017-0011

Small, N., Munday, M., & Durance, I. (2017). The challenge of valuing ecosystem services that have no material benefits. Global Environmental Change, 44, 57–67. https://doi.org/10.1016/j.gloenvcha.2017.03.005

Smith, B. (2015). New Zealand: Environmental Issues, Policies and Clean Technology. Retrieved October 1, 2019, from AZO Cleantech website: https://www.azocleantech.com/article.aspx?ArticleID=569

Smith, P. (2018). Managing the global land resource. Proceedings of the Royal Society B: Biological Sciences, 285, 1–9. https://doi.org/10.1098/rspb.2017.2798

State of Green. (2018). Green energy jobs are booming. Retrieved September 7, 2019, from State of Green website: https://stateofgreen.com/en/partners/state-of-green/news/green-energy-jobs-are-booming/

Suzuki, D. (2018). Reports emphasize urgent need to reverse biodiversity decline. Retrieved October 9, 2019, from Science Matters website: https://davidsuzuki.org/story/reports-emphasize-urgent-need-reverse-biodiversity-decline/

Symon, C. (2013). Climate Change: Action, Trends and implications for business - The IPCC's Fifth Assessment Report, Working Group 1. In European Climate Foundation, University of Cambridge's Judge Business School and Programme for Sustainability Leadership. Retrieved from https://europeanclimate.org/documents/IPCCWebGuide.pdf

Talukder, B., Hipel, K. W., & VanLoon, G. W. (2017). Developing composite indicators for agricultural sustainability assessment: Effect of normalization and aggregation techniques. Resources, 6(66), 1–27. https://doi.org/10.3390/resources6040066

Tamanini, J., Bassi, A., Hoffman, C., & Valenciano, J. (2014). The Global Green Economy Index: Measuring National Performance in the Green Economy 4th Edition. Retrieved from https://dualcitizeninc.com/GGEI-Report2014.pdf GGEI

Tamanini, J., & Valenciano, J. (2016). The Global Green Economy Index: Measuring National Performance in the Green Economy 5th Edition. Retrieved from https://dualcitizeninc.com/GGEI-2016.pdf

ten Brink, P., Mazza, L., Badura, T., Kettunen, M., & Withana, S. (2012). Nature and its Role in the Transition to a Green Economy. Institute for European Environmental Policy (IEEP) and TEEB. Retrieved from http://www.teebweb.org/publication/nature-and-its-role-in-a-green-economy/

Tett, P., Gowen, R. J., Painting, S. J., Elliott, M., Forster, R., Mills, D. K., … Wilkinson, M. (2013). Framework for understanding marine ecosystem health. Marine Ecology Progress Series, 494, 1–27. https://doi.org/10.3354/meps10539

The Economist. (2014). Performance indices: Ranking the rankings (p. 9p). p. 9p. Retrieved from https://www.economist.com/international/2014/11/08/ranking-the-rankings

UCLG. (2014). Basic Services for All in an Urbanizing World. Retrieved from https://www.uclg.org/en/media/news/gold-iii-report-basic-services-all-urbanizing-world

UN DESA. (2007). Indicators of Sustainable Development : Guidelines and Methodologies. https://doi.org/10.1016/j.cirpj.2010.03.002

UN DESA. (2017). World population projected to reach 9.8 billion in 2050, and 11.2 billion in 2100. Retrieved September 8, 2019, from UN Department of Economic and Social Affairs website: https://www.un.org/development/desa/en/news/policy/will-robots-and-ai-cause-mass-unemployment-not-necessarily-but-they-do-bring-other-threats.html

UN ESCAP. (2013). Green growth indicators: A practical approach for Asia and the Pacific. https://doi.org/10.1017/CBO9781107415324.004

UN Women. (2018). Turning promises into action: Gender equality in the 2030 Agenda for Sustainable Development. In Discussion Paper. Retrieved from http://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2018/sdg-report-fact-sheet-sub-saharan-africa-en.pdf?la=en&vs=3558

UNECA. (2015). Industry and the green economy in North Africa: Challenges, practices and lessons learned. Economic Commission for Africa. Retrieved from https://www.uneca.org/publications/industry-and-green-economy-north-africa-challenges-practices-and-lessons-learned

UNEP-WCMC and IUCN. (2016). Protected Planet Report 2016: How Protected Areas contribute to achieving Global Targets for Biodiversity. In UNEP-WCMC and IUCN: Cambridge UK and Gland, Switzerland. Retrieved from https://wdpa.s3.amazonaws.com/Protected_Planet_Reports/2445 Global Protected Planet 2016_WEB.pdf

UNEP. (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. Retrieved from https://sustainabledevelopment.un.org/content/documents/126GER_synthesis_en.pdf

UNEP. (2012). Measuring Progress towards an Inclusive Green Economy. Retrieved from https://www.gwp.org/globalassets/global/toolbox/references/measuring-progress-towards-an-inclusive-green-economy-unep-2012.pdf

UNEP. (2013). Green Economy and Trade – Trends, Challenges and Opportunities. Retrieved from http://www.unep.org/greeneconomy/GreenEconomyandTrade

UNEP. (2014a). Assessing Global Land Use: Balancing Consumption with Sustainable Supply. In S. Bringezu, H. Schütz, W. Pengue, M. O´Brien, F. Garcia, R. Sims, … J. Herrick (Eds.), A Report of the Working Group on Land and Soils of the International Resource Panel. (p. 46). Nairobi, Kenya.

UNEP. (2014b). Water and Energy Efficiency. Retrieved from http://www.un.org/waterforlifedecade/water_and_energy_2014/

UNEP. (2017a). Energy Profile: Gabon. Retrieved from United Nation Environment Programme website: https://environmentlive.unep.org/publication/country/GA/unep

UNEP. (2017b). Resource Efficiency: Potential and Economic Implication. In P. Ekins, N. Hughes, S. Bringezu, C. A. Clarke, M. Fischer-kowalski, T. Graedel, … H. Westhoek (Eds.), A report of the International Resource Panel.

UNEP. (2018a). Dominican Republic leapfrogs to energy-efficient lighting. Retrieved from United Nations Environment Programme website: https://www.unenvironment.org/news-and-stories/story/dominican-republic-leapfrogs-energy-efficient-lighting

UNEP. (2018b). Resource Efficiency for Sustainable Development : Key Messages for the Group of 20 (pp. 1–46). pp. 1–46. Retrieved from https://www.resourcepanel.org/sites/default/files/documents/document/media/thinkpiece_-_resource_efficiency_-_key_messages_for_the_g20_270818.pdf

UNICEF. (n.d.). Gender equality. Retrieved October 1, 2019, from https://www.unicef.org/rosa/what-we-do/gender-equality

UNICEF. (2011). Promoting Gender Equality: An Equity-Focused Approach to Programming: Operational Guidance Overview (pp. 1–28). pp. 1–28. Retrieved from https://www.unicef.org/gender/files/Overarching_Layout_Web.pdf

United Nations. (n.d.). Gender Equality. Retrieved October 1, 2019, from UN Ukraine website: http://www.un.org.ua/en/resident-coordinator-system/gender-equality

UNRISD. (2010). Combating Poverty and Inequality: Structural Change, Social Policy, and Politics. Retrieved from http://www.unrisd.org/80256B3C005BCCF9/(httpAuxPages)/92B1D5057F43149CC125779600434441/$file/PovRep (small).pdf

UNSTATS. (n.d.). Countries or areas / geographical regions. Retrieved October 1, 2019, from United Nations Statistics Division website: https://unstats.un.org/unsd/methodology/m49/

Vazquez-Brust, D., Smith, A. M., & Sarkis, J. (2014). Managing the transition to critical green growth: The "Green Growth State." Futures, 64, 38–50. https://doi.org/10.1016/j.futures.2014.10.005

Virto, I., Imaz, M. J., Fernández-Ugalde, O., Gartzia-Bengoetxea, N., Enrique, A., & Bescansa, P. (2015). Soil degradation and soil quality in Western Europe: Current situation and future perspectives. Sustainability, 7(1), 313–365. https://doi.org/10.3390/su7010313

Walby, S. (2018). The Concept of Economic Growth. Soundings, 14(4), 138–156. https://doi.org/10.1111/j.1467-6435.1961.tb00368.x

Wang, Z., Yang, J., Deng, X., & Lan, X. (2015). Optimal water resources allocation under the constraint of land use in the Heihe river basin of China. Sustainability, 7(2), 1558–1575. https://doi.org/10.3390/su7021558

WB. (2012). Inclusive Green Growth. The World Bank. https://doi.org/10.1596/978-0-8213-9551-6

WB. (2015). FAQs: Global Poverty Line Update. Retrieved October 9, 2019, from The World Bank website: https://www.worldbank.org/en/topic/poverty/brief/global-poverty-line-faq

WB. (2016). Country Profiles. Retrieved February 5, 2019, from World Development Indicators website: https://datacatalog.worldbank.org/dataset/country-profiles

WB. (2019a). Access to Electricity (% of Population). Retrieved October 10, 2019, from World Bank Open Data website: http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS

WB. (2019b). Agriculture, forestry, and fishing, value added (% of GDP). Retrieved October 10, 2019, from World Bank Open Data website: https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS

WB. (2019c). GDP per capita, PPP (constant 2011 international $). Retrieved October 10, 2019, from World Bank Open Data website: https://data.worldbank.org/indicator/ny.gdp.pcap.pp.kd

Wendling, Z. A., Emerson, J. W., Esty, D. C., Levy, M. A., & Sherbinen, A. (2018). 2018 Environmental Performance Index (EPI). Retrieved from https://epi.envirocenter.yale.edu/downloads/epi2018policymakerssummaryv01.pdf

WHO. (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide: Global update 2005. World Health Organization. https://doi.org/10.1016/0004-6981(88)90109-6

WHO. (2017). 2.1 billion people lack safe drinking water at home, more than twice as many lack safe sanitation. Retrieved September 10, 2019, from World Health Organization website: http://www.who.int/news-room/detail/12-07-2017-2-1-billion-people-lack-safe-drinking-water-at-home-more-than-twice-as-many-lack-safe-sanitation%0Ahttp://www.who.int/news-room/headlines/12-07-2017-2-1-billion-people-lack-safe-drinking-water-at-home-more-th

Wicklin, R. (2017). 3 Problems with Mean Imputation. Retrieved from https://blogs.sas.com/content/iml/2017/12/06/problems-mean-imputation.html

Windle, G. (2011). What is resilience? A review and concept analysis. Reviews in Clinical Gerontology, 21, 152–169. https://doi.org/10.1017/S0959259810000420

Worldometers. (2019). World population. Retrieved August 9, 2019, from https://www.worldometers.info/world-population/

Worrall, L., Roberts, L., & Whitley, S. (2018). Enabling a just transition to a low-carbon economy in the energy sector: Progress and lessons in Emerging Markets. In HSBC Centre of Sustainable Finance. Retrieved from https://www.sustainablefinance.hsbc.com/reports/enabling-a-just-transition-to-a-low-carbon-economy-in-the-energy-sector

WTO, & UNEP. (2018). Making Trade Work for the Environment, Prosperity and Resilience. https://doi.org/10.30875/f14f8c90-en

Xin, X., Yuding, W., & Jianzhong, W. (2011). The problems and strategies of the low carbon economy development. Energy Procedia, 5, 1831–1836. https://doi.org/10.1016/j.egypro.2011.03.312

Yuan, H., Zhou, P., & Zhou, D. (2011). What is low-carbon development? A conceptual analysis. Energy Procedia, 5, 1706–1712. https://doi.org/10.1016/j.egypro.2011.03.290

Appendices

Appendix 1

Statistical tables of Green Growth Index, dimensions, indicator categories, and indicators

Table A1.1 Green growth dimension sub-indices and Green Growth Index and ranks for the African countries

African Countries/ Territories	Africa Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Botswana	Southern	64.48	77.53	14.23	62.32	45.88	Moderate	1
Tanzania	Eastern	41.32	75.61	33.81	36.51	44.32	Moderate	2
Mauritius	Eastern	46.28	61.02	14.81	78.97	42.63	Moderate	3
Morocco	Northern	27.93	74.82	28.68	54.98	42.61	Moderate	4
Ghana	Western	38.27	72.36	23.36	50.06	42.42	Moderate	5
Uganda	Eastern	47.04	75.70	27.10	29.18	40.96	Moderate	6
Tunisia	Northern	19.18	59.16	29.66	67.89	38.88	Low	7
Senegal	Western	32.14	71.39	22.71	40.73	38.17	Low	8
Ethiopia	Eastern	37.72	70.31	26.05	28.56	37.48	Low	9
Egypt	Northern	17.37	48.22	38.51	56.51	36.74	Low	10
South Africa	Southern	28.79	61.02	15.68	65.26	36.62	Low	11
Cameroon	Middle	45.41	62.26	15.28	35.94	35.30	Low	12
Madagascar	Eastern	43.98	62.65	18.31	25.85	33.79	Low	13
Malawi	Eastern	37.72	84.55	9.63	24.44	29.43	Low	14
Zambia	Eastern	36.04	78.49	7.63	24.25	26.89	Low	15
Kenya	Eastern	41.60	66.04	3.83	44.72	26.19	Low	16
Zimbabwe	Eastern	30.95	84.08	4.12	40.69	25.71	Low	17
Burundi	Eastern	41.57	73.36	4.06	32.69	25.22	Low	18
Nigeria	Western	37.05	57.00	3.94	32.69	22.84	Low	19
Algeria	Northern	11.66	46.51	7.76	59.40	22.36	Low	20
Sudan	Northern	21.41	40.54	3.98	23.93	16.96	Very Low	21
Gabon	Middle	79.38	71.98	-	57.53	-	-	-
Congo, Republic of	Middle	83.52	72.65	-	39.10	-	-	-
Sao Tome & Principe	Middle	80.96	77.54	-	36.50	-	-	-
Rwanda	Eastern	71.92	76.70	-	33.38	-	-	-
Cabo Verde	Western	47.18	67.22	-	64.38	-	-	-
Gambia	Western	72.01	66.95	-	38.90	-	-	-
Guinea	Western	63.22	73.39	-	35.95	-	-	-
Cote d'Ivoire	Western	39.57	80.23	-	34.69	-	-	-

Table A1.1 Green growth dimension sub-indices and Green Growth Index and ranks for the African countries *(continued)*

African Countries/ Territories	Africa Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Liberia	Western	55.38	65.92	-	31.60	-	-	-
Chad	Middle	76.40	58.57	-	17.24	-	-	-
Comoros	Eastern	51.23	62.50	-	37.49	-	-	-
Mauritania	Western	64.59	38.55	-	43.52	-	-	-
Seychelles	Eastern	-	70.70	-	75.79	-	-	-
Namibia	Southern	31.63	71.03	-	43.58	-	-	-
Sierra Leone	Western	43.11	65.80	-	34.74	-	-	-
Togo	Western	34.98	67.44	-	39.48	-	-	-
Mozambique	Eastern	36.63	76.22	-	26.02	-	-	-
Burkina Faso	Western	34.20	72.95	-	28.71	-	-	-
Central African Rep.	Middle	61.76	58.74	-	14.59	-	-	-
Angola	Middle	41.88	59.11	-	33.73	-	-	-
Benin	Western	35.75	68.23	-	28.69	-	-	-
Lesotho	Southern	42.91	51.49	-	36.00	-	-	-
Congo Dem. Rep. of	Middle	33.77	72.09	-	21.56	-	-	-
Eritrea	Eastern	61.04	58.43	-	-	-	-	-
Mali	Western	30.01	52.80	-	32.50	-	-	-
Sudan South	Eastern	41.27	62.52	-	10.91	-	-	-
Guinea-Bissau	Western	28.42	70.07	-	14.77	-	-	-
Eswatini	Southern	-	71.10	-	41.99	-	-	-
Libya	Northern	25.25	23.64	-	58.28	-	-	-
Equatorial Guinea	Middle	-	62.05	-	40.62	-	-	-
Niger	Western	24.45	51.31	-	23.33	-	-	-
Somalia	Eastern	-	53.39	-	22.98	-	-	-
Djibouti	Eastern	-	31.07	-	31.53	-	-	-

Table A1.2 Green growth dimension sub-indices and Green Growth Index and ranks for American countries

Countries/ Territories in the Americas	The Americas Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Dominican Republic	Carribean	55.89	81.28	31.56	64.30	55.10	Moderate	1
United States	Northern	38.88	62.61	44.14	80.44	54.22	Moderate	2
Canada	Northern	46.90	55.24	38.68	85.13	54.04	Moderate	3
El Salvador	Central	42.96	66.84	44.84	65.76	53.94	Moderate	4
Mexico	Central	37.70	77.36	40.70	65.03	52.71	Moderate	5
Colombia	South	42.18	75.72	32.37	64.25	50.77	Moderate	6
Costa Rica	Central	50.99	73.11	23.50	75.01	50.63	Moderate	7
Brazil	South	40.91	74.32	30.98	65.41	49.82	Moderate	8
Ecuador	South	44.22	74.81	25.06	68.78	48.87	Moderate	9
Guatemala	Central	52.46	73.20	23.56	52.90	46.77	Moderate	10
Chile	South	47.05	69.74	18.76	76.46	46.58	Moderate	11
Bolivia	South	37.58	74.31	25.17	64.26	46.10	Moderate	12
Argentina	South	43.28	57.94	22.07	75.45	45.21	Moderate	13
Paraguay	South	38.70	77.22	20.61	59.34	43.72	Moderate	14
Honduras	Central	53.35	77.93	15.35	53.98	43.08	Moderate	15
Uruguay	South	63.50	57.32	12.84	73.11	42.99	Moderate	16
Bahamas	Carribean	21.11	75.26	29.05	63.42	41.36	Moderate	17
Peru	South	49.13	74.25	10.98	61.07	39.55	Low	18
Panama	Central	42.02	74.72	10.96	62.42	38.29	Low	19
Nicaragua	Central	44.28	80.21	5.67	57.04	32.74	Low	20
Trinidad & Tobago	Carribean	19.67	53.30	9.39	82.16	29.99	Low	21
Antigua & Barbuda	Carribean	63.45	74.34	-	68.23	-	-	-
Venezuela	South	63.11	71.24	-	63.10	-	-	-
Belize	Central	49.52	84.84	-	57.91	-	-	-
Guyana	South	39.28	73.17	-	66.32	-	-	-
Suriname	South	32.97	77.49	-	66.15	-	-	-
Barbados	Carribean	34.51	73.04	-	68.07	-	-	-
Jamaica	Carribean	38.56	72.50	-	55.11	-	-	-
Saint Lucia	Carribean	-	79.49	-	68.10	-	-	-
Grenada	Carribean	-	71.89	-	74.70	-	-	-
St Vincent & Grenadines	Carribean	-	71.53	-	56.01	-	-	-
Dominica	Carribean	-	72.37	-	53.21	-	-	-
Haiti	Carribean	45.22	51.71	-	26.01	-	-	-
Cuba	Carribean	39.24	68.72	-	-	-	-	-
Puerto Rico	Carribean	31.07	65.31	-	-	-	-	-
Turks & Caicos Islands	Carribean	-	72.15	-	-	-	-	-

Table A1.2 Green growth dimension sub-indices and Green Growth Index and ranks for American countries *(continued)*

Countries/ Territories in the Americas	The Americas Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Cayman Islands	Carribean	-	65.14	-	-	-	-	-
US Virgin Islands	Carribean	-	63.35	-	-	-	-	-
British Virgin Islands	Carribean	-	63.35	-	-	-	-	-
Saint Kitts and Nevis	Carribean	-	62.62	-	-	-	-	-
Bermuda	Northern	-	61.32	-	-	-	-	-
Aruba	Carribean	-	57.47	-	-	-	-	-
Greenland	Northern	-	44.66	-	-	-	-	-

Table A1.3 Green growth dimension sub-indices and Green Growth Index and ranks for the Asian countries

Asian Countries/ Territories	Asia Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Singapore	South-eastern	51.20	63.21	42.88	84.00	58.43	Moderate	1
Malaysia	South-eastern	43.54	70.29	51.03	62.45	55.88	Moderate	2
Philippines	South-eastern	46.48	70.62	48.34	59.96	55.54	Moderate	3
Georgia	Western	50.00	72.46	37.19	70.17	55.45	Moderate	4
China	Eastern	34.49	70.15	55.41	70.32	55.41	Moderate	5
Korea Republic of	Eastern	34.48	61.09	54.06	76.41	54.31	Moderate	6
Japan	Eastern	41.39	73.53	33.23	83.23	53.86	Moderate	7
Sri Lanka	Southern	60.97	69.67	33.42	54.49	52.74	Moderate	8
India	Southern	34.58	63.24	40.31	48.95	45.58	Moderate	9
Azerbaijan	Western	32.31	64.14	29.33	67.35	44.98	Moderate	10
Myanmar	South-eastern	42.58	66.44	30.42	45.79	44.55	Moderate	11
Thailand	South-eastern	40.16	79.03	17.07	71.46	44.36	Moderate	12
Cyprus	Western	48.25	72.59	13.05	82.26	44.03	Moderate	13
Nepal	Southern	41.98	80.17	18.05	59.15	43.54	Moderate	14
Israel	Western	25.18	55.68	27.14	82.89	42.14	Moderate	15
Indonesia	South-eastern	52.42	70.48	12.30	61.04	40.81	Moderate	16
Lebanon	Western	33.60	55.91	27.99	46.07	39.45	Low	17
Turkey	Western	40.54	54.32	17.71	60.66	39.22	Low	18
Viet Nam	South-eastern	33.86	68.29	14.20	70.81	39.05	Low	19
Kyrgyzstan	Central	32.39	63.35	12.68	70.06	36.74	Low	20
Armenia	Western	35.35	72.55	9.19	67.74	35.55	Low	21
Qatar	Western	50.35	33.64	13.79	62.29	35	Low	22
Cambodia	South-eastern	41.36	83.20	5.72	41.87	30	Low	23
Pakistan	Southern	14.62	50.89	27.75	34.65	29	Low	24
Kazakhstan	Central	29.65	37.46	8.87	63.28	28	Low	25
Saudi Arabia	Western	12.24	31.09	24.35	65.63	28	Low	26
Mongolia	Eastern	44.47	60.63	3.31	62.54	27	Low	27
Jordan	Western	14.93	42.20	12.71	63.52	27	Low	28
Oman	Western	13.87	28.56	30.89	38.82	26	Low	29
Tajikistan	Central	22.78	62.59	3.98	68.74	25	Low	30
Kuwait	Western	14.59	37.94	12.42	53.46	25	Low	31
Iraq	Western	11.71	33.67	3.59	63.53	17	Very Low	32
Brunei Darussalam	South-eastern	-	58.06	46.39	69.87	-	-	-

Table A1.3 Green growth dimension sub-indices and Green Growth Index and ranks for the Asian countries *(continued)*

Asian Countries/ Territories	Asia Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Bhutan	Southern	48.38	77.21	-	46.36	-	-	-
Hong Kong China SAR	Eastern	-	78.70	6.49	85.30	-	-	-
Laos	South-eastern	43.17	79.30	-	46.50	-	-	-
Bangladesh	Southern	45.52	60.63	-	45.74	-	-	-
United Arab Emirates	Western	21.69	47.72	-	71.08	-	-	-
Timor-Leste	South-eastern	-	76.07	-	59.53	-	-	-
Uzbekistan	Central	11.95	53.64	-	68.51	-	-	-
Iran	Southern	9.84	54.86	-	67.17	-	-	-
Turkmenistan	Central	7.58	45.12	-	76.31	-	-	-
Palestine	Western	28.05	47.92	-	49.71	-	-	-
Bahrain	Western	25.31	33.71	-	60.30	-	-	-
Maldives	Southern	-	46.97	-	70.65	-	-	-
Syria	Western	12.25	39.05	-	47.05	-	-	-
Afghanistan	Southern	24.74	43.14	-	30.46	-	-	-
Yemen	Western	21.52	37.69	-	16.42	-	-	-
Korea Dem. People's Rep. of	Eastern	-	59.51	-	-	-	-	-

Table A1.4 Green growth dimension sub-indices and Green Growth Index and ranks for the European countries

European Countries/ Territories	Europe Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Denmark	Northern	75.50	72.52	63.84	92.07	75.32	High	1
Sweden	Northern	75.79	77.26	57.96	93.70	75.09	High	2
Austria	Western	71.57	79.56	52.27	91.92	72.32	High	3
Finland	Northern	67.36	72.25	58.86	92.23	71.69	High	4
Czech Republic	Eastern	63.04	78.40	61.85	84.48	71.29	High	5
Italy	Southern	58.31	83.15	57.63	87.01	70.22	High	6
Germany	Western	55.02	81.52	60.55	88.65	70.04	High	7
Estonia	Northern	62.02	69.31	59.12	86.66	68.50	High	8
Latvia	Northern	72.05	74.43	49.40	81.87	68.24	High	9
Slovakia	Eastern	61.57	83.35	49.51	82.21	67.60	High	10
Portugal	Southern	58.77	80.40	47.25	86.66	66.32	High	11
Belgium	Western	46.51	75.74	55.88	90.34	64.94	High	12
Hungary	Eastern	49.04	82.52	55.10	79.20	64.82	High	13
France	Western	55.80	77.74	45.39	88.77	64.66	High	14
Croatia	Southern	64.05	81.37	44.29	74.94	64.49	High	15
Slovenia	Southern	60.39	77.58	41.78	85.73	64.00	High	16
Spain	Southern	50.04	78.47	47.61	87.90	63.67	High	17
Lithuania	Northern	60.01	70.87	46.47	83.02	63.65	High	18
Netherlands	Western	50.41	74.39	46.76	91.99	63.38	High	19
United Kingdom	Northern	60.41	76.96	39.20	88.09	63.30	High	20
Switzerland	Western	74.34	77.70	29.30	91.44	62.72	High	21
Norway	Northern	67.12	64.26	37.62	91.67	62	High	22
Poland	Eastern	46.07	70.77	52.48	84.55	62	High	23
Romania	Eastern	46.64	76.56	44.56	78.32	59	Moderate	24
Ireland	Northern	63.23	58.46	38.15	84.08	59	Moderate	25
Luxembourg	Western	53.53	73.84	33.19	90.13	59	Moderate	26
Greece	Southern	53.28	80.47	30.95	81.94	57	Moderate	27
Bulgaria	Eastern	41.69	78.25	40.67	78.85	57	Moderate	28
Iceland	Northern	52.87	45.77	40.56	89.39	54	Moderate	29
Serbia	Southern	40.26	74.02	33.89	74.83	52	Moderate	30
Albania	Southern	50.27	80.49	23.42	75.14	52	Moderate	31
Russian Federation	Eastern	37.81	58.56	37.27	73.36	50	Moderate	32
Ukraine	Eastern	31.78	59.09	36.05	69.45	47	Moderate	33
Belarus	Eastern	57.60	69.22	12.36	81.59	45	Moderate	34
Montenegro	Southern	57.54	68.12	9.40	72.36	40	Moderate	35
Moldova Republic	Eastern	37.96	61.62	14.84	64.47	39	Low	36
Bosnia & Herzegovina	Southern	40.15	62.24	9.27	64.66	35	Low	37

Table A1.4 Green growth dimension sub-indices and Green Growth Index and ranks for the European countries *(continued)*

European Countries/ Territories	Europe Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
Malta	Southern	41.52	70.91	2.45	86.95	28	Low	38
North Macedonia	Southern	45.09	78.15	-	73.97	-	-	-
Liechtenstein	Western	-	85.40	-	-	-	-	-
Andorra	Southern	-	80.49	-	-	-	-	-
Gibraltar	Southern	-	46.35	-	-	-	-	-
Faeroe Islands	Northern	-	38.00	-	-	-	-	-

Table A1.5 Green growth dimension sub-indices and Green Growth Index and ranks for the Oceania countries

Oceania Countries/ Territories	Oceania Subregion	Dimensions				Green Growth Index		
		Efficient and Sustainable Resource Use	Natural Capital Protection	Green Economic Opportunities	Social Inclusion	Scores	Level	Rank
New Zealand	Australia & New Zealand	48.23	64.84	26.83	88.29	52.17	Moderate	1
Australia	Australia & New Zealand	50.96	47.09	25.77	85.08	47.89	Moderate	2
Fiji	Melanesia	61.06	70.95	18.49	53.38	45.48	Moderate	3
Samoa	Polynesia	78.28	72.01	-	50.05	-	-	-
Vanuatu	Melanesia	69.95	65.62	-	26.31	-	-	-
Palau	Micronesia	-	81.62	-	61.08	-	-	-
Papua New Guinea	Melanesia	58.29	59.59	-	11.10	-	-	-
Kiribati	Micronesia	-	78.64	-	40.33	-	-	-
Marshall Islands	Micronesia	-	71.74	-	45.53	-	-	-
Fed. States Micronesia	Micronesia	-	66.69	-	40.20	-	-	-
Tonga	Polynesia	-	65.72	-	40.39	-	-	-
American Samoa	Polynesia	-	83.95	-	-	-	-	-
Solomon Islands	Melanesia	-	63.56	-	20.36	-	-	-
Northern Mariana Islands	Micronesia	-	78.27	-	-	-	-	-
New Caledonia	Melanesia	-	75.48	-	-	-	-	-
French Polynesia	Polynesia	-	63.02	-	-	-	-	-
Guam	Micronesia	-	35.94	-	-	-	-	-
Nauru	Micronesia	-	18.47	-	-	-	-	-

Table A1.6 Scores on indicator categories for efficient and sustainable resource use by region and rank

Countries/Territories	Regional Rank	Efficient and Sustainable Resource Use	Indicator categories			
			Efficient and sustainable energy	Efficient and sustainable water use	Sustainable land use	Material use efficiency
Africa						
Congo, Republic of	-	83.52	89.58	68.72	-	94.63
Sao Tome & Principe	-	80.96	77.34	-	76.10	90.16
Gabon	-	79.38	80.60	63.54	-	97.66
Chad	-	76.40	93.99	51.21	-	92.66
Gambia	-	72.01	87.87	51.36	-	82.76
Rwanda	-	71.92	86.51	53.09	-	80.98
Mauritania	-	64.59	72.58	50.84	-	73.04
Botswana	1	64.48	70.27	57.60	-	66.24
Guinea	-	63.22	66.08	51.49	-	74.28
Central African Rep.	-	61.76	75.05	52.77	-	59.49
Eritrea	-	61.04	86.69	51.36	-	51.07
Liberia	-	55.38	50.50	50.80	-	66.22
Comoros	-	51.23	81.34	54.28	30.44	-
Cabo Verde	-	47.18	70.12	55.96	13.91	90.78
Uganda	6	47.04	69.57	53.16	16.05	82.50
Mauritius	3	46.28	56.42	50.56	19.00	84.65
Cameroon	12	45.41	86.87	52.77	10.49	88.41
Madagascar	13	43.98	84.77	50.57	12.04	72.50
Sierra Leone	-	43.11	78.97	51.69	16.98	49.82
Lesotho	-	42.91	69.28	55.68	15.04	58.45
Angola	-	41.88	89.27	70.74	5.17	94.22
Kenya	16	41.60	75.94	52.51	8.62	87.14
Burundi	18	41.57	76.40	51.32	11.98	63.58
Tanzania	2	41.32	74.19	50.85	9.18	84.19
Sudan South	-	41.27	88.13	-	8.23	96.92
Cote d'Ivoire	-	39.57	78.11	52.59	6.48	92.06
Ghana	5	38.27	80.92	51.52	6.22	82.76
Ethiopia	9	37.72	55.22	50.84	10.00	72.09
Malawi	14	37.72	89.36	50.85	6.85	64.98
Nigeria	19	37.05	83.66	51.73	4.63	94.09
Mozambique	-	36.63	50.50	51.69	7.94	86.82
Zambia	15	36.04	77.75	51.28	5.64	75.07
Benin	-	35.75	71.08	55.10	5.39	77.46
Togo	-	34.98	52.83	52.03	7.80	69.84
Burkina Faso	-	34.20	82.42	51.45	4.35	74.22
Congo Dem. Rep. of	-	33.77	50.50	-	10.11	75.46
Senegal	8	32.14	77.79	50.98	3.05	88.35
Namibia	-	31.63	68.27	53.70	3.01	90.74
Zimbabwe	17	30.95	50.50	50.70	4.12	86.85
Mali	-	30.01	93.81	50.63	2.14	79.87
South Africa	11	28.79	39.93	35.52	5.28	91.82

Table A1.6 Scores on indicator categories for efficient and sustainable resource use by region and rank *(continued)*

Countries/Territories	Regional Rank	Efficient and Sustainable Resource Use	Indicator categories			
			Efficient and sustainable energy	Efficient and sustainable water use	Sustainable land use	Material use efficiency
Africa						
Guinea-Bissau	-	28.42	61.09	50.93	7.38	-
Morocco	4	27.93	54.07	28.00	4.38	91.87
Libya	-	25.25	41.30	4.43	-	88.00
Niger	-	24.45	79.14	51.00	1.42	62.47
Sudan	21	21.41	89.79	1.28	-	85.43
Tunisia	7	19.18	53.03	2.99	9.25	92.07
Egypt	10	17.37	47.39	1.69	13.35	85.20
Algeria	20	11.66	39.74	3.87	1.30	92.57
Eswatini	-	-	87.47	-	-	87.64
Equatorial Guinea	-	-	54.05	100.00	-	-
Djibouti	-	-	57.06	-	-	93.84
Seychelles	-	-	46.29	-	-	88.24
Somalia	-	-	-	45.21	-	59.87
Réunion	-	-	-	-	41.84	-
The Americas						
Uruguay	16	63.50	92.89	51.75	52.89	63.94
Antigua & Barbuda	-	63.45	40.54	67.47	-	93.39
Venezuela	-	63.11	49.95	53.03	-	94.90
Dominican Republic	1	55.89	61.54	33.26	49.54	96.23
Honduras	15	53.35	81.99	51.64	21.27	89.97
Guatemala	10	52.46	87.94	52.89	17.72	91.90
Costa Rica	7	50.99	81.43	54.15	16.31	93.98
Belize	-	49.52	69.92	52.05	18.59	88.86
Peru	18	49.13	69.01	52.53	18.68	86.07
Chile	11	47.05	64.89	51.38	18.67	78.72
Canada	3	46.90	49.47	56.20	22.79	76.34
Haiti	-	45.22	67.89	51.34	13.35	89.90
Nicaragua	20	44.28	81.47	51.49	10.54	86.95
Ecuador	9	44.22	54.81	51.73	15.19	88.76
Argentina	13	43.28	48.60	52.74	15.94	85.89
El Salvador	4	42.96	64.89	52.20	10.66	94.35
Colombia	6	42.18	69.03	53.37	9.32	92.19
Panama	19	42.02	67.11	57.77	8.42	95.51
Brazil	8	40.91	81.85	54.43	7.61	82.59
Guyana	-	39.28	56.07	50.76	-	21.29
Cuba	-	39.24	65.44	52.01	7.43	93.65
United States	2	38.88	43.52	56.70	11.68	79.22
Paraguay	14	38.70	89.82	51.77	6.39	75.41
Jamaica	-	38.56	51.99	53.29	8.62	92.57
Mexico	5	37.70	49.95	52.70	8.20	93.55

Table A1.6 Scores on indicator categories for efficient and sustainable resource use by region and rank *(continued)*

Countries/Territories	Regional Rank	Efficient and Sustainable Resource Use	Indicator categories			
			Efficient and sustainable energy	Efficient and sustainable water use	Sustainable land use	Material use efficiency
The Americas						
Bolivia	12	37.58	53.66	52.18	9.78	72.85
Barbados	-	34.51	43.62	9.87	-	95.49
Suriname	-	32.97	66.31	51.58	4.02	85.80
Puerto Rico	-	31.07	52.27	55.18	10.39	-
Bahamas	17	21.11	41.20	-	2.58	88.42
Trinidad & Tobago	21	19.67	1.27	62.39	-	96.11
Falkland Islands	-	-	-	-	79.62	-
British Virgin Islands	-	-	-	-	-	77.91
St Vincent & Grenadines	-	-	49.55	-	-	-
Bermuda	-	-	49.43	-	-	-
Aruba	-	-	49.05	-	-	-
Saint Kitts and Nevis	-	-	46.85	-	-	-
Saint Lucia	-	-	45.08	-	-	-
Dominica	-	-	49.08	-	32.05	-
Grenada	-	-	54.33	-	24.44	-
French Guiana	-	-	-	-	38.75	-
Guadeloupe	-	-	-	-	25.40	-
Martinique	-	-	-	-	24.88	-
US Virgin Islands	-	-	-	-	14.90	-
Asia						
Sri Lanka	8	60.97	96.55	42.09	36.32	93.65
Indonesia	16	52.42	77.34	51.08	21.57	88.62
Singapore	1	51.20	46.56	59.72	-	48.28
Qatar	22	50.35	31.60	44.56	-	90.65
Georgia	4	50.00	61.41	51.38	21.78	90.96
Bhutan	-	48.38	66.82	51.08	19.69	81.49
Cyprus	13	48.25	52.32	53.19	25.87	75.31
Philippines	3	46.48	69.71	50.93	14.10	93.27
Bangladesh	-	45.52	76.67	51.04	12.47	88.00
Mongolia	27	44.47	35.97	53.07	-	46.08
Malaysia	2	43.54	42.72	53.61	19.88	78.94
Laos	-	43.17	85.48	50.76	13.36	59.94
Myanmar	11	42.58	92.78	50.52	8.66	80.98
Nepal	14	41.98	77.47	50.70	10.77	73.39
Japan	7	41.39	47.14	56.66	12.89	85.18
Cambodia	23	41.36	83.34	51.13	8.49	80.89
Turkey	18	40.54	56.76	49.58	11.10	86.46
Thailand	12	40.16	57.14	51.47	10.59	83.54
Armenia	21	35.35	50.44	16.95	21.11	86.56

Table A1.6 Scores on indicator categories for efficient and sustainable resource use by region and rank *(continued)*

Countries/Territories	Regional Rank	Efficient and Sustainable Resource Use	Indicator categories			
			Efficient and sustainable energy	Efficient and sustainable water use	Sustainable land use	Material use efficiency
Asia						
India	9	34.58	72.24	31.50	7.20	87.30
China	5	34.49	42.52	48.78	9.52	71.71
Korea, Republic of	6	34.48	33.68	23.11	22.11	82.14
Viet Nam	19	33.86	66.95	50.74	6.82	56.79
Lebanon	17	33.60	43.02	-	10.07	87.53
Kyrgyzstan	20	32.39	46.07	31.81	13.00	57.78
Azerbaijan	10	32.31	43.33	23.17	11.85	91.54
Kazakhstan	25	29.65	27.69	48.66	7.65	74.97
Palestine	-	28.05	51.30	29.89	14.40	-
Bahrain	-	25.31	19.53	9.38	-	88.47
Israel	15	25.18	45.18	20.34	5.13	85.19
Afghanistan	-	24.74	63.37	32.05	2.16	85.46
Tajikistan	30	22.78	79.56	4.67	9.20	78.73
United Arab Emirates	-	21.69	36.44	13.99	6.51	66.78
Yemen	-	21.52	49.28	2.34	-	86.38
Jordan	28	14.93	40.98	5.92	2.37	86.44
Pakistan	24	14.62	83.41	1.17	5.52	84.98
Kuwait	31	14.59	35.45	14.15	1.36	66.32
Oman	29	13.87	31.96	7.00	1.87	88.39
Syria	-	12.25	40.54	1.50	5.29	69.77
Saudi Arabia	26	12.24	33.75	4.60	1.60	90.16
Uzbekistan	-	11.95	21.68	1.09	-	71.96
Iraq	32	11.71	41.91	1.22	4.05	90.66
Iran	-	9.84	27.53	1.69	2.49	81.05
Turkmenistan	-	7.58	5.08	1.06	-	81.17
Maldives	-	-	41.69	-	-	88.20
Korea Dem. People's Rep. of	-	-	-	50.80	-	78.06
Brunei Darussalam	-	-	41.40	-	-	87.04
Macao China SAR	-		57.29	-	-	-
Hong Kong China SAR	-	-	49.90	-	-	-
Timor-Leste	-	-	-	50.56	46.26	-
Europe						
Sweden	2	75.79	88.69	78.08	59.66	79.88
Denmark	1	75.50	77.04	100.00	49.38	85.39
Switzerland	21	74.34	70.95	100.00	53.57	80.37
Latvia	9	72.05	77.16	67.33	62.28	83.29
Austria	3	71.57	74.65	67.96	65.16	79.37
Finland	4	67.36	73.35	65.57	55.99	76.46
Norway	22	67.12	90.54	69.73	42.41	75.82

Table A1.6 Scores on indicator categories for efficient and sustainable resource use by region and rank *(continued)*

Countries/Territories	Regional Rank	Efficient and Sustainable Resource Use	Indicator categories			
			Efficient and sustainable energy	Efficient and sustainable water use	Sustainable land use	Material use efficiency
Europe						
Croatia	15	64.05	71.87	61.74	42.10	90.11
Ireland	25	63.23	56.19	89.74	35.99	88.07
Czech Republic	5	63.04	49.05	62.03	61.56	84.30
Estonia	8	62.02	58.35	52.49	64.08	75.37
Slovakia	10	61.57	51.35	70.44	52.00	76.40
United Kingdom	20	60.41	52.02	100.00	29.42	87.03
Slovenia	16	60.39	58.19	56.16	47.87	85.02
Lithuania	18	60.01	68.53	60.17	42.11	74.70
Portugal	11	58.77	68.65	53.46	36.56	88.88
Italy	6	58.31	59.37	37.65	58.92	87.80
Belarus	34	57.60	37.87	56.35	-	89.55
Montenegro	35	57.54	79.95	-	30.59	77.89
France	14	55.80	52.79	62.76	33.36	87.69
Germany	7	55.02	55.26	46.52	41.18	86.54
Luxembourg	26	53.53	52.87	100.00	31.06	49.99
Greece	27	53.28	57.68	54.93	30.61	83.07
Iceland	29	52.87	50.50	65.03	30.29	78.55
Netherlands	19	50.41	46.03	61.85	27.11	83.67
Albania	31	50.27	81.29	51.43	17.27	88.49
Spain	17	50.04	58.18	31.84	39.48	85.71
Hungary	13	49.04	53.99	53.78	22.28	89.38
Romania	24	46.64	64.68	54.64	15.43	86.76
Belgium	12	46.51	46.37	31.48	37.34	85.82
Poland	23	46.07	51.12	43.30	24.69	82.42
North Macedonia	-	45.09	62.65	52.75	14.93	83.80
Bulgaria	28	41.69	48.67	35.73	20.67	84.02
Malta	38	41.52	53.11	65.71	10.36	82.17
Serbia	30	40.26	51.42	-	16.01	79.27
Bosnia & Herzegovina	37	40.15	62.59	-	11.84	87.33
Moldova Republic	36	37.96	38.26	51.11	14.10	75.30
Russian Federation	32	37.81	27.62	52.48	15.75	89.51
Ukraine	33	31.78	16.40	51.54	15.92	75.78
Faeroe Islands	-	-	-	-	85.15	-
Liechtenstein	-	-	-	-	71.65	-
Andorra	-	-	-	-	24.08	-
Oceania						
Samoa	-	78.28	68.89	-	75.52	92.19
Vanuatu	-	69.95	75.38	-	50.85	89.28
Fiji	3	61.06	67.22	56.26	39.26	93.66
Papua New Guinea	-	58.29	70.85	55.61	37.18	78.82

Table A1.6 Scores on indicator categories for efficient and sustainable resource use by region and rank *(continued)*

Countries/Territories	Regional Rank	Efficient and Sustainable Resource Use	Indicator categories			
			Efficient and sustainable energy	Efficient and sustainable water use	Sustainable land use	Material use efficiency
Oceania						
Australia	2	50.96	45.32	60.93	34.76	70.26
New Zealand	1	48.23	64.74	55.87	17.86	83.75
French Polynesia	-	-	-	-	77.47	-
Solomon Islands	-	-	86.01	-	49.08	-
Kiribati	-	-	43.74	-	62.70	-
Tonga	-	-	45.41	-	49.12	-
Niue	-	-	-	-	44.34	-
Tuvalu	-	-	40.47	-	-	-
Nauru	-	-	38.91	-	-	-
Cook Islands	-	-	-	-	36.28	-
Fed. States Micronesia	-	-	32.08	-	-	-
Marshall Islands	-	-	24.73	-	-	-
New Caledonia	-	-	-	-	20.74	-
Palau	-	-	17.93	-	-	-

Table A1.7 Scores on indicator categories for natural capital protection by region and rank

Countries/Territories	Regional Rank	Natural Capital Protection	Indicator categories			
			Environmental quality	GHG emissions reductions	Biodiversity and ecosystem protection	Cultural and social value
Africa						
Malawi	14	84.55	78.08	94.37	82.50	84.05
Zimbabwe	17	84.08	79.76	90.05	84.47	82.38
Cote d'Ivoire	-	80.23	60.78	92.11	81.53	90.76
Zambia	15	78.49	72.22	77.74	75.16	89.93
Sao Tome & Principe	-	77.54	91.32	96.01	81.03	50.89
Botswana	1	77.53	86.31	68.71	61.96	98.31
Rwanda	-	76.70	67.75	94.91	75.46	71.31
Mozambique	-	76.22	80.45	89.00	73.70	63.97
Uganda	6	75.70	66.55	88.80	69.59	79.86
Tanzania	2	75.61	82.59	85.83	76.27	60.45
Morocco	4	74.82	89.62	91.33	46.54	82.29
Guinea	-	73.39	70.04	77.10	82.19	65.36
Burundi	18	73.36	61.68	94.71	69.23	71.61
Burkina Faso	-	72.95	44.14	83.17	77.81	99.15
Congo, Republic of	-	72.65	69.30	75.73	77.86	68.19
Ghana	5	72.36	74.19	91.28	83.10	48.71
Congo Dem. Rep. of	-	72.09	64.02	92.68	74.83	60.84
Gabon	-	71.98	79.19	64.05	79.29	66.74
Senegal	8	71.39	65.86	87.80	61.93	72.55
Eswatini	-	71.10	72.81	93.46	73.77	50.90
Namibia	-	71.03	80.02	68.08	62.13	75.22
Seychelles	-	70.70	85.37	87.10	69.03	48.66
Ethiopia	9	70.31	64.05	86.09	51.19	86.57
Guinea-Bissau	-	70.07	51.69	88.21	77.29	68.41
Benin	-	68.23	51.76	90.54	70.86	65.26
Togo	-	67.44	58.90	89.40	59.95	65.54
Cabo Verde	-	67.22	77.20	95.82	45.74	60.33
Gambia	-	66.95	62.65	90.62	70.19	50.41
Kenya	16	66.04	78.17	86.08	49.80	56.75
Liberia	-	65.92	71.71	93.26	67.21	42.02
Sierra Leone	-	65.80	63.61	89.80	80.74	40.66
Madagascar	13	62.65	60.64	86.97	71.09	41.09
Sudan South	-	62.52	51.60	50.33	-	94.12
Comoros	-	62.50	83.01	93.71	65.34	30.03
Cameroon	12	62.26	42.13	90.30	71.31	55.37
Equatorial Guinea	-	62.05	74.00	59.85	93.09	35.95
South Africa	11	61.02	78.21	69.14	41.60	61.62
Mauritius	3	61.02	90.49	92.32	68.77	24.12
Tunisia	7	59.16	87.13	83.08	28.57	59.24
Angola	-	59.11	60.83	75.40	59.79	44.51

Table A1.7 Scores on indicator categories for natural capital protection by region and rank *(continued)*

Countries/Territories	Regional Rank	Natural Capital Protection	Indicator categories			
			Environmental quality	GHG emissions reductions	Biodiversity and ecosystem protection	Cultural and social value
Africa						
Central African Rep.	-	58.74	47.09	33.98	78.34	94.96
Chad	-	58.57	42.60	76.98	38.48	93.28
Eritrea	-	58.43	60.21	81.82	45.47	52.04
Nigeria	19	57.00	34.13	90.50	58.20	58.73
Somalia	-	53.39	63.36	79.91	37.37	42.94
Mali	-	52.80	43.26	79.62	28.57	78.99
Lesotho	-	51.49	71.34	88.55	22.75	48.93
Niger	-	51.31	29.18	83.95	29.80	94.96
Egypt	10	48.22	62.21	84.85	15.76	65.01
Algeria	20	46.51	85.40	70.91	14.85	52.05
Sudan	21	40.54	68.97	72.23	31.84	17.02
Mauritania	-	38.55	53.31	75.53	12.92	42.45
Djibouti	-	31.07	71.95	88.41	3.42	42.77
Libya	-	23.64	77.05	48.93	2.51	33.03
Mayotte	-	-	-	-	80.06	67.16
Réunion	-	-	-	-	76.29	31.70
Saint Helena	-	-	-	-	49.65	-
Western Sahara	-	-	-	-	1.00	56.65
The Americas						
Belize	-	84.84	89.10	82.99	81.78	85.68
Dominican Republic	1	81.28	85.01	86.23	89.81	66.31
Nicaragua	20	80.21	88.29	78.93	85.89	69.17
Saint Lucia	-	79.49	86.64	92.24	82.04	60.88
Honduras	15	77.93	85.27	88.95	82.28	59.10
Suriname	-	77.49	90.94	80.11	83.74	59.11
Mexico	5	77.36	87.34	79.00	66.71	77.81
Paraguay	14	77.22	88.75	59.09	70.78	95.80
Colombia	6	75.72	90.93	79.63	74.81	60.70
Bahamas	17	75.26	82.65	84.35	64.70	71.14
Ecuador	9	74.81	90.41	83.27	73.53	56.59
Panama	19	74.72	88.01	85.78	77.38	53.36
Antigua & Barbuda	-	74.34	90.11	87.54	62.96	61.48
Brazil	8	74.32	89.56	64.94	72.92	71.96
Bolivia	12	74.31	89.95	53.04	71.73	89.09
Peru	18	74.25	88.10	86.09	68.27	58.71
Guatemala	10	73.20	83.96	89.38	76.53	50.00
Guyana	-	73.17	89.20	64.12	98.10	51.08
Costa Rica	7	73.11	89.95	87.42	72.89	49.84
Barbados	-	73.04	82.76	88.79	62.49	61.99
Jamaica	-	72.50	89.65	91.57	66.79	50.39

Table A1.7 Scores on indicator categories for natural capital protection by region and rank *(continued)*

Countries/Territories	Regional Rank	Natural Capital Protection	Indicator categories			
			Environmental quality	GHG emissions reductions	Biodiversity and ecosystem protection	Cultural and social value
The Americas						
Dominica	-	72.37	92.79	89.66	67.93	48.53
Turks & Caicos Islands	-	72.15	-	90.54	70.30	59.00
Grenada	-	71.89	90.06	90.78	81.82	39.92
St Vincent & Grenadines	-	71.53	89.92	93.88	79.96	38.78
Venezuela	-	71.24	85.96	62.75	83.05	57.49
Chile	11	69.74	87.64	77.47	52.78	66.01
Cuba	-	68.72	91.89	82.64	76.78	38.24
El Salvador	4	66.84	85.77	92.53	64.52	38.98
Puerto Rico	-	65.31	68.67	96.76	74.03	36.98
Cayman Islands	-	65.14	-	81.11	61.00	55.85
US Virgin Islands	-	63.35	64.82	97.19	70.12	36.47
British Virgin Islands	-	63.35	-	86.02	55.69	53.06
Saint Kitts and Nevis	-	62.62	-	90.12	72.35	37.66
United States	2	62.61	81.26	43.67	59.67	72.57
Bermuda	-	61.32	69.62	81.34	64.35	38.79
Argentina	13	57.94	88.66	56.30	41.16	54.84
Aruba	-	57.47	-	86.37	34.06	64.54
Uruguay	16	57.32	90.68	59.10	51.18	39.35
Canada	3	55.24	83.57	30.93	54.59	65.98
Trinidad & Tobago	21	53.30	84.69	31.63	77.76	38.74
Haiti	-	51.71	74.37	93.72	38.30	26.78
Greenland	-	44.66	79.60	52.89	12.19	77.47
Anguilla	-	-	-	-	-	93.28
Saint Martin (French)	-	-	-	-	88.25	-
Saint Barthélemy	-	-	-		84.04	-
Martinique	-	-	-	-	81.18	-
Montserrat	-	-	-	-	-	72.31
French Guiana	-	-	-	-	84.32	60.01
Guadeloupe	-	-	-	-	70.66	36.28
Curaçao	-	-	-	45.32	-	57.56
Falkland Islands	-	-	-	-	17.09	51.52
Asia						
Cambodia	23	83.20	91.47	81.38	72.19	89.17
Nepal	14	80.17	74.52	89.68	72.81	84.89
Laos	-	79.30	84.96	75.96	72.89	84.05
Thailand	12	79.03	86.25	75.58	78.57	76.16
Hong Kong China SAR	-	78.70	-	87.44	65.66	84.89
Bhutan	-	77.21	81.83	76.04	68.63	83.21
Timor-Leste	-	76.07	92.07	91.44	73.01	54.49
Japan	7	73.53	91.06	81.26	72.67	54.36

Table A1.7 Scores on indicator categories for natural capital protection by region and rank *(continued)*

Countries/Territories	Regional Rank	Natural Capital Protection	Indicator categories			
			Environmental quality	GHG emissions reductions	Biodiversity and ecosystem protection	Cultural and social value
Asia						
Cyprus	13	72.59	87.13	83.41	63.57	60.11
Armenia	21	72.55	91.55	78.62	44.47	86.57
Georgia	4	72.46	91.86	75.64	61.36	64.68
Philippines	3	70.62	90.32	91.33	76.81	39.26
Indonesia	16	70.48	87.41	84.29	69.48	48.20
Malaysia	2	70.29	87.26	67.48	71.89	57.67
China	5	70.15	84.42	70.66	59.83	67.86
Sri Lanka	8	69.67	92.41	94.21	72.44	37.35
Viet Nam	19	68.29	92.53	80.54	73.28	39.82
Myanmar	11	66.44	83.42	79.98	67.04	43.57
Azerbaijan	10	64.14	86.33	64.13	48.39	63.18
Kyrgyzstan	20	63.35	92.56	87.22	27.18	73.38
India	9	63.24	68.51	89.64	61.54	42.32
Singapore	1	63.21	64.44	72.75	64.82	52.54
Tajikistan	30	62.59	73.23	90.04	23.68	98.31
Korea, Republic of	6	61.09	86.87	74.73	52.75	40.68
Bangladesh	-	60.63	70.06	92.36	56.88	36.72
Mongolia	27	60.63	71.82	48.17	40.76	95.80
Korea Dem. People's Rep. of	-	59.51	88.72	87.16	50.63	32.04
Brunei Darussalam	-	58.06	88.15	30.63	73.36	57.35
Lebanon	17	55.91	84.85	90.52	39.68	32.06
Israel	15	55.68	82.99	81.97	30.33	46.60
Iran	-	54.86	84.17	62.35	35.18	49.08
Turkey	18	54.32	83.18	81.34	40.58	31.71
Uzbekistan	-	53.64	87.26	67.29	23.36	60.37
Pakistan	24	50.89	67.66	84.95	22.45	51.98
Palestine	-	47.92	88.80	97.86	12.67	
United Arab Emirates	-	47.72	61.79	31.84	33.15	79.52
Maldives	-	46.97	83.09	93.81	10.70	58.40
Turkmenistan	-	45.12	90.06	31.38	24.54	59.74
Afghanistan	-	43.14	70.19	94.08	14.01	37.44
Jordan	28	42.20	85.61	91.43	7.37	54.99
Syria	-	39.05	85.78	87.41	9.45	32.81
Kuwait	31	37.94	60.32	32.71	17.06	61.53
Yemen	-	37.69	64.26	93.09	11.73	28.77
Kazakhstan	25	37.46	90.71	33.50	12.61	51.39
Bahrain	-	33.71	66.11	33.78	13.79	41.95
Iraq	32	33.67	74.23	79.33	7.89	27.67
Qatar	22	33.64	55.88	29.90	13.44	57.04

Table A1.7 Scores on indicator categories for natural capital protection by region and rank *(continued)*

Countries/Territories	Regional Rank	Natural Capital Protection	Indicator categories			
			Environmental quality	GHG emissions reductions	Biodiversity and ecosystem protection	Cultural and social value
Asia						
Saudi Arabia	26	31.09	54.68	36.09	8.48	55.87
Oman	29	28.56	71.71	40.64	5.41	42.22
Macao China SAR	-	-	-	94.50	-	-
Europe						
Liechtenstein	-	85.40	-	89.87	74.18	93.43
Slovakia	10	83.35	89.60	78.32	71.18	96.64
Italy	6	83.15	87.29	82.10	72.57	91.90
Hungary	13	82.52	87.20	80.09	70.56	94.12
Germany	7	81.52	84.78	72.73	72.91	98.22
Croatia	15	81.37	88.31	71.20	73.84	94.40
Andorra	-	80.49	87.77	87.16	58.82	93.28
Albania	31	80.49	89.25	80.42	73.42	79.63
Greece	27	80.47	88.13	77.94	71.33	85.57
Portugal	11	80.40	89.60	81.26	63.19	90.85
Austria	3	79.56	85.80	73.33	69.53	91.60
Spain	17	78.47	90.07	79.55	63.49	83.36
Czech Republic	5	78.40	90.08	59.03	72.90	97.47
Bulgaria	28	78.25	86.08	77.06	77.56	72.88
North Macedonia	-	78.15	85.42	83.01	63.10	83.36
France	14	77.74	87.97	68.88	75.28	80.08
Switzerland	21	77.70	83.23	82.16	63.25	84.27
Slovenia	16	77.58	87.51	69.49	77.51	76.84
Sweden	2	77.26	89.60	78.35	62.42	81.29
United Kingdom	20	76.96	88.52	76.34	67.09	77.36
Romania	24	76.56	91.56	73.37	71.25	71.79
Belgium	12	75.74	88.75	64.61	75.50	76.01
Latvia	9	74.43	88.71	60.68	69.84	81.62
Netherlands	19	74.39	86.66	63.46	64.95	85.75
Serbia	30	74.02	91.56	77.54	59.24	71.37
Luxembourg	26	73.84	84.12	52.17	68.32	99.15
Denmark	1	72.52	81.65	65.44	69.75	74.23
Finland	4	72.25	88.46	61.76	67.37	74.03
Malta	38	70.91	85.14	88.28	44.28	75.95
Lithuania	18	70.87	87.67	59.97	65.70	73.04
Poland	23	70.77	89.19	56.82	68.50	72.25
Estonia	8	69.31	91.52	44.41	70.06	81.06
Belarus	34	69.22	87.01	57.63	55.67	82.26
Montenegro	35	68.12	84.92	82.01	54.35	56.87
Norway	22	64.26	90.30	43.31	60.80	71.72

Table A1.7 Scores on indicator categories for natural capital protection by region and rank *(continued)*

Countries/Territories	Regional Rank	Natural Capital Protection	Indicator categories			
			Environmental quality	GHG emissions reductions	Biodiversity and ecosystem protection	Cultural and social value
Europe						
Bosnia & Herzegovina	37	62.24	84.25	73.73	61.83	39.08
Moldova Republic	36	61.62	71.27	83.90	38.16	63.19
Ukraine	33	59.09	89.65	62.62	50.77	42.76
Russian Federation	32	58.56	88.68	42.82	56.99	54.34
Ireland	25	58.46	86.38	45.18	64.15	46.66
Gibraltar	-	46.35	-	56.95	18.06	96.77
Iceland	29	45.77	66.99	67.51	15.93	60.91
Faeroe Islands	-	38.00	-	66.62	19.38	42.51
Monaco	-	-	-	-	-	77.76
Svalbard & Jan Mayen Islands	-	-	-	-	44.89	-
Isle of Man	-	-	-	-	41.41	-
San Marino	-	-	-	-	25.86	-
Oceania						
American Samoa	-	83.95	90.65	98.71	75.61	73.42
Palau	-	81.62	-	81.79	83.82	79.31
Kiribati	-	78.64	84.57	97.98	62.56	73.79
Northern Mariana Islands	-	78.27	84.25	100.00	66.24	67.24
New Caledonia	-	75.48	-	66.29	82.11	79.00
Samoa	-	72.01	95.09	87.61	61.80	52.23
Marshall Islands	-	71.74	94.04	97.20	58.96	49.14
Fiji	3	70.95	91.84	86.39	62.66	50.96
Fed. States Micronesia	-	66.69	92.43	91.96	56.74	41.03
Tonga	-	65.72	94.62	90.94	45.27	47.89
Vanuatu	-	65.62	89.39	81.36	52.28	48.76
New Zealand	1	64.84	83.09	46.98	56.72	79.86
Solomon Islands	-	63.56	89.00	97.32	54.27	34.72
French Polynesia	-	63.02	-	92.93	56.15	47.96
Papua New Guinea	-	59.59	82.02	89.16	60.89	28.31
Australia	2	47.09	87.03	11.27	64.30	77.95
Guam	-	35.94	77.63	99.51	73.62	2.93
Nauru	-	18.47	-	92.94	1.00	67.83
Tokelau	-	-	-	-	-	78.99
Niue	-	-	-	-	76.19	81.17
Norfolk Island	-	-	-	-	75.92	-
Tuvalu	-	-	-	92.87	-	50.91
Cook Islands	-	-	-	-	42.65	74.26

Table A1.8 Scores on indicator categories for green economic opportunities by region and rank

Countries/ Territories	Regional Rank	Green Economic Opportunities	Indicator categories			
			Green investment	Green Trade	Green employment	Green innovation
Africa						
Egypt	10	38.51	61.19	19.97	66.51	27.05
Tanzania	2	33.81	84.68	12.20	37.40	-
Tunisia	7	29.66	44.54	41.27	15.56	27.05
Morocco	4	28.68	83.64	9.93	30.12	27.05
Uganda	6	27.10	42.50	6.35	73.79	-
Ethiopia	9	26.05	65.79	5.17	51.96	-
Ghana	5	23.36	54.33	6.27	37.40	-
Senegal	8	22.71	72.46	7.08	22.84	-
Madagascar	13	18.31	67.14	4.00	22.84	-
South Africa	11	15.68	55.72	36.00	30.12	1.00
Cameroon	12	15.28	61.51	7.00	8.28	-
Mauritius	3	14.81	47.15	8.32	8.28	-
Botswana	1	14.23	91.39	2.03	15.56	-
Malawi	14	9.63	22.96	16.38	22.84	1.00
Algeria	20	7.76	86.67	5.39	-	1.00
Zambia	15	7.63	68.34	6.49	-	1.00
Zimbabwe	17	4.12	29.33	2.39	-	1.00
Burundi	18	4.06	29.81	2.24	1.00	-
Sudan	21	3.98	55.01	1.15	1.00	-
Nigeria	19	3.94	57.13	1.07	1.00	-
Kenya	16	3.83	56.13	-	1.00	1.00
Lesotho	-	-	66.98	-	-	-
Comoros	-	-	63.72	-	-	-
Djibouti	-	-	61.89	-	-	-
Cote d'Ivoire	-	-	78.41	5.83	-	-
Congo Dem. Rep. of	-	-	41.38	-	-	-
Guinea-Bissau	-	-	40.70	-	-	-
Cabo Verde	-	-	74.77	1.51	-	-
Angola	-	-	36.97	-	-	-
Togo	-	-	45.43	27.07	-	-
Niger	-	-	62.53	1.95	-	-
Eswatini	-	-	61.96	-	1.00	-
Namibia	-	-	53.06	4.08	-	-
Benin	-	-	51.16	5.69	-	-
Rwanda	-	-	47.10	8.91	-	-
Mali	-	-	52.66	2.83	-	-
Burkina Faso	-	-	43.48	2.03	-	-
Mauritania	-	-	43.07	1.00	-	-
Mozambique	-	-	34.17	4.30	-	-
Guinea	-	-	23.98	3.93	-	-
Sierra Leone	-	-	9.99	1.66	-	-

Table A1.8 Scores on indicator categories for green economic opportunities by region and rank *(continued)*

Countries/ Territories	Regional Rank	Green Economic Opportunities	Indicator categories			
			Green investment	Green Trade	Green employment	Green innovation
Africa						
Congo, Republic of	-	-	1.00	7.08	-	-
Seychelles	-	-	-	1.66	-	-
Sao Tome & Principe	-	-	-	1.44	-	-
Gambia	-	-	-	1.73	1.00	-
Liberia	-	-	1.00	-	-	-
Central African Rep.	-	-	-	1.00	-	-
Eritrea	-	-	-	-	1.00	-
The Americas						
El Salvador	4	44.84	63.39	15.43	-	92.18
United States	2	44.14	63.88	47.94	88.35	14.03
Mexico	5	40.70	65.46	44.93	66.51	14.03
Canada	3	38.68	62.34	25.60	100.00	14.03
Colombia	6	32.37	61.48	7.22	37.40	66.13
Dominican Republic	1	31.56	78.28	14.84	-	27.05
Brazil	8	30.98	63.34	23.55	22.84	27.05
Bahamas	17	29.05	77.19	20.40	15.56	-
Bolivia	12	25.17	58.98	6.05	44.68	-
Ecuador	9	25.06	73.65	5.17	73.79	14.03
Guatemala	10	23.56	59.04	15.79	-	14.03
Costa Rica	7	23.50	77.20	11.98	-	14.03
Argentina	13	22.07	64.67	8.69	30.12	14.03
Paraguay	14	20.61	75.02	2.24	51.96	-
Chile	11	18.76	63.12	4.66	15.56	27.05
Honduras	15	15.35	80.61	3.20	-	14.03
Uruguay	16	12.84	69.95	3.34	8.28	14.03
Peru	18	10.98	66.41	8.10	1.00	27.05
Panama	19	10.96	88.87	10.45	15.56	1.00
Trinidad & Tobago	21	9.39	-	100.00	8.28	1.00
Nicaragua	20	5.67	74.09	2.46	-	1.00
Haiti	-	-	85.93		-	-
Bermuda	-	-	-	100.00	8.28	-
Saint Lucia	-	-	52.60	41.93	-	-
Jamaica	-	-	78.31	14.25	-	-
Guyana	-	-	75.03	6.49	-	-
Belize	-	-	55.88	17.62	-	-
Venezuela	-	-	65.59	6.49	-	-
St Vincent & Grenadines	-	-	57.51	9.71	-	-
Barbados	-	-	46.48	13.23	-	-
Cuba	-	-	-	-	-	27.05
Antigua & Barbuda	-	-	-	16.96	-	-

Table A1.8 Scores on indicator categories for green economic opportunities by region and rank *(continued)*

Countries/ Territories	Regional Rank	Green Economic Opportunities	Indicator categories			
			Green investment	Green Trade	Green employment	Green innovation
The Americas						
Aruba	-	-	-	16.01	-	-
Saint Kitts and Nevis	-	-	-	8.32	-	-
Suriname	-	-	-	7.88	-	-
Greenland	-	-	-	1.59	-	-
Asia						
China	5	55.41	83.11	38.34	73.79	40.08
Korea, Republic of	6	54.06	83.01	43.03	88.35	27.05
Malaysia	2	51.03	70.51	48.16	73.79	27.05
Philippines	3	48.34	94.61	41.05	51.96	27.05
Brunei Darussalam	-	46.39	100.00	26.70	37.40	-
Singapore	1	42.88	100.00	36.22	66.51	14.03
India	9	40.31	81.29	23.11	51.96	27.05
Georgia	4	37.19	67.55	34.76	30.12	27.05
Sri Lanka	8	33.42	93.67	13.23	30.12	-
Japan	7	33.23	65.08	58.48	22.84	14.03
Oman	29	30.89	33.89	16.74	51.96	-
Myanmar	11	30.42	90.33	4.22	73.79	-
Azerbaijan	10	29.33	64.28	4.44	88.35	-
Lebanon	17	27.99	33.93	14.47	44.68	-
Pakistan	24	27.75	76.70	12.20	22.84	-
Israel	15	27.14	78.31	31.75	15.56	14.03
Saudi Arabia	26	24.35	70.58	9.49	37.40	14.03
Nepal	14	18.05	100.00	1.95	30.12	-
Turkey	18	17.71	71.11	26.63	51.96	1.00
Thailand	12	17.07	74.21	30.58	37.40	1.00
Viet Nam	19	14.20	74.73	18.06	30.12	1.00
Qatar	22	13.79	87.04	1.00	30.12	-
Cyprus	13	13.05	60.93	12.72	37.40	1.00
Jordan	28	12.71	62.43	13.89	30.12	1.00
Kyrgyzstan	20	12.68	62.64	11.03	37.40	1.00
Kuwait	31	12.42	66.26	3.49	8.28	-
Indonesia	16	12.30	74.06	13.52	22.84	1.00
Armenia	21	9.19	56.66	8.10	15.56	1.00
Kazakhstan	25	8.87	62.93	3.27	30.12	1.00
Hong Kong China SAR	-	6.49	-	19.53	1.00	14.03
Cambodia	23	5.72	69.83	2.68	1.00	-
Tajikistan	30	3.98	63.25	-	1.00	1.00
Iraq	32	3.59	46.25	1.00	1.00	-
Mongolia	27	3.31	55.31	2.17	1.00	1.00

Table A1.8 Scores on indicator categories for green economic opportunities by region and rank *(continued)*

Countries/ Territories	Regional Rank	Green Economic Opportunities	Indicator categories			
			Green investment	Green Trade	Green employment	Green innovation
Asia						
Bhutan	-	-	91.51	-	-	-
Iran	-	-	-	-	73.79	-
Bahrain	-	-	77.02	17.99	-	-
Bangladesh	-	-	91.12	2.46	-	-
Afghanistan	-	-	60.46	-	1.00	-
Laos	-	-	54.74	3.12	-	-
Timor-Leste	-	-	24.68	4.59	-	-
Syria	-	-	-		8.28	-
United Arab Emirates	-	-	-	6.20	-	-
Palestine	-	-	-	6.86	1.00	-
Yemen	-	-	-	4.66	1.00	-
Macao China SAR	-	-	-	1.07	-	1.00
Turkmenistan	-	-	-	-	1.00	-
Maldives	-	-	-	1.00	1.00	-
Uzbekistan	-	-	-	-	-	1.00
Europe						
Denmark	1	63.84	79.51	77.23	100.00	27.05
Czech Republic	5	61.85	69.48	54.97	95.63	40.08
Germany	7	60.55	75.08	66.17	100.00	27.05
Estonia	8	59.12	71.99	37.98	44.68	100.00
Finland	4	58.86	67.05	45.67	73.79	53.11
Sweden	2	57.96	81.54	43.98	59.24	53.11
Italy	6	57.63	63.31	58.92	73.79	40.08
Belgium	12	55.88	69.71	26.92	51.96	100.00
Hungary	13	55.10	73.08	63.17	73.79	27.05
Poland	23	52.48	69.44	40.98	66.51	40.08
Austria	3	52.27	74.38	50.28	73.79	27.05
Slovakia	10	49.51	63.20	29.26	81.07	40.08
Latvia	9	49.40	61.38	20.26	51.96	92.18
Spain	17	47.61	67.40	28.61	66.51	40.08
Portugal	11	47.25	58.64	40.83	51.96	40.08
Netherlands	19	46.76	77.45	34.32	66.51	27.05
Lithuania	18	46.47	-	36.37	51.96	53.11
France	14	45.39	67.13	39.44	59.24	27.05
Romania	24	44.56	62.00	45.23	51.96	27.05
Croatia	15	44.29	69.39	26.63	51.96	40.08
Slovenia	16	41.78	66.46	44.28	73.79	14.03
Bulgaria	28	40.67	73.09	26.63	51.96	27.05
Iceland	29	40.56	77.87	11.54	30.12	100.00

Table A1.8 Scores on indicator categories for green economic opportunities by region and rank *(continued)*

Countries/ Territories	Regional Rank	Green Economic Opportunities	Indicator categories			
			Green investment	Green Trade	Green employment	Green innovation
Europe						
United Kingdom	20	39.20	61.93	45.89	59.24	14.03
Ireland	25	38.15	80.61	13.23	37.40	53.11
Norway	22	37.62	78.44	30.73	59.24	14.03
Russian Federation	32	37.27	66.75	11.18	95.63	27.05
Ukraine	33	36.05	57.59	13.38	81.07	27.05
Serbia	30	33.89	51.37	28.02		27.05
Luxembourg	26	33.19	81.33	44.93	8.28	40.08
Greece	27	30.95	49.39	18.35	37.40	27.05
Switzerland	21	29.30	79.25	29.05	22.84	14.03
Albania	31	23.42	66.94	4.30	44.68	
Moldova Republic	36	14.84	75.84	23.63	1.00	27.05
Belarus	34	12.36	82.13	18.28	15.56	1.00
Montenegro	35	9.40	-	7.15	8.28	14.03
Bosnia & Herzegovina	37	9.27	-	26.41	30.12	1.00
Malta	38	2.45	-	14.62	1.00	1.00
North Macedonia	-	-	73.73	100.00	-	-
Andorra	-	-	-	23.48	-	-
Monaco	-	-	-	-	-	1.00
San Marino	-	-	-	-	-	1.00
Oceania						
New Zealand	1	26.83	74.44	11.11	44.68	14.03
Australia	2	25.77	61.82	9.79	51.96	14.03
Fiji	3	18.49	66.76	94.73	1.00	-
Palau	-	-	-	100.00	-	-
Vanuatu	-	-	84.13	-	-	-
Kiribati	-	-	-	33.15	-	-
French Polynesia	-	-	-	5.69	-	-
New Caledonia	-	-	-	3.05	-	-
Samoa	-	-	-	2.46	-	-
Solomon Islands	-	-	-	2.24	-	-
Tonga	-	-	-	-	1.00	-

Table A1.9 Scores on indicator categories for social inclusion by region and rank

Countries/Territories	Regional Rank	Social Inclusion	Indicator categories			
			Access to basic services and resources	Gender balance	Social equity	Social protection
Africa						
Mauritius	3	78.97	88.56	72.33	76.88	-
Seychelles	-	75.79	95.44	59.11	77.85	75.12
Tunisia	7	67.89	81.69	48.16	88.82	60.81
South Africa	11	65.26	80.88	94.14	36.55	65.18
Cabo Verde	-	64.38	67.27	61.49	64.02	64.88
Botswana	1	62.32	64.60	58.42	-	64.13
Algeria	20	59.40	55.71	48.89	82.59	55.34
Libya	-	58.28	55.66	71.35	-	49.84
Gabon	-	57.53	73.85	55.57	61.16	43.65
Egypt	10	56.51	69.86	40.44	61.29	58.91
Morocco	4	54.98	69.94	41.12	-	57.78
Ghana	5	50.06	43.52	53.83	62.21	43.10
Kenya	16	44.72	32.33	77.89	40.97	38.76
Namibia	-	43.58	47.80	97.49	12.38	62.51
Mauritania	-	43.52	41.80	39.73	-	49.62
Eswatini	-	41.99	44.63	32.88	-	50.46
Senegal	8	40.73	37.02	62.85	31.48	37.58
Zimbabwe	17	40.69	34.49	74.49	31.04	34.38
Equatorial Guinea	-	40.62	33.34	70.30	-	28.59
Togo	-	39.48	29.33	67.36	48.38	25.42
Congo, Republic of	-	39.10	56.31	36.90	36.97	30.42
Gambia	-	38.90	45.67	48.32	26.44	39.22
Comoros	-	37.49	32.17	56.54	41.28	26.30
Tanzania	2	36.51	19.97	84.56	35.74	29.44
Sao Tome & Principe	-	36.50	39.34	19.02	78.13	30.37
Lesotho	-	36.00	30.33	71.78	16.63	46.38
Guinea	-	35.95	28.02	62.33	41.16	23.23
Cameroon	12	35.94	38.41	53.85	21.95	36.76
Sierra Leone	-	34.74	46.34	43.87	39.01	18.36
Cote d'Ivoire	-	34.69	48.42	48.18	29.11	21.34
Angola	-	33.73	30.29	55.88	29.10	26.27
Rwanda	-	33.38	20.54	84.37	25.95	27.62
Burundi	18	32.69	11.84	78.89	53.82	22.71
Nigeria	19	32.69	24.99	35.95	46.19	27.50
Mali	-	32.50	36.85	31.36	38.01	25.38
Liberia	-	31.60	14.00	61.53	47.70	24.26
Djibouti	-	31.53	22.53	64.06	-	21.72
Uganda	6	29.18	10.86	81.87	32.38	25.18
Burkina Faso	-	28.71	27.08	36.70	33.90	20.17
Benin	-	28.69	28.09	39.33	27.67	22.16

Table A1.9 Scores on indicator categories for social inclusion by region and rank *(continued)*

Countries/Territories	Regional Rank	Social Inclusion	Indicator categories			
			Access to basic services and resources	Gender balance	Social equity	Social protection
Africa						
Ethiopia	9	28.56	11.65	56.60	44.94	22.46
Mozambique	-	26.02	13.08	62.66	29.61	18.88
Madagascar	13	25.85	9.51	48.32	53.75	18.07
Malawi	14	24.44	9.80	69.87	27.19	19.15
Zambia	15	24.25	28.44	70.34	8.68	19.92
Sudan	21	23.93	33.91	31.20	24.91	12.43
Niger	-	23.33	8.34	44.25	41.88	19.16
Somalia	-	22.98	13.78	61.26	-	14.38
Congo Dem. Rep. of	-	21.56	12.08	51.72	-	16.04
Chad	-	17.24	9.41	41.57	29.61	7.62
Guinea-Bissau	-	14.77	19.75	14.56	-	11.20
Central African Rep.	-	14.59	12.36	30.07	8.36	-
Sudan South	-	10.91	3.37	28.74	25.63	5.72
Eritrea	-	-	14.68	59.91	-	-
The Americas						
Canada	3	85.13	78.44	84.82	84.06	93.91
Trinidad & Tobago	21	82.16	92.42	72.61	85.75	79.20
United States	2	80.44	89.92	71.30	75.72	86.26
Chile	11	76.46	85.84	70.56	72.20	78.14
Argentina	13	75.45	78.95	72.68	74.29	76.03
Costa Rica	7	75.01	94.31	64.97	68.80	75.11
Grenada	-	74.70	77.23	96.73	-	55.79
Uruguay	16	73.11	82.33	68.20	75.03	67.81
Ecuador	9	68.78	66.27	80.82	71.66	58.31
Antigua & Barbuda	-	68.23	95.97	49.11	-	67.40
Saint Lucia	-	68.10	76.31	67.03	78.76	53.37
Barbados	-	68.07	83.78	57.93	73.80	59.94
Guyana	-	66.32	59.74	82.08	61.26	64.42
Suriname	-	66.15	81.82	63.37	56.61	65.24
El Salvador	4	65.76	85.16	65.62	69.75	47.97
Brazil	8	65.41	64.55	63.09	64.06	70.15
Mexico	5	65.03	60.09	83.19	69.31	51.61
Dominican Republic	1	64.30	67.54	73.72	72.58	47.31
Bolivia	12	64.26	46.29	82.72	70.37	63.29
Colombia	6	64.25	68.24	65.26	65.07	58.79
Bahamas	17	63.42	76.45	50.80	-	65.69
Venezuela	-	63.10	50.59	67.24	81.01	57.52
Panama	19	62.42	78.51	55.98	63.48	54.41
Peru	18	61.07	60.63	72.86	66.93	47.05
Paraguay	14	59.34	67.87	73.02	51.06	49.00

Table A1.9 Scores on indicator categories for social inclusion by region and rank *(continued)*

Countries/Territories	Regional Rank	Social Inclusion	Indicator categories			
			Access to basic services and resources	Gender balance	Social equity	Social protection
The Americas						
Belize	-	57.91	59.33	49.33	58.04	66.19
Nicaragua	20	57.04	62.32	75.71	52.51	42.73
St Vincent & Grenadines	-	56.01	79.51	38.62	-	57.23
Jamaica	-	55.11	74.16	43.08	74.06	39.00
Honduras	15	53.98	56.15	57.44	53.13	49.56
Dominica	-	53.21	76.85	50.50	-	38.81
Guatemala	10	52.90	61.16	55.39	61.49	37.59
Haiti	-	26.01	21.56	54.58	-	14.96
Cayman Islands	-	-	100.00	-	-	-
Greenland	-	-	97.31	-	-	-
Curaçao	-	-	86.01	-		-
Bermuda	-	-	84.88	-	-	-
Puerto Rico	-	-	60.21	81.80	-	-
Saint Kitts and Nevis	-	-	91.43	38.92	-	-
Cuba	-	-	43.74	-	-	77.19
Asia						
Hong Kong China SAR	-	85.30	85.22	87.04	83.68	-
Singapore	1	84.00	95.16	72.77	85.60	-
Japan	7	83.23	93.68	57.17	97.51	91.90
Israel	15	82.89	90.70	76.12	76.93	88.89
Cyprus	13	82.26	90.89	69.40	81.40	89.19
Korea, Republic of	6	76.41	92.86	53.47	87.49	78.46
Turkmenistan	-	76.31	88.42	62.24	80.75	-
Thailand	12	71.46	90.07	52.06	78.67	70.68
United Arab Emirates	-	71.08	97.42	41.86	88.05	-
Viet Nam	19	70.81	74.04	66.96	86.27	58.80
Maldives	-	70.65	98.16	43.97	74.92	77.04
China	5	70.32	66.65	55.19	84.32	78.84
Georgia	4	70.17	79.38	65.82	69.04	67.23
Kyrgyzstan	20	70.06	71.58	52.59	82.75	77.34
Brunei Darussalam	-	69.87	83.17	59.51	-	68.92
Tajikistan	30	68.74	62.00	55.66	94.34	68.56
Uzbekistan	-	68.51	67.71	58.73	87.59	63.26
Armenia	21	67.74	73.08	60.21	67.82	70.54
Azerbaijan	10	67.35	75.19	42.76	99.04	64.61
Iran	-	67.17	82.45	52.45	88.00	53.48
Saudi Arabia	26	65.63	81.38	36.26	82.99	75.72
Iraq	32	63.53	71.03	49.76	91.68	50.26
Jordan	28	63.52	77.54	31.84	87.19	75.62
Kazakhstan	25	63.28	88.30	57.81	91.72	34.26

Table A1.9 Scores on indicator categories for social inclusion by region and rank *(continued)*

Countries/Territories	Regional Rank	Social Inclusion	Indicator categories			
			Access to basic services and resources	Gender balance	Social equity	Social protection
Asia						
Mongolia	27	62.54	62.91	68.09	53.52	66.74
Malaysia	2	62.45	84.58	57.34	87.65	35.79
Qatar	22	62.29	88.72	35.45	98.62	48.54
Indonesia	16	61.04	79.42	67.55	71.26	36.32
Turkey	18	60.66	64.60	48.40	73.17	59.20
Bahrain	-	60.30	94.72	42.15	-	54.92
Philippines	3	59.96	59.58	75.21	68.79	41.94
Timor-Leste	-	59.53	46.29	71.59	61.70	61.42
Nepal	14	59.15	46.03	65.48	87.70	46.30
Sri Lanka	8	54.49	63.49	45.69	70.67	42.99
Kuwait	31	53.46	95.84	31.39	-	50.78
Palestine	-	49.71	66.24	31.43	69.99	41.90
India	9	48.95	51.80	38.68	79.64	35.98
Syria	-	47.05	70.96	14.07	89.43	54.90
Laos	-	46.50	34.32	68.36	57.17	34.86
Bhutan	-	46.36	49.17	61.35	88.11	17.38
Lebanon	17	46.07	66.85	37.30	-	39.23
Myanmar	11	45.79	39.17	57.23	58.67	33.41
Bangladesh	-	45.74	46.16	38.18	65.92	37.68
Cambodia	23	41.87	35.10	71.56	44.02	27.79
Oman	29	38.82	87.53	14.56	-	45.90
Pakistan	24	34.65	43.96	16.54	75.89	26.13
Afghanistan	-	30.46	39.39	25.88	63.00	13.40
Yemen	-	16.42	44.84	1.00	62.14	26.07
Macao China SAR	-	-	100.00	-	94.75	-
Korea Dem. People's Rep. of	-	-	15.47	-	-	-
Europe						
Sweden	2	93.70	92.14	97.04	90.42	95.33
Finland	4	92.23	91.46	94.72	90.46	92.34
Denmark	1	92.07	92.09	91.68	91.52	92.99
Netherlands	19	91.99	92.96	90.76	91.98	92.26
Austria	3	91.92	99.13	89.70	87.94	91.31
Norway	22	91.67	86.21	93.94	91.48	95.33
Switzerland	21	91.44	94.94	88.06	89.02	93.95
Belgium	12	90.34	89.09	92.08	89.12	91.09
Luxembourg	26	90.13	93.76	85.29	89.58	92.12
Iceland	29	89.39	87.56	88.22	93.79	88.12
France	14	88.77	88.56	90.81	84.77	91.09
Germany	7	88.65	94.47	79.01	88.65	93.32

Table A1.9 Scores on indicator categories for social inclusion by region and rank *(continued)*

Countries/Territories	Regional Rank	Social Inclusion	Indicator categories			
			Access to basic services and resources	Gender balance	Social equity	Social protection
Europe						
United Kingdom	20	88.09	91.53	87.86	84.46	88.67
Spain	17	87.90	89.47	91.25	79.26	92.25
Italy	6	87.01	92.63	88.62	76.15	91.68
Malta	38	86.95	95.65	74.47	90.12	89.04
Portugal	11	86.66	83.25	88.42	84.02	91.18
Estonia	8	86.66	90.06	84.23	86.11	86.33
Slovenia	16	85.73	85.19	74.47	92.00	92.56
Poland	23	84.55	86.42	76.07	86.36	90.00
Czech Republic	5	84.48	86.80	70.94	93.13	88.82
Ireland	25	84.08	82.57	81.65	82.90	89.40
Lithuania	18	83.02	87.89	79.12	82.51	82.81
Slovakia	10	82.21	87.33	70.79	87.67	84.28
Greece	27	81.94	85.57	78.57	78.76	85.15
Latvia	9	81.87	83.89	76.78	83.42	83.62
Belarus	34	81.59	86.33	73.27	97.10	72.17
Hungary	13	79.20	82.53	63.96	87.28	85.40
Bulgaria	28	78.85	78.78	81.16	76.53	79.00
Romania	24	78.32	76.78	75.23	78.88	82.59
Albania	31	75.14	72.40	81.92	74.02	72.60
Croatia	15	74.94	77.41	76.10	81.74	65.49
Serbia	30	74.83	70.52	88.15	73.14	68.96
North Macedonia	-	73.97	73.16	72.28	74.47	76.00
Russian Federation	32	73.36	87.41	52.29	84.62	74.88
Montenegro	35	72.36	88.83	56.98	82.52	65.63
Ukraine	33	69.45	86.90	39.79	86.78	77.52
Bosnia & Herzegovina	37	64.66	63.22	59.58	73.05	63.52
Moldova Republic	36	64.47	71.06	55.75	76.30	57.16
Isle of Man	-	-	98.02	-	-	-
Channel Islands	-	-	95.75	-	-	-
Gibraltar	-	-	94.17	-	-	-
Liechtenstein	-	-	93.72	-	-	-
Andorra	-	-	90.95	-	-	-
Monaco	-	-	88.48	-	-	-
Faeroe Islands	-	-	86.92	-	-	-
Kosovo	-	-	-	83.11	-	-
San Marino	-	-	86.39	64.56	-	-
Oceania						
New Zealand	1	88.29	90.38	84.03	85.81	93.23
Australia	2	85.08	81.17	85.55	87.24	86.49
Palau	-	61.08	53.75	50.50	83.94	-

Table A1.9 Scores on indicator categories for social inclusion by region and rank *(continued)*

Countries/Territories	Regional Rank	Social Inclusion	Indicator categories			
			Access to basic services and resources	Gender balance	Social equity	Social protection
Oceania						
Fiji	3	53.38	61.11	41.59	78.44	40.73
Samoa	-	50.05	46.21	48.03	59.96	47.18
Marshall Islands	-	45.53	44.04	47.13	-	45.45
Tonga	-	40.39	62.54	45.45	-	23.18
Kiribati	-	40.33	30.44	56.94	37.85	-
Fed. States Micronesia	-	40.20	24.05	38.13	70.84	-
Vanuatu	-	26.31	32.44	25.75	54.66	10.50
Solomon Islands	-	20.36	31.91	17.34	-	15.25
Papua New Guinea	-	11.10	17.30	13.38	-	5.91
New Caledonia	-	-	98.45	-	-	-
Nauru	-	-	91.11	-	-	-
Northern Mariana Islands	-	-	90.68	-	-	-
French Polynesia	-	-	79.29	-	-	-
Tuvalu	-	-	36.82	-	68.87	-

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
Africa									
Botswana	1	83.92	56.62	15.20	100.00	2.99	-	74.15	58.32
Tanzania	2	48.39	100.00	1.71	100.00	11.70	6.66	68.37	100.00
Mauritius	3	89.62	23.23	3.79	97.33	36.76	1.25	91.36	77.94
Morocco	4	85.35	22.80	3.61	52.40	7.50	1.25	83.74	100.00
Ghana	5	81.07	80.76	3.05	100.00	10.27	2.16	65.52	100.00
Uganda	6	39.13	100.00	6.33	100.00	15.96	16.14	65.01	100.00
Tunisia	7	80.86	25.19	4.99	1.00	2.53	15.97	85.90	98.24
Senegal	8	72.31	83.26	1.97	100.00	4.43	1.67	76.69	100.00
Ethiopia	9	10.44	100.00	1.67	100.00	14.77	5.24	44.18	100.00
Egypt	10	82.78	12.00	2.38	1.00	2.08	24.63	70.41	100.00
South Africa	11	45.83	34.03	6.52	64.52	9.47	1.08	88.95	94.69
Cameroon	12	73.74	100.00	5.55	100.00	19.99	1.00	76.82	100.00
Madagascar	13	69.54	100.00	1.15	100.00	21.91	2.16	45.01	100.00
Malawi	14	78.72	100.00	1.71	100.00	10.96	2.75	29.96	100.00
Zambia	15	55.51	100.00	2.57	100.00	10.02	1.25	50.15	100.00
Kenya	16	51.88	100.00	5.02	100.00	11.58	5.66	74.28	100.00
Zimbabwe	17	1.00	100.00	1.41	100.00	7.08	1.17	73.71	100.00
Burundi	18	52.80	100.00	2.64	100.00	22.96	1.00	27.16	100.00
Nigeria	19	67.33	100.00	3.46	100.00	7.68	1.58	88.19	100.00
Algeria	20	78.37	1.12	6.74	1.00	1.60	1.00	85.14	100.00
Sudan	21	79.58	100.00	1.56	1.00	1.00	-	70.85	100.00
Sao Tome & Principe	-	74.59	80.08	-	100.00	52.21	100.00	81.84	98.48
Eswatini	-	74.95	100.00	-	85.45	29.40	-	82.47	92.81
Congo, Republic of	-	79.15	100.00	37.45	100.00	22.45	-	89.27	100.00
Gabon	-	61.21	100.00	27.09	100.00	26.09	-	95.43	99.90
Equatorial Guinea	-	92.04	16.06	100.00	100.00	29.32	-	88.44	-
Sudan South	-	100.00	76.25	-	100.00	11.64	4.83	93.84	100.00
Chad	-	87.98	100.00	2.42	100.00	2.33	-	85.33	100.00
Djibouti	-	83.49	30.62	-	100.00	5.65	-	87.68	100.00
Rwanda	-	73.03	100.00	6.18	100.00	28.73	-	61.96	100.00
Saint Helena	-	-	-	-	-	66.85	-	-	-
Gambia	-	75.73	100.00	2.71	100.00	14.88	-	65.52	100.00
Angola	-	82.07	96.48	41.47	100.00	9.34	1.00	88.44	100.00
Cabo Verde	-	88.05	52.19	11.92	100.00	21.58	6.24	86.66	94.90
Comoros	-	74.38	88.31	8.56	100.00	43.66	17.22	69.58	-
Cote d'Ivoire	-	56.22	100.00	5.17	100.00	10.30	2.66	84.12	100.00
Guinea	-	32.15	100.00	2.98	100.00	14.64	-	48.56	100.00
Mali	-	87.62	100.00	1.26	100.00	3.03	1.25	59.74	100.00
Seychelles	-	88.98	3.60	21.46	-	48.02	-	100.00	76.47
Mauritania	-	82.21	62.94	1.67	100.00	1.91	-	46.09	100.00
Central African Rep.	-	50.10	100.00	5.55	100.00	13.94	-	18.97	100.00

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use *(continued)*

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
Africa									
Eritrea	-	73.38	100.00	2.71	100.00	3.05	-	2.14	100.00
Namibia	-	84.56	51.98	7.41	100.00	4.35	1.67	86.09	95.39
Congo Dem. Rep. of	-	1.00	100.00		100.00	16.22	3.99	50.91	100.00
Burkina Faso	-	64.84	100.00	2.90	100.00	5.78	2.91	48.44	100.00
Somalia	-	-	100.00	1.00	89.43	7.89	-	19.73	100.00
Benin	-	43.19	98.96	10.20	100.00	8.52	2.25	54.91	100.00
Liberia	-	1.00	100.00	1.60	100.00	15.01	-	32.43	100.00
Lesotho	-	38.56	100.00	11.36	100.00	28.91	1.17	26.34	90.55
Sierra Leone	-	57.93	100.00	3.39	100.00	18.32	15.64	1.00	98.64
Mozambique	-	1.00	100.00	3.39	100.00	14.80	1.08	73.65	100.00
Niger	-	58.29	100.00	2.01	100.00	1.84	1.00	24.94	100.00
Togo	-	5.66	100.00	4.06	100.00	9.86	5.74	39.67	100.00
Réunion	-	-	-	-	-	67.53	16.14	-	-
Guinea-Bissau	-	22.18	100.00	1.86	100.00	13.42	1.33	46.85	-
Libya	-	77.80	4.79	7.86	1.00	2.07	-	75.99	100.00
Mayotte	-	-	-	-	-	31.70	-	-	-
Western Sahara	-	-	-	-	-	2.72	-	-	-
The Americas									
Dominican Republic	1	90.33	32.74	3.61	62.91	25.46	73.63	94.73	97.74
United States	2	69.25	17.80	13.41	100.00	18.21	5.16	98.22	60.22
Canada	3	55.51	43.43	12.40	100.00	30.02	15.56	96.25	56.43
El Salvador	4	81.79	48.00	4.39	100.00	19.58	1.75	90.60	98.09
Mexico	5	81.14	18.76	5.40	100.00	10.16	6.24	93.84	93.26
Colombia	6	91.68	46.38	6.74	100.00	17.07	1.58	92.19	92.19
Costa Rica	7	87.27	75.60	8.30	100.00	27.88	4.74	92.44	95.51
Brazil	8	78.37	85.34	8.86	100.00	12.06	3.16	81.84	83.34
Ecuador	9	82.00	27.62	3.46	100.00	23.39	6.99	85.84	91.69
Guatemala	10	75.87	100.00	5.77	100.00	31.52	3.91	83.81	100.00
Chile	11	80.86	48.92	2.75	100.00	35.52	1.83	75.04	82.40
Bolivia	12	72.53	34.78	4.35	100.00	16.07	3.50	46.28	99.43
Argentina	13	76.87	20.34	5.47	100.00	15.00	16.89	85.33	86.46
Paraguay	14	79.65	100.00	3.53	100.00	9.38	3.41	64.88	85.95
Honduras	15	63.98	100.00	3.27	100.00	34.14	8.40	79.93	100.00
Uruguay	16	85.77	100.00	3.50	100.00	9.37	96.42	72.76	55.13
Bahamas	17	79.08	3.33	-	100.00	1.17	3.99	100.00	76.84
Peru	18	87.91	50.11	5.06	100.00	24.96	12.40	78.53	93.61
Panama	19	92.32	41.89	15.53	100.00	10.27	6.57	95.30	95.73
Nicaragua	20	69.11	93.84	2.98	100.00	14.58	6.49	73.90	100.00
Trinidad & Tobago	21	1.00	1.54	24.78	100.00	6.50	-	92.76	99.46

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use *(continued)*

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
The Americas									
Falkland Islands	-	-	-	-	-	59.24	100.00	-	-
St Pierre & Miquelon	-	-	-	-	-	63.04	-	-	-
Antigua & Barbuda	-	80.08	1.00	34.95	100.00	35.73	-	99.36	87.42
Bermuda	-	93.32	5.55	-	100.00	47.33	-	-	-
St Vincent & Grenadines	-	86.91	12.19	-	100.00	43.67	-	-	-
Dominica	-	82.07	16.08	-	100.00	55.10	8.99	96.25	-
Grenada	-	86.63	22.03	-	100.00	38.47	10.40	100.00	-
Venezuela	-	74.17	25.73	6.07	100.00	14.68	-	93.33	96.47
Belize	-	71.39	68.45	4.09	100.00	34.18	3.00	82.03	95.70
Saint Lucia	-	85.06	5.10	-	100.00	37.90	-	-	-
Haiti	-	35.78	100.00	2.68	100.00	22.95	3.75	79.80	100.00
Cuba	-	92.75	38.13	5.25	98.77	13.70	1.17	91.81	95.50
Suriname	-	83.64	48.98	3.16	100.00	6.55	1.50	85.27	86.34
Jamaica	-	70.68	33.30	6.59	100.00	15.58	1.67	89.90	95.25
British Virgin Islands	-	-	3.37	-	-	45.32	-	100.00	55.83
Barbados	-	80.86	6.37	18.74	1.00	23.73	-	99.87	91.11
Saint Kitts and Nevis	-	89.55	4.16	-	48.03	33.32	-	-	-
Montserrat	-	-	-	-	-	40.64	-	-	-
Puerto Rico	-	100.00	4.54	10.35	100.00	19.71	1.08	-	-
French Guiana	-	-	-	-	-	5.21	72.30	-	-
Guyana	-	62.49	49.65	1.52	100.00	7.37	-	41.58	1.00
Aruba	-	84.13	13.96	-	-	13.32	-	-	-
Saint Barthélemy	-	-	-	-	-	31.26	-	-	-
Turks & Caicos Islands	-	-	2.10	-	-	60.16	-	-	-
Saint Martin (French)	-	-	-	-	-	30.62	-	-	-
Cayman Islands	-	-	1.00	-	-	59.00	-	-	-
Anguilla	-	-	-	-	-	29.44	-	-	-
Guadeloupe	-	-	-	-	-	47.06	3.75	-	-
Martinique	-	-	-	-	-	40.70	9.07	-	-
Bonaire, St Eustatius & Saba	-	-	-	-	-	23.27	-	-	-
Greenland	-	-	30.91	-	-	3.14	-	-	-
US Virgin Islands	-	-	8.47	-	-	22.56	7.24	-	-
Curaçao	-	-	1.67	-	-	18.87	-	-	-
Asia									
Singapore	1	90.76	2.37	32.64	86.79	80.22	-	95.55	1.00
Malaysia	2	74.45	11.00	7.22	100.00	38.67	1.08	85.33	72.55
Philippines	3	85.56	53.87	1.97	99.90	13.97	14.23	86.54	100.00
Georgia	4	66.62	56.20	2.75	100.00	42.06	1.50	86.98	94.94
China	5	60.14	24.90	7.19	90.38	14.46	4.58	65.20	78.22

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use *(continued)*

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
Asia									
Korea, Republic of	6	61.13	6.22	10.73	35.49	33.32	10.90	97.08	67.20
Japan	7	81.14	13.13	20.15	93.17	22.96	2.83	99.55	70.81
Sri Lanka	8	93.11	100.00	2.16	82.02	42.44	30.20	87.30	100.00
India	9	74.09	70.38	1.67	61.33	6.49	7.91	74.60	100.00
Azerbaijan	10	81.22	5.45	2.04	44.30	16.13	7.57	84.31	98.76
Myanmar	11	85.56	100.00	1.04	100.00	15.98	1.33	61.96	100.00
Thailand	12	69.25	45.03	2.94	100.00	18.02	3.16	80.82	86.25
Cyprus	13	84.49	20.15	31.41	74.97	9.65	42.10	93.97	56.64
Nepal	14	54.94	100.00	1.41	100.00	18.63	2.91	46.78	100.00
Israel	15	82.21	8.15	39.68	1.00	2.36	7.91	97.84	72.55
Indonesia	16	82.64	72.03	2.16	100.00	40.31	2.83	78.73	98.51
Lebanon	17	78.01	8.03	-	83.61	17.73	2.41	90.16	84.91
Turkey	18	86.77	26.75	4.09	95.07	9.80	12.40	88.38	84.55
Viet Nam	19	65.48	68.41	1.48	100.00	8.97	4.66	23.48	90.10
Kyrgyzstan	20	46.25	45.90	1.15	62.48	24.33	1.67	20.69	94.87
Armenia	21	69.47	31.41	1.89	32.01	40.64	1.58	76.57	96.54
Qatar	22	62.20	1.00	88.13	1.00	2.18	-	95.62	85.68
Cambodia	23	66.69	100.00	2.27	100.00	14.48	2.50	61.77	100.00
Pakistan	24	76.30	90.52	1.34	1.00	9.04	2.00	69.96	100.00
Kazakhstan	25	51.38	4.00	3.53	93.78	13.13	2.16	68.57	81.37
Saudi Arabia	26	66.48	1.02	8.19	1.00	2.12	1.08	90.98	89.34
Mongolia	27	64.34	7.61	6.14	100.00	15.82	-	4.24	87.91
Jordan	28	74.74	7.22	10.84	1.00	2.58	2.16	77.52	95.36
Oman	29	62.92	1.00	13.00	1.00	2.74	1.00	84.31	92.46
Tajikistan	30	72.10	87.02	1.11	8.23	15.16	3.25	57.45	100.00
Kuwait	31	69.89	1.00	27.31	1.00	1.64	1.08	93.97	38.68
Iraq	32	81.29	2.54	1.45	1.00	7.09	1.00	81.33	100.00
Brunei Darussalam	-	81.79	1.02	-	100.00	78.63	-	95.30	78.79
Maldives	-	80.43	2.95	-	100.00	66.23	-	93.01	83.40
Bangladesh	-	85.42	67.93	2.08	100.00	23.36	1.58	75.99	100.00
Korea Dem. People's Rep. of	-	-	45.53	1.60	100.00	38.34	-	56.12	100.00
Bhutan	-	33.65	100.00	2.16	100.00	27.81	11.57	70.60	92.39
Laos	-	70.96	100.00	1.52	100.00	22.97	3.75	22.21	97.67
Timor-Leste	-	-	36.09	1.11	100.00	29.53	62.98	73.58	-
Afghanistan	-	90.26	36.48	1.07	63.03	3.31	1.00	70.91	100.00
Macao China SAR	-	100.00	14.58	-	-	10.84	-	-	-
Yemen	-	93.18	5.39	3.68	1.00	2.81	-	72.76	100.00
Hong Kong China SAR	-	97.17	2.64			10.82	-	-	-

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use *(continued)*

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
Asia									
Bahrain	-	38.06	1.00	17.77	1.00	2.35	-	91.04	85.89
Palestine	-	81.43	21.17	6.81	52.98	10.99	17.81	-	-
United Arab Emirates	-	71.60	1.27	26.97	1.00	2.19	10.82	96.38	37.18
Syria	-	79.08	2.00	2.01	1.00	8.42	2.16	39.55	100.00
Iran	-	52.31	2.75	2.38	1.00	3.64	1.33	74.98	87.13
Uzbekistan	-	36.64	6.72	1.19	1.00	2.27	-	45.58	98.34
Turkmenistan	-	9.08	1.08	1.11	1.00	1.19	-	86.28	76.06
Europe									
Denmark	1	89.19	64.89	100.00	100.00	33.37	65.39	98.98	71.81
Sweden	2	77.37	100.00	56.15	100.00	19.32	100.00	98.79	60.96
Austria	3	82.07	67.24	35.92	100.00	30.33	100.00	98.66	60.07
Finland	4	62.42	84.28	31.15	100.00	23.88	88.10	97.01	55.92
Czech Republic	5	68.54	29.56	24.07	100.00	23.12	100.00	94.16	74.44
Italy	6	85.92	32.82	14.56	60.74	17.84	100.00	98.73	76.86
Germany	7	82.14	28.37	25.63	67.41	24.62	57.74	98.73	74.36
Estonia	8	62.77	53.93	4.99	100.00	28.16	100.00	84.25	66.48
Latvia	9	79.93	74.38	34.65	100.00	24.56	100.00	90.92	75.65
Slovakia	10	75.87	26.83	40.87	100.00	20.48	83.53	95.68	57.13
Portugal	11	83.99	53.31	6.93	100.00	15.71	57.41	97.33	80.44
Belgium	12	74.02	18.72	25.30	37.67	25.34	49.34	98.47	73.16
Hungary	13	77.01	30.97	7.56	100.00	14.19	30.37	92.38	86.38
France	14	78.58	27.00	25.52	100.00	21.22	45.51	98.98	76.40
Croatia	15	78.94	64.81	23.47	100.00	32.79	51.42	95.24	84.98
Slovenia	16	75.16	41.22	12.33	100.00	36.01	59.73	96.63	73.41
Spain	17	84.06	32.30	12.48	51.19	13.99	64.98	98.16	73.26
Lithuania	18	80.29	56.78	20.34	100.00	20.74	63.48	92.95	56.46
Netherlands	19	79.72	12.34	23.69	100.00	28.92	25.29	99.05	68.29
United Kingdom	20	86.27	17.78	100.00	100.00	34.30	24.54	99.87	74.18
Switzerland	21	92.18	49.71	100.00	100.00	28.61	78.54	99.62	61.12
Norway	22	81.07	100.00	39.46	100.00	43.55	41.27	99.11	52.53
Poland	23	78.30	23.94	11.92	74.68	17.35	32.03	91.43	73.41
Romania	24	82.71	46.65	9.27	100.00	15.97	14.89	90.16	83.37
Ireland	25	93.89	18.49	79.48	100.00	56.59	15.39	99.68	76.46
Luxembourg	26	87.34	18.39	100.00	100.00	32.17	29.95	98.98	1.00
Greece	27	81.29	34.07	9.87	100.00	13.79	47.42	97.01	69.12
Bulgaria	28	62.35	35.00	2.45	69.01	13.72	27.62	78.41	89.63
Iceland	29	1.00	100.00	30.07	100.00	55.08	5.49	99.49	57.61
Serbia	30	61.06	41.77		100.00	27.52	4.49	80.00	78.54
Albania	31	87.20	75.38	2.86	100.00	33.03	1.50	85.52	91.46

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use *(continued)*

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
Europe									
Russian Federation	32	47.89	7.36	4.95	100.00	29.33	2.16	85.65	93.38
Ukraine	33	23.82	8.97	3.09	100.00	23.19	8.65	60.82	90.74
Belarus	34	61.70	14.04	12.70	100.00	20.61	-	79.11	100.00
Montenegro	35	76.09	83.82	6.55	-	48.78	12.40	84.82	70.96
Moldova Republic	36	48.03	28.49	2.23	100.00	16.97	11.23	50.59	100.00
Bosnia & Herzegovina	37	45.68	79.49	-	100.00	22.27	1.42	80.19	94.47
Malta	38	94.89	11.32	69.76	61.67	17.31	3.41	96.00	68.35
Liechtenstein	-	-	100.00	-	-	43.30	100.00	-	-
Faeroe Islands	-	-	15.46	-	-	100.00	70.30	-	-
North Macedonia	-	77.66	47.65	5.51	100.00	26.69	3.16	79.68	87.93
Andorra	-	-	39.04		100.00	47.00	1.17	-	-
Kosovo	-	-	40.39	-	-	-	-	-	-
Jersey	-	-	-	-	-	25.48	-	-	-
Guernsey	-	-	-	-	-	24.72	-	-	-
Isle of Man	-	-	9.11	-	-	39.23	-	-	-
Monaco	-	-	-	-	-	19.18	-	-	-
Channel Islands	-	-	-	-	-	-	17.31	-	-
Åland Islands	-	-	-	-	-	15.49	-	-	-
Holy See	-	-	-	-		12.01	-	-	-
Gibraltar	-	-	1.00	-	-	19.02	-	-	-
San Marino	-	-		-	-	9.42	-	-	-
Svalbard & Jan Mayen Islands	-	-	-	-	-	3.72	-	-	-
Oceania									
New Zealand	1	69.18	60.30	11.73	100.00	28.90	6.82	96.00	71.50
Australia	2	71.96	18.68	21.87	100.00	7.62	61.90	95.17	45.35
Fiji	3	73.24	61.21	12.52	100.00	51.31	27.21	90.54	96.78
Tokelau	-	-	-	-	-	100.00	-	-	-
Samoa	-	70.68	67.10	-	-	51.03	100.00	88.19	96.20
Vanuatu	-	80.22	70.55	-	100.00	48.21	53.49	82.15	96.40
Solomon Islands	-	72.03	100.00	-	100.00	53.24	44.93	65.01	-
Pitcairn	-			-	-	72.04	-	-	-
Tuvalu	-	79.93	1.00	-	-	99.98	-	98.47	-
Papua New Guinea	-	41.70	100.00	11.21	100.00	62.47	11.90	57.64	100.00
Marshall Islands	-	26.96	22.49	-	-	93.15	-	97.20	-
French Polynesia	-	-	19.93	-	-	54.94	100.00	-	-
Wallis & Futuna Islands	-	-	-	-	-	56.88	-	-	-
Kiribati	-	78.30	9.19	-	-	85.22	40.18	68.37	-
Fed. States Micronesia	-	60.85	3.31	-	-	55.90	-	94.92	-
Tonga	-	86.20	4.62	-	-	59.38	38.85	65.33	-

Table A1.10 Normalized values of green growth indicators for efficient and sustainable resource use *(continued)*

Countries/Territories	Regional Rank	Indicators							
		EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
Oceania									
Palau	-	34.86	1.00	-	-	58.52	-	100.00	-
Nauru	-	76.66	1.15	-	-	65.98	-	-	-
Norfolk Island	-	-	-	-	-	45.97	-	-	-
Niue	-	-	-	-	-	61.06	27.62	-	-
Cook Islands	-	-	-	-	-	65.98	6.57	-	-
Northern Mariana Islands	-	-	1.00	-	-	41.96	-	-	-
New Caledonia	-	-	10.17	-	-	38.48	3.00	-	-
American Samoa	-	-	2.71	-	-	26.80	-	-	-
Guam	-	-	1.00	-	-	16.69	-	-	-

Definitons:

EE1: Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)
EE2: Share of renewables to total final energy consumption (Percent)
EW1: Water use efficiency (USD per m^3)
EW2: Share of freshwater withdrawal to available freshwater resources (Percent)
SL1: Average soil organic carbon content (Tons per hectare)
SL2: Share of organic agriculture to total agricultural land area (Percent)
ME1: Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)
ME2: Total material footprint (MF) per capita (MF tons per capita)

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
Africa													
Botswana	1	89.93	75.82	93.18	85.83	83.72	36.59	33.06	100.00	52.83	96.63	-	100.00
Tanzania	2	90.53	70.31	86.93	99.26	90.27	67.97	58.01	100.00	70.81	49.65	31.69	100.00
Mauritius	3	96.58	99.08	75.82	85.35	95.18	96.44	12.24	100.00	94.08	1.00	70.30	1.07
Morocco	4	88.19	94.43	86.23	92.50	94.09	87.38	55.78	74.38	9.46	81.53	65.35	100.00
Ghana	5	66.09	67.47	89.01	97.84	86.99	89.00	79.56	100.00	69.75	73.14	14.86	58.13
Uganda	6	51.31	62.10	86.23	99.66	88.09	78.65	75.31	57.37	76.10	59.72	-	100.00
Tunisia	7	80.40	97.53	83.46	88.72	72.80	87.71	37.93	40.43	7.35	94.95	43.57	39.21
Senegal	8	64.15	44.42	89.01	97.53	89.18	76.71	25.56	100.00	60.23	89.92	27.73	100.00
Ethiopia	9	69.53	27.35	95.26	99.71	90.27	68.29	19.32	74.03	60.23	73.14	-	100.00
Egypt	10	11.05	92.12	83.46	90.46	74.44	89.65	43.82	1.41	2.06	86.56	22.78	85.70
South Africa	11	80.14	79.38	75.12	60.31	62.97	84.15	37.18	45.38	42.25	63.07	45.55	76.24
Cameroon	12	1.00	35.70	89.71	98.86	89.18	82.85	38.90	100.00	75.04	73.14	15.85	77.12
Madagascar	13	91.21	1.00	89.71	99.66	89.72	71.53	33.99	100.00	79.27	66.43	38.62	18.23
Malawi	14	86.00	53.66	94.57	99.93	93.55	89.65	70.36	100.00	77.15	68.11	-	100.00
Zambia	15	84.25	44.78	87.62	98.95	86.99	47.26	57.86	100.00	67.63	79.85	-	100.00
Kenya	16	95.18	48.94	90.40	98.86	87.54	71.85	42.63	46.54	60.23	66.43	25.75	78.07
Zimbabwe	17	88.88	58.62	91.79	96.77	94.09	79.29	84.71	100.00	68.69	64.75	-	100.00
Burundi	18	72.19	32.17	80.68	100.00	90.27	93.85	77.53	64.65	65.52	86.56	-	56.66
Nigeria	19	13.77	1.00	87.62	97.79	85.36	88.35	71.25	43.10	60.23	78.17	11.89	86.14
Algeria	20	79.13	97.79	79.29	83.70	38.40	90.62	37.78	5.78	1.00	83.21	19.81	53.14
Sudan	21	48.09	63.56	95.26	98.91	71.16	46.62	28.84	-	34.85	-	12.88	21.17
Cote d'Ivoire	-	63.38	34.12	84.85	98.06	86.99	91.26	71.68	100.00	72.92	81.53	-	100.00
Sao Tome & Principe	-	95.84	87.04	91.09	97.62	93.00	97.41	68.06	100.00	75.04	64.75	85.15	2.76
Mayotte	-	-	-	-	-	-	100.00	70.27	-	89.85	79.85	54.46	-
Rwanda	-	67.20	61.64	74.43	99.93	93.55	91.26	48.18	100.00	78.21	74.82		67.81
Mozambique	-	91.57	55.91	93.87	98.86	87.54	80.59	50.28	100.00	70.81	71.46	20.80	99.63
Burkina Faso	-	22.78	19.24	90.40	99.53	85.90	64.09	78.49	100.00	54.94	98.31		100.00
Guinea	-	72.29	42.57	95.26	99.31	78.26	53.74	82.11	100.00	64.46	83.21	12.88	100.00
Congo Dem. Rep. of	-	64.52	39.93	87.62	99.97	88.09	89.97	50.51	100.00	73.98	81.53	1.00	100.00
Congo, Republic of	-	64.87	54.70	88.32	97.39	48.23	81.56	58.53	100.00	75.04	96.63	7.93	100.00
Eswatini	-	89.15	40.27	89.01	96.11	90.82	-	-	100.00	47.54	69.78	-	32.02
Seychelles	-	96.29	97.21	62.63	76.14	86.45	98.71	26.76	100.00	80.33	44.62	100.00	1.37
Gabon	-	71.34	81.38	84.85	87.92	13.28	90.94	69.17	100.00	68.69	93.27	6.94	100.00
Guinea-Bissau	-	62.31	3.73	89.01	99.53	95.18	69.91	53.66	100.00	78.21	93.27	25.75	86.21
Namibia	-	87.82	63.22	89.01	93.22	91.91	19.12	89.47	49.39	47.54	94.95	30.70	100.00
Cabo Verde	-	56.58	92.95	82.07	96.11	98.46	92.88	8.72	100.00	28.50	79.85	100.00	1.15

Table A1.11 Normalized values of green growth indicators for natural capital protection

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
Africa													
Benin	-	34.10	29.39	91.79	97.53	90.27	83.82	54.47	100.00	58.12	84.88	10.90	100.00
Sierra Leone	-	75.37	22.98	92.48	99.44	86.45	83.50	66.12	100.00	76.10	84.88	11.89	25.20
Liberia	-	94.38	31.73	89.01	99.31	83.72	96.76	21.30	100.00	80.33	81.53	34.66	9.87
Gambia	-	34.81	63.43	89.71	99.04	91.91	80.91	45.05	100.00	65.52	96.63	43.57	11.05
Togo	-	43.16	43.84	89.71	98.64	81.53	88.03	98.51	18.99	62.35	74.82	21.79	100.00
Comoros	-	92.99	64.25	91.79	99.35	92.45	89.32	10.41	100.00	85.62	61.40	26.74	1.95
Equatorial Guinea	-	53.10	79.90	89.01	79.21	1.00	99.35	100.00	100.00	79.27	68.11	25.75	13.98
Réunion	-	-	-	-	-	-	93.85	62.74	-	89.85	22.81	40.60	-
Sudan South	-	70.33	1.00	83.46	99.66	-	1.00	44.48	-	-	88.24	-	100.00
Central African Rep.	-	56.82	1.00	83.46	99.93	1.00	1.00	73.74	100.00	61.29	89.92	-	100.00
Angola	-	79.88	14.29	88.32	94.50	71.16	60.53	19.13	100.00	60.23	89.92	5.95	37.67
Chad	-	34.32	1.00	92.48	100.00	80.44	50.50	63.98	22.95	28.50	86.56	-	100.00
Lesotho	-	87.03	29.63	97.34	95.13	88.63	81.88	17.50	10.61	40.13	94.95	-	2.91
Eritrea	-	68.94	22.68	89.01	-	90.82	72.82	8.43	87.83	40.13	84.88	48.52	22.71
Saint Helena	-	-	-	-	-	-	88.03	63.39	-	35.90	-	41.59	-
Somalia	-	89.35	11.72	89.01	100.00	85.36	54.38	1.00	59.35	51.77	84.88	1.00	-
Niger	-	1.00	1.00	85.54	99.75	91.91	60.21	64.24	6.18	18.98	89.92	-	100.00
Mali	-	36.98	1.00	91.79	99.88	94.64	44.35	39.36	23.13	23.21	96.63	-	61.35
Djibouti	-	52.69	73.46	89.71	96.73	90.82	77.68	1.58	2.40	6.29	69.78	48.52	10.02
Mauritania	-	12.89	55.95	91.09	97.26	89.18	40.15	27.09	2.22	9.46	96.63	21.79	8.92
Western Sahara	-	-	-	-	-	-	88.68	1.00	-	1.00	86.56	26.74	-
Libya	-	58.82	96.50	75.82	59.38	1.00	86.41	3.77	1.70	2.06	94.95	1.00	3.13
The Americas													
Dominican Republic	1	89.50	92.48	73.04	91.04	91.91	75.74	82.75	100.00	86.67	56.36	42.58	100.00
United States	2	100.00	99.90	43.88	26.88	40.04	64.09	46.29	100.00	32.73	73.14	44.56	100.00
Canada	3	100.00	99.90	50.82	33.01	12.19	47.59	29.98	100.00	33.79	94.95	54.46	48.52
El Salvador	4	82.07	93.85	81.37	95.79	94.09	87.71	44.25	74.26	75.04	71.46	28.72	16.77
Mexico	5	93.23	97.84	70.96	83.03	76.62	77.35	38.85	100.00	61.29	46.30	87.13	100.00
Colombia	6	94.54	96.18	82.07	92.41	80.44	66.03	48.33	100.00	76.10	56.36	25.75	100.00
Costa Rica	7	93.46	97.80	78.60	92.99	93.55	75.74	36.21	100.00	82.44	69.78	56.44	23.29
Brazil	8	97.97	97.66	73.04	88.72	76.62	29.47	42.66	100.00	76.10	83.21	32.68	100.00
Ecuador	9	97.57	96.45	77.21	87.97	84.81	77.03	51.91	100.00	68.69	47.97	21.79	100.00
Guatemala	10	85.80	77.75	88.32	95.13	90.82	82.21	29.59	100.00	100.00	53.01	21.79	75.21
Chile	11	90.82	99.04	73.04	79.39	78.26	74.76	35.13	100.00	23.21	61.40	36.64	100.00
Bolivia	12	90.77	93.54	85.54	91.66	40.58	26.88	50.73	100.00	64.46	78.17	-	100.00
Argentina	13	96.82	98.21	70.96	79.12	73.89	15.88	36.92	58.07	28.50	76.50	32.68	55.34
Paraguay	14	89.51	95.36	81.37	96.37	79.90	1.00	47.88	100.00	64.46	91.59	-	100.00
Honduras	15	85.05	87.30	83.46	95.44	92.45	78.97	61.23	100.00	85.62	58.04	38.62	80.64
Uruguay	16	98.83	98.78	74.43	91.48	84.81	1.00	25.94	63.14	64.46	71.46	28.72	17.87
Bahamas	17	97.86	97.18	52.90	72.14	83.17	97.74	27.51	100.00	66.58	49.65	100.00	63.77
Peru	18	87.70	95.22	81.37	91.39	90.82	76.06	41.40	100.00	63.40	53.01	25.75	97.36
Panama	19	96.83	92.78	74.43	90.24	93.00	74.12	38.08	100.00	94.08	56.36	64.36	39.35
Nicaragua	20	90.26	93.25	81.37	96.64	91.91	48.24	66.78	100.00	90.90	74.82	32.68	100.00
Trinidad & Tobago	21	94.78	97.35	61.93	1.00	1.00	92.88	37.10	100.00	96.19	69.78	30.70	15.74
Saint Martin (French)	-	-	-	65.40	-	-	-	73.85	100.00	90.90	-	-	100.00
Belize	-	92.20	94.42	80.68	93.97	88.63	66.35	45.33	100.00	100.00	58.04	99.01	100.00
Saint Barthélemy	-	-	-	-	-	-	-	77.17	-	90.90	-	-	-
Saint Lucia	-	94.37	96.00	69.57	89.97	93.55	93.21	51.00	100.00	95.13	74.82	100.00	7.82
Martinique	-	-	-	-	-	-	97.41	68.29	-	94.08	56.36	-	-
Suriname	-	91.16	91.94	89.71	84.10	92.45	63.76	52.92	100.00	98.31	98.31	15.85	63.19
Antigua & Barbuda	-	95.64	96.79	77.90	76.32	92.45	93.85	25.92	100.00	-	81.53	100.00	2.91
French Guiana	-	-	-	-	-	-	93.85	74.57	-	94.08	93.27	26.74	-
Turks & Caicos Islands	-	-	-	100.00	73.16	98.46	100.00	28.47	100.00	82.44	73.14	100.00	3.86
Grenada	-	93.48	96.03	80.68	90.10	86.45	95.79	50.33	100.00	95.13	59.72	57.43	2.61
St Vincent & Grenadines	-	94.35	95.43	79.98	91.75	94.09	95.79	44.74	100.00	95.13	61.40	50.50	4.45
Dominica	-	94.73	96.02	87.62	91.97	91.91	85.12	10.77	100.00	93.02	44.62	95.05	5.91
Jamaica	-	96.11	97.72	75.12	88.72	92.45	93.53	22.15	100.00	78.21	54.69	85.15	11.34
Anguilla	-	-	-	-	-	-	100.00	9.94	-	-	86.56	100.00	-
Barbados	-	93.55	97.66	57.07	80.28	91.91	94.18	6.02	86.31	95.13	84.88	100.00	1.07
Guyana	-	92.53	91.60	83.46	88.55	85.36	18.47	-	100.00	96.19	86.56	26.74	39.94
St Pierre & Miquelon	-	-	-	-	-	-	98.38	-	-	-	-	47.53	-
Cuba	-	94.93	97.29	83.46	86.68	89.72	71.53	51.06	100.00	79.27	41.26	19.81	53.65
Venezuela	-	87.48	93.20	77.21	73.43	50.41	64.41	69.89	100.00	79.27	71.46	1.00	100.00
Bonaire, St Eustatius & Saba	-	-	-	-	-	-	-	42.07	-	-	-	100.00	-
US Virgin Islands	-	93.58	96.60	4.30	-	99.55	94.82	40.23	100.00	-	64.75	-	8.19
Puerto Rico	-	92.29	96.92	16.80		100.00	93.53	34.37	100.00	87.73	44.62	50.50	15.81

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
The Americas													
Saint Kitts and Nevis	-	-	-	57.76	81.12	94.09	95.15	25.09	100.00	91.96	54.69	55.45	2.83
Bermuda	-	99.64	97.29	11.94	60.94	85.36	97.74	28.70	100.00	-	31.20	84.16	1.00
Cayman Islands	-	-	-	29.99	59.47	86.45	97.41	22.01	100.00	-	69.78	96.04	1.73
British Virgin Islands	-	-	-	29.30	73.25	93.55	91.26	11.39	100.00	-	58.04	100.00	1.15
Guadeloupe	-	-	-	-	-	-	90.29	48.29	-	93.02	37.91	34.66	-
Aruba	-	-	-	41.10	62.85	96.28	100.00	16.79	14.57	70.81	91.59	100.00	2.03
Haiti	-	89.61	47.97	85.54	99.04	94.09	88.03	7.97	21.32	85.62	53.01	23.77	3.57
Curaçao	-	-	-	89.01	1.00	-	89.65	37.30	-	-	69.78	100.00	2.91
Greenland	-	100.00	99.79	39.02	60.27	1.00	97.41	30.34	1.00	5.23	84.88	47.53	100.00
Sint Maarten (Dutch)	-	-	-	-	-	-	-	10.46	-	-	-	100.00	-
Montserrat	-	-	-	-	-	-	1.00	29.23	-	-	44.62	100.00	-
Falkland Islands	-	-	-	-	-	-	-	12.03	-	22.15	44.62	58.42	-
Asia													
Singapore	1	88.48	99.85	4.99	54.40	65.15	98.71	13.08	100.00	81.38	78.17	60.40	19.04
Malaysia	2	94.17	97.35	70.26	64.54	51.50	86.41	45.92	100.00	69.75	49.65	56.44	66.93
Philippines	3	89.87	90.69	90.40	95.53	94.64	83.82	41.64	100.00	88.79	41.26	52.48	24.03
Georgia	4	91.77	98.96	84.85	89.48	55.87	81.56	35.47	100.00	48.60	76.50	69.31	48.23
China	5	64.48	99.06	89.71	66.72	60.79	84.47	35.13	100.00	44.37	58.04	45.55	100.00
Korea, Republic of	6	85.68	99.79	75.12	48.80	83.17	92.24	28.69	100.00	29.56	63.07	28.72	30.26
Japan	7	97.58	99.79	75.82	57.82	90.82	95.15	69.40	100.00	48.60	64.75	23.77	74.55
Sri Lanka	8	88.01	97.43	91.79	96.28	95.73	90.62	40.15	100.00	77.15	27.84	58.42	25.79
India	9	49.56	66.95	89.01	92.55	91.91	84.47	28.61	100.00	56.00	47.97	52.48	26.52
Azerbaijan	10	82.38	97.31	79.29	82.77	31.30	78.32	38.85	83.11	23.21	84.88	-	41.48
Myanmar	11	70.25	86.83	93.18	98.37	84.26	57.29	31.38	100.00	69.75	68.11	27.73	34.88
Thailand	12	89.90	95.80	73.04	79.70	73.89	73.15	65.95	100.00	69.75	66.43	69.31	92.74
Cyprus	13	93.97	99.93	67.49	76.85	94.09	79.29	64.31	100.00	26.38	96.63	70.30	13.39
Nepal	14	47.49	80.13	95.96	99.00	94.64	75.41	49.74	100.00	68.69	69.78	-	100.00
Israel	15	93.35	99.94	55.68	65.29	86.45	94.18	29.16	46.02	15.81	58.04	17.83	63.92
Indonesia	16	94.83	84.64	82.76	92.15	82.08	78.65	28.12	100.00	80.33	61.40	43.57	39.65
Lebanon	17	82.71	96.72	75.12	81.12	94.64	95.79	14.51	79.21	25.33	86.56	1.00	8.63
Turkey	18	79.11	98.08	72.35	80.28	81.53	82.21	3.92	90.39	27.44	79.85	12.88	2.39
Viet Nam	19	87.51	97.59	92.48	92.24	71.71	77.68	42.70	100.00	77.15	56.36	40.60	22.49
Kyrgyzstan	20	93.94	96.81	86.93	92.90	94.64	74.12	34.00	20.10	27.44	96.63	-	50.13
Armenia	21	86.99	99.33	88.32	91.79	60.24	83.82	24.32	68.96	40.13	73.14	-	100.00
Qatar	22	1.00	99.15	67.49	1.00	1.00	87.71	37.26	1.00	2.06	73.14	62.38	35.61
Cambodia	23	87.63	91.52	95.26	98.28	83.72	62.15	44.72	100.00	71.87	71.46	96.04	100.00
Pakistan	24	49.60	64.37	89.01	96.24	84.81	73.79	37.66	11.77	17.92	78.17	4.96	72.79

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
Asia													
Kazakhstan	25	92.59	98.87	80.68	36.39	1.00	63.12	17.02	8.16	12.63	78.17	-	24.61
Saudi Arabia	26	1.00	98.33	64.71	13.41	1.00	93.85	20.81	3.62	1.00	84.88	48.52	34.22
Mongolia	27	84.91	97.10	33.46	68.54	74.98	1.00	45.02	47.70	29.56	91.59	-	100.00
Jordan	28	79.14	98.41	79.29	86.90	91.91	95.47	10.52	7.41	4.17	93.27	57.43	14.27
Oman	29	47.90	97.65	69.57	31.59	1.00	89.32	13.11	1.06	2.06	81.53	36.64	8.48
Tajikistan	30	60.63	74.21	84.85	97.48	94.64	78.00	26.35	18.30	26.38	96.63	-	100.00
Kuwait	31	22.60	98.51	59.85	1.00	1.00	96.12	46.09	3.04	2.06	78.17	24.76	81.67
Iraq	32	51.50	96.07	75.12	78.85	66.25	92.88	3.20	12.06	8.40	69.78	1.00	12.22
Macao China SAR	-	-	-	57.07	90.55	98.46	-	-	-	-	94.95	-	-
Laos	-	86.45	71.77	96.65	98.91	70.07	58.91	42.56	100.00	76.10	68.11		100.00
Timor-Leste	-	94.63	84.93	96.65	98.51	98.46	77.35	31.31	100.00	87.73	81.53	48.52	33.41
Bhutan	-	64.89	91.58	89.01	94.50	52.05	81.56	43.55	100.00	62.35	66.43		100.00
Hong Kong China SAR	-	-	-	45.96	71.83	90.82	99.68	54.16	-	77.15	69.78	-	100.00
Maldives	-	87.07	98.19	64.01	85.70	95.73	100.00	1.00	20.39	-	74.82	99.01	1.37
Bangladesh	-	30.22	86.10	93.87	98.19	94.09	84.79	26.55	64.83	79.27	61.40	11.89	36.86
Palestine	-	93.18	96.71	76.51	97.66		98.06	5.99	9.85	22.15	64.75	-	-
Korea Dem. People's Rep. of	-	80.05	97.38	-	93.08	73.89	94.50	10.71	100.00	41.19	84.88	1.00	10.24
Brunei Darussalam	-	100.00	99.74	64.71	1.89	1.00	89.00	64.08	100.00	56.00	71.46	33.67	66.93
Uzbekistan	-	71.87	98.80	91.09	85.03	48.23	68.62	21.00	44.91	4.17	94.95	-	25.79
Iran	-	70.14	97.51	84.85	63.43	37.85	85.76	47.37	39.20	18.98	73.14	16.84	57.25
Afghanistan	-	59.48	62.06	89.01	98.91	96.28	87.06	5.76	13.05	23.21	73.14	-	1.73
Syria	-	74.28	98.23	84.85	93.13	80.44	88.68	2.35	16.55	9.46	91.59	1.00	5.84
United Arab Emirates	-	27.08	98.44	59.85	1.00	1.00	93.53	67.72	27.56	4.17	78.17	60.40	100.00
Turkmenistan	-	78.73	97.57	93.87	44.57	1.00	48.56	15.21	52.13	6.29	94.95	-	24.54
Yemen	-	52.05	53.11	87.62	96.42	91.91	90.94	25.02	7.06	3.12	79.85	1.00	5.47
Bahrain	-	46.57	98.17	53.60	1.00	1.00	99.35	32.71	5.54	3.12	74.82	37.63	13.39
Europe													
Denmark	1	99.75	99.94	45.27	73.83	77.17	45.32	93.09	86.61	29.56	94.95	27.73	100.00
Sweden	2	100.00	99.94	68.87	80.32	77.71	77.03	64.06	100.00	23.21	98.31	45.55	100.00
Austria	3	96.19	99.96	61.24	69.69	75.53	74.76	67.40	100.00	41.19	83.21	-	100.00
Finland	4	100.00	99.97	65.40	61.74	57.51	66.03	75.72	100.00	26.38	98.31	23.77	100.00
Czech Republic	5	92.96	99.37	77.90	59.47	58.60	-	92.33	100.00	26.38	94.95	-	100.00
Italy	6	95.80	99.96	66.10	76.81	85.36	84.15	78.65	100.00	39.08	86.56	90.10	99.05
Germany	7	97.35	99.92	57.07	60.71	80.44	77.03	81.76	100.00	36.96	96.63	98.02	100.00

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
Europe													
Estonia	8	100.00	99.44	75.12	34.21	44.95	54.06	95.43	100.00	14.75	96.63	46.54	100.00
Latvia	9	96.48	99.39	70.26	84.68	43.31	54.06	96.89	100.00	12.63	98.31	46.54	100.00
Slovakia	10	92.08	99.50	77.21	75.07	74.44	85.44	83.97	100.00	29.56	93.27	-	100.00
Portugal	11	100.00	99.91	68.87	80.99	83.17	79.62	70.60	100.00	18.98	76.50	96.04	100.00
Belgium	12	95.37	99.92	70.96	63.20	55.87	74.76	81.07	100.00	45.42	98.31	29.71	100.00
Hungary	13	88.83	99.02	73.74	81.25	82.63	76.38	83.19	100.00	28.50	88.24	-	100.00
France	14	98.57	99.95	65.40	79.92	61.33	65.38	81.48	100.00	44.37	79.85	60.40	100.00
Croatia	15	92.47	99.43	73.04	82.59	52.05	78.97	76.11	100.00	45.42	83.21	100.00	100.00
Slovenia	16	94.01	99.66	68.87	72.63	59.15	76.71	83.92	100.00	48.60	89.92	40.60	100.00
Spain	17	100.00	99.96	70.26	77.88	86.99	73.79	61.97	100.00	28.50	74.82	75.25	100.00
Lithuania	18	94.85	99.30	68.87	80.77	54.78	44.35	84.48	100.00	12.63	98.31	20.80	100.00
Netherlands	19	95.99	99.98	64.01	56.13	69.52	64.74	88.60	66.11	40.13	89.92	67.33	100.00
United Kingdom	20	98.83	99.94	66.79	71.34	80.99	76.71	86.15	77.11	38.02	64.75	67.33	100.00
Switzerland	21	99.61	99.96	50.13	81.08	84.81	80.59	43.28	100.00	46.48	96.63	-	71.91
Norway	22	100.00	99.94	70.96	59.02	1.00	69.91	58.14	100.00	24.27	89.92	87.13	38.11
Poland	23	88.04	99.53	79.98	66.80	28.57	75.09	87.59	100.00	17.92	94.95	21.79	100.00
Romania	24	93.05	98.87	82.76	84.59	59.15	76.38	81.02	100.00	32.73	91.59	23.77	100.00
Ireland	25	100.00	99.98	59.15	67.74	66.79	1.00	87.07	65.23	40.13	86.56	22.78	30.63
Luxembourg	26	95.32	99.96	57.07	23.05	66.79	66.68	60.61	100.00	44.37	98.31	-	100.00
Greece	27	99.00	99.98	65.40	72.76	82.08	78.97	85.49	100.00	28.50	74.82	100.00	81.89
Bulgaria	28	88.00	99.29	70.96	74.14	79.35	77.68	98.88	100.00	33.79	89.92	28.72	100.00
Iceland	29	100.00	99.97	1.00	73.30	89.72	39.50	25.95	3.91	17.92	78.17	85.15	19.41
Serbia	30	93.22	99.39	82.07	76.76	-	78.32	32.28	100.00	45.42	93.27	-	49.47
Albania	31	96.45	98.95	72.35	91.44	81.53	68.29	76.96	100.00	43.31	76.50	62.38	100.00
Russian Federation	32	95.78	99.29	70.96	47.51	1.00	79.94	29.78	100.00	41.19	93.27	12.88	56.88
Ukraine	33	92.94	99.50	76.51	77.92	29.66	80.26	32.91	98.31	21.10	89.92	8.92	29.45
Belarus	34	92.49	99.66	68.87	70.45	70.07	32.38	52.26	100.00	14.75	94.95	-	69.57
Montenegro	35	92.06	99.38	63.32	84.41	-	79.62	8.12	100.00	54.94	69.78	69.31	31.51
Moldova Republic	36	92.38	99.08	22.35	94.06	68.98	88.68	19.14	74.26	21.10	94.95	-	31.43
Bosnia & Herzegovina	37	77.56	99.38	75.82	72.54	73.89	74.76	33.71	100.00	51.77	83.21	22.78	11.27
Malta	38	98.36	99.98	57.07	76.23	95.73	92.88	99.11	7.35	26.38	79.85	100.00	48.01
Kosovo	-	-	-	87.62	-	-	-	-	-	-	-	-	-
Andorra	-	99.33	99.98	64.01	74.32	-	100.00	26.82	100.00	49.65	86.56	-	100.00
Liechtenstein	-	-	-	38.32	94.95	-	84.79	76.06	100.00	46.48	98.31	-	88.56
North Macedonia	-	83.20	99.32	73.74	84.19	84.26	80.59	45.99	100.00	43.31	94.95	-	71.77
Holy See	-	-	-	-	-	-	100.00	-	-	30.62	98.31	-	-
Monaco	-	-	-	15.41	-	-	100.00	-	-	34.85	58.04	75.25	100.00
San Marino	-	-	-	64.01	-	-	100.00	-	1.00	50.71	98.31	-	-

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
Europe													
Gibraltar	-	-	-	65.40	31.28	82.63	-	35.13	1.00	-	-	96.04	97.51
Isle of Man	-	-	-	56.38	-	-	98.38	-	36.35	46.48	-		32.02
Guernsey	-	-	-	-	-	-	-	-	-	-	-	48.52	-
Jersey	-	-	-	-	-	-	-	-	-	43.31	-	48.52	-
Svalbard & Jan Mayen Islands	-	-	-	-	-	-	-	71.86	-	17.92	-	-	-
Faeroe Islands	-	-	-	13.33	45.82	99.00	55.03	12.42	1.35	44.37	79.85	46.54	1.15
Channel Islands	-	-	-	24.44	-	-	-	-	24.53	-	-	-	-
Åland Islands	-	-	-	-	-	-	-	-	-	18.98	-	-	-
Oceania													
New Zealand	1	100.00	99.83	49.43	66.05	73.89	1.00	37.42	100.00	32.73	39.59	100.00	100.00
Australia	2	100.00	99.86	61.24	31.81	1.00	1.00	56.00	95.69	41.19	71.46	62.38	100.00
Fiji	3	100.00	90.67	84.85	94.37	96.82	67.97	8.71	100.00	79.27	44.62	100.00	8.26
American Samoa	-	100.00	95.45	76.51		100.00	97.41	72.94	100.00	53.88	73.14	82.18	64.95
Kiribati	-	100.00	75.11	78.60	97.75	98.46	97.74	36.76	88.35	-	61.40	72.28	87.68
Norfolk Island	-	-	-	-	-	-	-	82.09	-	69.75	-	90.10	-
Palau	-	-	-	69.57	45.37	100.00	100.00	-	100.00	67.63	59.72	78.22	100.00
Niue	-	-	-	-	-	-	74.76	95.33	-	57.06	78.17	84.16	-
Northern Mariana Islands	-	99.01	95.99	57.76	-	100.00	100.00	35.30	100.00	63.40	24.49	77.23	100.00
Tuvalu	-			75.12	95.75	100.00	82.85		100.00		71.46	80.20	1.07
Wallis & Futuna Islands	-	-	-	-	-	-	67.32	-	-	-	-	84.16	-
New Caledonia	-	-	-	73.04	29.06	94.09	75.74	67.05	100.00	79.27	42.94	94.06	100.00
Marshall Islands	-	99.16	93.94	89.01	91.61	100.00	100.00	14.54	100.00	62.35	73.14	71.29	2.98
Samoa	-	100.00	95.57	89.71	95.66	96.28	70.88	31.51	100.00	53.88	69.78	84.16	2.76
Pitcairn	-							57.04				86.14	
Fed. States Micronesia	-	100.00	94.52	82.76	93.79	99.55	82.53	1.53	100.00	68.69	49.65	72.28	1.15
Tonga	-	100.00	94.84	89.01	95.17	99.00	78.65	6.03	73.79	56.00	51.33	80.20	12.15
Solomon Islands	-	100.00	89.10	77.90	98.68	96.82	96.44	7.87	100.00	54.94	61.40	40.60	2.17
Vanuatu	-	100.00	86.10	82.07	97.62	97.91	48.56	7.19	100.00	49.65	44.62	100.00	1.66
Guam	-	100.00	93.89	39.02		100.00	99.03	54.28	100.00	66.58	4.36		1.51
French Polynesia	-	-	-	62.63	87.26	95.73	95.79	5.06	100.00	63.40	54.69	88.12	1.07

Table A1.11 Normalized values of green growth indicators for natural capital protection

Countries/ Territories	Regional Rank	Indicators											
		EQ1	EQ2	EQ3	GE1	GE2	GE3	BE1	BE2	BE3	CV1	CV2	CV3
Oceania													
Papua New Guinea	-	97.18	57.80	91.09	96.64	88.63	82.21	5.50	100.00	77.15	73.14	5.95	5.84
Tokelau	-	-	-	-	-	-	89.32	5.81	-	-	74.82	83.17	-
Cook Islands	-	-	-	-	-	-	73.15	24.02	-	61.29	61.40	87.13	-
Nauru	-	-	-	67.49	82.37	100.00	96.44	1.00	1.00	-	61.40	74.26	-

Definitions:

EQ1: PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m^3)

EQ2: DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)

EQ3: Municipal solid waste (MSW) generation per capita (Tons per year per capita)

GE1: Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita)

GE2: Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita)

GE3: Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1000 persons)

BE1: Average proportion of Key Biodiversity Areas covered by protected areas (Percent)

BE2: Share of forest area to total land area (Percent)

BE3: Soil biodiversity, potential level of diversity living in soils (Index)

CV1: Red list index (Index)

CV2: Tourism and recreation in coastal and marine areas (Score)

CV3: Share of terrestrial and marine protected areas to total territorial areas (Percent)

Table A1.12 Normalized values of green growth indicators for green economic opportunities

Countries/Territories	Regional Rank	Indicators			
		GV1	GT1	GJ1	GN1
Africa					
Botswana	1	91.39	2.03	15.56	-
Tanzania	2	84.68	12.20	37.40	-
Mauritius	3	47.15	8.32	8.28	-
Morocco	4	83.64	9.93	30.12	27.05
Ghana	5	54.33	6.27	37.40	-
Uganda	6	42.50	6.35	73.79	-
Tunisia	7	44.54	41.27	15.56	27.05
Senegal	8	72.46	7.08	22.84	-
Ethiopia	9	65.79	5.17	51.96	-
Egypt	10	61.19	19.97	66.51	27.05
South Africa	11	55.72	36.00	30.12	1.00
Cameroon	12	61.51	7.00	8.28	-
Madagascar	13	67.14	4.00	22.84	-
Malawi	14	22.96	16.38	22.84	1.00
Zambia	15	68.34	6.49	-	1.00
Kenya	16	56.13	-	1.00	1.00
Zimbabwe	17	29.33	2.39	-	1.00
Burundi	18	29.81	2.24	1.00	-
Nigeria	19	57.13	1.07	1.00	-
Algeria	20	86.67	5.39	-	1.00
Sudan	21	55.01	1.15	1.00	-
Lesotho	-	66.98	-	-	-
Comoros	-	63.72	-	-	-
Djibouti	-	61.89	-	-	-
Cote d'Ivoire	-	78.41	5.83	-	-
Congo Dem. Rep. of	-	41.38	-	-	-
Guinea-Bissau	-	40.70	-	-	-
Cabo Verde	-	74.77	1.51	-	-
Angola	-	36.97	-	-	
Togo	-	45.43	27.07	-	-
Niger	-	62.53	1.95	-	-
Eswatini	-	61.96	-	1.00	-
Namibia	-	53.06	4.08	-	-
Benin	-	51.16	5.69	-	-
Rwanda	-	47.10	8.91	-	-
Mali	-	52.66	2.83	-	-
Burkina Faso	-	43.48	2.03	-	-
Mauritania	-	43.07	1.00	-	-
Mozambique	-	34.17	4.30	-	-
Guinea	-	23.98	3.93	-	-
Sierra Leone	-	9.99	1.66	-	-

Table A1.12 Normalized values of green growth indicators for green economic opportunities *(continued)*

Countries/Territories	Regional Rank	Indicators			
		GV1	GT1	GJ1	GN1
Africa					
Congo, Republic of	-	1.00	7.08	-	-
Seychelles	-	-	1.66	-	-
Sao Tome & Principe	-	-	1.44	-	-
Gambia	-	-	1.73	1.00	-
Central African Rep.	-	-	1.00	-	-
Eritrea	-	-	-	1.00	-
Liberia	-	1.00	-	-	-
The Americas					
Dominican Republic	1	78.28	14.84	-	-27.05
United States	2	63.88	47.94	88.35	14.03
Canada	3	62.34	25.60	100.00	14.03
El Salvador	4	63.39	15.43	-	92.18
Mexico	5	65.46	44.93	66.51	14.03
Colombia	6	61.48	7.22	37.40	66.13
Costa Rica	7	77.20	11.98	-	14.03
Brazil	8	63.34	23.55	22.84	27.05
Ecuador	9	73.65	5.17	73.79	14.03
Guatemala	10	59.04	15.79	-	14.03
Chile	11	63.12	4.66	15.56	27.05
Bolivia	12	58.98	6.05	44.68	-
Argentina	13	64.67	8.69	30.12	14.03
Paraguay	14	75.02	2.24	51.96	-
Honduras	15	80.61	3.20	-	14.03
Uruguay	16	69.95	3.34	8.28	14.03
Bahamas	17	77.19	20.40	15.56	-
Peru	18	66.41	8.10	1.00	27.05
Panama	19	88.87	10.45	15.56	1.00
Nicaragua	20	74.09	2.46	-	1.00
Trinidad & Tobago	21	-	100.00	8.28	1.00
Haiti	-	85.93	-	-	-
Bermuda	-	-	100.00	8.28	-
Saint Lucia	-	52.60	41.93	-	-
Jamaica	-	78.31	14.25		-
Guyana	-	75.03	6.49	-	-
Belize	-	55.88	17.62	-	-
Venezuela	-	65.59	6.49	-	-
St Vincent & Grenadines	-	57.51	9.71	-	-
Barbados	-	46.48	13.23	-	-
Cuba	-	-	-	-	27.05
Antigua & Barbuda	-	-	16.96	-	-

Table A1.12 Normalized values of green growth indicators for green economic opportunities *(continued)*

Countries/Territories	Regional Rank	Indicators			
		GV1	GT1	GJ1	GN1
The Americas					
Aruba	-	-	16.01	-	-
Saint Kitts and Nevis	-	-	8.32	-	-
Suriname	-	-	7.88	-	-
Greenland	-	-	1.59	-	-
Asia					
Singapore	1	100.00	36.22	66.51	14.03
Malaysia	2	70.51	48.16	73.79	27.05
Philippines	3	94.61	41.05	51.96	27.05
Georgia	4	67.55	34.76	30.12	27.05
China	5	83.11	38.34	73.79	40.08
Korea, Republic of	6	83.01	43.03	88.35	27.05
Japan	7	65.08	58.48	22.84	14.03
Sri Lanka	8	93.67	13.23	30.12	-
India	9	81.29	23.11	51.96	27.05
Azerbaijan	10	64.28	4.44	88.35	-
Myanmar	11	90.33	4.22	73.79	-
Thailand	12	74.21	30.58	37.40	1.00
Cyprus	13	60.93	12.72	37.40	1.00
Nepal	14	100.00	1.95	30.12	-
Israel	15	78.31	31.75	15.56	14.03
Indonesia	16	74.06	13.52	22.84	1.00
Lebanon	17	33.93	14.47	44.68	-
Turkey	18	71.11	26.63	51.96	1.00
Viet Nam	19	74.73	18.06	30.12	1.00
Kyrgyzstan	20	62.64	11.03	37.40	1.00
Armenia	21	56.66	8.10	15.56	1.00
Qatar	22	87.04	1.00	30.12	-
Cambodia	23	69.83	2.68	1.00	-
Pakistan	24	76.70	12.20	22.84	-
Kazakhstan	25	62.93	3.27	30.12	1.00
Saudi Arabia	26	70.58	9.49	37.40	14.03
Mongolia	27	55.31	2.17	1.00	1.00
Jordan	28	62.43	13.89	30.12	1.00
Oman	29	33.89	16.74	51.96	-
Tajikistan	30	63.25	-	1.00	1.00
Kuwait	31	66.26	3.49	8.28	-
Iraq	32	46.25	1.00	1.00	-
Bhutan	-	91.51	-	-	-
Iran	-	-	-	73.79	-
Brunei Darussalam	-	100.00	26.70	37.40	-

Table A1.12 Normalized values of green growth indicators for green economic opportunities *(continued)*

Countries/Territories	Regional Rank	Indicators			
		GV1	GT1	GJ1	GN1
Asia					
Bahrain	-	77.02	17.99	-	-
Bangladesh	-	91.12	2.46	-	-
Afghanistan	-	60.46	-	1.00	-
Laos	-	54.74	3.12	-	-
Timor-Leste	-	24.68	4.59	-	-
Hong Kong China SAR	-	-	19.53	1.00	14.03
Syria	-	-		8.28	-
United Arab Emirates	-	-	6.20	-	-
Palestine	-	-	6.86	1.00	-
Yemen	-	-	4.66	1.00	-
Macao China SAR	-	-	1.07	-	1.00
Maldives	-	-	1.00	1.00	-
Turkmenistan	-	-	-	1.00	-
Uzbekistan	-	-	-	-	1.00
Europe					
Denmark	1	79.51	77.23	100.00	27.05
Sweden	2	81.54	43.98	59.24	53.11
Austria	3	74.38	50.28	73.79	27.05
Finland	4	67.05	45.67	73.79	53.11
Czech Republic	5	69.48	54.97	95.63	40.08
Italy	6	63.31	58.92	73.79	40.08
Germany	7	75.08	66.17	100.00	27.05
Estonia	8	71.99	37.98	44.68	100.00
Latvia	9	61.38	20.26	51.96	92.18
Slovakia	10	63.20	29.26	81.07	40.08
Portugal	11	58.64	40.83	51.96	40.08
Belgium	12	69.71	26.92	51.96	100.00
Hungary	13	73.08	63.17	73.79	27.05
France	14	67.13	39.44	59.24	27.05
Croatia	15	69.39	26.63	51.96	40.08
Slovenia	16	66.46	44.28	73.79	14.03
Spain	17	67.40	28.61	66.51	40.08
Lithuania	18	-	36.37	51.96	53.11
Netherlands	19	77.45	34.32	66.51	27.05
United Kingdom	20	61.93	45.89	59.24	14.03
Switzerland	21	79.25	29.05	22.84	14.03
Norway	22	78.44	30.73	59.24	14.03
Poland	23	69.44	40.98	66.51	40.08
Romania	24	62.00	45.23	51.96	27.05
Ireland	25	80.61	13.23	37.40	53.11

Table A1.12 Normalized values of green growth indicators for green economic opportunities *(continued)*

Countries/Territories	Regional Rank	Indicators			
		GV1	GT1	GJ1	GN1
Europe					
Luxembourg	26	81.33	44.93	8.28	40.08
Greece	27	49.39	18.35	37.40	27.05
Bulgaria	28	73.09	26.63	51.96	27.05
Iceland	29	77.87	11.54	30.12	100.00
Serbia	30	51.37	28.02	-	27.05
Albania	31	66.94	4.30	44.68	-
Russian Federation	32	66.75	11.18	95.63	27.05
Ukraine	33	57.59	13.38	81.07	27.05
Belarus	34	82.13	18.28	15.56	1.00
Montenegro	35	-	7.15	8.28	14.03
Moldova Republic	36	75.84	23.63	1.00	27.05
Bosnia & Herzegovina	37	-	26.41	30.12	1.00
Malta	38	-	14.62	1.00	1.00
North Macedonia	-	73.73	100.00	-	-
Andorra	-	-	23.48	-	-
Monaco	-	-	-	-	1.00
San Marino	-	-	-	-	1.00
Oceania					
New Zealand	1	74.44	11.11	44.68	14.03
Australia	2	61.82	9.79	51.96	14.03
Fiji	3	66.76	94.73	1.00	-
Palau	-	-	100.00	-	-
Vanuatu	-	84.13	-	-	-
Kiribati	-	-	33.15	-	-
French Polynesia	-	-	5.69	-	-
New Caledonia	-	-	3.05	-	-
Samoa	-	-	2.46	-	-
Solomon Islands	-	-	2.24	-	-
Tonga	-	-	-	1.00	-

Definitions:

GV1: Adjusted net savings, minus natural resources and pollution damages (Percent GNI)

GT1: Share of export of environmental goods (OECD & APEC class.) to total export (Percent)

GJ1: Share of green employment in total manufacturing employment (Percent)

GN1: Share of patent publications in environmental technology to total patents (Percent)

Table A1.13 Normalized values of Green growth indicators for social inclusion

Countries/ Territories	Regional Rank	Indicators											
		AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
Africa													
Botswana	1	-	59.60	69.61	19.81	80.20	75.25	-	26.44	-	100.00	28.26	-
Tanzania	2	-	7.48	32.47	74.66	79.04	100.00	70.49	1.00	-	4.17	26.50	57.66
Mauritius	3	-	95.80	81.31	23.97	93.01	100.00	79.07	94.50	57.08	-	49.65	-
Morocco	4	50.73	98.03	61.06	41.59	31.28	50.50	-	100.00	-	40.40	43.20	89.74
Ghana	5	22.61	46.39	61.55	26.15	84.86	50.50	64.56	75.94	46.13	33.97	26.20	69.13
Uganda	6	1.00	6.77	24.81	68.91	76.71	100.00	66.81	1.00	29.33	7.53	16.24	51.77
Tunisia	7	82.12	99.50	63.45	62.97	55.74	25.75	77.64	100.00	-	34.46	56.10	91.88
Senegal	8	19.70	44.45	46.91	83.76	79.04	25.75	59.66	11.31	23.48	24.27	18.44	70.05
Ethiopia	9	5.34	15.83	13.78	77.82	66.22	25.75	88.88	1.00	-	16.15	18.14	33.09
Egypt	10	58.32	98.62	52.64	30.50	65.06	25.75	42.08	100.00	41.78	38.13	42.76	95.84
South Africa	11	-	84.08	77.69	84.75	97.67	100.00	1.00	74.56	34.07	92.67	29.57	73.30
Cameroon	12	-	38.53	38.28	62.58	73.21	25.75	42.90	1.00	-	13.87	18.44	77.97
Madagascar	13	-	7.12	11.90	39.02	80.20	25.75	74.58	1.00	85.66	5.55	17.41	31.26
Malawi	14	-	3.69	15.91	34.07	75.54	100.00	50.05	1.00	30.53	3.24	22.25	31.97
Zambia	15	-	21.28	35.59	36.64	74.38	100.00	16.94	1.00	8.09	9.71	14.33	35.73
Kenya	16	-	24.87	39.79	44.16	89.52	100.00	48.62	33.31	-	-	24.74	52.78
Zimbabwe	17	-	29.36	39.61	63.37	84.86	75.25	61.09	1.00	-	7.14	24.74	71.26
Burundi	18	-	1.00	22.69	73.07	88.35	75.25	73.55	1.00	86.91	4.91	12.58	50.65
Nigeria	19	14.71	26.18	34.08	12.09	45.26	50.50	58.63	25.06	54.89	8.68	28.55	45.27
Algeria	20	14.44	95.89	56.80	52.08	44.09	50.50	92.97	99.31	55.48	63.96	46.72	-
Sudan	21	-	36.53	31.30	61.39	-	1.00	48.82	1.00	-	5.55	26.79	4.96
Seychelles	-	-	94.79	96.09	42.98	-	75.25	56.39	99.31	-	100.00	50.24	-
Cabo Verde	-	-	79.82	54.71	47.73	-	75.25	59.04	99.31	33.70	85.96	43.79	-
Libya	-	21.96	98.48	46.54	32.68	81.36	100.00	-	97.94	-	43.87	55.81	-
Gabon	-	-	83.72	63.98	34.86	81.36	50.50	74.58	47.75	-	39.41	28.70	62.84
Namibia	-	-	44.30	51.30	92.48	100.00	100.00	6.72	1.00	29.43	98.42	32.07	57.05
Mauritania	-	-	40.76	42.84	41.19	52.25	25.75	65.99	-	-	100.00	29.57	19.28
Equatorial Guinea	-	-	49.18	17.51	40.60	-	100.00	-	49.81	-	-	24.30	32.88
Lesotho	-	-	29.15	31.50	44.76	95.34	75.25	32.27	1.00	-	94.06	5.69	39.38
Togo	-	-	23.27	35.38	35.85	66.22	100.00	64.97	1.00	79.18	11.79	18.29	46.18
Rwanda	-	-	8.88	32.19	100.00	77.87	75.25	41.88	1.00	34.98	5.65	23.42	53.80
Sao Tome & Principe	-	-	39.34	39.33	37.04	-	1.00	85.82	70.44	-	52.98	26.06	12.07
Congo, Republic of	-	33.34	39.72	95.86	23.37	61.56	25.75	72.94	1.00	-	22.88	17.12	51.26
Liberia	-	-	4.33	23.67	25.35	59.24	100.00	69.87	1.00	72.22	-	19.90	28.62
Eswatini	-	-	54.36	34.90	15.26	-	50.50	-	-	25.13	86.14	14.77	-
Gambia	-	-	22.48	68.85	21.39	-	75.25	51.89	1.00	-	17.87	26.20	73.60
Guinea	-	-	13.44	42.61	44.36	67.39	75.25	81.32	1.00	-	9.71	9.94	50.04
Comoros	-	-	39.93	24.42	13.08	-	100.00	1.82	80.75	-	-	23.27	29.33

Table A1.13 Normalized values of Green growth indicators for social inclusion *(continued)*

Countries/ Territories	Regional Rank	Indicators											
		AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
Africa													
Djibouti	-	-	29.29	15.78	52.88	-	75.25	59.66	-	-	12.88	18.88	33.39
Cote d'Ivoire	-	42.65	39.15	63.46	21.99	72.05	50.50	60.27	3.06	23.99	8.62	15.51	39.89
Angola	-	-	42.93	17.65	61.39	55.74	50.50	57.20	1.00	-	15.36	13.02	50.45
Sierra Leone	-	-	5.81	86.88	25.35	55.74	50.50	77.03	1.00	-	1.89	13.90	39.28
Mozambique	-	-	11.08	15.09	79.41	58.07	50.50	58.23	1.00	-	18.13	16.39	22.12
Eritrea	-	-	28.36	1.00	44.56	-	75.25	-	38.13	-	-	9.21	-
Mali	-	-	16.71	56.98	18.42	49.92	25.75	84.79	1.00	28.25	3.67	20.20	52.28
Congo Dem. Rep. of	-	-	7.33	16.82	18.62	86.02	50.50	58.63	-	-	15.85	12.58	19.68
Benin	-	-	20.61	35.56	15.26	52.25	50.50	54.34	1.00	-	10.60	16.39	39.48
Burkina Faso	-	-	10.73	43.43	22.78	61.56	25.75	66.81	1.00	-	3.67	16.24	40.60
Niger	-	3.21	6.36	15.45	34.66	47.59	50.50	82.75	1.00	-	6.78	13.46	37.25
Somalia	-	9.09	12.52	19.72	49.31	73.21	-	-	1.00	-	-	3.49	25.27
Chad	-	-	2.42	16.40	31.29	42.93	50.50	58.23	1.00		2.58	8.62	11.66
Guinea-Bissau	-	-	4.81	34.69	28.13	-	1.00	38.81	-	-	7.14	6.57	19.89
Sudan South	-		1.25	5.49	57.43	27.79	1.00	50.25	1.00	-	-	10.23	1.20
Central African Rep.	-	-	4.21	20.52	18.03	46.42	25.75	15.72	1.00	-	-	-	1.00
The Americas													
Dominican Republic	1	-	94.07	41.01	54.06	91.85	75.25	58.84	100.00	58.90	11.99	44.96	84.97
United States	2	93.93	100.00	75.84	39.81	98.84	75.25	58.84	100.00	68.31	100.00	72.51	-
Canada	3	75.43	100.00	59.90	54.46	100.00	100.00	80.71	100.00	71.48	100.00	81.74	99.99
El Salvador	4	-	89.75	80.58	62.38	59.24	75.25	68.85	100.00	40.41	18.92	47.75	77.26
Mexico	5	40.63	91.83	47.81	96.44	77.87	75.25	49.23	100.00	58.71	25.96	45.11	83.75
Colombia	6	42.19	94.57	67.95	36.84	83.69	75.25	42.28	97.25	55.69	52.18	52.73	71.47
Costa Rica	7	89.21	96.18	97.53	91.29	77.87	25.75	50.05	100.00	56.34	69.08	60.20	96.04
Brazil	8	35.07	97.47	61.09	22.19	91.85	75.25	41.26	100.00	50.92	78.52	48.48	83.45
Ecuador	9	55.94	96.94	45.92	76.24	66.22	100.00	53.93	100.00	61.05	52.48	43.06	79.39
Guatemala	10	58.54	66.76	58.17	26.15	89.52	50.50	50.46	91.75	42.26	9.26	35.00	68.52
Chile	11	91.34	95.73	70.45	45.75	90.68	75.25	52.71	100.00	63.88	78.81	64.74	90.86
Bolivia	12	14.30	76.31	48.25	100.00	97.67	50.50	51.28	82.81	77.01	100.00	40.13	49.74
Argentina	13	60.33	99.11	77.42	78.02	89.52	50.50	63.54	100.00	59.34	89.41	53.61	85.07
Paraguay	14	-	81.61	54.14	30.70	88.35	100.00	35.54	97.25	20.38	22.98	41.88	82.13
Honduras	15	-	70.01	42.30	42.78	79.04	50.50	44.94	73.19	41.25	57.33	32.36	58.98
Uruguay	16	61.49	98.77	86.73	41.00	88.35	75.25	64.56	100.00	60.54	76.74	58.88	-
Bahamas	17	-	100.00	52.91	26.34	-	75.25	-	100.00	-	84.36	47.01	-
Peru	18	36.73	83.35	61.82	55.85	62.73	100.00	58.43	78.00	64.36	20.11	55.37	65.68
Panama	19	-	90.21	66.81	37.23	80.20	50.50	41.67	84.88	63.90	37.93	47.75	77.56
Nicaragua	20	56.31	65.22	65.42	91.49	60.40	75.25	56.59	48.44	-	24.46	47.60	56.14

Table A1.13 Normalized values of Green growth indicators for social inclusion *(continued)*

Countries/ Territories	Regional Rank	Indicators											
		AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
The Americas													
Trinidad & Tobago	21	-	99.62	85.21	62.38	80.20	75.25	71.51	100.00	-	98.71	44.38	94.52
Cayman Islands	-	-	100.00	100.00	-	-	-	-	100.00	-	-	-	-
Sint Maarten (Dutch)	-	-	-	-	-	-	-	-	100.00	-	-	-	-
Aruba	-	-	95.09	-	-	-	-	-	94.50	-	100.00	-	-
Guadeloupe	-	-	-	-	-	-	-	-	-	-	-	-	94.52
Curaçao	-	-	100.00	72.01	-	-	-	-	100.00	-	-	-	-
French Guiana	-	-	-	-	-	-	-	-	-	-	-	-	89.34
Greenland	-	94.61	100.00	-	-	-	-	-	100.00	-	-	57.42	-
US Virgin Islands	-	-	100.00	-	-	-	-	-	100.00	-	-	56.24	-
Bermuda	-	-	100.00	69.77	-	-	-	-	100.00	-	-	69.14	-
Grenada	-	-	94.01	60.44	93.47	-	100.00	-	100.00	-	34.66	38.81	93.91
Antigua & Barbuda	-	-	97.68	94.26	22.98	-	75.25	-	97.25	-	83.67	51.12	-
Puerto Rico	-	28.17	100.00	52.45	-	88.35	75.25	-	100.00	-	-	65.62	-
Saint Martin (French)	-	-	69.83	-	-	-	-	-	-	-	-	-	-
Cuba	-	26.83	89.19	15.20	100.00	-	-	-	100.00	-	-	61.08	93.30
Barbados	-	-	99.69	67.86	40.60	-	75.25	47.60	100.00	-	68.62	51.26	-
Saint Kitts and Nevis	-	-	99.97	82.90	27.33	-	50.50	-	100.00	-	45.25	-	-
Saint Lucia	-	-	96.98	55.65	34.07	-	100.00	60.27	97.25	-	27.24	44.96	87.92
Suriname	-	-	88.14	75.50	51.49	-	75.25	40.04	73.19	-	-	36.46	94.01
Guyana	-	-	77.39	42.09	64.16	-	100.00	64.97	93.13	25.67	100.00	26.35	66.90
St Vincent & Grenadines	-	-	97.61	61.41	26.74	-	50.50	-	97.94	-	76.83	37.63	-
Venezuela	-	14.41	97.64	39.74	44.96	89.52	-	64.77	97.25	-	59.81	48.19	64.56
Dominica	-	-	94.82	58.87	50.50	-	50.50		100.00	-	39.12	38.51	-
Belize	-		88.13	30.54	19.61	77.87	50.50	38.81	93.13	42.18	64.95	38.81	94.82
Jamaica	-	-	93.38	54.94	35.65	-	50.50	50.87	97.25	-	31.01	46.72	39.28
Turks & Caicos Islands	-	-	95.29	-	-	-	-	-	7.88	-	-	-	-
Haiti	-	-	18.76	24.37	5.95	82.53	75.25	17.35	-	-	1.99	9.79	33.09
British Virgin Islands	-	-	-	12.52	-	-	-	-	-	-	-	-	-
Martinique	-	-	-	-	-	-	-	-	-	-	10.21	-	-

Table A1.13 Normalized values of Green growth indicators for social inclusion *(continued)*

Countries/ Territories	Regional Rank	Indicators											
		AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
Asia													
Singapore	1	100.00	100.00	85.48	46.54	96.51	75.25	65.17	100.00	91.63	-	79.84	-
Malaysia	2	86.29	98.09	69.37	28.52	93.01	50.50	-	100.00	75.30	20.60	50.97	-
Philippines	3	-	65.07	54.10	59.41	66.22	100.00	61.50	91.75	53.11	40.40	29.57	55.83
Georgia	4	71.40	87.81	78.93	32.68	89.52	75.25	63.74	100.00	43.36	91.94	44.38	65.38
China	5	57.35	78.61	63.98	50.30	89.52	25.75	68.65	100.00	-	100.00	62.11	74.41
Korea, Republic of	6	98.14	98.29	82.16	34.66	100.00	25.75	74.98	100.00	-	77.82	79.10	-
Japan	7	98.41	100.00	82.64	21.00	100.00	50.50	100.00	100.00	92.54	100.00	83.79	-
Sri Lanka	8	-	58.38	68.60	12.48	98.84	25.75	73.35	95.88	42.79	25.93	60.05	-
India	9	-	62.80	40.80	24.36	90.68	1.00	77.85	81.44	-	24.86	19.02	64.06
Azerbaijan	10	69.86	97.47	58.23	34.26	93.01	1.00	98.08	100.00	-	81.33	47.89	-
Myanmar	11	-	36.79	41.55	21.20	100.00	50.50	100.00	14.06	61.96	-	24.30	42.53
Thailand	12	-	86.56	93.58	11.49	94.18	50.50	67.63	100.00	68.37	79.90	57.12	75.02
Cyprus	13	86.88	100.00	85.80	36.44	96.51	75.25	78.05	100.00	66.16	100.00	78.37	-
Nepal	14	22.49	55.52	60.08	65.75	80.20	50.50	82.95	92.44		62.88	27.82	48.22
Israel	15	96.13	100.00	75.98	55.45	97.67	75.25	62.31	100.00	68.48	99.11	78.67	-
Indonesia	16	-	76.28	82.57	40.20	87.19	75.25	65.38	95.88	52.52	14.86	25.47	68.62
Lebanon	17	29.95	100.00	70.59	10.31	51.08	50.50	-	100.00	-	1.00	70.61	46.08
Turkey	18	41.05	100.00	52.76	35.45	59.24	50.50	70.08	100.00	49.42	20.80	65.04	91.78
Viet Nam	19	-	81.34	66.74	53.87	96.51	50.50	72.53	100.00	-	40.50	50.53	85.38
Kyrgyzstan	20	64.35	89.62	60.76	39.02	93.01	25.75	91.33	100.00	56.91	100.00	41.88	90.15
Armenia	21	58.29	98.26	62.69	36.84	68.55	75.25	80.71	100.00	22.76	68.77	52.29	90.56
Qatar	22	87.78	99.20	79.19	20.40	-	50.50	-	100.00	97.25	18.85	78.23	-
Cambodia	23	19.69	29.80	55.82	40.60	98.84	75.25	87.04	1.00		4.15	27.67	51.57
Pakistan	24	31.90	66.79	33.18	41.79	6.82	1.00	92.56	99.31	35.78	3.28	16.53	58.57
Kazakhstan	25	-	97.45	79.15	54.66	93.01	25.75	95.22	100.00	79.94	25.60	42.91	-
Saudi Arabia	26	83.60	97.94	62.61	40.40	67.39	1.00	-	100.00	65.99	-	69.73	81.72
Mongolia	27	-	60.03	65.78	34.86	94.18	75.25	84.18	19.56	56.81	100.00	39.10	61.11
Jordan	28	84.42	99.50	48.68	31.49	38.27	25.75	74.37	100.00	-	82.80	65.48	78.58
Oman	29	87.83	97.45	77.30	3.38	-	25.75	-	100.00	-	25.45	66.36	-
Tajikistan	30	44.34	88.93	52.74	38.62	77.87	50.50	88.68	100.00	-	92.82	39.25	73.60
Kuwait	31	100.00	100.00	87.52	7.14	86.02	1.00	-	100.00	-	28.03	73.54	-
Iraq	32	27.98	98.59	86.51	51.49	72.05	25.75	83.36	100.00	-	56.44	41.44	52.89
Macao China SAR	-	100.00	100.00	100.00	-	-	-	-	100.00	89.50	-	-	-
Hong Kong China SAR	-	55.66	100.00	100.00	-	98.84	75.25	63.95	100.00	87.10	73.17	-	-
Brunei Darussalam	-	-	100.00	66.34	19.02	-	100.00	-	100.00	-	81.88	55.95	-

Table A1.13 Normalized values of Green growth indicators for social inclusion *(continued)*

Countries/ Territories	Regional Rank	Indicators											
		AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
Asia													
Maldives	-	-	96.33	100.00	12.68	-	75.25	74.37	100.00	50.39	99.70	64.01	67.41
Turkmenistan	-	85.34	99.62	80.30	50.10	74.38	-	61.50	100.00	-	-	38.51	-
United Arab Emirates	-	92.98	99.29	100.00	45.55	79.04	1.00	-	100.00	76.10	-	59.18	-
Bahrain	-	98.67	100.00	85.50	15.85	84.86	25.75		100.00	-	40.70	69.14	-
Uzbekistan	-	-	95.78	39.64	32.68	93.01	50.50	75.19	100.00	-	98.12	44.67	47.00
Iran	-	90.88	99.17	57.29	12.68	94.18	50.50	76.01	100.00	-	27.14	57.56	75.73
Timor-Leste	-	-	34.91	57.66	67.92	-	75.25	88.47	40.88	55.75	89.80	28.99	65.48
Syria	-	-	99.32	42.60	27.14	-	1.00	78.87	100.00	-	17.53	62.69	84.46
Palestine	-	57.95	100.00	40.77	-	37.11	25.75	78.46	100.00	31.52	8.92	56.68	60.10
Bhutan	-	30.32	74.30	42.88	17.83	66.22	100.00	76.21	100.00	-	4.17	30.60	-
Laos	-	-	45.96	22.68	55.45	74.38	75.25	74.78	85.56	11.15	6.54	19.17	78.88
Bangladesh	-	53.09	40.62	44.78	41.19	47.59	25.75	84.18	74.56	39.01	34.06	29.14	49.84
Korea Dem. People's Rep. of	-	-	21.34	9.59	33.27	-	-	-	100.00	-	-	44.67	-
Afghanistan	-		49.24	29.54	55.85	20.80	1.00	94.20	83.50	11.30	11.59	1.00	27.60
Yemen	-	-	66.21	23.47	1.00	1.00	-	71.71	52.56	-	9.42	26.06	42.73
Europe													
Denmark	1	94.68	100.00	81.60	75.05	100.00	100.00	86.84	100.00	87.71	100.00	78.96	100.00
Sweden	2	94.85	100.00	81.58	92.28	98.84	100.00	85.00	100.00	86.27	100.00	85.99	100.00
Austria	3	97.61	100.00	99.79	69.11	100.00	100.00	80.09	100.00	83.72	100.00	82.62	-
Finland	4	93.89	100.00	80.47	84.16	100.00	100.00	92.36	100.00	79.03	100.00	84.67	-
Czech Republic	5	89.16	98.55	72.70	44.56	93.01	75.25	94.20	100.00	85.20	100.00	77.64	-
Italy	6	94.23	100.00	83.65	71.69	94.18	100.00	70.28	100.00	58.18	100.00	83.35	-
Germany	7	97.20	100.00	86.21	61.79	100.00	75.25	80.09	100.00	85.85	100.00	79.98	99.99
Estonia	8	86.56	96.19	87.41	53.87	98.84	100.00	77.64	100.00	80.68	100.00	72.66	-
Latvia	9	79.01	97.45	75.22	32.68	97.67	100.00	73.96	100.00	76.31	100.00	67.24	-
Slovakia	10	86.83	98.31	76.85	40.60	96.51	75.25	88.88	100.00	74.12	100.00	68.55	-
Portugal	11	77.13	100.00	72.62	69.90	95.34	100.00	74.37	100.00	77.70	100.00	77.20	96.34
Belgium	12	97.60	100.00	69.68	76.24	100.00	100.00	88.27	100.00	79.10	100.00	82.18	-
Hungary	13	77.35	100.00	70.24	25.95	90.68	75.25	85.20	100.00	76.65	100.00	70.02	86.19
France	14	92.29	100.00	73.39	79.41	93.01	100.00	79.28	100.00	75.02	100.00	82.18	-
Croatia	15	73.85	96.02	62.36	37.63	90.68	100.00	80.91	100.00	64.30	58.02	72.95	-
Slovenia	16	86.12	97.94	71.51	49.31	98.84	75.25	92.97	100.00	83.02	100.00	81.45	96.24
Spain	17	97.68	100.00	70.72	78.42	95.34	100.00	68.65	100.00	69.13	100.00	84.67	92.08
Lithuania	18	75.08	100.00	88.59	43.17	94.18	100.00	67.42	100.00	80.11	100.00	65.62	-
Netherlands	19	98.63	100.00	80.25	72.28	100.00	100.00	85.61	100.00	90.33	100.00	84.53	-
United Kingdom	20	96.46	100.00	78.12	64.76	98.84	100.00	76.41	100.00	76.96	100.00	77.35	-
Switzerland	21	97.06	100.00	87.75	65.35	98.84	100.00	81.93	100.00	85.13	100.00	87.90	-

Table A1.13 Normalized values of Green growth indicators for social inclusion *(continued)*

Countries/ Territories	Regional Rank	Indicators											
		AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
Europe													
Norway	22	85.96	100.00	72.66	82.97	98.84	100.00	85.82	100.00	88.64	100.00	85.99	100.00
Poland	23	84.67	100.00	74.58	56.44	96.51	75.25	81.32	100.00	77.77	100.00	70.02	99.99
Romania	24	70.83	92.43	67.10	41.99	83.69	100.00	73.35	100.00	63.29	100.00	62.40	85.38
Ireland	25	83.67	100.00	64.03	44.96	100.00	100.00	75.19	100.00	73.52	95.88	82.91	-
Luxembourg	26	95.70	100.00	85.57	57.03	98.84	100.00	80.09	100.00	88.64	100.00	84.23	-
Greece	27	86.32	97.07	73.31	38.03	97.67	100.00	69.67	100.00	66.60	77.63	80.86	96.95
Bulgaria	28	71.11	94.03	71.19	48.12	95.34	100.00	68.04	100.00	61.56	100.00	58.00	-
Iceland	29	82.64	100.00	80.04	76.44		100.00	90.11	100.00	91.28	85.71	90.53	-
Serbia	30	53.53	87.10	70.92	69.11	95.34	100.00	57.61	100.00	61.81	46.67	63.86	96.34
Albania	31	64.91	87.30	64.97	56.24	89.52	100.00	91.33	100.00	30.74	77.23	67.97	-
Russian Federation	32	74.09	99.05	89.08	32.28	98.84	25.75	80.09	100.00	73.78	91.32	58.44	-
Ukraine	33	91.70	97.68	71.32	25.35	93.01	1.00	98.90	100.00	61.43	91.93	59.91	80.71
Belarus	34	84.48	98.97	75.54	69.31	100.00	50.50	94.20	100.00		100.00	62.40	54.10
Montenegro	35	89.11	83.78	93.59	47.53	97.67	25.75	86.43	100.00	61.13	52.78	71.63	72.48
Moldova Republic	36	68.21	95.53	49.42	46.14	95.34	25.75	87.66	100.00	41.23	75.45	60.49	35.52
Bosnia & Herzegovina	37	53.26	80.51	55.89	43.37	84.86	50.50	74.98	100.00	44.16	30.30	67.97	92.28
Malta	38	96.29	100.00	90.68	24.56	98.84	100.00	88.27	100.00	82.09	100.00	78.08	-
Isle of Man	-	96.04	100.00	-	-	-	-	-	100.00	-	-	-	-
Channel Islands	-	91.50	100.00	-	-	-	-	-	100.00	-	-	-	-
Gibraltar	-	98.99	100.00	83.50					100.00				
Faeroe Islands	-	-	100.00	73.85	-	-	-	-	100.00	-	-	-	-
Andorra	-	100.00	100.00	72.85	64.56	-	-	-	100.00	-	-	92.00	-
Monaco	-	100.00	100.00	65.45	66.93	-	-	-	100.00	-	-	-	-
San Marino	-	88.30	100.00	70.87	53.87	-	75.25	-	100.00	-	-	-	-
Liechtenstein	-	99.64	100.00	81.51	24.76	-	-	-	100.00	-	-	-	-
Kosovo	-	-	100.00	-	-	66.22	100.00	-	-	36.44	-	-	-
North Macedonia	-	82.53	81.89	55.04	76.83	89.52	50.50	74.78	100.00	48.64	71.69	64.74	91.57
Jersey	-	-	-	-	-	-	-	-	-	-	42.78	-	-
Oceania													
New Zealand	1	87.27	100.00	83.86	76.83	100.00	75.25	82.75	100.00	74.69	100.00	79.69	99.99
Australia	2	72.71	100.00	70.81	57.83	98.84	100.00	80.09	100.00	81.63	74.53	84.97	99.99
Fiji	3	-	67.13	55.10	32.68	-	50.50	-	99.31	57.57	11.49	21.66	89.03
Cook Islands	-	-	-	-	-	-	-	-	100.00	-	-	-	-
New Caledonia	-	96.90	100.00	-	-	-	-	-	100.00	-	-	-	-

Table A1.13 Normalized values of Green growth indicators for social inclusion *(continued)*

Countries/ Territories	Regional Rank	AB1	AB2	AB3	GB1	GB2	GB3	SE1	SE2	SE3	SP1	SP2	SP3
		Indicators											
Oceania													
French Polynesia	-	-	100.00	58.58	-	-	-	-	100.00	-	-	-	-
Northern Mariana Islands	-	81.37	100.00	-	-	-	-	-	100.00	-	-	58.59	-
Guam	-	-	100.00	-	-	-	-	-	100.00	-	-	46.28	-
Nauru	-	-	94.92	87.29	21.79	-	-	-	-	-	56.94	-	-
Palau	-	14.95	92.55		25.75		75.25	69.26	98.63		48.52		
Marshall Islands	-	-	77.38	10.71	19.02	-	75.25	-	95.88	-	64.56	26.35	-
Tonga	-	-	76.80	48.28	15.65	-	75.25	-	98.63	-	1.99	44.38	-
Samoa	-	-	64.64	27.77	20.80	-	75.25	-	100.00	19.91	49.98	44.38	-
American Samoa	-	-	-	-	-	-	-	-	-	-	-	46.13	-
Tuvalu	-	3.69	72.94	33.83	14.27	-	-	68.44	99.31	38.85	20.31	-	-
Fed. States Micronesia	-	-	40.85	7.24	1.00	-	75.25	62.31	79.38	-	-	32.21	-
Kiribati	-	-	46.07	14.80	13.87	-	100.00	17.35	95.19	1.00	-	19.17	-
Vanuatu	-	-	26.43	38.44	1.00	-	50.50	76.01	33.31	-	4.47	16.53	-
Solomon Islands	-	-	29.57	34.25	8.92	-	25.75	-	53.94	-	13.97	16.53	-
Papua New Guinea	-	-	14.91	19.70	1.00	-	25.75	-	1.00	-	1.89	9.94	-

Definitions:

AB1: Population with access to safely managed water and sanitation (Percent)
AB2: Population with access to electricity and clean fuels/technology (Percent)
AB3: Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)
GB1: Proportion of seats held by women in national parliaments (Percent)
GB2: Ratio of female to male with account in financial institution, age 15+ (Percent)
GB3: Getting paid, covering laws and regulations for equal gender pay (Score)
SE1: Inequality in income based on Atkinson (Index)
SE2: Ratio of urban to rural, access to safely managed water/sanitation & electricity (Percent)
SE3: Share of youth not in education, employment or training, aged 15-24 years (Percent)
SP1: Proportion of population above statutory pensionable age receiving pension (Percent)
SP2: Healthcare access and quality index (Index)
SP3: Proportion of urban population living in slums (Percent)

Table A1.14 Data gaps in indicators by dimension and across all indicators

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension: Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Missing across all indicators: Number	percent
Africa							
Botswana	1	1	1	1	4	7	19
Tanzania	2	0	0	1	2	3	8
Mauritius	3	0	0	1	3	4	11
Morocco	4	0	0	0	2	2	6
Ghana	5	0	0	1	0	1	3
Uganda	6	0	1	1	0	2	6
Tunisia	7	0	0	0	1	1	3
Senegal	8	0	0	1	0	1	3
Ethiopia	9	0	1	1	1	3	8
Egypt	10	0	0	0	0	0	0
South Africa	11	0	0	0	1	1	3
Cameroon	12	0	0	1	2	3	8
Madagascar	13	0	0	1	1	2	6
Malawi	14	0	1	0	1	2	6
Zambia	15	0	1	1	1	3	8
Kenya	16	0	0	1	3	4	11
Zimbabwe	17	0	1	1	2	4	11
Burundi	18	0	1	1	1	3	8
Nigeria	19	0	0	1	0	1	3
Algeria	20	0	0	1	1	2	6
Sudan	21	1	2	1	3	7	19
Cote d'Ivoire	-	0	1	2	0	3	8
Namibia	-	0	0	2	1	3	8
Togo	-	0	0	2	1	3	8
Benin	-	0	0	2	2	4	11
Congo, Republic of	-	1	0	2	1	4	11
Mali	-	0	1	2	1	4	11
Mozambique	-	0	0	2	2	4	11
Niger	-	0	1	2	1	4	11
Sierra Leone	-	0	0	2	2	4	11
Angola	-	0	0	3	2	5	14
Burkina Faso	-	0	1	2	2	5	14
Cabo Verde	-	0	0	2	3	5	14
Guinea	-	1	0	2	2	5	14
Rwanda	-	1	1	2	1	5	14
Gambia	-	1	0	2	3	6	17
Liberia	-	1	0	3	2	6	17
Lesotho	-	0	1	3	2	6	17
Mauritania	-	1	0	2	3	6	17

Table A1.14 Data gaps in indicators by dimension and across all indicators *(continued)*

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension				Missing across all indicators	
		Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Number	percent
Africa							
Congo Dem. Rep. of	-	1	0	3	3	7	19
Gabon	-	1	0	4	2	7	19
Sao Tome & Principe	-	1	0	3	3	7	19
Comoros	-	1	0	3	4	8	22
Guinea-Bissau	-	1	0	3	4	8	22
Libya	-	1	0	4	3	8	22
Chad	-	1	1	4	2	8	22
Central African Rep.	-	1	1	3	4	9	25
Djibouti	-	2	0	3	4	9	25
Seychelles	-	2	0	3	4	9	25
Eritrea	-	1	1	3	6	11	31
Equatorial Guinea	-	2	0	4	5	11	31
Somalia	-	2	1	4	4	11	31
Sudan South	-	1	4	4	3	12	33
Eswatini	-	2	3	2	5	12	33
Réunion	-	6	7	4	12	29	81
Western Sahara	-	7	7	4	12	30	83
Mayotte	-	7	7	4	12	30	83
Saint Helena	-	7	8	4	12	31	86
The Americas							
Dominican Republic	1	0	0	1	1	2	6
United States	2	0	0	0	1	1	3
Canada	3	0	0	0	0	0	0
El Salvador	4	0	0	1	1	2	6
Mexico	5	0	0	0	0	0	0
Colombia	6	0	0	0	0	0	0
Costa Rica	7	0	0	1	0	1	3
Brazil	8	0	0	0	0	0	0
Ecuador	9	0	0	0	0	0	0
Guatemala	10	0	0	1	0	1	3
Chile	11	0	0	0	0	0	0
Bolivia	12	0	1	1	0	2	6
Argentina	13	0	0	0	0	0	0
Paraguay	14	0	1	1	1	3	8
Honduras	15	0	0	1	1	2	6
Uruguay	16	0	0	0	1	1	3

Table A1.14 Data gaps in indicators by dimension and across all indicators *(continued)*

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension				Missing across all indicators	
		Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Number	percent
The Americas							
Bahamas	17	1	0	1	5	7	19
Peru	18	0	0	0	0	0	0
Panama	19	0	0	0	1	1	3
Nicaragua	20	0	0	1	1	2	6
Trinidad & Tobago	21	1	0	1	2	4	11
Belize	-	0	0	2	1	3	8
Jamaica	-	0	0	2	3	5	14
Venezuela	-	1	0	2	2	5	14
Guyana	-	1	1	2	2	6	17
Haiti	-	0	0	3	3	6	17
Barbados	-	1	0	2	4	7	19
Suriname	-	0	0	3	4	7	19
Cuba	-	0	0	3	5	8	22
Saint Lucia	-	4	0	2	3	9	25
Antigua & Barbuda	-	1	1	3	5	10	28
Grenada	-	2	0	4	4	10	28
Dominica	-	2	0	4	5	11	31
St Vincent & Grenadines	-	4	0	2	5	11	31
Puerto Rico	-	2	1	4	5	12	33
Bermuda	-	4	1	2	8	15	42
Saint Kitts and Nevis	-	4	2	3	6	15	42
Greenland	-	6	0	3	8	17	47
Aruba	-	5	2	3	9	19	53
US Virgin Islands	-	5	3	4	9	21	58
Cayman Islands	-	6	3	4	9	22	61
Turks & Caicos Islands	-	6	2	4	10	22	61
British Virgin Islands	-	4	3	4	11	22	61
Curaçao	-	6	5	4	9	24	67
Guadeloupe	-	6	7	4	11	28	78
French Guiana	-	6	7	4	11	28	78
Saint Martin (French)	-	7	7	4	11	29	81
Martinique	-	6	8	4	11	29	81
Falkland Islands	-	6	8	4	12	30	83
Anguilla	-	7	8	4	12	31	86

Table A1.14 Data gaps in indicators by dimension and across all indicators *(continued)*

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension				Missing across all indicators	
		Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Number	percent
The Americas							
Montserrat	-	7	8	4	12	31	86
Bonaire, St Eustatius & Saba	-	7	10	4	12	33	92
Saint Barthélemy	-	7	10	4	12	33	92
Sint Maarten (Dutch)	-	8	10	4	11	33	92
St Pierre & Miquelon	-	7	10	4	12	33	92
Asia							
Singapore	1	1	0	0	2	3	8
Malaysia	2	0	0	0	2	2	6
Philippines	3	0	0	0	1	1	3
Georgia	4	0	0	0	0	0	0
China	5	0	0	0	1	1	3
Korea, Republic of	6	0	0	0	2	2	6
Japan	7	0	0	0	1	1	3
Sri Lanka	8	0	0	1	2	3	8
India	9	0	0	0	2	2	6
Azerbaijan	10	0	1	1	2	4	11
Myanmar	11	0	0	1	2	3	8
Thailand	12	0	0	0	1	1	3
Cyprus	13	0	0	0	1	1	3
Nepal	14	0	1	1	1	3	8
Israel	15	0	0	0	1	1	3
Indonesia	16	0	0	0	1	1	3
Lebanon	17	1	0	1	2	4	11
Turkey	18	0	0	0	0	0	0
Viet Nam	19	0	0	0	2	2	6
Kyrgyzstan	20	0	1	0	0	1	3
Armenia	21	0	1	0	0	1	3
Qatar	22	1	0	1	3	5	14
Cambodia	23	0	0	1	1	2	6
Pakistan	24	0	0	1	0	1	3
Kazakhstan	25	0	1	0	2	3	8
Saudi Arabia	26	0	0	0	2	2	6
Mongolia	27	1	1	0	1	3	8
Jordan	28	0	0	0	1	1	3
Oman	29	0	0	1	4	5	14
Tajikistan	30	0	1	1	1	3	8
Kuwait	31	0	0	1	3	4	11

Table A1.14 Data gaps in indicators by dimension and across all indicators *(continued)*

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension				Missing across all indicators	
		Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Number	percent
Asia							
Iraq	32	0	0	1	1	2	6
Bangladesh	-	0	0	2	0	2	6
Afghanistan	-	0	1	2	1	4	11
Iran	-	0	0	3	1	4	11
Laos	-	0	1	2	1	4	11
United Arab Emirates	-	0	0	3	3	6	17
Bahrain	-	1	0	2	3	6	17
Bhutan	-	0	1	3	2	6	17
Syria	-	0	0	3	3	6	17
Timor-Leste	-	2	0	2	2	6	17
Yemen	-	1	0	2	3	6	17
Maldives	-	2	1	2	2	7	19
Uzbekistan	-	1	1	3	2	7	19
Brunei Darussalam	-	2	0	1	5	8	22
Palestine	-	2	3	2	1	8	22
Turkmenistan	-	1	1	3	4	9	25
Hong Kong China SAR	-	5	4	1	3	13	36
Korea Dem. People's Rep. of	-	2	1	4	7	14	39
Macao China SAR	-	5	8	2	7	22	61
Europe							
Denmark	1	0	0	0	0	0	0
Sweden	2	0	0	0	0	0	0
Austria	3	0	1	0	1	2	6
Finland	4	0	0	0	1	1	3
Czech Republic	5	0	2	0	1	3	8
Italy	6	0	0	0	1	1	3
Germany	7	0	0	0	0	0	0
Estonia	8	0	0	0	1	1	3
Latvia	9	0	0	0	1	1	3
Slovakia	10	0	1	0	1	2	6
Portugal	11	0	0	0	0	0	0
Belgium	12	0	0	0	1	1	3
Hungary	13	0	1	0	0	1	3

Table A1.14 Data gaps in indicators by dimension and across all indicators *(continued)*

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension				Missing across all indicators	
		Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Number	percent
Europe							
France	14	0	0	0	1	1	3
Croatia	15	0	0	0	1	1	3
Slovenia	16	0	0	0	0	0	0
Spain	17	0	0	0	0	0	0
Lithuania	18	0	0	1	1	2	6
Netherlands	19	0	0	0	1	1	3
United Kingdom	20	0	0	0	1	1	3
Switzerland	21	0	1	0	1	2	6
Norway	22	0	0	0	0	0	0
Poland	23	0	0	0	0	0	0
Romania	24	0	0	0	0	0	0
Ireland	25	0	0	0	1	1	3
Luxembourg	26	0	1	0	1	2	6
Greece	27	0	0	0	0	0	0
Bulgaria	28	0	0	0	1	1	3
Iceland	29	0	0	0	2	2	6
Serbia	30	1	2	1	0	4	11
Albania	31	0	0	1	1	2	6
Russian Federation	32	0	0	0	1	1	3
Ukraine	33	0	0	0	0	0	0
Belarus	34	1	1	0	1	3	8
Montenegro	35	1	1	1	0	3	8
Moldova Republic	36	0	1	0	0	1	3
Bosnia & Herzegovina	37	1	0	1	0	2	6
Malta	38	0	0	1	1	2	6
North Macedonia	-	0	1	2	0	3	8
Andorra	-	4	2	3	6	15	42
Faeroe Islands	-	5	2	4	9	20	56
Liechtenstein	-	5	4	4	7	20	56
Gibraltar	-	6	5	4	8	23	64
Monaco	-	7	6	3	7	23	64
San Marino	-	7	7	3	6	23	64
Isle of Man	-	6	7	4	9	26	72
Channel Islands	-	7	10	4	9	30	83
Kosovo	-	7	11	4	8	30	83
Jersey	-	7	10	4	11	32	89

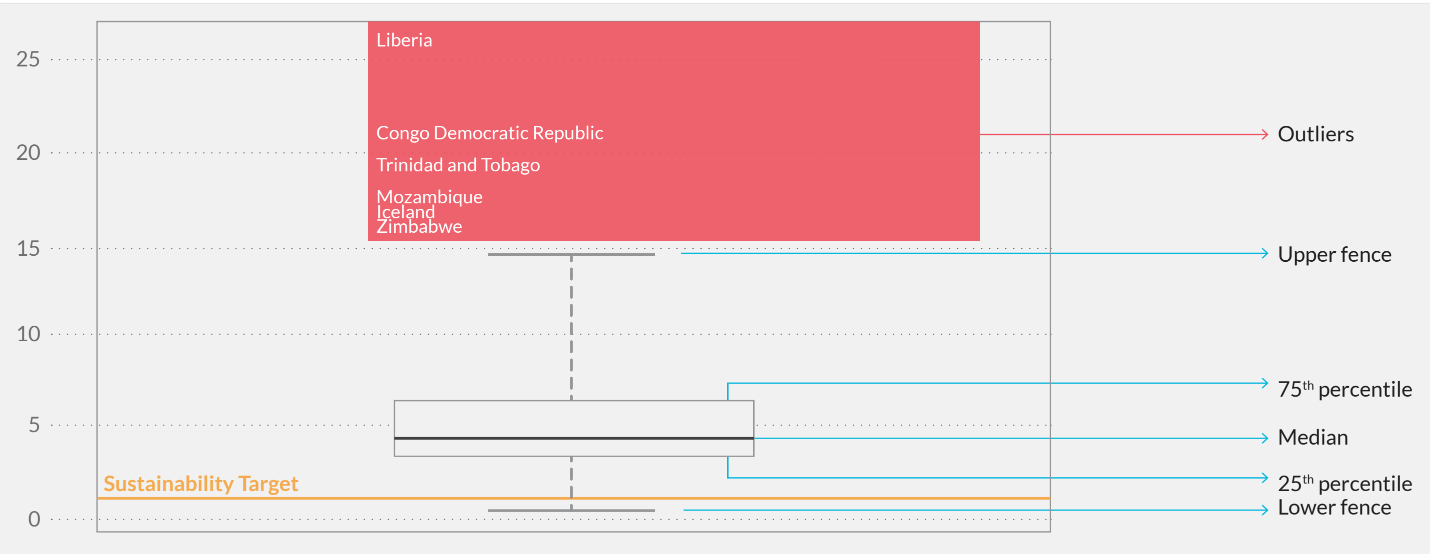
Table A1.14 Data gaps in indicators by dimension and across all indicators *(continued)*

Countries/ Territories	Regional Rank	Missing Indicators in each Dimension				Missing across all indicators	
		Efficient and sustainable resource use	Natural capital protection	Green economic opportunities	Social Inclusion	Number	percent
Europe							
Holy See	-	7	9	4	12	32	89
Svalbard & Jan Mayen Islands	-	7	10	4	12	33	92
Åland Islands	-	7	11	4	12	34	94
Guernsey	-	7	11	4	12	34	94
Oceania							
New Zealand	1	0	0	0	0	0	0
Australia	2	0	0	0	0	0	0
Fiji	3	0	0	1	3	4	11
Vanuatu	-	1	0	3	4	8	22
Papua New Guinea	-	0	0	4	5	9	25
Samoa	-	2	0	3	4	9	25
Solomon Islands	-	2	0	3	5	10	28
Kiribati	-	3	1	3	4	11	31
Tonga	-	3	0	3	5	11	31
Fed. States Micronesia	-	4	0	4	5	13	36
Marshall Islands	-	4	0	4	5	13	36
Palau	-	4	3	3	5	15	42
Tuvalu	-	4	4	4	4	16	44
Northern Mariana Islands	-	6	1	4	8	19	53
New Caledonia	-	5	2	3	9	19	53
French Polynesia	-	5	2	3	9	19	53
Guam	-	6	2	4	9	21	58
Nauru	-	5	4	4	8	21	58
American Samoa	-	6	1	4	11	22	61
Cook Islands	-	6	7	4	11	28	78
Niue	-	6	7	4	12	29	81
Tokelau	-	7	8	4	12	31	86
Norfolk Island	-	7	9	4	12	32	89
Pitcairn	-	7	10	4	12	33	92
Wallis & Futuna Islands	-	7	10	4	12	33	92

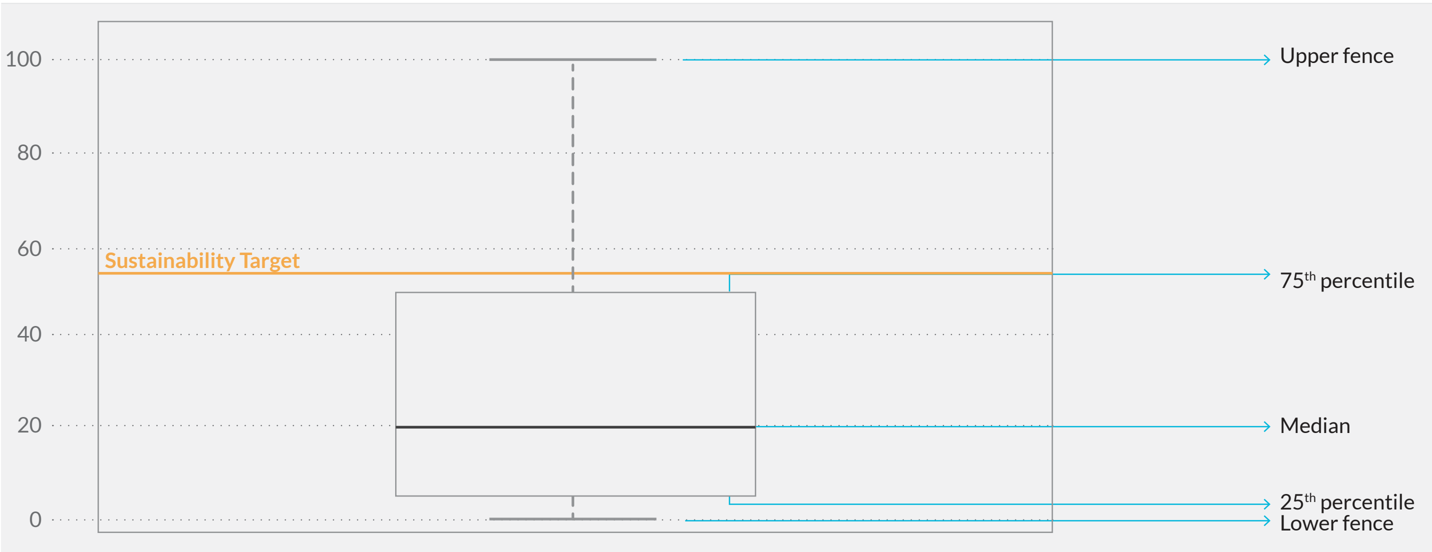
Appendix 2

Boxplots and extreme outliers for the indicators in the Green Growth Index

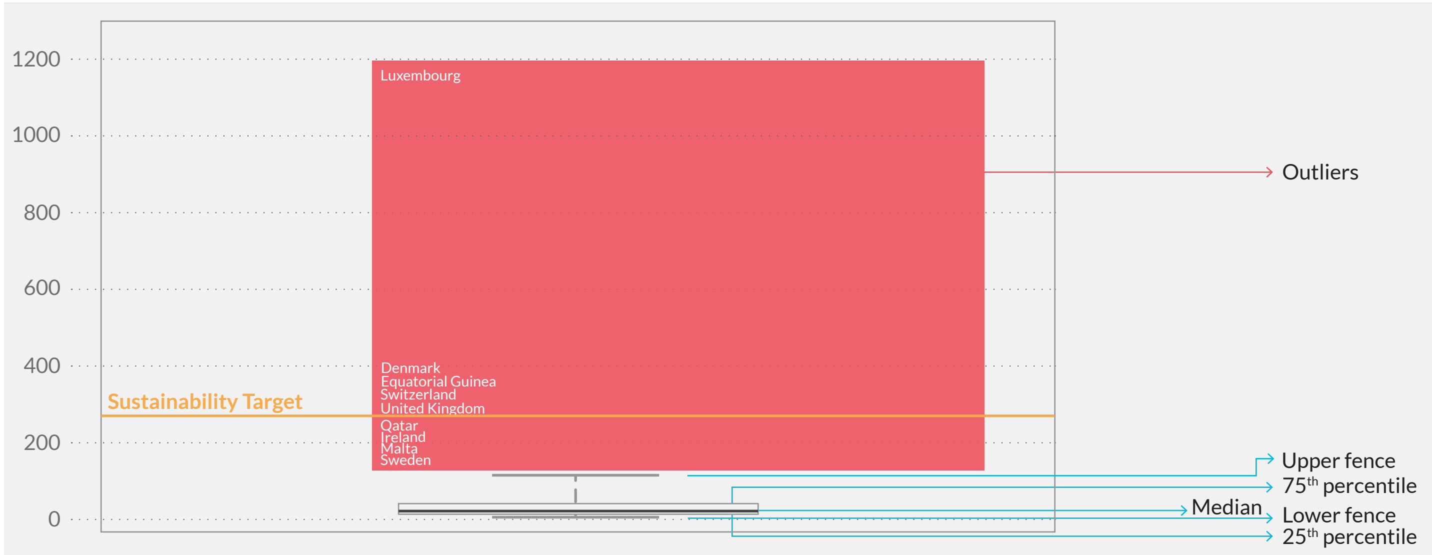
EE1: Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)



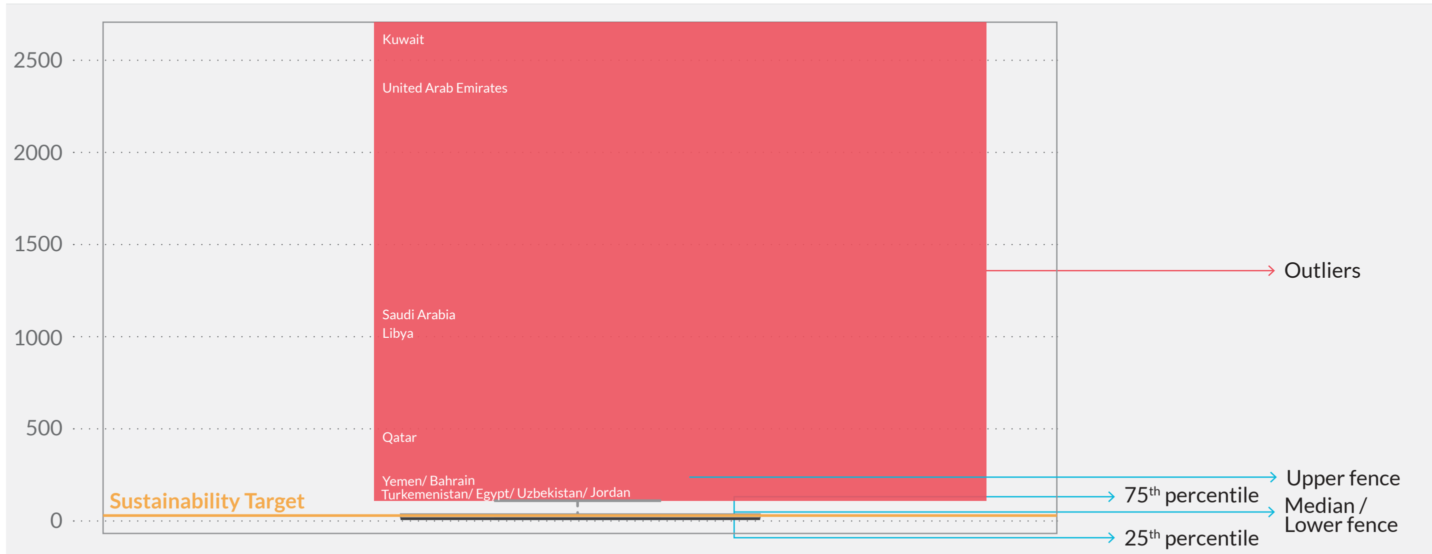
EE2: Share of renewable to total final energy consumption (Percent)



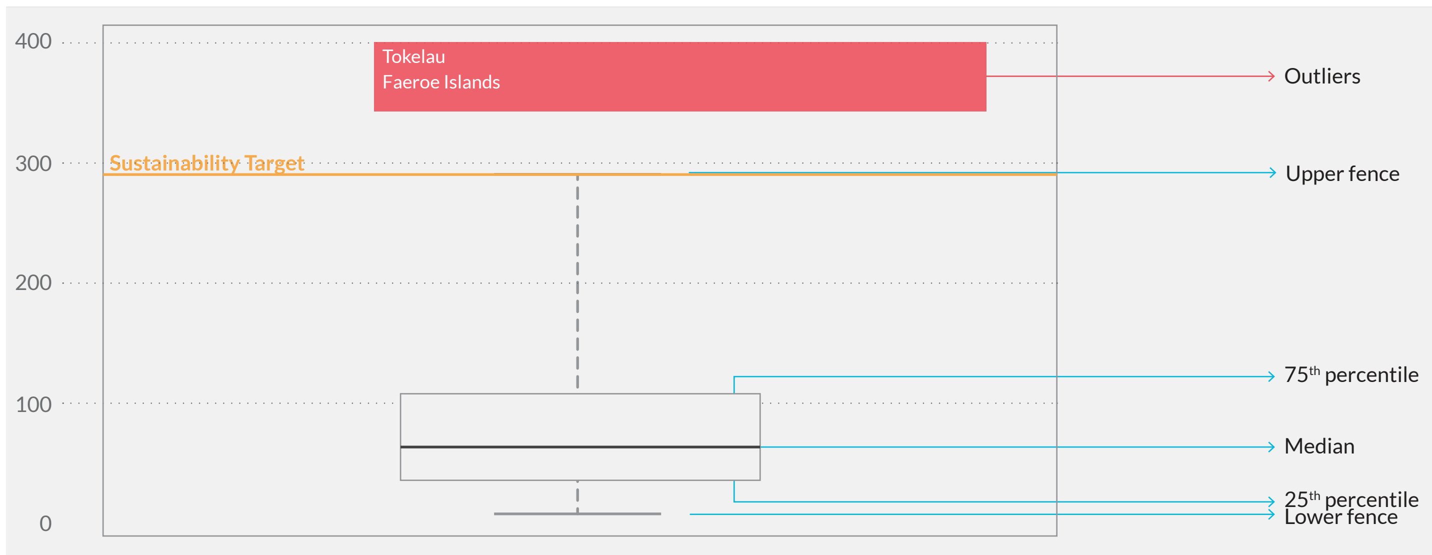
EW1: Water use efficiency (USD per m³)



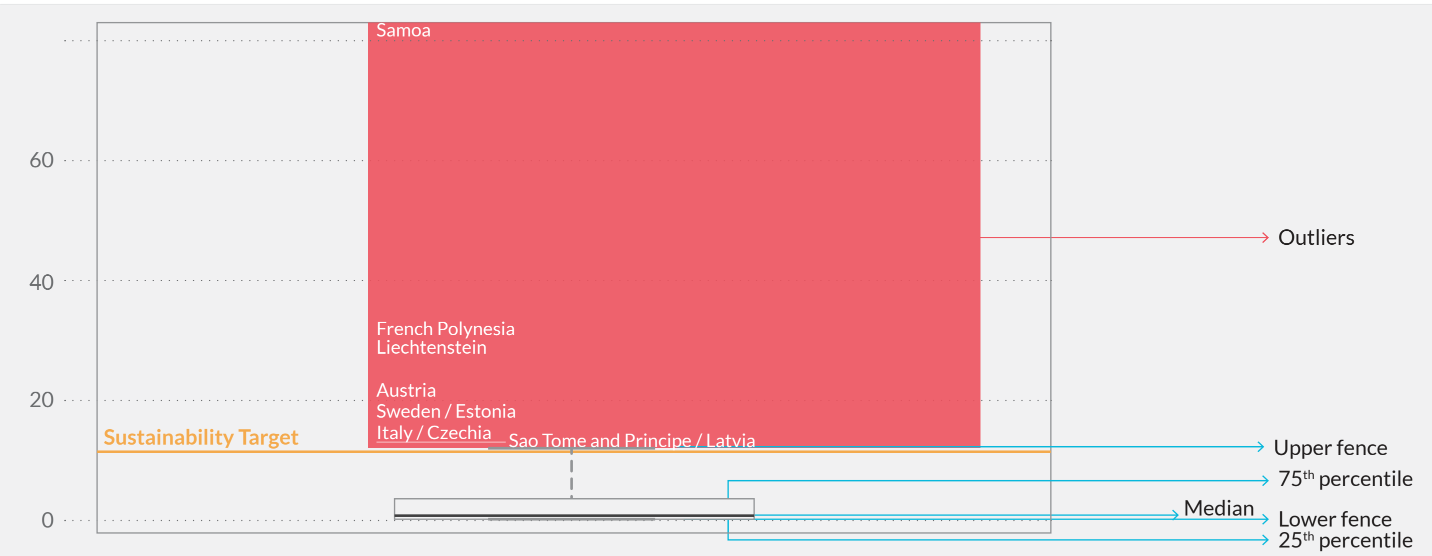
EW2: Share of freshwater withdrawal to available freshwater resources (Percent)



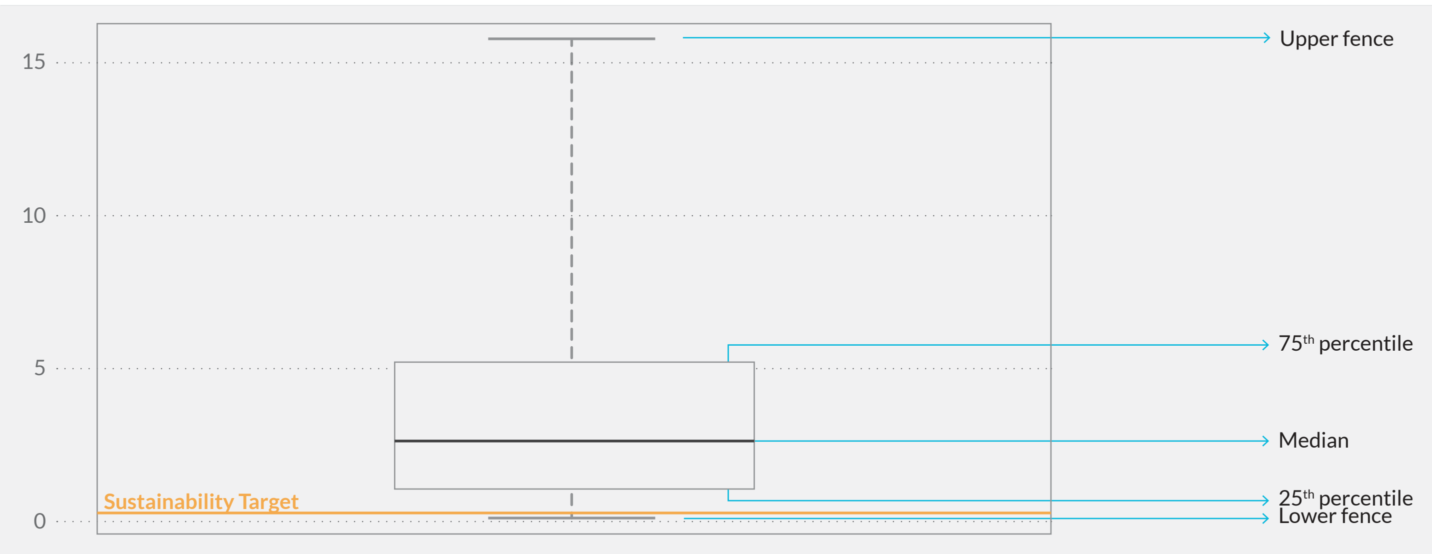
SL1: Average soil organic carbon content (Ton per hectare)



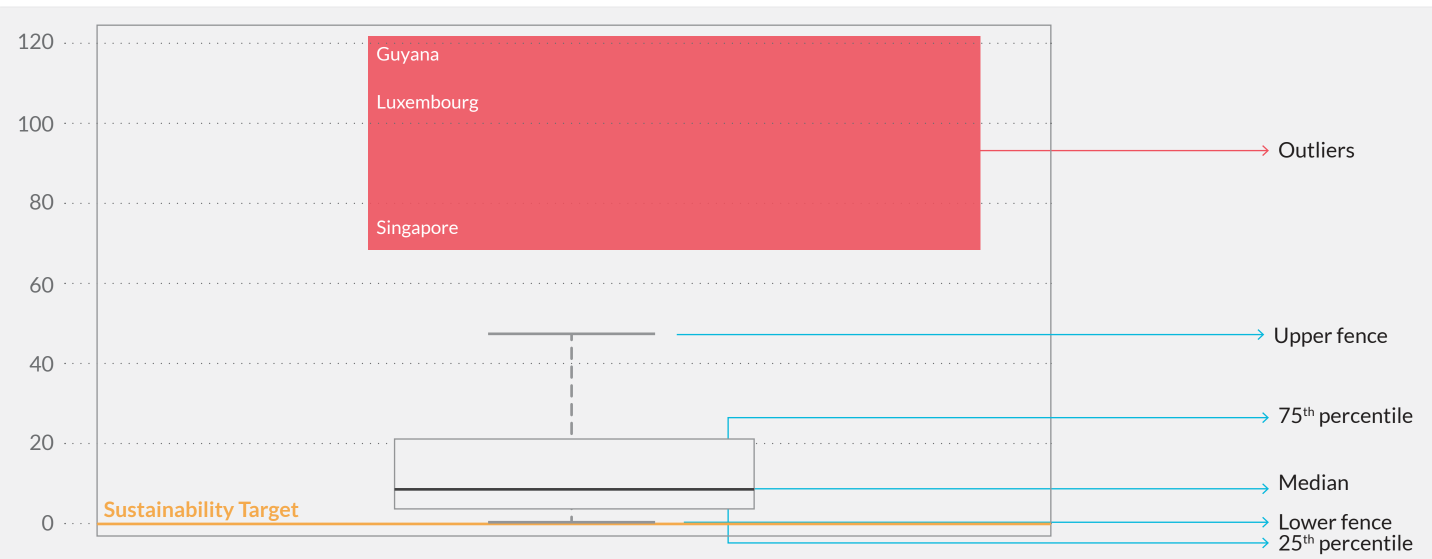
SL2: Share of organic agriculture to total agricultural land area (Percent)



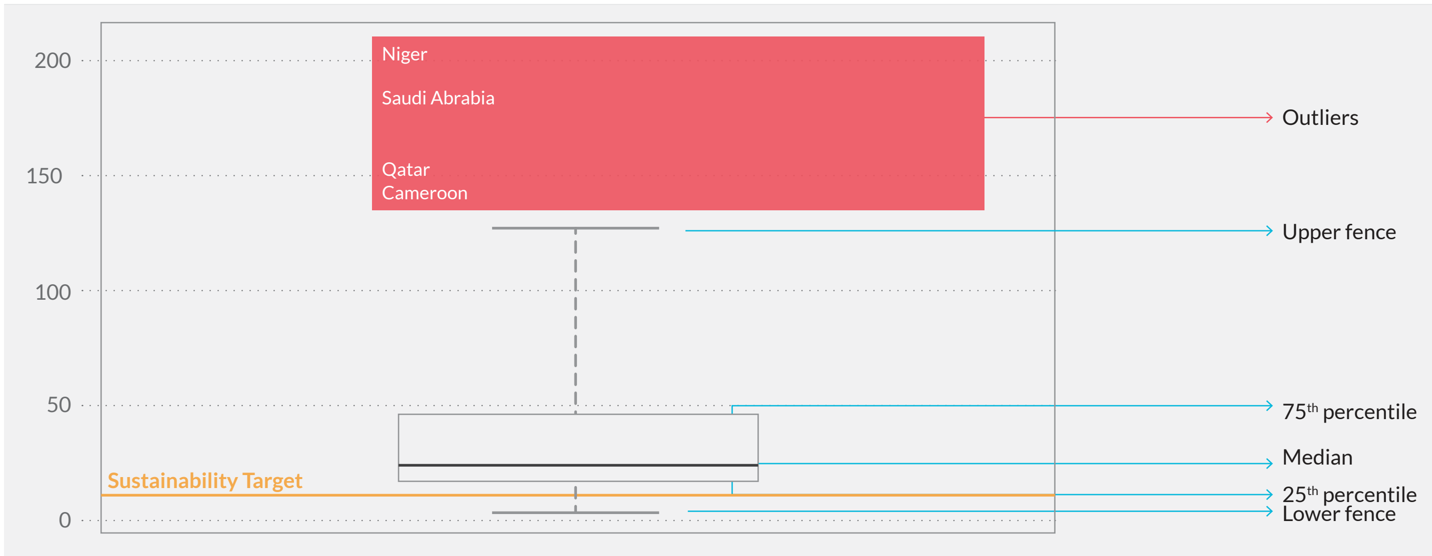
ME1: Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)



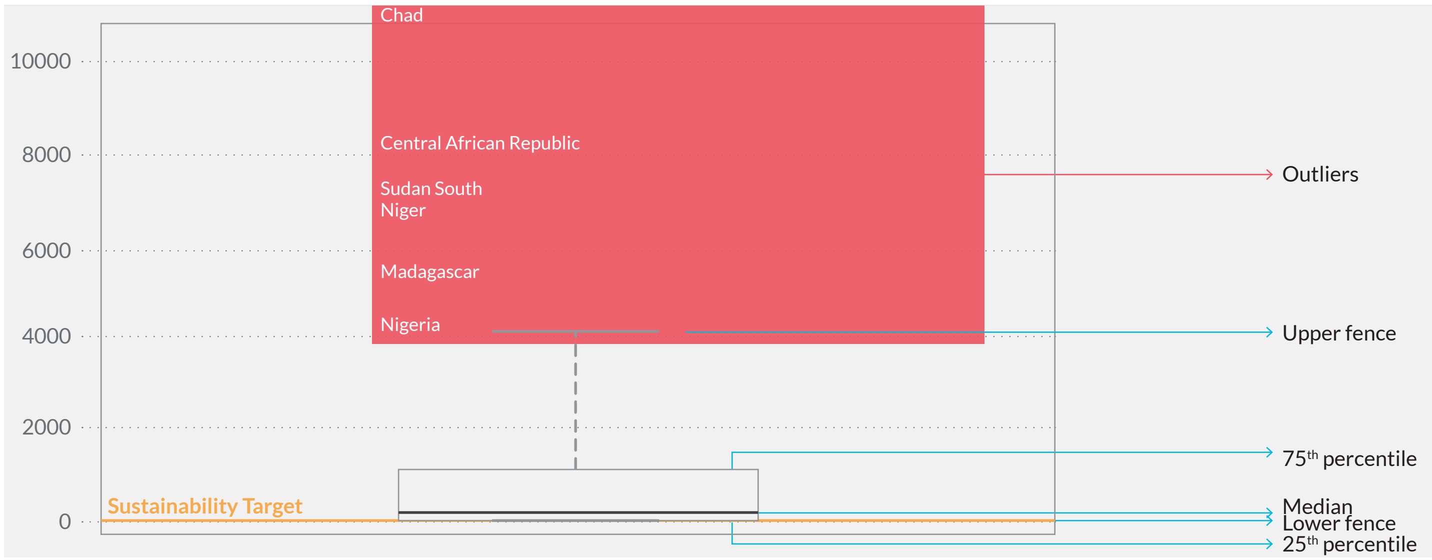
ME2: Total material footprint (MF) per capita (MF tons per capita)



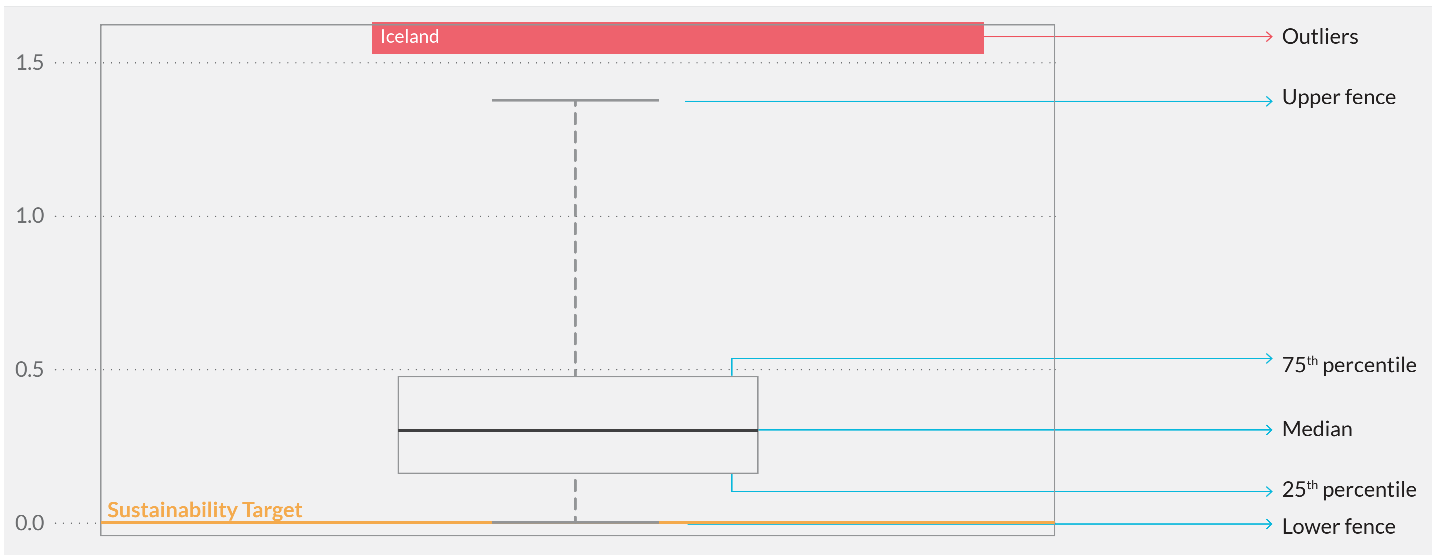
EQ1: PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m^3)



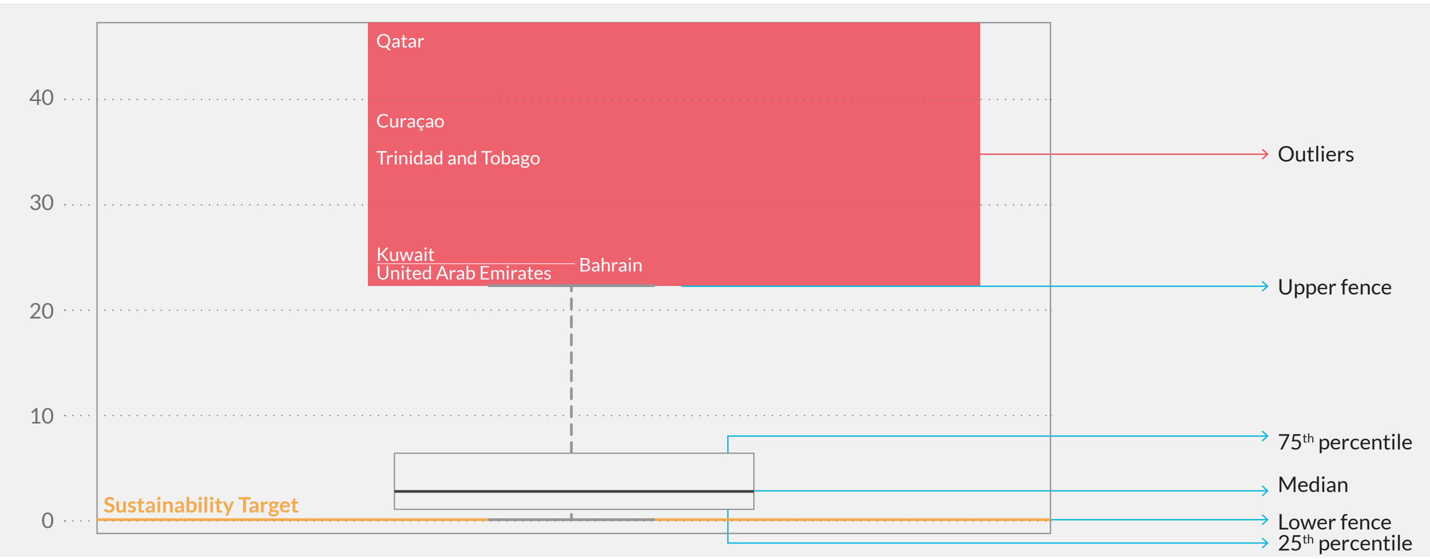
EQ2: DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)



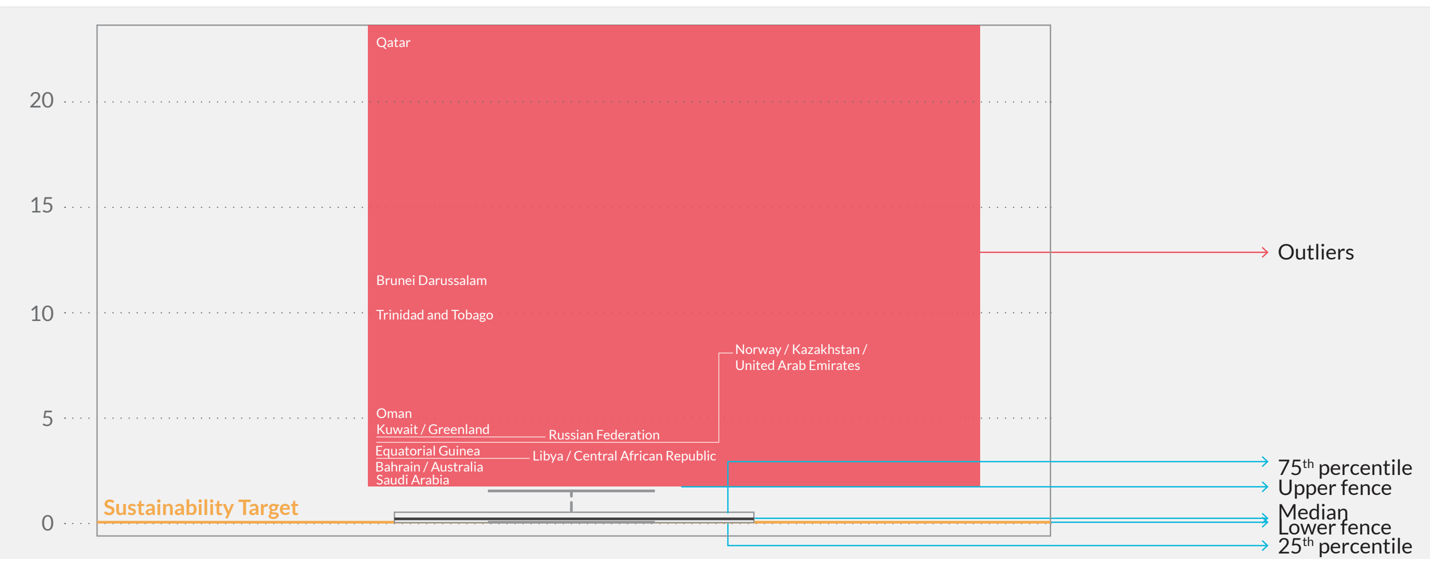
EQ3: Municipal solid waste (MSW) generation per capita (Tons per year per capita)



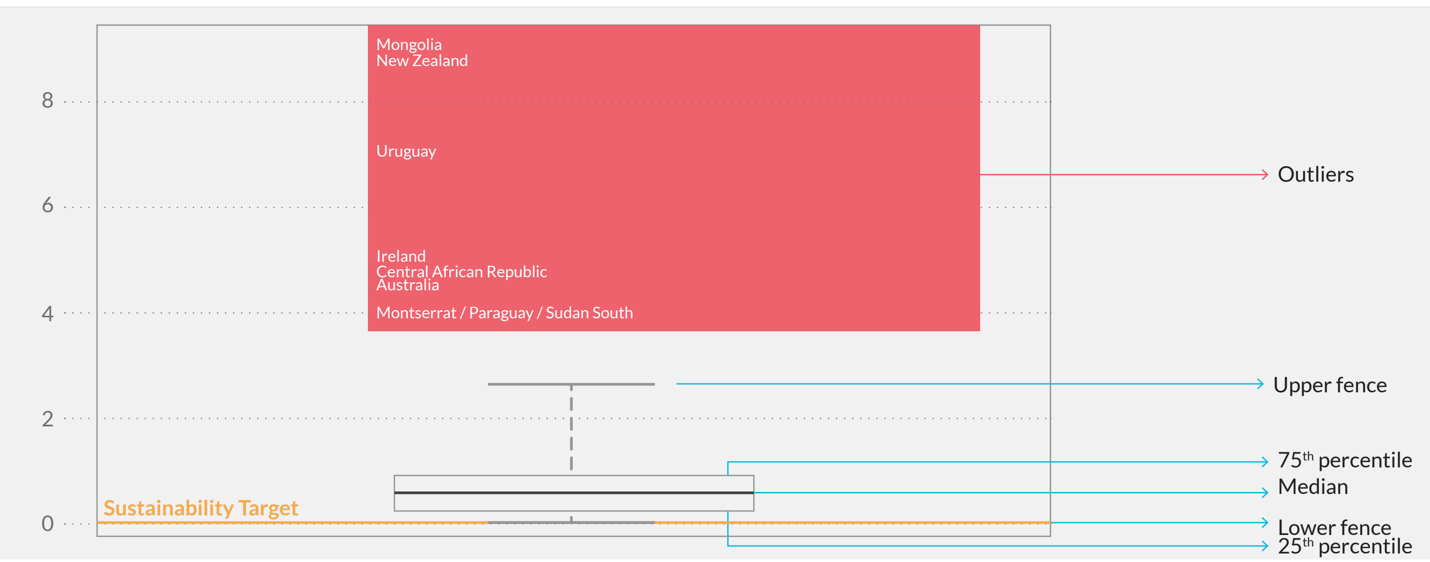
GE1: Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita)



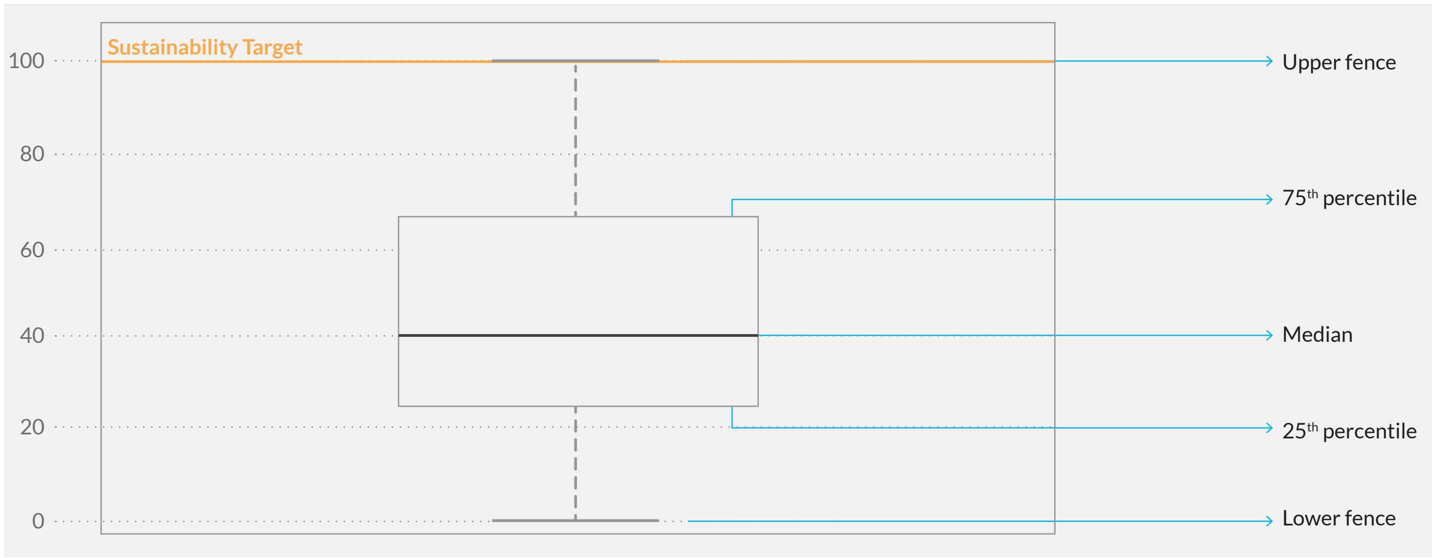
GE2: Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita)



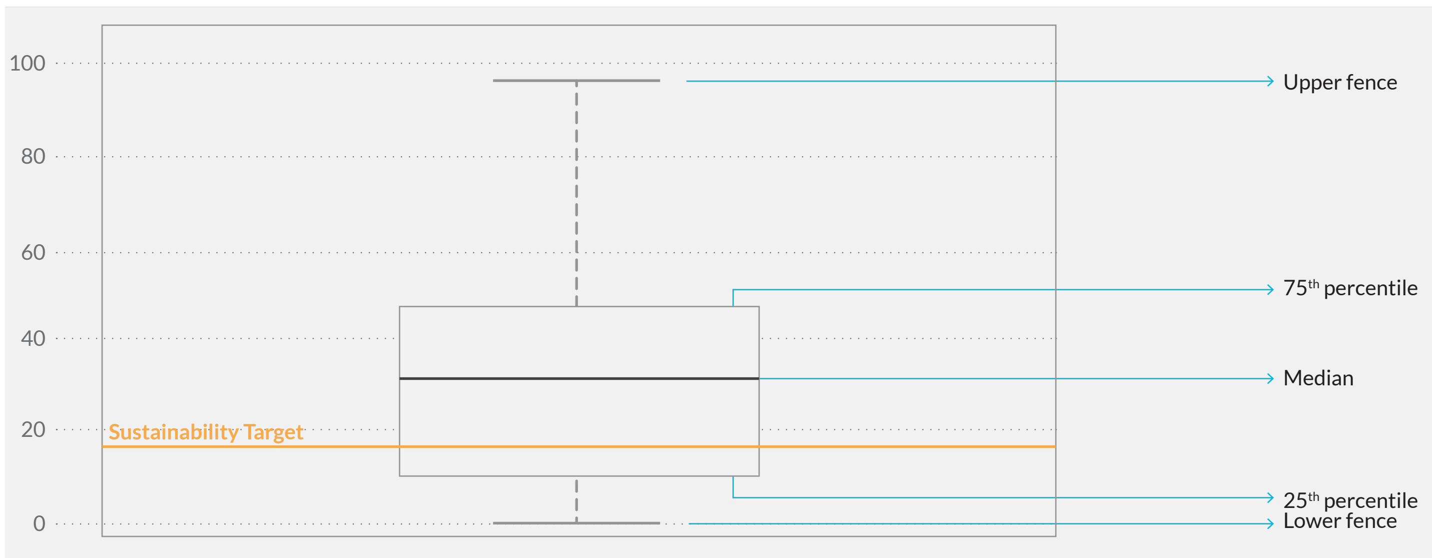
GE3: Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1000 persons)



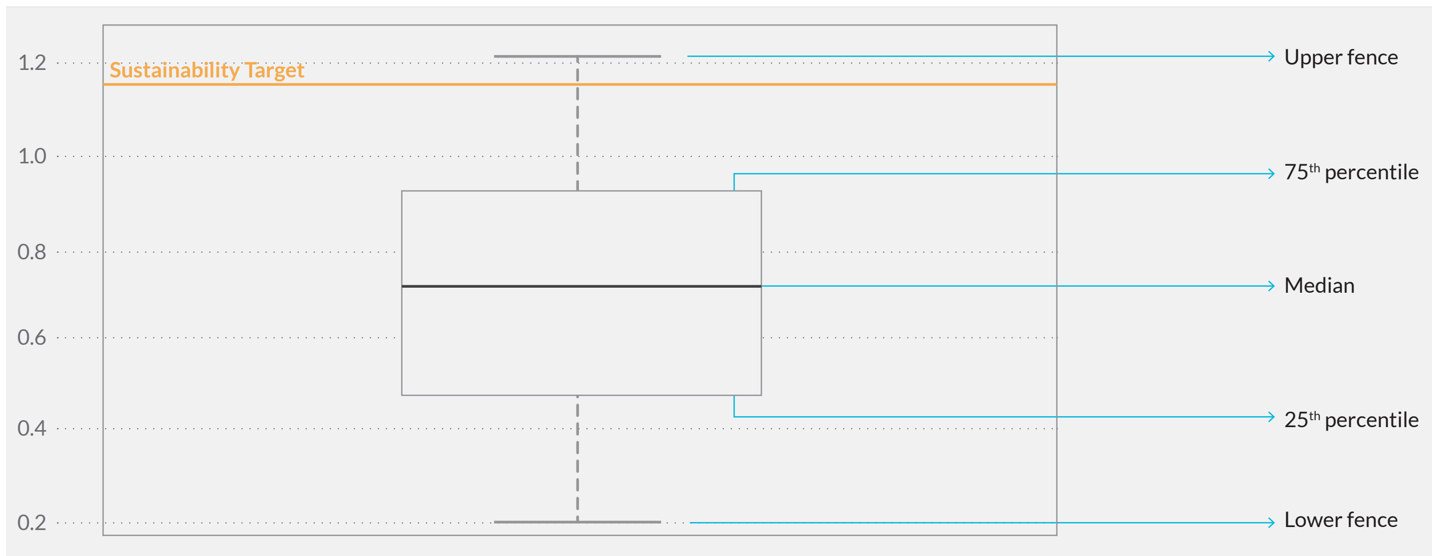
BE1: Average proportion of Key Biodiversity Areas covered by protected areas (Percent)



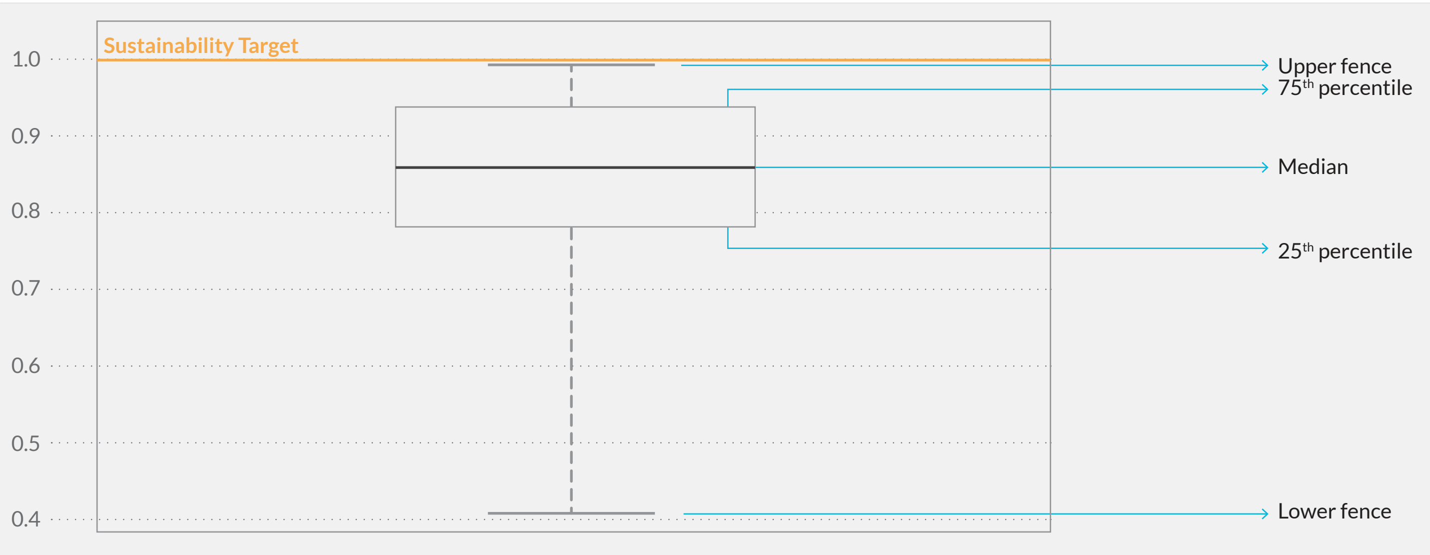
BE2: Share of forest area to total land area (Percent)



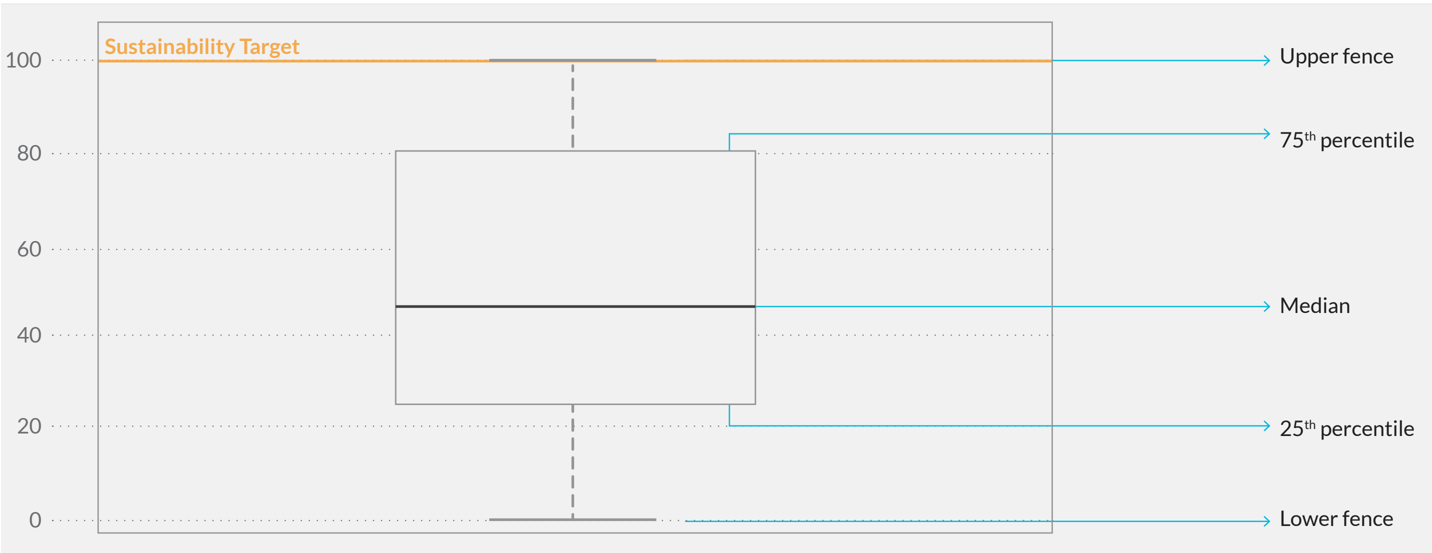
BE3: Soil biodiversity, potential level of diversity living in soils (Index)



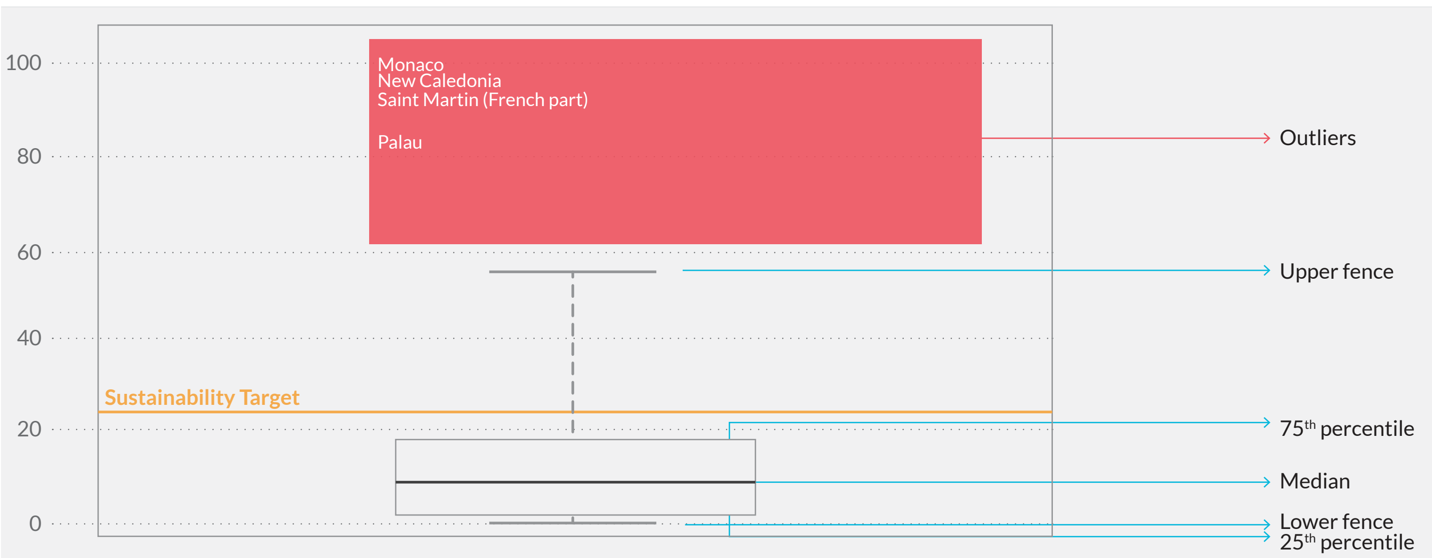
CV1: Red list index (Index)



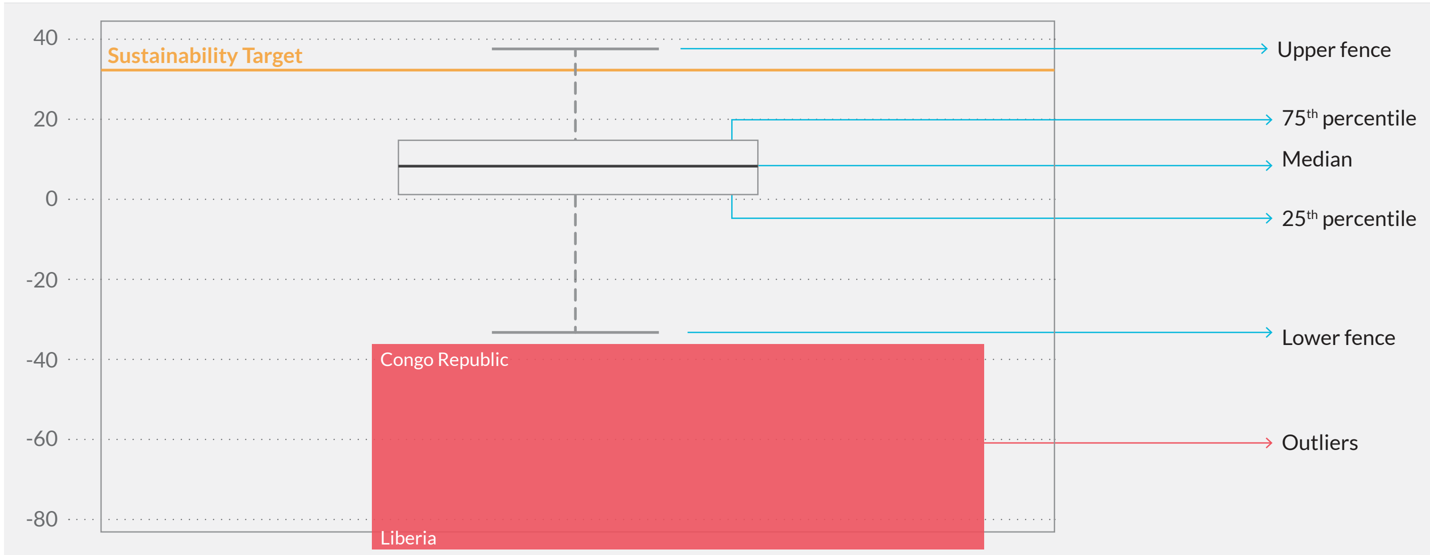
CV2: Tourism and recreation in coastal and marine areas (Score)



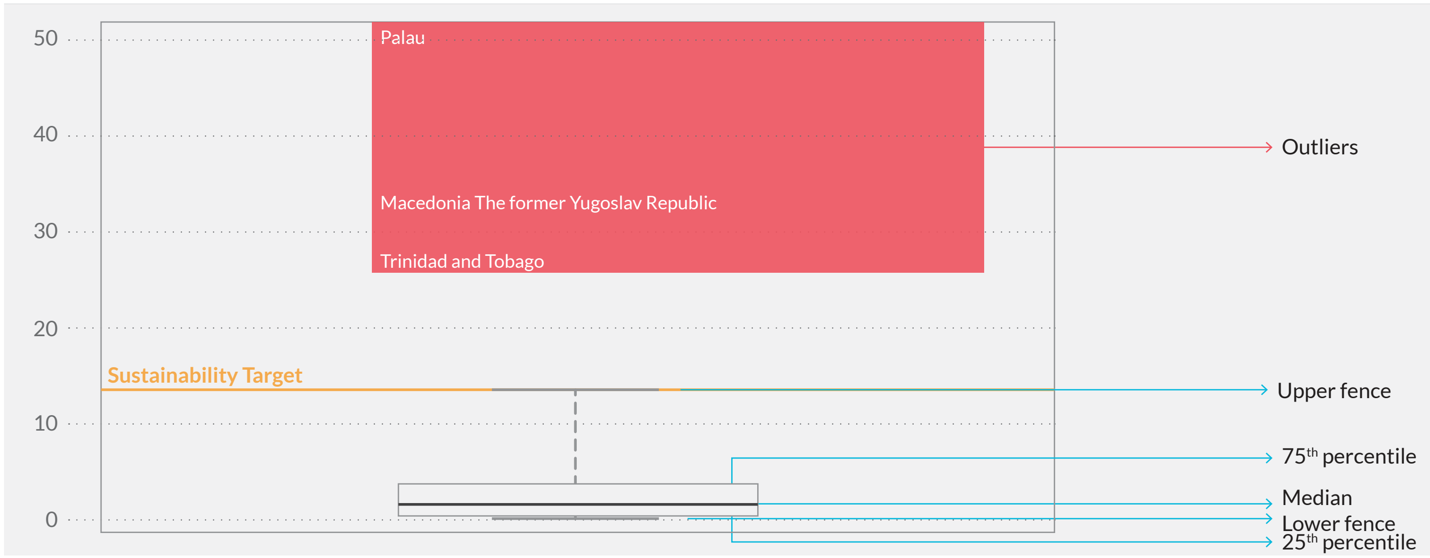
CV3: Share of terrestrial and marine protected areas to total territorial areas (Percent)



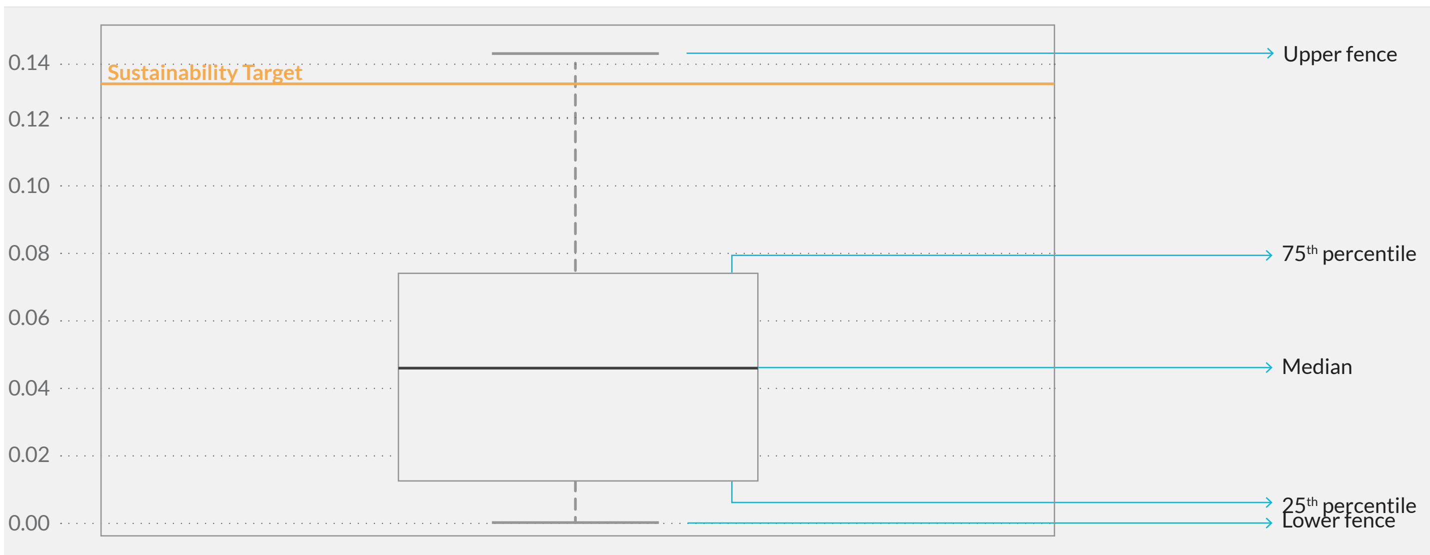
GV1: Adjusted net savings, minus natural resources and pollution damages (Percent GNI)



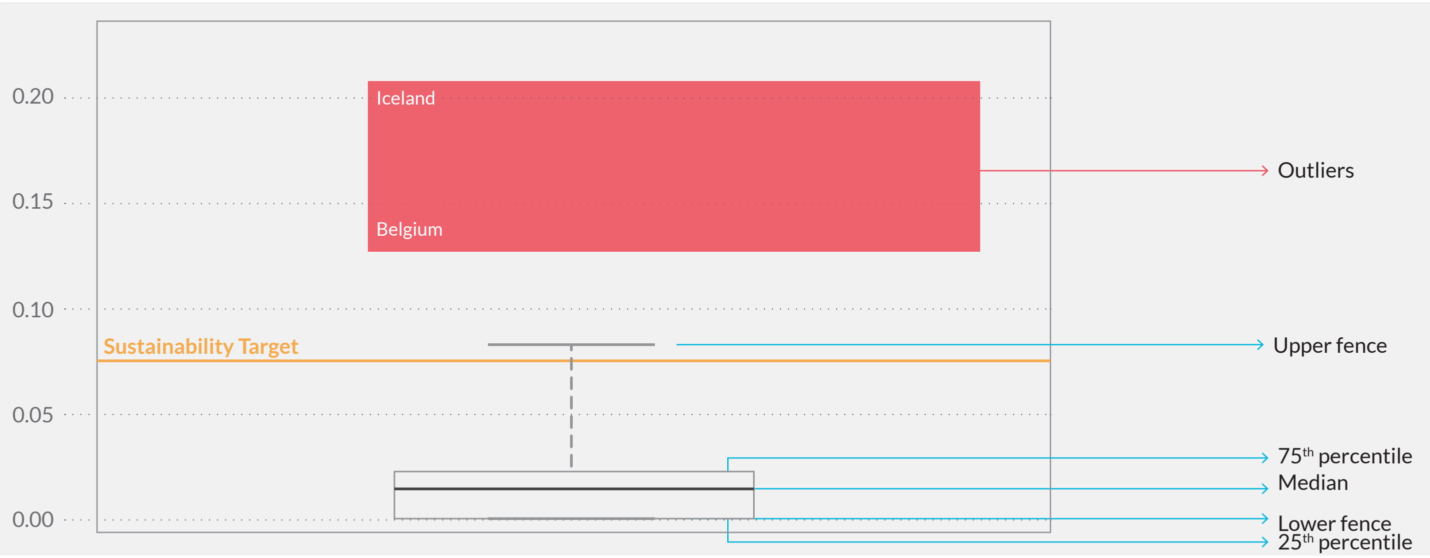
GT1: Share of export of environmental goods (OECD & APEC class.) to total export (Percent)



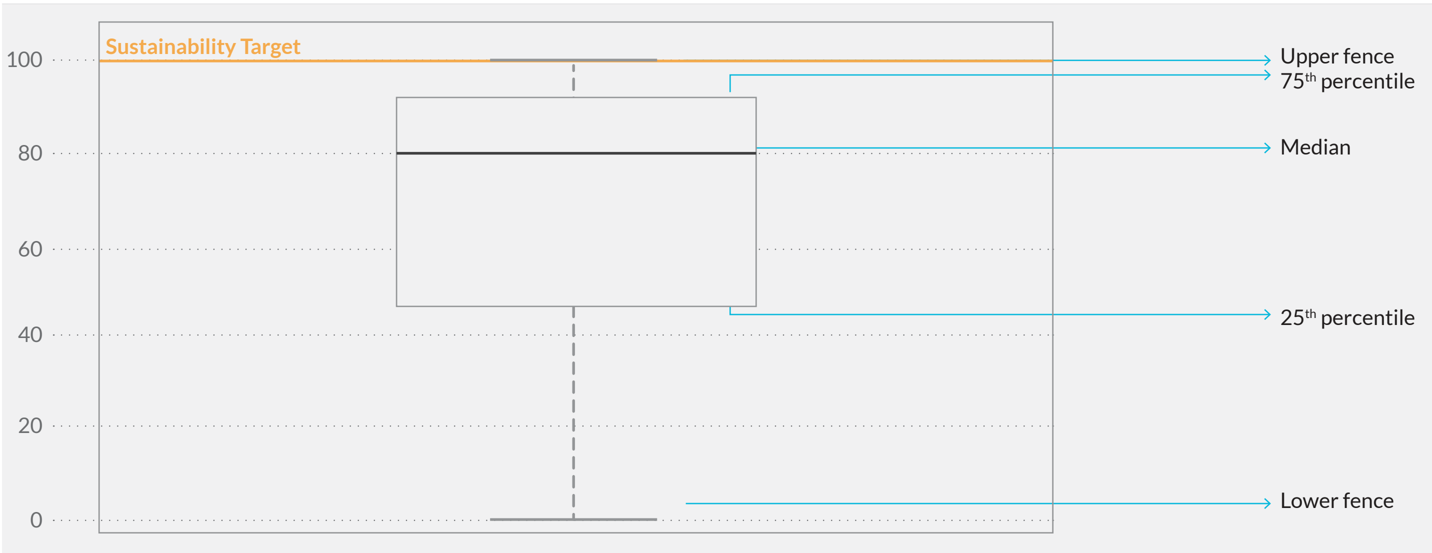
GJ1: Share of green employment in total manufacturing employment (Percent)



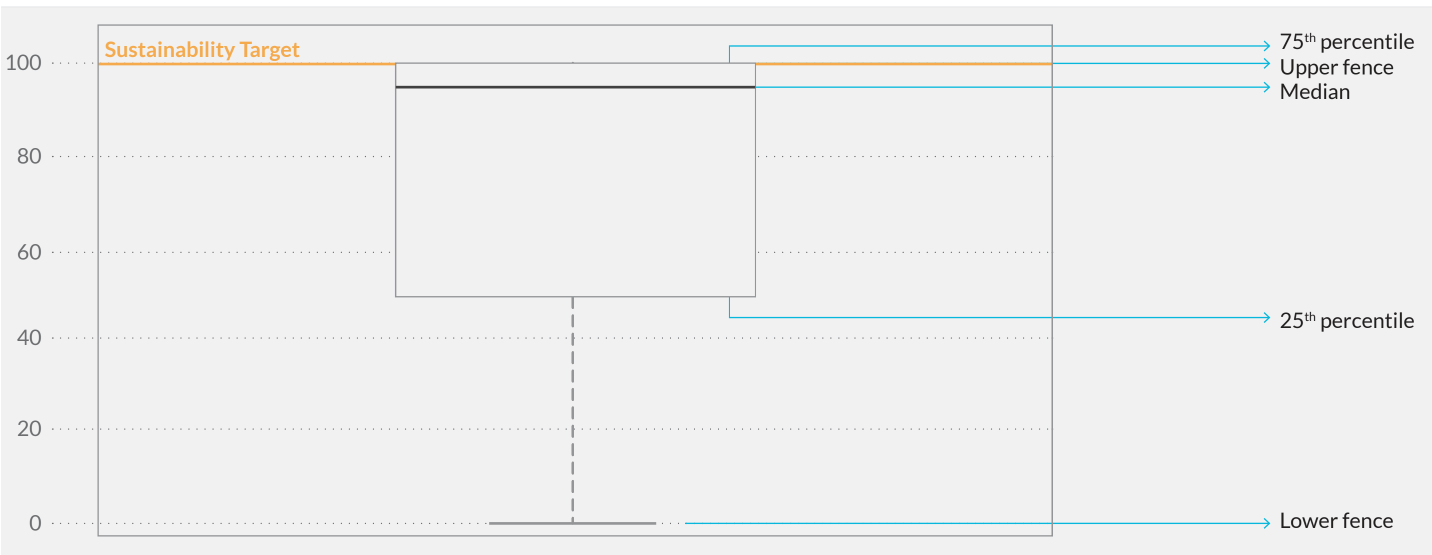
GN1: Share of patent publications in environmental technology to total patents (Percent)



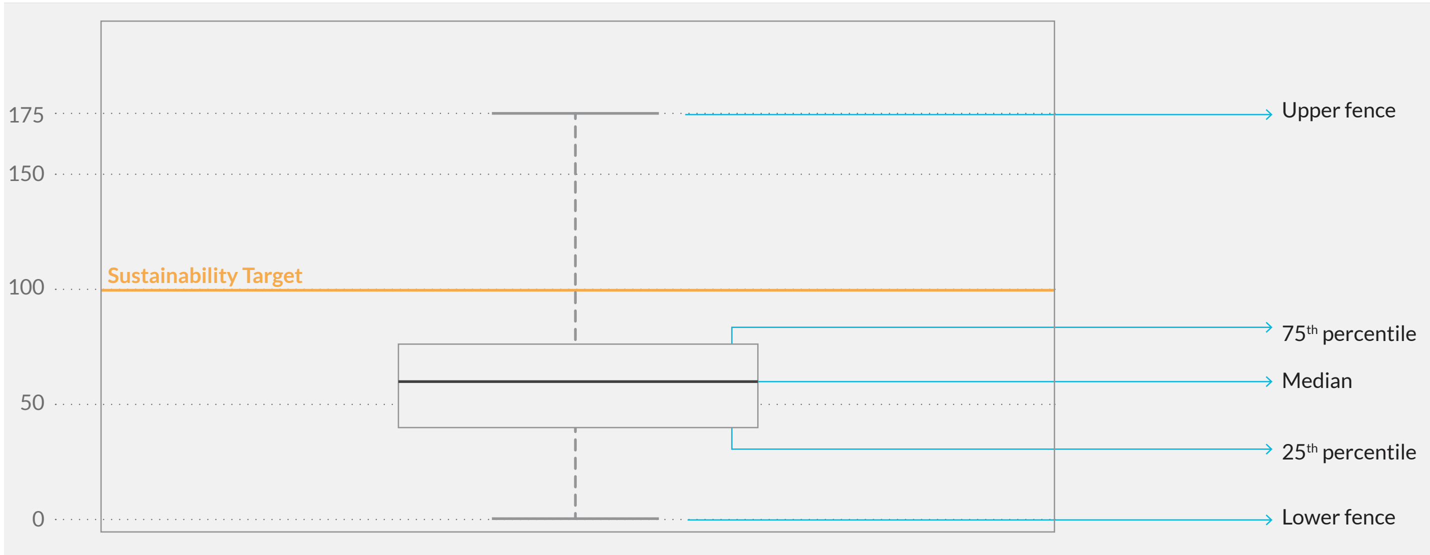
AB1: Population with access to safely managed water and sanitation (Percent)



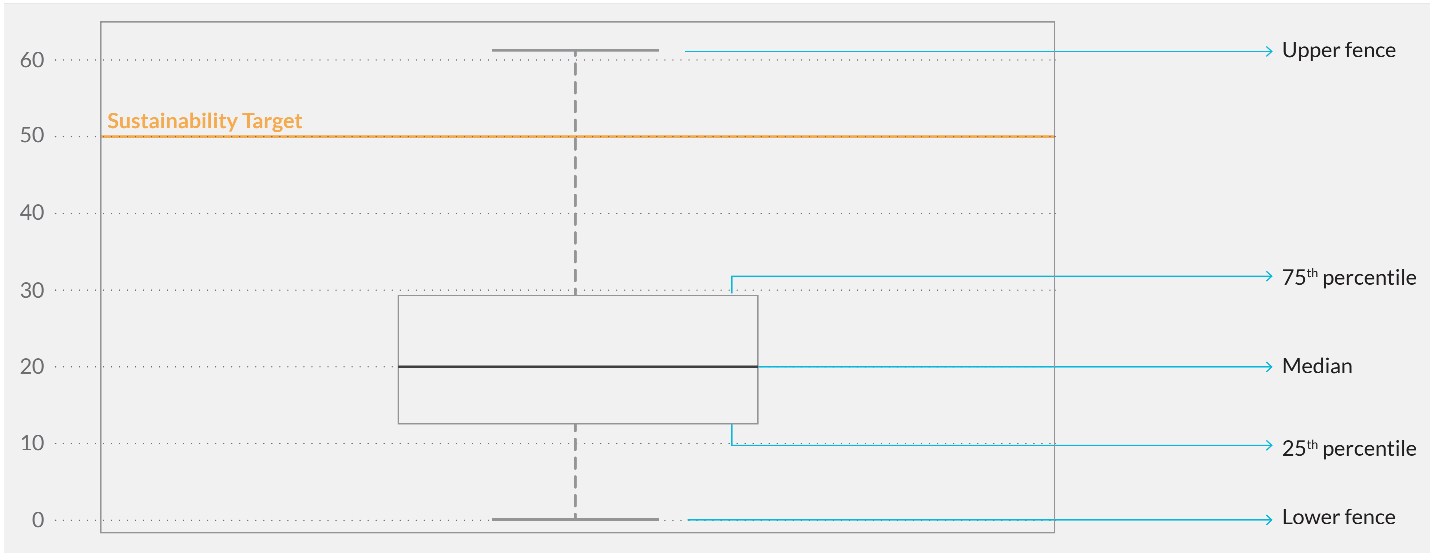
AB2: Population with access to electricity and clean fuels/technology (Percent)



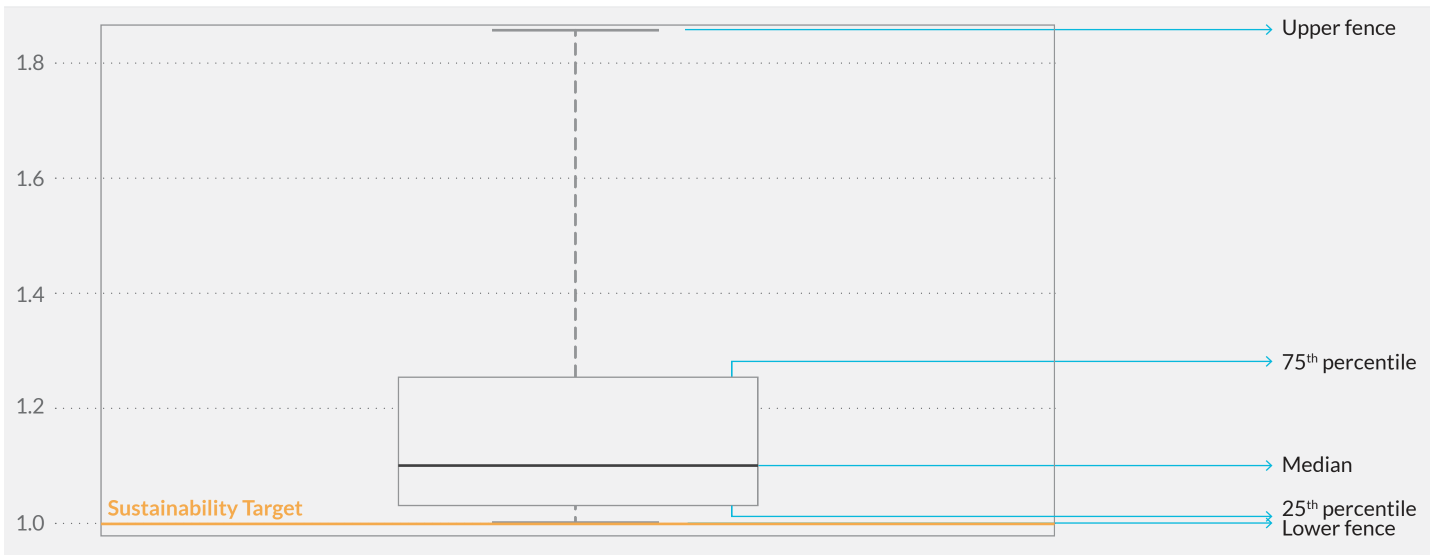
AB3: Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)



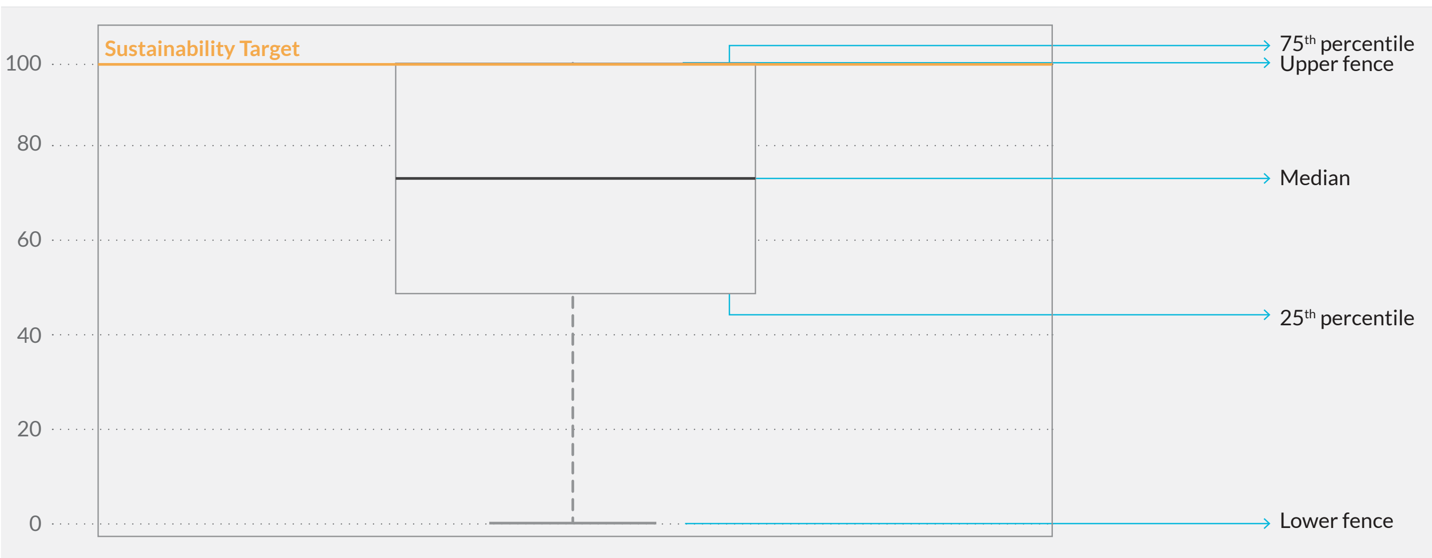
GB1: Proportion of seats held by women in national parliaments (Percent)



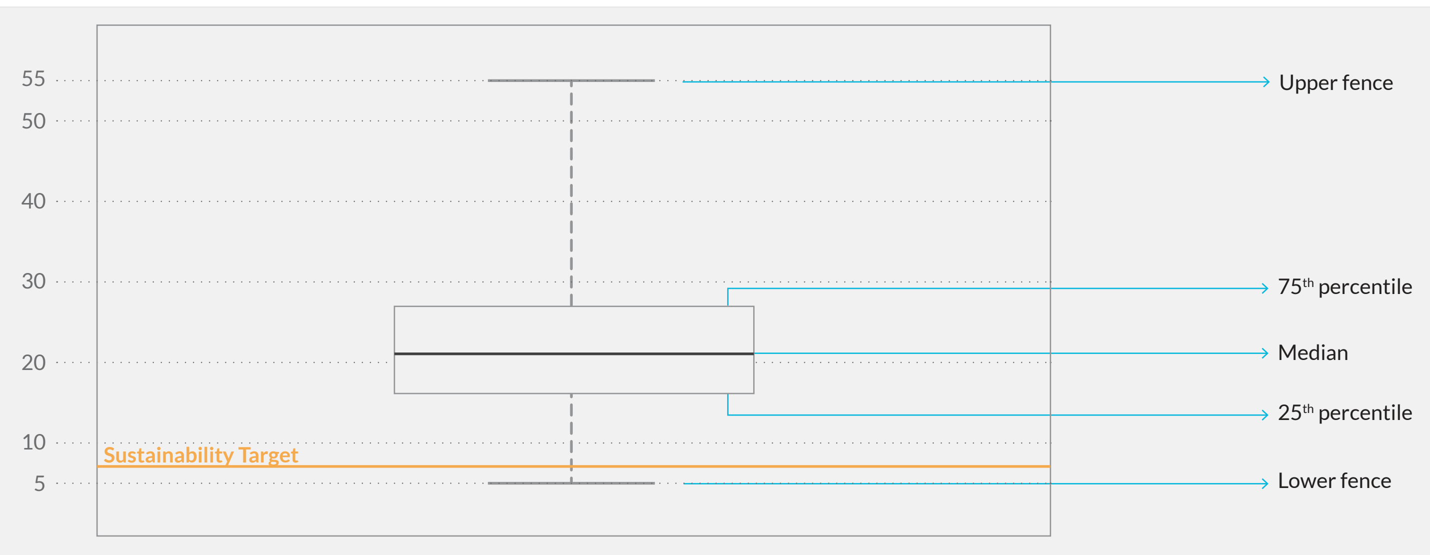
GB2: Ratio of female to male with account in financial institution, age 15+ (Percent)



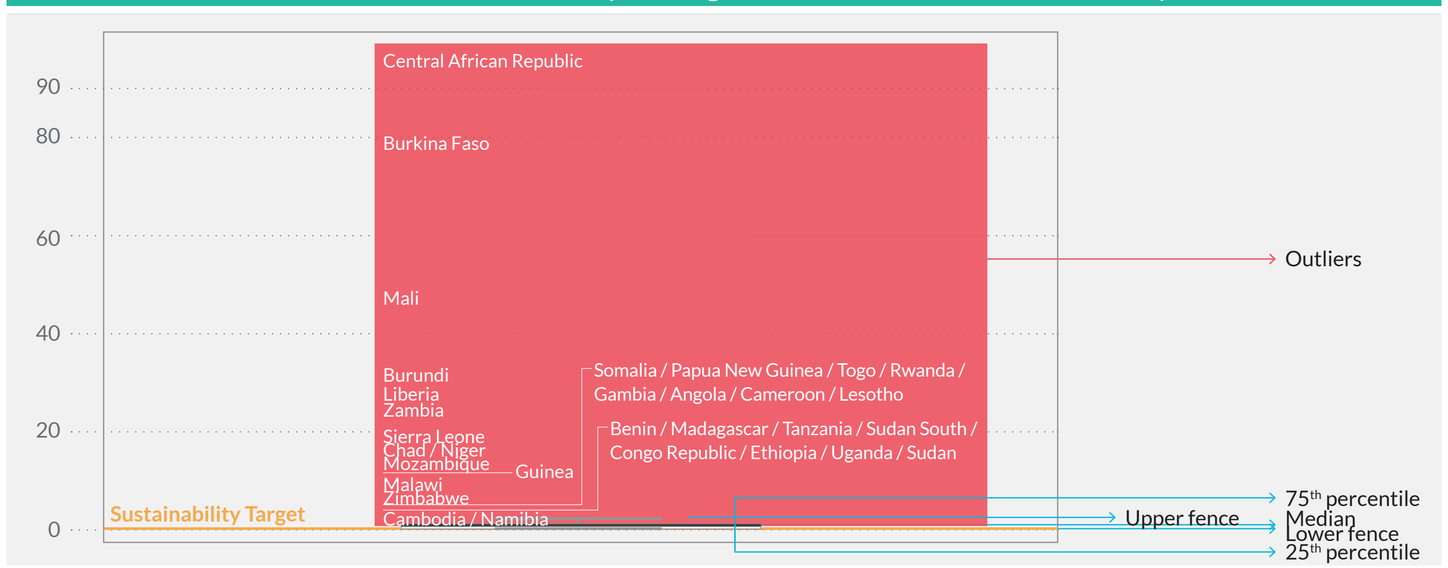
GB3: Getting paid, covering laws and regulations for equal gender pay (Score)



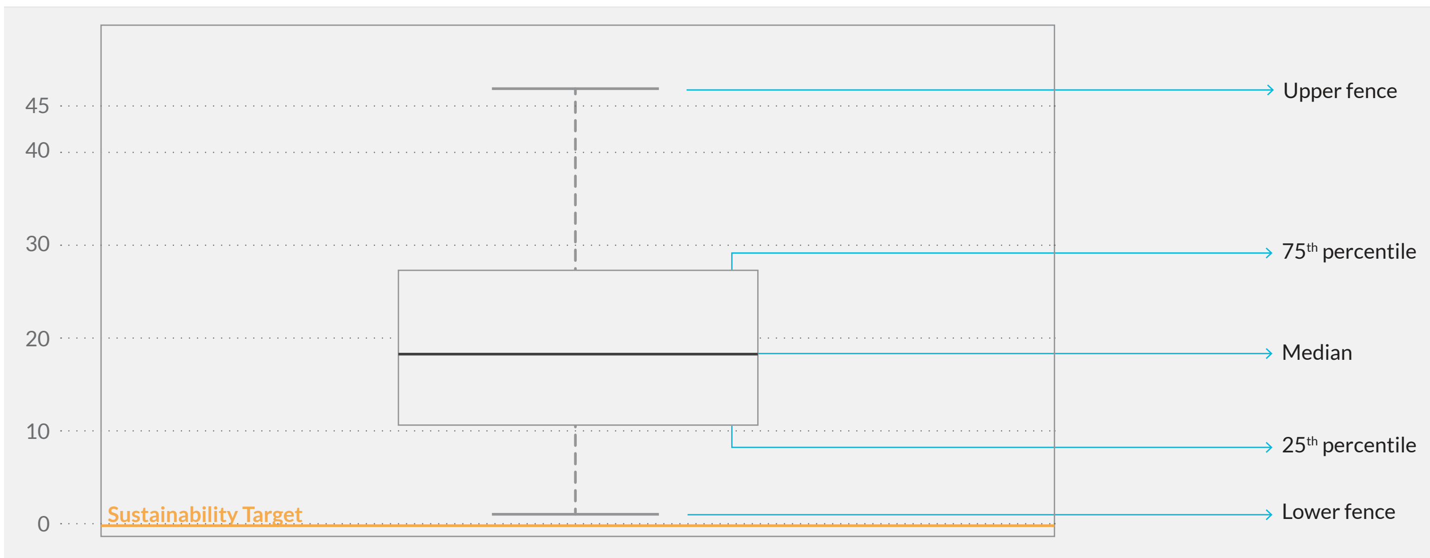
SE1: Inequality in income based on Atkinson (Index)



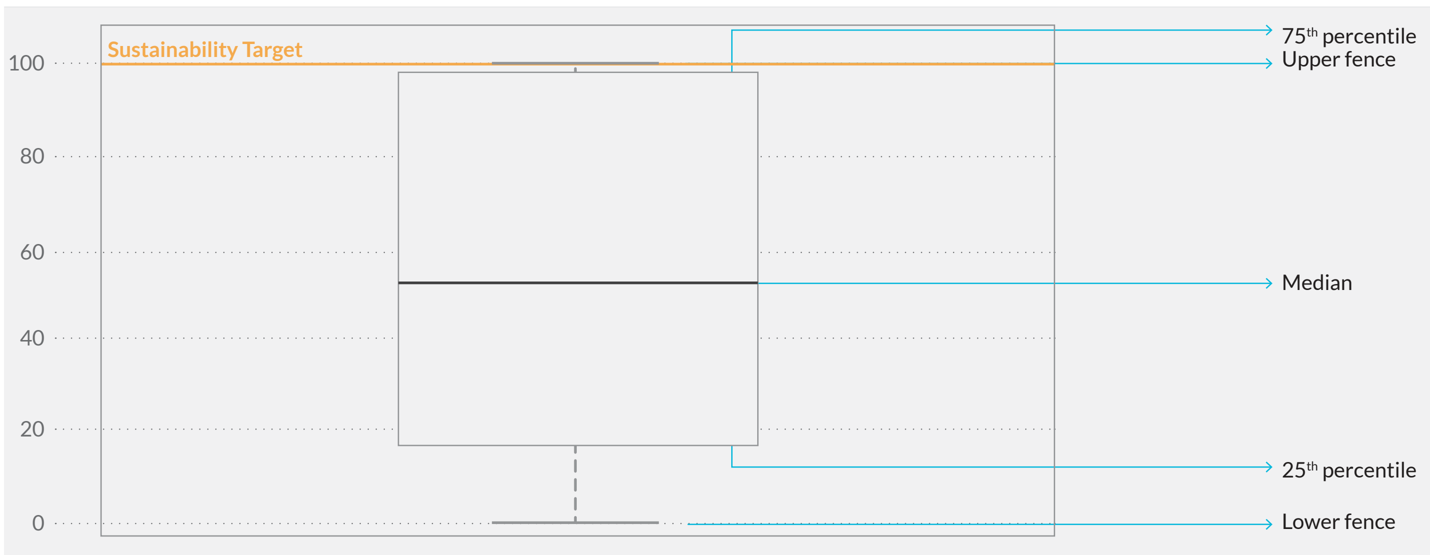
SE2: Ratio of urban to rural, access to safely managed water/sanitation & electricity (Percent)



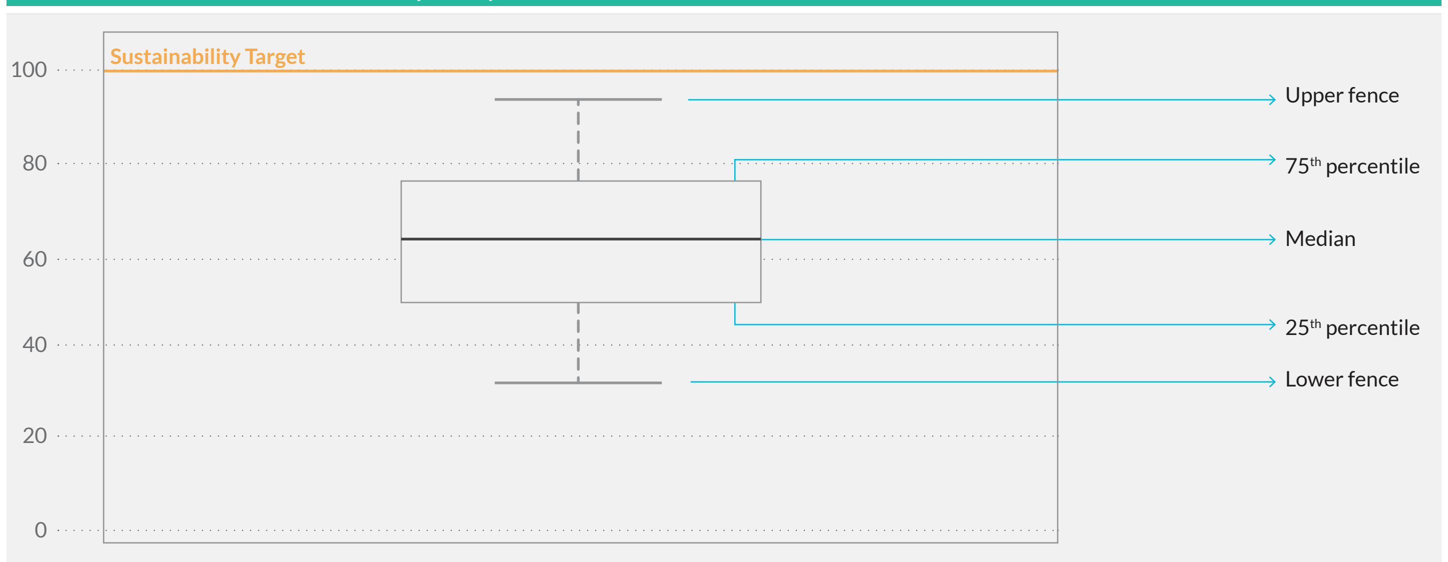
SE3: Share of youth not in education, employment or training, aged 15-24 years (Percent)



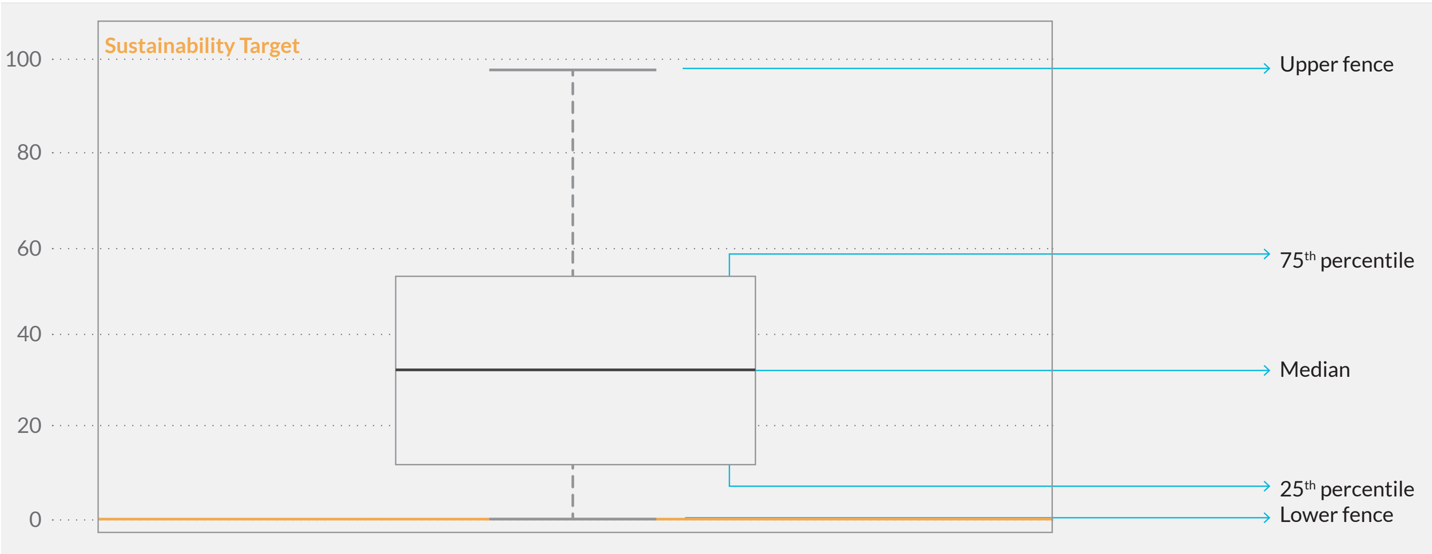
SP1: Proportion of population above statutory pensionable age receiving pension (Percent)



SP2: Healthcare access and quality index (Index)



SP3: Proportion of urban population living in slums (Percent)



Appendix 3

Correlation of indicators in each green growth dimension

Table A3.1 Correlation between indicators of efficient and sustainable development

Indicator	EE1	EE2	EW1	EW2	SL1	SL2	ME1	ME2
EE1: Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP)	1.000	0.391***	-0.161 **	-0.015	-0.070	-0.102	0.341***	-0.161**
EE2: Share of renewables to total final energy consumption (Percent)	0.000	1.000	-0.177**	-0.215***	-0.181***	-0.040	0.508***	-0.350***
EW1: Water use efficiency (USD per m³)	0.040	0.023	1.000	0.025	0.197**	0.214**	-0.287***	0.546***
EW2: Share of freshwater withdrawal to available freshwater resources (Percent)	0.844	0.003	0.756	1.000	-0.221***	-0.071	-0.109	0.187**
SL1: Average soil organic carbon content (Tons per hectare)	0.336	0.008	0.011	0.003	1.000	0.260***	-0.252***	0.210***
SL2: Share of organic agriculture to total agricultural land area (Percent)	0.216	0.620	0.013	0.395	0.001	1.000	-0.204**	0.185**
ME1: Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP)	0.000	0.000	0.000	0.151	0.001	0.013	1.000	-0.331***
ME2: Total material footprint (MF) per capita (MF tons per capita)	0.036	0.000	0.000	0.015	0.006	0.029	0.000	1.000

Correlation Coefficient

Level of Significance

Notes: The values on the right of the matrix refer to correlation coefficients and those on the left are the level of significance, which are defined as follows:
** Correlation is significant at the 0.1 level (2-tailed)*
*** Correlation is significant at the 0.05 level (2-tailed)*
**** Correlation is significant at the 0.01 level (2-tailed)*

Table A3.2 Correlation between indicators of natural capital protection

Indicator	EQ1	EQ2	EQ3	GE1	GE2	GE3
EQ1: PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m³)	1.000	0.442***	-0.265***	0.089	0.215***	-0.088
EQ2: DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)	0.000	1.000	-0.373***	-0.346***	-0.105	0.135*
EQ3: Municipal solid waste (MSW) generation per capita (Tons per year per capita)	0.000	0.000	1.000	0.393	0.085	0.031
GE1: Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita)	0.225	0.000	0.000	1.000	0.745	-0.040
GE2: Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita)	0.003	0.149	0.227	0.000	1.000	-0.018
GE3: Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1000 persons)	0.223	0.061	0.655	0.575	0.798	1.000
BE1: Average proportion of Key Biodiversity Areas covered by protected areas (Percent)	0.604	0.509	0.709	0.639	0.834	0.118
BE2: Share of forest area to total land area (Percent)	0.000	0.088	0.125	0.093	0.221	0.415
BE3: Soil biodiversity, potential level of diversity living in soils (Index)	0.001	0.079	0.009	0.000	0.002	0.204
CV1: Red list index (Index)	0.007	0.039	0.339	0.491	0.219	0.076
CV2: Tourism and recreation in coastal and marine areas (Score)	0.000	0.000	0.000	0.069	0.385	0.762
CV3: Share of terrestrial and marine protected areas to total territorial areas (Percent)	0.402	0.646	0.273	0.301	0.550	0.107

Correlation Coefficient

Level of Significance

Notes: The values on the right of the matrix refer to correlation coefficients and those on the left are the level of significance, which are defined as follows:

** Correlation is significant at the 0.1 level (2-tailed)*

*** Correlation is significant at the 0.05 level (2-tailed)*

**** Correlation is significant at the 0.01 level (2-tailed)*

Table A3.2 Correlation between indicators of natural capital protection *(continued)*

Indicator	BE1	BE2	BE3	CV1	CV2	CV3
EQ1: PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m³)	-0.038	-0.367***	-0.244***	0.193***	-0.347***	-0.061
EQ2: DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons)	0.048	-0.124*	0.128*	0.148**	-0.378***	0.033
EQ3: Municipal solid waste (MSW) generation per capita (Tons per year per capita)	-0.026	-0.107	-0.185***	-0.066	0.341***	0.076
GE1: Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita)	0.033	-0.119*	-0.337***	0.049	0.145*	0.073
GE2: Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita)	0.015	-0.087	-0.224***	0.087	-0.069	-0.043
GE3: Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1000 persons)	0.107	-0.057	-0.088	0.120*	-0.023	0.113
BE1: Average proportion of Key Biodiversity Areas covered by protected areas (Percent)	1.000	0.170*	0.065	0.227***	-0.083	0.519***
BE2: Share of forest area to total land area (Percent)	0.016	1.000	0.531***	-0.202***	0.058	0.165**
BE3: Soil biodiversity, potential level of diversity living in soils (Index)	0.353	0.000	1.000	-0.464***	0.116	0.034
CV1: Red list index (Index)	0.001	0.004	0.000	1.000	-0.304***	0.055
CV2: Tourism and recreation in coastal and marine areas (Score)	0.276	0.468	0.137	0.000	1.000	0.034
CV3: Share of terrestrial and marine protected areas to total territorial areas (Percent)	0.000	0.018	0.634	0.437	0.673	1.000

Correlation Coefficient

Level of Significance

Notes: The values on the right of the matrix refer to correlation coefficients and those on the left are the level of significance, which are defined as follows:

** Correlation is significant at the 0.1 level (2-tailed)*

*** Correlation is significant at the 0.05 level (2-tailed)*

**** Correlation is significant at the 0.01 level (2-tailed)*

greengrowthindex.gggi.org

Table A3.3 Correlation between indicators of green economic opportunities

Indicators	GV1	GT1	GJ1	GI1
GV1: Adjusted net savings, minus natural resources and pollution damages (Percent GNI)	1.000	0.183**	0.178*	0.067
GT1: Share of export of environmental goods (OECD & APEC class.) to total export (Percent)	0.183	1.000	0.240**	-0.075
GJ1: Share of green employment in total manufacturing employment (Percent)	0.178	0.240	1.000	-0.041
GN1: Share of patent publications in environmental technology to total patents (Percent)	0.067	-0.075	-0.041	1.000

Correlation Coefficient

Level of Significance

Notes: The values on the right of the matrix refer to correlation coefficients and those on the left are the level of significance, which are defined as follows:
** Correlation is significant at the 0.1 level (2-tailed)*
*** Correlation is significant at the 0.05 level (2-tailed)*
**** Correlation is significant at the 0.01 level (2-tailed)*

Table A3.4 Correlation between indicators of social inclusion

Indicators	AB1	AB2	AB3	GB1	GB2	GB3
AB1: Population with access to safely managed water and sanitation (Percent)	1.000	0.672***	0.632***	0.070	-0.139	0.163
AB2: Population with access to electricity and clean fuels/ technology (Percent)	0.000	1.000	0.673***	0.127*	-0.037	0.174**
AB3: Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)	0.000	0.000	1.000	0.103	-0.016	0.131*
GB1: Proportion of seats held by women in national parliaments (Percent)	0.475	0.079	0.157	1.000	-0.203**	0.272***
GB2: Ratio of female to male with account in financial institution, age 15+ (Percent)	0.170	0.656	0.844	0.014	1.000	-0.048
GB3: Getting paid, covering laws and regulations for equal gender pay (Score)	0.103	0.017	0.077	0.000	0.567	1.000
SE1: Inequality in income based on Atkinson (Index)	0.010	0.000	0.000	0.624	0.923	0.081
SE2: Ratio of urban to rural, access to safely managed water/ sanitation & electricity (Percent)	0.000	0.000	0.002	0.092	0.912	0.087
SE3: Share of youth not in education, employment or training, aged 15-24 years (Percent)	0.000	0.000	0.000	0.045	0.943	0.039
SP1: Proportion of population above statutory pensionable age receiving pension (Percent)	0.000	0.000	0.000	0.001	0.050	0.000
SP2: Healthcare access and quality index (Index)	0.000	0.000	0.000	0.003	0.907	0.000
SP3: Proportion of urban population living in slums (Percent)	0.000	0.000	0.000	0.052	0.823	0.028

Correlation Coefficient

Level of Significance

Notes: The values on the right of the matrix refer to correlation coefficients and those on the left are the level of significance, which are defined as follows:
** Correlation is significant at the 0.1 level (2-tailed)*
*** Correlation is significant at the 0.05 level (2-tailed)*
**** Correlation is significant at the 0.01 level (2-tailed)*

Table A3.4 Correlation between indicators of social inclusion *(continued)*

Indicators	SE1	SE2	SE3	SP1	SP2	SP3
AB1: Population with access to safely managed water and sanitation (Percent)	-0.266**	-0.390***	-0.666***	0.627***	0.797***	-0.776***
AB2: Population with access to electricity and clean fuels/ technology (Percent)	-0.298***	-0.455***	-0.458***	0.626***	0.819***	-0.810***
AB3: Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people)	-0.299***	-0.223***	-0.556***	0.559***	0.693***	0.622***
GB1: Proportion of seats held by women in national parliaments (Percent)	-0.039	-0.124*	-0.192**	0.263***	0.216***	-0.200
GB2: Ratio of female to male with account in financial institution, age 15+ (Percent)	0.008	-0.009	-0.007	-0.168**	-0.010	-0.025
GB3: Getting paid, covering laws and regulations for equal gender pay (Score)	0.140*	-0.128*	-0.197**	0.354***	0.278***	-0.230**
SE1: Inequality in income based on Atkinson (Index)	1.000	0.180**	0.457	-0.257***	-0.388***	0.028
SE2: Ratio of urban to rural, access to safely managed water/ sanitation & electricity (Percent)	0.025	1.000	0.139***	-0.306***	-0.330***	0.398***
SE3: Share of youth not in education, employment or training, aged 15-24 years (Percent)	0.000	0.146	1.000	-0.489	-0.677	0.151
SP1: Proportion of population above statutory pensionable age receiving pension (Percent)	0.002	0.000	0.000	1.000	0.653	-0.439
SP2: Healthcare access and quality index (Index)	0.000	0.000	0.000	0.000	1.000	-0.724
SP3: Proportion of urban population living in slums (Percent)	0.795	0.000	0.311	0.000	0.000	1.000

Correlation Coefficient

Level of Significance

Notes: The values on the right of the matrix refer to correlation coefficients and those on the left are the level of significance, which are defined as follows:
** Correlation is significant at the 0.1 level (2-tailed)*
*** Correlation is significant at the 0.05 level (2-tailed)*
**** Correlation is significant at the 0.01 level (2-tailed)*

Appendix 4

Results of Principal Components Analysis (PCA) and Analytic Hierarchy Process (AHP) on weights

1. Principal Components Analysis

Weights for the indicators can be estimated using Principal Components Analysis (PCA). PCA puts together indicators which correlate well into groups in order to account for the highest possible variation in each direction (i.e., positive or negative) with as less indicators as possible. One of the relevant results for estimating PCA weights are the rotated factor loadings using a given rotation method. In this case the GGPM team used the varimax rotation. This method allows the construction of weights for each category (Nicoletti et al. 2000), but it does not reflect the theoretical importance of each indicator. It simply normalizes the share of the variance for each indicator.

The method to calculate the **weight** W_j **of each factor** *j* is as follows:
Equation 1

$$W_j = \frac{\Sigma_i F_{ij}}{\Sigma_j \Sigma_i F_{ij}}$$

Where F_{ij} is the factor loading of each indicator *i* on each factor *j*.

The squared factor loadings for each indicator *i* and each factor *j* were calculated and then scaled to the unity sum (S_{ij}). The S_{ij} with the highest value for indicator *i* and for a given factor j is chosen to estimate the weight:
Equation 2

$$S_{ij_0}{}^* = \max_j S_{ij}$$

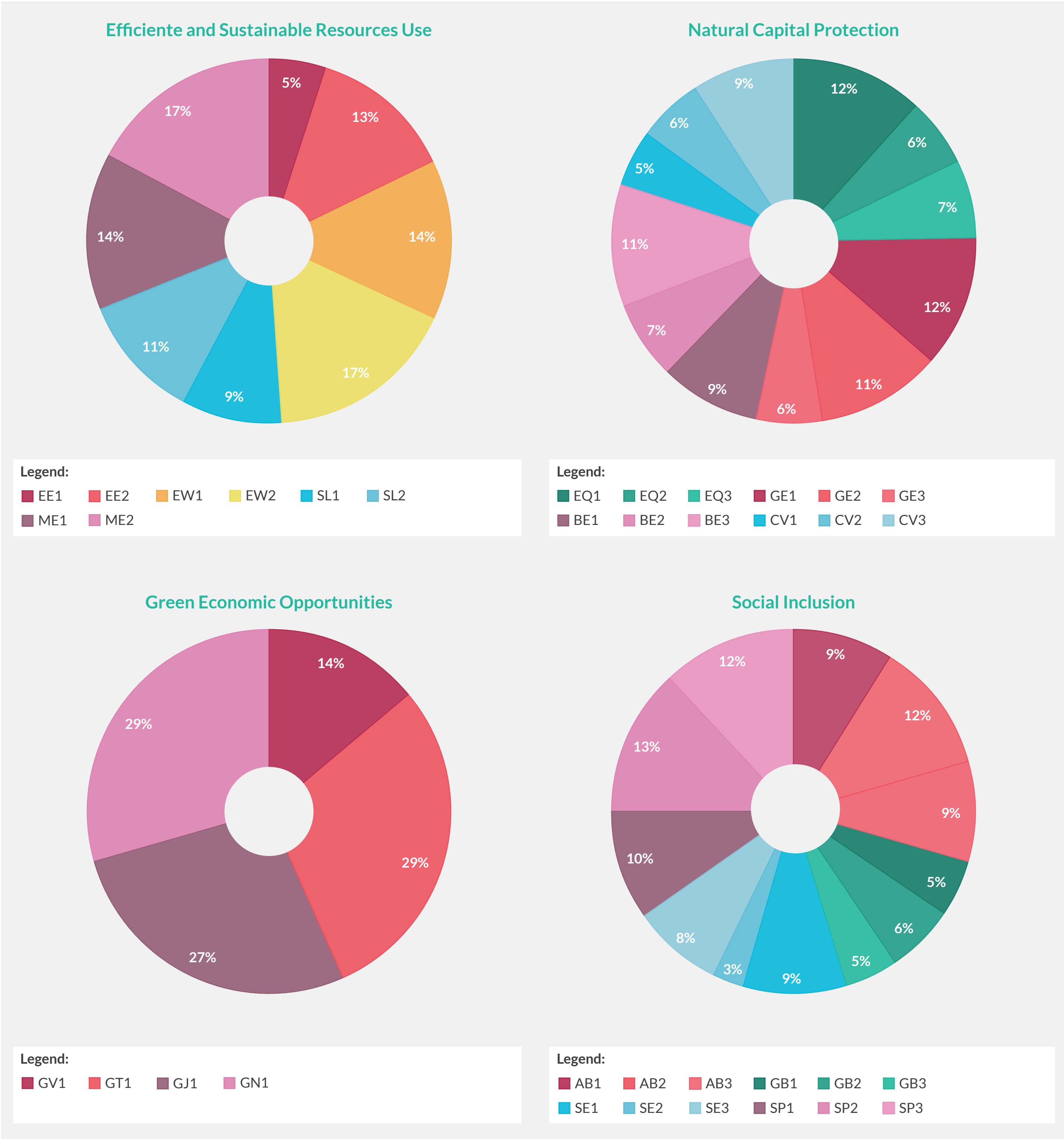
Finally, to get the **weight** w_i **of each indicator** *i* is derived by multiplying the unity sum by the weight of the respective factor:
Equation 3

$$w_i = S_{ij_0}{}^* \times W_{j_0}$$

This method was repeated for the indicators in other dimensions. For illustration of this method, please refer to OECD and JRC Handbook on constructing composite indicators (2008).

The results are presented in Figure A4.1. Except for two indicators, all other indicators for efficient and sustainable resource use have relatively equal weights (13-17 percent). Similarly, except for one indicator, all other indicators for green economic opportunities have relatively equal weights (ca. 27-29 percent). In the case of natural capital protection and social inclusion, about half of the indicators have relatively equal weights (5-9 percent).

Figure A4.1 Weights estimated from Principal Component Analysis



Legend (Figure A4.1):

Efficient and sustainable resource use

EE1: Ratio of total primary energy supply to GDP (MJ per $2011 PPP GDP); **EE2**: Share of renewables to total final energy consumption (Percent); **EW1**: Water use efficiency (USD per m^3); **EW2**: Share of freshwater withdrawal to available freshwater resources (Percent); **SL1**: Average soil organic carbon content (Tons per hectare); **SL2**: Share of organic agriculture to total agricultural land area (Percent); **ME1**: Total domestic material consumption (DMC) per unit of GDP (DMC kg per GDP); **ME2**: Total material footprint (MF) per capita (MF tons per capita).

Natural capital protection

EQ1: PM2.5 air pollution, mean annual population-weighted exposure (Micrograms per m^3); **EQ2:** DALY rate as affected by unsafe water sources (DALY lost per 100,000 persons); **EQ3:** Municipal solid waste (MSW) generation per capita (Tons per year per capita); **GE1:** Ratio of CO_2 emissions to population, excluding AFOLU (Metric tons per capita); **GE2:** Ratio of non-CO_2 emissions to population, excluding AFOLU (Tons per capita); **GE3:** Ratio of non-CO_2 emissions in agriculture to population (Gigagrams per 1000 persons); **BE1:** Average proportion of Key Biodiversity Areas covered by protected areas (Percent); **BE2:** Share of forest area to total land area (Percent); **BE3:** Soil biodiversity, potential level of diversity living in soils (Index); **CV1:** Red list index (Index); **CV2:** Tourism and recreation in coastal and marine areas (Score); **CV3:** Share of terrestrial and marine protected areas to total territorial areas (Percent).

Green economic opportunities

GV1: Adjusted net savings, minus natural resources and pollution damages (Percent GNI); **GT1:** Share of export of environmental goods (OECD & APEC class.) to total export (Percent); **GJ1:** Share of green employment in total manufacturing employment (Percent); **GN1:** Share of patent publications in environmental technology to total patents (Percent).

Social inclusion

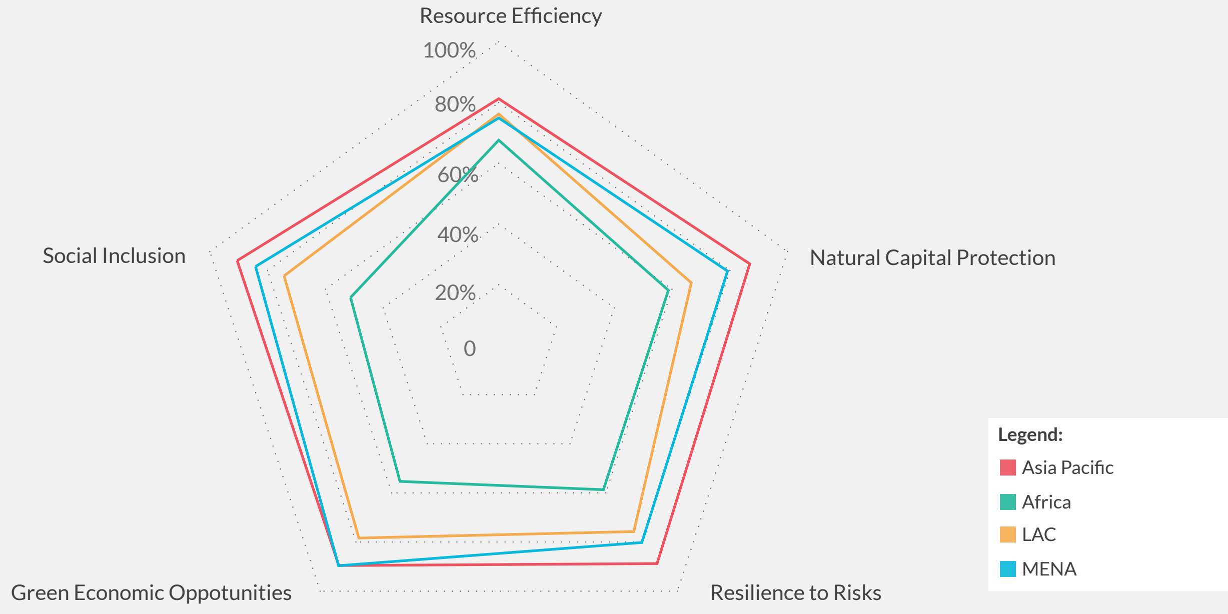
AB1: Population with access to safely managed water and sanitation (Percent); **AB2:** Population with access to electricity and clean fuels/ technology (Percent); **AB3:** Fixed Internet broadband and mobile cellular subscriptions (Number per 100 people); **GB1:** Proportion of seats held by women in national parliaments (Percent); **GB2:** Ratio of female to male with account in financial institution, age 15+ (Percent); **GB3:** Getting paid, covering laws and regulations for equal gender pay (Score); **SE1:** Inequality in income based on Atkinson (Index); **SE2:** Ratio of urban to rural, access to safely managed water/sanitation & electricity (Percent); **SE3:** Share of youth not in education, employment or training, aged 15-24 years (Percent); **SP1:** Proportion of population above statutory pensionable age receiving pension (Percent); **SP2:** Healthcare access and quality index (Index); **SP3:** Proportion of urban population living in slums (Percent).

2. Analytic Hierarchy Process

Analytic Hierarchy Process (AHP) is a participatory and multicriteria decision-making approach that indicates the relative importance of indicators based on their pairwise comparisons (Dedeke, 2013; Pakkar, 2014). For example, for the resource efficiency dimension, experts were asked which of these they consider more important: energy efficiency or land-use efficiency. Then, they had to give the level of importance of one indicator over the other as follows: 1 = equal importance, 2 = weak difference in importance, 3 = moderate importance, 4 = moderate plus, 5 = strong importance, 6 = strong plus, 7 = very strong importance, 8 = very, very strong importance, and 8 = extreme importance. An AHP Excel Template developed by Goepel (2018) was used to analyze the responses of the experts to the questionnaire. Additional analyses were conducted to assess the consistency of the experts' opinions on the ratings and weights. In addition to the weights, the AHP Excel template generates a consensus index that ranges from 0 percent, which means there was no consensus among experts, to 100 percent, which means there was full consensus among experts.

Figure A4.2 presents the level of consensus among the experts on the weights assigned to the indicators based on the AHP survey (more detailed results are in Acosta et al. 2019). The consensus values range from zero to 100 percent, where the latter implies a unanimous opinion on the weights (Figure A4.2). The consensus was highest among the experts in Asia Pacific and lowest in Africa. Asia Pacific had at least 80 percent consensus for their weights, with highest agreement on weights assigned to social inclusion. In the case of Africa, the highest consensus was for resource efficiency at 68 percent and lowest for social inclusion at only 51 percent. The very low consensus on social inclusion is not surprising because the region has one of the most complex social issues to address. The levels of consensus among the experts in Latin America and the Caribbean (LAC) were around 75 percent in all dimensions, except for the natural capital protection which was only 67 percent.

Figure A4.2 Expert level of consensus on the weights, by region



Note: LAC - Latin America and the Caribbean, MENA – Middle East and North Africa

Appendix References:

Acosta, L.A., R.J. Mamiit, C. Ho, I. Gunderson, O. Anastasia, M. Angawi, C.O. Balmes, N. Desta, N. Krairiksh, H.W. Lakew, J.L.A. Loustaunau, P. Martinez, K. Ram-Indra, and C. Shrestha. (2018). Assessment of feedback from regional expert consultations on the Green Growth Index (Phase 2). GGGI Technical Report, The Global Green Growth Institute, Seoul, Republic of Korea.

Dedeke. (2013). Estimating the Weights of a Composite Index Using AHP: Case of the Environmental Performance Index, British Journal of Arts and Social Sciences, Vol.11 No.II, p. 199-221, ISSN: 2046-9578, www.bjournal.co.uk/BJASS.aspx

Goepel. (2018). Implementation of an Online Software Tool for the Analytic Hierarchy Process (AHP-OS). International Symposium on the Analytic Hierarchy Process, Hong Kong, July 13 – July 15, 2018. Available in: https://www.isahp.org/uploads/isahp18_proceeding_1370731_001.pdf

Nicoletti G., Scarpetta S. and Boylaud O. (2000), Summary indicators of product market regulation with an extension to employment protection legislation, OECD, Economics department working papers No. 226, ECO/WKP(99)18. http://www.oecd.org/eco/eco.

OECD and JRC. (2008). Handbook on constructing composite indicators: Methodology and use guide. Statistics Directorate and the Directorate for Science, Technology and Industry of the Organisation for Economic Co-operation and Development (OECD) and the Econometrics and Applied Statistics Unit of the Joint Research Centre (JRC) of the European Commission. Available in: https://www.oecd.org/sdd/42495745.pdf

Pakkar. (2014). Using data envelopment analysis and analytic hierarchy process to construct composite indicators. Journal of Applied Operational Research (2014) 6(3), 174–18.

Appendix 5
List of Authors

Dr. Lilibeth A. Acosta
Program Manager, Green Growth Performance Measurement Specialist, Thought Leadership Department
Global Green Growth Institute
Seoul, South Korea
E-mail: lilibeth.acosta@gggi.org

Ms. Prapti Maharjan
GGGI Consultant
Master - Technical University of Berlin
Berlin, Germany
E-mail: prapti.maharjan@campus.tu-berlin.de

Mr. Hugo Peyriere
GGGI Consultant
École Polytechnique
Paris, France
E-mail: hugo.peyriere@polytechnique.edu

Ms. Ludovica Galotto
GGGI Consultant
Via Bosio 23
Rome, Italy
E-mail: ludovica.galotto@gmail.com

Dr. Rusyan Jill Mamiit
Analyst, UAE Country Office
Global Green Growth Institute
Abu Dhabi, United Arab Emirates
E-mail: rusyan.mamiit@gggi.org

Ms. Carrie Ho
Senior Associate
Global Green Growth Institute
Seoul, South Korea
E-mail: carrie.ho@gggi.org

Mr. BenJeMar-Hope Flores
GGGI Research Intern
Department of Electrical and Information Engineering
Seoul National University of Science and Technology
Seoul, South Korea
E-mail: floresbenjie@gmail.com

Mr. Orestes Anastasia
Head, Thought Leadership Department
Global Green Growth Institute
Seoul, South Korea
E-mail: orestes.anastasia@gggi.org

Ms. Aastha Sharma
Associate Fellow
The Energy and Resources Institute (TERI)
New Delhi, India
E-mail: aastha.sharma@teri.res.in

Dr. Arun Jacob
Environmental Affairs Officer
United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)
Bangkok, Thailand
E-mail: jacoba@un.org

Dr. Beibei Liu
Associate Professor
Nanjing University
Jiangsu Province, China
E-mail: lbeibei@nju.edu.cn

Mr. Chris Hopkins
Policy Manager
Green Economy Coalition
London, United Kingdom
E-mail: chris.hopkins@greeneconomycoalition.org

Dr. Cornelia Krug
Science-Policy Liaison
URPP Global Change and Biodiversity
Department of Geography
University of Zurich
Zurich, Switzerland
E-mail: cornelia.krug@geo.uzh.ch

Mr. Fabio Eboli
Researcher
Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)
Rome, Italy
E-mail: fabio.eboli@enea.it

Mr. Francesco Tubiello
Senior Statistician
Team Leader, Agri-Environmental Statistics
Statistics Division
Food and Agriculture Organization of the United Nations
Rome, Italy
E-mail: Francesco.Tubiello@fao.org

Mr. Fulai Sheng
Head, Sustainable Infrastructure Partnership/PAGE UNEP Delivery Team /Economic and Fiscal Policy Unit
UN Environment
Geneva, Switzerland
E-mail: fulai.sheng@un.org

Mr. Guillaume Lafortune
Project Manager
Sustainable Development Solutions Network
Paris, France
E-mail: guillaume.lafortune@unsdsn.org

Mr. Guillermo Montt
Social Protection Specialist
International Labour Organization (ILO)
Santiago, Chile
E-mail: montt@ilo.org

Ms. Joan John-Norville
Programme Coordinator, Biodiversity and Ecosystems Management
Organisation of Eastern Caribbean States (OECS) Commission
Castries, Saint Lucia
E-mail: joan.norville@oecs.int

Mr. John Maughan
Research Programme Manager
Green Growth Knowledge Partnership (GGKP)
Geneva, Switzerland
E-mail: jmaughan@ggkp.org

Dr. Jose Gregorio Pineda
Adjunct Professor
Sauder School of Business
University of British Columbia
Vancouver, Canada
E-mail: jose.pineda@sauder.ubc.ca

Mr. Luca Farnia
Researcher
Fondazione Eni Enrico Mattei (FEEM)
Milan, Italy
E-mail: luca.farnia@feem.it

Ms. Ndaya Beltchika
Lead technical Specialist Gender
Environment, Climate, Gender and Social Inclusion Division
International Fund for Agricultural Development (IFAD)
Rome, Italy
E-mail: n.beltchika@ifad.org

Dr. Nicola Cantore
Research and Industrial Development Officer
United Nations Industrial Development Organization (UNIDO)
Vienna, Austria
E-mail: N.CANTORE@unido.org

Dr. Rick Hogeboom
Executive Director
Water Footprint Network (WFN)
Enschede, The Netherlands
E-mail: rick.hogeboom@waterfootprint.org

Mr. Robert Hamwey
Economics Affairs Officer
United Nations Conference on Trade and Development (UNCTAD)
Geneva, Switzerland
E-mail: robert.hamwey@unctad.org

Ms. Romina Cavatassi
Lead Environment and Natural Resource Economist
Environment and Climate Cluster Head
Environment, Climate, Gender and Social Inclusion Division
International Fund for Agricultural Development (IFAD)
Rome, Italy
E-mail: r.cavatassi@ifad.or

Dr. Ronal Gainza-Carmenates
Programme Management Officer
PAGE, UN Environment
Geneva, Switzerland
E-mail: ronal.gainza@un.org

Ms. Sandrine Koissy-Kpein
Statistics Specialist-SDGs Monitoring
United Nations Entity for Gender Equality and the Empowerment of Women (UN Women)
New York, United States
E-mail: s.dahouet-boigny@unwomen.org

Mr. Steffen Felix
Private Sector Development Adviser
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Eschborn, Germany
E-mail: steffen.felix@giz.de

Mr. Shun Chonabayashi
Economist
The World Bank (WB)
Washington DC, United States
E-mail: schonabayashi@worldbank.org

Mr. Usman Ali Iftikhar
Policy Specialist, Environmental Economics
Bureau for Policy and Programme Support
United Nations Development Programme (UNDP)
Addis Ababa, Ethiopia
E-mail: usman.iftikhar@undp.org

Dr. Valentin Todorov
Senior Management Information Officer
United Nations Industrial Development Organization (UNIDO)
Vienna, Austria
E-mail: V.TODOROV@unido.org

Dr. Ziga Zarnic
Special Advisor
Environment Directorate
Organisation for Economic Co-operation and Development (OECD)
Paris, France
E-mail: ziga.zarnic@oecd.org

Dr. Derek Eaton
Principal Consultant
Technopolis Group
Amsterdam, the Netherlands
derek.eaton@technopolis-group.com

Ms. Elena Eugenio
Research Associate
College of Agriculture and Food Science
University of the Philippines Los Banos (UPLB)
Laguna, Philippines
E-mail: lena.eugenio18@gmail.com

Ms. Jemily Sales
Senior Science Research Specialist
Department of Science and Technology (DOST)
Metro Manila, Philippines
E-mail: jemilysales0@gmail.com

Dr. Maria Victoria Espaldon
Professor
School of Environmental Science and Management
University of the Philippines Los Banos (UPLB)
Laguna, Philippines
E-mail: mariavictoriaespaldon@gmail.com

Ms. Andisa Dewi
Data Scientist
Master - Technical University of Berlin (TUB)
Berlin, Germany
E-mail: andisa.dewi@gmail.com

Ms. Asmaa Haja
Informatics
Berlin, Germany
E-mail: asmaa.a.math@gmail.com

Ms. Nera Mariz Puyo
Associate, Thought Leadership Department
Global Green Growth Institute
Seoul, South Korea
E-mail: mariz.puyo@gggi.org

Appendix 6
List of external reviewers

Chittinee Charoenchitt
Assistant Project Coordinator
Office of Natural Resources and Environmental Policy and Planning (ONEP)
Thailand
E-mail: c.jarin@hotmail.com

Akhanda Sharma
Senior Divisional Engineer
Ministry of Forests and Environment
Nepal
E-mail: akhanda10@yahoo.com

Amphayvan Chanmany
Director
National Institute for Economic Research
Laos
E-mail: c.amphayvan@gmail.com

Arief Yusuf Anshory
Professor
Padjadjaran University, Bandung
Indonesia
E-mail: arief.yusuf@unpad.ac.id

Chittinee Charoenchitt
Assistant Project Coordinator
Office of Natural Resources and Environmental Policy and Planning
Thailand
E-mail: c.jarin@hotmail.com

Ganzorig Gonchigsumlaa
Senior Lecturer
Mongolian University of Life Sciences
Mongolia
E-mail: ganzorig.g@muls.edu.mn

Gao Dongfeng
Associate Professor
China National Institute of Standardization
China
E-mail: gaodf@cnis.gov.cn

Hellen Tom Wilson
Manager
Admin, Finance & Procurement, Department of Energy
Vanuatu
E-mail: hwtom@vanuatu.gov.vu

Hitomi Rankine
Environment Affairs Officer
United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)
Thailand
E-mail: rankine.unescap@un.org

Jarunee Nugranad
Environmentalist
Office of Natural Resources and Environmental Policy and Planning
Thailand
E-mail: drjoy@onep.go.th

Jiranut Silamut
Project Coordinator
Office of Natural Resources and Environmental Policy and Planning
Thailand
E-mail: jiranutsilamut@hotmail.com

Mary Descery Joy B. Bongcac
Economic Development Specialist
Agriculture, Natural Resources, and Environmental Staff (ANRES),
National Economic and Development Authority (NEDA)
Philippines
E-mail: mbbongcac@neda.gov.ph

Minh Hue Tran
Expert
Ministry of Planning and Investment
Vietnam
E-mail: huetran@mpi.gov.vn

Montri Chamnanrot
Director of Administration and CFO
Thailand Environment Institute (TEI)
Thailand
E-mail: montri@tei.or.th

Nanik Supriyani
Head of Section Environmental Statistics under Directorate of Social Resilience Statistic
BPS-Statistics Indonesia
Indonesia
E-mail: nanik@bps.go.id

Nattanich Asvapoositkul
Environmentalist/Director of Knowledge and Database Section
Office of Natural Resources and Environmental Policy and Planning
Thailand
E-mail: natthan.asv@gmail.com

Nidatha Martin
NDA GCF Interim Coordinator
Climate Change & Development Authority
Papua New Guinea
E-mail: nidathamartin@gmail.com

Nyo Mar Htwe
Professor
Yezin Agricultural University
Myanmar
E-mail: nyomarhtwe@nationalcommunication.org

Panisa Vishuphong
Lecturer
Thammasat University, PRO-Green's Researcher
Thailand
E-mail: vpanisa@gmail.com

Pathom Chaiyapruksaton
Thailand Greenhouse Gas Management Organization
Thailand
E-mail: pathomc@tgo.or.th

Puji Lestari
BPS-Statistics Indonesia
Indonesia
E-mail: plestari@bps.go.id

Sarena Grace L. Quiñones
Researcher
University of the Philippines Los Baños
Philippines
E-mail: shacequin@gmail.com

Sasiwimon Wichadee
Project Coordinator
Office of Natural Resources and Environmental Policy and Planning
Thailand
E-mail: Sasi.wicha@gmail.com

Saykham Voladet
Director General
National Institute for Economic Research
Laos
E-mail: saykhamv@yahoo.com

Sirikanda Watcharathai
Thailand Greenhouse Gas Management Organization
Thailand
E-mail: sirikanda@tgo.or.th

Suttinee Jingjit
Assistant Project Coordinator
Office of Natural Resources and Environmental Policy and Planning
Thailand
E-mail: meaw_moza@hotmail.com

Turbadrakh Tumenjargal
Officer
Ministry of Environment and Tourism
Mongolia
E-mail: tturbadrakh@gmail.com

Vannakreth San
Director
Department of Investment Planning, General Directorate of Planning, Ministry of Planning
Cambodia
E-mail: vannak_reth@yahoo.com

Abdel Aleem Khan
Senior Associate
Department of Urban Planning & Municipality
UAE
E-mail: abdelaleem.khan@dpm.abudhabi.ae

Abeer Al-Aysah
Lead Statistician
Federal Competitiveness & Statistics Authority
Dubai, UAE
E-mail: abeer.alaysah@fsca.gov.ae

Ali Saad
Student Internship
Zayed University
Dubai, UAE
E-mail: 201215497@zu.ac.ae

Amna Alsuwaidi
Student Internship
Zayed University
Dubai, UAE
E-mail: 201210164@zu.ac.ae

Ayad Hamzah
Principal Specialist
Dubai Municipality
Dubai, UAE
E-mail: AYADHA@dm.gov.ae

Ayman Halawa
Environment Studies Specialist
Dubai Municipality
Dubai, UAE
E-mail: afhalawa@dm.gov.ae

Bilal Jabr
Engineer
Road and Transport Authority (RTA)
Dubai, UAE
E-mail: bilal.jabr@rta.ae

Jihad Alsawair
Director Green Economy
Ministry of Environment
Jordan
E-mail: jihad.alsawair@gmail.com

Fatima Al Habshi
Ministry of Climate Change and Environment (MOCCAE)
Dubai, UAE

Fatima Kokhardi
Biologist
Ministry of Climate Change and Environment (MOCCAE)
Dubai, UAE
E-mail: fgkokhardi@moccae.gov.ae

Fatmah AlHantoubi
Lead Officer
Department of Transport
Abu Dhabi, UAE
E-mail: fatmah.hantoubi@dot.abudhabi.ae

Humaid Kanji
Economist
Environment Agency
Abu Dhabi, UAE
E-mail: humaid.kanji@ead.ae

Hussein Hamed
Climate Change Scientist
Environment Agency
Abu Dhabi, UAE
E-mail: husseinhamed@ead.ae

Jehan Haddad
Manager of Air Studies
The Royal Scientific Society
Jordan
E-mail: jehan.haddad@rss.jo

Jihad Alsawair
Ministry of Environment
Jordan
E-mail: jihad.alsawair@MOENV.GOV.JO

Maha AlMa'ayta
Head of Projects Management
Ministry of Environment
Jordan
E-mail: m_maita@moenv.gov.jo

Mashael Al-Ansari
Ministry of Climate Change and Environment (MOCCAE)
Dubai, UAE

Mouza Alghfeli
Student Internship
Zayed University
Dubai, UAE
E-mail: 201411369@zu.ac.ae

Mouza Al Zaabi
Assistant Scientist
Environment Agency
Abu Dhabi, UAE
E-mail: mouza.alzaabi@ead.ae

Mubasak Al-Jaeedi
Engineer
Department of Transport
Abu Dhabi, UAE
E-mail: mubasak.aljaeedi@dot.abudhabi.ae

Naoko Machiba
Ministry of Climate Change and Environment (MOCCAE)
Dubai, UAE

Peter Farrington
Principle Specialist
Dubai Municipality
Dubai, UAE
E-mail: pdfarrington@dm.gov.ae

Roda Al Haj Naser
Zayed University
Dubai, UAE

Roudha Taha
Student Internship
Zayed University
Dubai, UAE
E-mail: 20142955@zu.ac.ae

Shahd Ali
Student Internship
Zayed University
Dubai, UAE
E-mail: 20130485@zu.ac.ae

Tala AbuShuqair
Sustainability Expert
Ministry of Infrastructure Development
Dubai, UAE
E-mail: tala.abushuqair@moid.gov.ae

Tomoo Machiba
Ministry of Climate Change and Environment (MOCCAE)
Dubai, UAE

Aaron Werikhe
Planner, Environment and Natural Resources
National Planning Authority
Uganda
E-mail: awerikhe@npa.ug

Aboubacry Diallo
Economist/In charge of studies
Corporate Planning and Policy Branch (MEFP)
Senegal
E-mail: diallo_aboubacry84@hotmail.com

Achraf Lachkar
Economist
National Accounts Department, High Commission forPlanning
Morocco
E-mail: a.lachkar@hcp.ma

Belaynesh Beru
CRGE Expert
Ministry of Water, Irrigation and Energy (MoWIE)
Ethiopia
E-mail: belayneshbirru2@gmail.com

Dawit Woubishet Mulatu
Research Fellow
Ethiopian Development Research Institute (EDRI)
Ethiopia

Eden Seyoum
CRGE Expert
Ministry of Trade and Industry
Ethiopia
E-mail: edenseyoum86@gmail.com

Gelila Abebe
Program Officer
Initiative Africa
Ethiopia
E-mail: abebe.gelila7@gmail.com

Hicham Makkaoui
Head of Service for economic studies and the simulation of economic policy
Department of Planning
Morocco
E-mail: h.makkaoui@hcp.ma

Ibrahima Sall
Private Consultant
Senegal
E-mail: ibasall@yahoo.fr

Kebour Ghenna
Initiative Africa (IA)
Executive Director
Ethiopa
E-mail: kebour.g@initiativeafrica.net

Magecha Mamuye
CRGE Expert
Ministry of Urban Development and Housing (MUDH)
Ethiopia
E-mail: magecha19@gmail.com

Mikyas Sime
CRGE Expert
Ministry of Finance and Economic Cooperation (MOFEC)
Ethiopia
E-mail: mikyassime@gmail.com

Mohammed Andoshe Faynet
Director, Climate Change Planning, implementation & Verification Coordination Directorate
Ministry of Environment, Forest and Climate Change, Ethiopia (MEFCC)
Ethiopa
E-mail: workineshbedet@gmail.com

Mustefa Abu Kufa
CRGE Expert
Ministry of Agriculture & Livestock (MoAL)
Ethiopia
E-mail: salim1mak@gmail.com

Pouahoulabou Joel Korahire
Director of Coordination of International Conventions
Ministry of Environment Green Economy and Climate Change
Burkina Faso
E-mail: joekorahire@gmail.com

Ribka Teklu
Senior technical expert
Agricultural Transformational Agency (ATA)
Ethiopa
E-mail: ribka.teklu@ata.gov.et

Ronald Kaggwa
Manager Production
National Planning Authority
Uganda
E-mail: ronald.kaggwa@npa.go.ug

Salvo Cossine Feliciano Tchamo
Monitoring and Evaluation Officer &Institutional Focal Point for Green Economy at MITADER
Ministry of Land, Environment and Rural Development -Directorate of Planning and Cooperation
Mozambique
E-mail: sstchamo@yahoo.com

Samuel Abera
Data management, and knowledge repository Program lead
Ethiopian Development Research Institute (EDRI)
Ethiopia

Selam Tarekegn
Enviromental Specialist
Industrial Parks Development Corporation
Ethiopia
E-mail: seltarekegn@gmail.com

Sisay Nune Hailemariam
Lead landscape Specalist
World Bank
Ethiopia
E-mail: shailemariam1@worldbank.org

Wagayehu Bekele
Director, Climate Change Adaptation & Mitigation
Agricultural Transformational Agency (ATA)
Ethiopa
E-mail: Wagayehu.Bekele@ata.gov.et

William Mugabo
Green Economy Specialist
Ministry of Environment
Rwanda
E-mail: ewills2007@gmail.com

Wondimu Abeje
Lecturer
Addis Ababa University-College of Development Studies (AAU)
Ethiopia
E-mail: wondimu.abeje@aau.edu.et

Yitatek Yitbarek
Program Coordinator and Policy Interaction Lead
Environment and Climate Research Center at Policy Studies Institute (ECRC)
Ethiopia
E-mail: yitatek@gmail.com

Yizengaw Yitayih
Green Economy Senior Expert
Ministry of Transport (MoT)
Ethiopia
E-mail: gmmergia@gmail.com

Zerihun Estifanos
CRGE Expert
Ministry of Finance and Economic Cooperation (MOFEC)
Ethiopia
E-mail: zerihun708@gmail.com

Zoure David Marcel Koussoyi
Manager/Urban Architect
Agence BEAU CONCEPT
Burkina Faso
E-mail: zouredavid@gmail.com

Alfredo Cisneros
Coordinator of Interinstitutional Actions
Secretariat of Environment and Natural Resources (SEMARNAT)
Mexico
E-mail: alfredo.cisneros@semarnat.gob.mx

Andrea Cruz Angón
Biodiversity and Cooperation Strategies Coordinator
Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO)
Mexico
E-mail: acruz@conabio.gob.mx

Cintia Amezcua
Director of Commercial Aspects
Unidad Coordinadora de Asuntos Internacionales (UCAI)
Mexico
E-mail: cintia.amezcua@semarnat.gob.mx

Claudia Arely Sánchez Castro
Subdirectora de Suelos
Secretariat of Environment and Natural Resources (SEMARNAT)
Mexico
E-mail: claudia.sanchez@semarnat.gob.mx

Eduardo Garza Pasalagua
Deputy Director of Sustainable Production
Secretariat of Environment and Natural Resources (SEMARNAT)
Mexico
E-mail: eduardo.garza@semarnat.gob.mx

Enrique Lendo
Head of the International Affairs Coordinating Unit
Unidad Coordinadora de Asuntos Internacionales (UCAI)
Mexico
E-mail: enrique.lendo@semarnat.gob.mx

Felipe Cortes Labra
Ministry of Environment of Chile
Chile
E-mail: FCortes@mma.gob.cl

Francisco Javier Turrent Cobo
Secretariat of Environment and Natural Resources (SEMARNAT)
Mexico
E-mail: javier.turrent@semarnat.gob.mx

Gavin Bovell
Project Manager
Office of Climate Change
Guyana
E-mail: gavinbovell@gmail.com

José Federico Gonzalez Medrano
Deputy Director
National Institute of Statistics and Geography (INEGI)
Mexico
E-mail: jfederico.gonzalez@inegi.org.mx

Julieta Anabel Leo Lozano
Project Leader in Urban Development
Mario Molina Center for Strategic Studies on Energy and Environment
Mexico
E-mail: jleo@centromariomolina.org

Lina Correa
Deputy Director of Economic Cooperation
Unidad Coordinadora de Asuntos Internacionales (UCAI)
Mexico
E-mail: lina.correa@semarnat.gob.mx

Maria Zorrilla Ramos
Consultant
Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO)
Mexico
E-mail: mzorrilla@conabio.gob.mx

Marisol Rivera
General Director of Policy Planning and Evaluation
Secretariat of Environment and Natural Resources (SEMARNAT)
Mexico
E-mail: marisol.rivera@semarnat.gob.mx

Neydi Cruz
Deputy Director General for International Cooperation
Unidad Coordinadora de Asuntos Internacionales (UCAI)
Mexico
E-mail: neydi.cruz@semarnat.gob.mx

Rocio Ruelas Fimbres
Head of the Climate Change Department
Comision de Ecologia y Desarrollo Sustentable del Estado de Sonora (CEDES)
Mexico
E-mail: rocio.ruelas@sonora.gob.mx

Rodolfo Garza Castro
Instituto Nacional de Ecología y Cambio Climático (INECC)
Mexico
E-mail: costoscnd@inecc.gob.mx

Rosi Amerena
Communication Consultant
ONU Ambiente
Mexico
E-mail: rosi.amerena.unep.mx@gmail.com

Sandra Fernandez
Director of Climate Change
Ministerio de Medio Ambiente y Desarrollo Sostenible de Paraguay
Paraguay

Silvia Rojas
Director of the Biodiversity Fund
Ministry of Environment, Energy and Telecommunications (MINAE)
Costa Rica
E-mail: Silvia.Rojas@fonafifo.go.cr

Kinga Csontos
Climate Policy Advisor
Ministry for Innovation and Technology
Hungary
E-mail: kinga.csontos@itm.gov.hu

Thorsten Arndt
Head of Communications
Programme for the Endorsement of Forest Certification (PEFC)
Switzerland
E- mail: thorsten.arndt@gmail.com

Jia Hua
Research Intern
Green Growth Knowledge Platform (GGKP)
Switzerland
E-mail: jhua@ggkp.org

Rosi Amerena
Consultant
Programa de las Naciones Unidas para el Medio Ambiente (PNUMA)
Mexico
E-mail: rosi.amerena.unep.mx@gmail.com

Shimelis Fekadu
Climate Change and Green Growth Specialist
African Development Bank (AfDB)
Ethiopia
E-mail: shimelis.fekadu@gmail.com

Gerald Esambe Njume
Senior Climate Change and Green Growth Officer
African Development Bank (AfDB)
Ethiopia
E-mail: g.njume@afdb.org

Jieun Seong
Deputy country director
Korea International Cooperation Agency (KOICA) - Ethiopia Office
Ethiopia
E-mail: sje0115@koica.go.kr

GGGI

ABOUT THE GLOBAL GREEN GROWTH INSTITUTE

The Global Green Growth Institute was founded to support and promote a model of economic growth known as “green growth”, which targets key aspects of economic performance such as poverty reduction, job creation, social inclusion and environmental sustainability.

Headquartered in Seoul, Republic of Korea, GGGI also has representation in a number of partner countries.

Member Countries: Australia, Cambodia, Costa Rica, Denmark, Ethiopia, Fiji, Guyana, Hungary, Indonesia, Jordan, Kiribati, Republic of Korea, Mexico, Mongolia, Norway, Papua New Guinea, Paraguay, Philippines, Qatar, Rwanda, Senegal, Thailand, United Arab Emirates, United Kingdom, Vanuatu, Vietnam

Operations: Cambodia, China, Colombia, Ethiopia, Fiji, India, Indonesia, Jordan, Laos, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Nepal, Peru, Philippines, Rwanda, Senegal, Thailand, Uganda, United Arab Emirates, Vanuatu, Vietnam

GGGI

Follow our activities on
Facebook and Twitter

www. gggi.org