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Assessment and Main Findings on the Green Growth Index

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Executive Summary

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GGGI's Green Growth Index was designed through a rigorous and inclusive process. The process was guided by a bottom-up approach and multiple iterative steps in consultation with experts working on indicators, metrics, and green growth policies in their respective organizations. To ensure its robustness and policy relevance, GGGI developed and improved the Index through multiple revisions of the conceptual and methodological frameworks based on the assessment of the expert feedback.

The indicators selected for the four dimensions of green growth have undergone systematic assessment, with regional experts rating their policy relevance to different countries and regions. International and GGGI expert groups then reviewed the assessment results to define sets of indicators that are applicable to measure green growth performance at the global level, as well as aligned with GGGI's six strategic outcomes and four thematic priority areas of sustainable energy, green cities, sustainable landscapes, and water and sanitation. As a result of this process, the green growth framework developed for the Index is directly applicable for tracking green growth performance at the national, regional, and global levels.

2

Roughly half of the ranked countries have moderate performance in attaining their green growth targets, and low-performing countries still outnumber high-performing ones. The call for action to increase efforts in making the world "greener" is growing, and all countries can now work towards identifying areas where opportunities for improving green growth performance are most abundant.

Regionally, Europe leads the world in green growth performance. Africa, on the other hand, is the region where green growth work remains imperative, but also where opportunities for the most conceivable impacts are most significant. Continued enhancement of local skills and infrastructure can help improve Africa's green growth performance. The switch to more efficient technologies also offers the region opportunities for leapfrogging to a greener future.

Across regions, improving green economic opportunities continues to present the largest opportunities for performance improvement, and can be targeted through innovation and green trade. For countries in Africa, the Americas and Asia, enhancements in sustainable land use will enable better green growth performance through more efficient and sustainable resources use.

3

The Index is the first metric for green growth that explicitly links to sustainable development. In order to make the Index relevant at the national and international level, it has been imperative for GGGI to align the Index with global sustainability goals and targets such as the SDGs, the Paris Agreement, and Aichi biodiversity targets. This complementary set of internationally accepted targets and related indicators serve as a reliable reference for the Green Growth Index and allow governments to align their pathway to green growth with achieving the SDGs, and national climate and biodiversity goals.

For the Green Growth Index to be wide-reaching and support transformational impact on a global scale, it is imperative that this broad set of indicators is supported by high-quality data. In particular, data gaps for green economic opportunities need to be addressed across all regions, but most urgently in Oceania and Africa. As one of the dimensions of green growth with the most potential for improving green growth performance across regions, improving data availability for green economic opportunities can help catalyze meaningful progress and impact. Complete data for green economic opportunities would also increase the global coverage of the Green Growth Index from 115 to 207 countries.

4

To date, there is no universal definition of green growth, thus resulting in different ways of measuring related targets. GGGI is bridging the gap by developing a common understanding of green growth performance through the Green Growth Index.

GGGI is contributing to the increasing momentum for green growth through collaborative efforts to increase the applicability of the Index. The participatory Index development process opened new doors to enhance collaborative work on green growth and sustainable development. GGGI has strengthened collaboration not only with its Member countries but also with various international organizations that jointly support global and national sustainability targets. Today, the United Nations Environment Programme and the African Development Bank have partnered with GGGI to benefit from its experience with the Green Growth Index and to further increase understanding and engagement on green growth.

Through these collaborations, GGGI intends to further develop and improve the Green Growth Index in years to come. This can be done by leveraging the efforts of various international organizations to improve the indicators, targets, and underlying data for the SDGs; the work of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) to increase knowledge and data on biodiversity; and the ambitions of governments to develop Nationally Determined Contributions (NDCs) under the Paris Agreement.

GGGI is also complementing the Green Growth Index with a policy simulation tool. The purpose of the Simulation Tool is to estimate the impact of different policies on country performance within the Green Growth Index framework. This will further improve the policy relevance of the Index, and help countries embark on transformational green growth trajectories.

1 Introduction

The shift to a green economic model that sustains natural capital stocks and flows, preserves planetary systems, and ensures social inclusion involves a wide range of performance metrics that guide countries in understanding how well they are performing and what areas need more work.

GGGI and numerous partner organizations are using a range of performance metrics and indicators to assess several specific dimensions of green growth at national and subnational levels in countries around the world, considering:

1. national or subnational performance across multiple sectors;
2. potential for green growth based on current conditions and future policy actions and investments; and
3. performance of specific green growth technical assistance projects, such as those supported through GGGI or its partners.

GGGI applies a range of green metrics and indicators in implementing its Green Growth Potential Assessment framework, through which countries can assess and debate future green growth options and priorities, as well as its internal Strategic Outcomes framework for tracking GGGI's impact as a development assistance organization relative to a country's own progress.

Metrics and indicators are useful tools to measure the performance of countries in implementing green policies and development outcomes of green investments. The ability to measure green growth performance allows policymakers to identify problems or gaps in policies and design and plan the use of resources that will lead to better green growth outcomes. In policy-making, measuring green growth progress serves several purposes across all stages of the policy process—from objective setting, planning and design to implementation as well as monitoring and evaluation.[1] The use of indicators to track green growth performance provides benchmarks against which to measure the adequacy of policy actions.[2] When they are used to benchmark against Sustainable Development Goals (SDG) targets or the Paris Agreement commitments, they can inform countries on the progress in achieving them. Metrics and indicators are thus intended to raise awareness and help sustain the momentum for green growth by measuring, tracking, benchmarking, and communicating how countries perform with respect to green growth.

GGGI's newest initiative focusing on measuring green growth performance is embodied in the Green Growth Index, a global composite index designed to inform countries on their performance over time in four key dimensions of green growth.

The key messages for policy from GGGI's Green Growth Index in 2019 are:

1. It is the first global Green Growth Index that is benchmarked against sustainability targets to show how countries perform in using and protecting natural resources for a sustainable future and in creating economic opportunities for an inclusive society. The framework, representing 36 green growth indicators, was built on robust concepts, guided by multidisciplinary experts, and developed in consultation with policymakers.

2. With half of the countries performing only moderately and more than 25% scoring low on the Green Growth Index, much more effort is needed to build a "greener" world. Actions are most critical for green economic opportunities where performance is lowest globally.

3. The 36 indicators for the Green Growth Index guide policymakers to achieve the SDGs, Paris Climate Agreement, and Aichi Biodiversity Targets. More than half of the green growth indicators are based on SDGs, but there are insufficient SDG indicators to measure economic opportunities from green growth.

4. Green growth targets remain distant for many countries. But growing interest among policymakers, practitioners, and stakeholders in finding a common framework and policy-relevant indicators to measure green growth performance hints at an increasing green growth momentum. GGGI is contributing to this momentum.

2 Green Growth Concept

2.1 Measuring Green Growth Performance and Exploring Opportunities for Action

Varying definitions and understanding of green growth since the concept first emerged about 10 years ago have led to a lack of uniform or harmonized approaches to measure green growth. Thus, GGGI developed the Green Growth Index in response to the requests of its member and partner countries to use a standard set of metrics to gauge the performance of their green growth policies and actions.

The Green Growth Index is a global composite index*[3] comprising 36 performance indicators measuring varying aspects of green growth across 115 countries worldwide using widely available data from international sources. It was developed to quantify green growth performance—taking into account its complexity and multidimensionality—and contribute to the global stock of innovative knowledge on green growth.

With the launch of the Index, countries around the world now have a standard framework for tracking their green growth performance over time, considering their performance against similar countries or countries in the same geographic region, and assessing performance within certain dimensions of green growth, indicator categories, and thematic areas. Since the Index is based on a robust sustainability framework, it highlights progress towards achieving many relevant SDGs that are linked to green growth.

Key Characteristics of the Index

The Green Growth Index is one of the several relevant indices⁺ that addresses the concept of green growth, but GGGI has taken extensive measures to build strategic collaborations with existing green growth performance systems to maximize synergy and avoid redundancy. GGGI's Green Growth Index pioneered an inclusive and rigorous process that is concept-driven, expert-guided, and policy-relevant. The development of its concept and methods adopts best practices suggested by international organizations[4] and further enhances its key characteristics on these aspects to increase its value-added including the following:

1. **Participatory:** A major strength of the Index is that it was developed through a comprehensive, highly participatory consultation process involving government representatives and green growth specialists from around the world to ensure the policy relevance and practicality of the Index. Drawing from the outcomes of these consultations, the stakeholder-driven process of designing the Index involved a series of revisions to refine its conceptual and methodological frameworks.

2. **Expert-guided:** The participatory process of developing the Index initiated in 2016 involved obtaining inputs from more than 300 experts from multidisciplinary backgrounds and who are knowledge on the various dimensions of green growth. These experts represented the public sector, research institutions and think tanks, academic institutions, international organizations, and other relevant stakeholders.

3. **Policy-relevant:** The experts were directly engaged in assessing the policy-relevance of the indicators in the Green Growth Index. Building on policy-relevant indicators, the Index is designed to provide a basis for conducting an in-depth policy analysis and assist users in prioritizing the most impactful green growth policies. The Index is also expected to fill the knowledge gaps in providing an integrated assessment of green growth performance, emphasizing the interlinkages between the economic, environmental, and social goals of sustainable development. The Green Growth Index is particularly policy relevant because it is benchmarked using SDG and other internationally relevant targets.

4. **Concept-driven:** A set of underlying concepts for and interlinkages among the green growth dimensions were identified. The identified concepts include low carbon economy, ecosystem health, societal resilience, and inclusive growth, which guided the selection of the green growth indicators and formed the foundation for framing the Green Growth Index. They encapsulate many internationally agreed sustainability goals including SDGs, the Paris Agreement, and Aichi Biodiversity Targets.

**"A composite index is the mathematical combination of individual indicators that represent different dimensions of a concept whose description is the objective of the analysis. It is a combination of multiple sources of information measured in or off a system in order to provide a summary of the system that itself is not directly measurable."*[3]*

⁺*Examples include the Asian Development Bank (ADB) Inclusive Green Growth Index, AfDB African Green Growth Index, UNEP's Green Economy Progress Index, and the Dual Citizen Institute's (DCI) Global Green Economy Index, among others. These indices demonstrate different perspectives in defining and measuring green growth resulting in diverse set of indicators to capture the depth of the concept.*

2.2 Index Structure: The Dimensions and Indicators of Green Growth

Framing the Green Growth Indicators

Key message

The Green Growth Index is framed on four closely interlinked dimensions: (1) efficient and sustainable resource use; (2) natural capital protection; (3) green economic opportunities; and (4) social inclusion. Their interlinkages build on the concepts of low carbon economy, ecosystem health, inclusive growth, and resilient society.

Green growth, as an approach towards achieving sustainable development and transforming entire economies, is multi-dimensional and complex. The conceptual framework for the Green Growth Index builds on GGGI's definition of green growth, as "a development approach that seeks to deliver economic growth that is both environmentally sustainable and socially inclusive."[5] This definition emphasizes four closely interlinked green growth dimensions which form the underlying structure of the Index:

1. **Using resources efficiently and sustainably:** This dimension measures the use of natural capital and other resources including energy, water, land, and materials. Natural resources are depleting rapidly due to excessive resource consumption by a growing population, especially in developing countries.[6] Enhanced resource efficiency and a reduction in the negative environmental impacts from resource consumption are therefore necessary to ensure the future availability of resources.

2. **Protecting natural capital:** This dimension refers to natural resource stocks and key planetary systems and measures environmental quality, greenhouse gas (GHG) emissions reductions, and the protection of biodiversity and ecosystems. Natural capital is the most fundamental form of capital as it provides the basic conditions and provisions for all social and economic activities.[7] Green growth entails that natural assets continue to provide environmental services on which our well-being relies.[8] Achieving SDG targets related to natural capital protection is aligned with the notion of operating within planetary boundaries.

3. **Creating green economic opportunities:** The third dimension encompasses the areas related to green investment, trade, employment, and innovation. Green growth strategies create new economic opportunities by accelerating investments and innovation that reinforce the foundations of sustainability.[9] Green investment is one of the significant determinants of green growth as it facilitates the smooth transition towards a more sustainable pathway for development and economic growth.

4. **Ensuring inclusive growth:** Finally, this dimension measures access to basic services and resources, social equality, and social protections. A clean and livable environment is a fundamental requirement for a socially cohesive society.[10] However, a society can only be inclusive if every member has equal access to resources and opportunities to participate fully in social processes irrespective of the individual abilities, ethnic and social background, gender, or age.

These four dimensions serve as intermediate goals to achieving green growth and guide the framing of the indicators for the Green Growth Index (Figure 1). The green growth indicators are organized into different categories, which in turn serve as sustainability pillars in each dimension. The Green Growth Index for 2019 consists of 36 indicators, with green economic opportunities only consisting of four indicators due to dearth of policy-relevant data. Going forward, the Index will require regular updating especially when better indicators become available and thus may be included in future versions of the 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 renewable to total final energy consumption (Percent)
		Efficient and sustainable water use	EW1	Water use efficiency (USD per m^3)
			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 m^3)
			EQ2	DALY rate due to 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. Indicator Framework of the Green Growth Index

Linking to Sustainability Targets

Key message

Twenty-one (21) indicators of the Green Growth Index are directly derived from the SDGs. The remaining 15, while not SDGs indicators, contribute to achieving SDGs, Paris Agreement, and Aichi targets. The Index is the first to benchmark green growth performance against the targets for these international agreements.

The SDGs and their corresponding targets are excellent framework to follow in the transition towards green growth.[11] During the regional consultation workshops, experts emphasized the policy relevance of benchmarking the Index using SDG and other internationally agreed targets. Thus, GGGI explicitly considered these targets when framing the Green Growth Index, making the inclusion of green growth-related SDG indicators highly pertinent (Figure 2). About 61% and 19% of the indicators in the framework are SDG indicators and indicators that are highly related to the SDGs, respectively.[12] About 6% contribute specifically to achieving the Paris Agreement.[13] The remaining indicators, including three for green economic opportunities and one indicator each in natural capital protection and social inclusion, are more general indicators of sustainable development.

Including the indicators for green economic opportunities in the Green Growth Index fills in an important gap in the SDG indicators, which mainly focus on social and environmental dimensions of sustainable development. Green economic opportunities reflect much-needed investments to support both social and environmental development.

Using many SDG indicators in the framework allows the use of SDG targets to benchmark the Green Growth Index. So far, only the SDSN's SDG index (2018) and OECD's Measuring Distance to the SDG Targets (2019) show the distance of countries' performance to SDG targets. These reports have been an important source of information on explicit values for the SDG targets considered in the Index. Unlike SDSN and OECD, GGGI's Green Growth Index emphasizes measuring the performance in achieving not only the SDGs but also the other sustainability targets. It is the first composite index for green growth to make explicit links to the SDGs and sustainable development. Moreover, it gives a comprehensive vision of green growth and is intended to support policy directed towards the achievement of sustainability targets.

Details on the sustainability targets are available in GGGI Technical Report Number 5, Green Growth Index: Concepts, Methods, Applications (2019).[14]

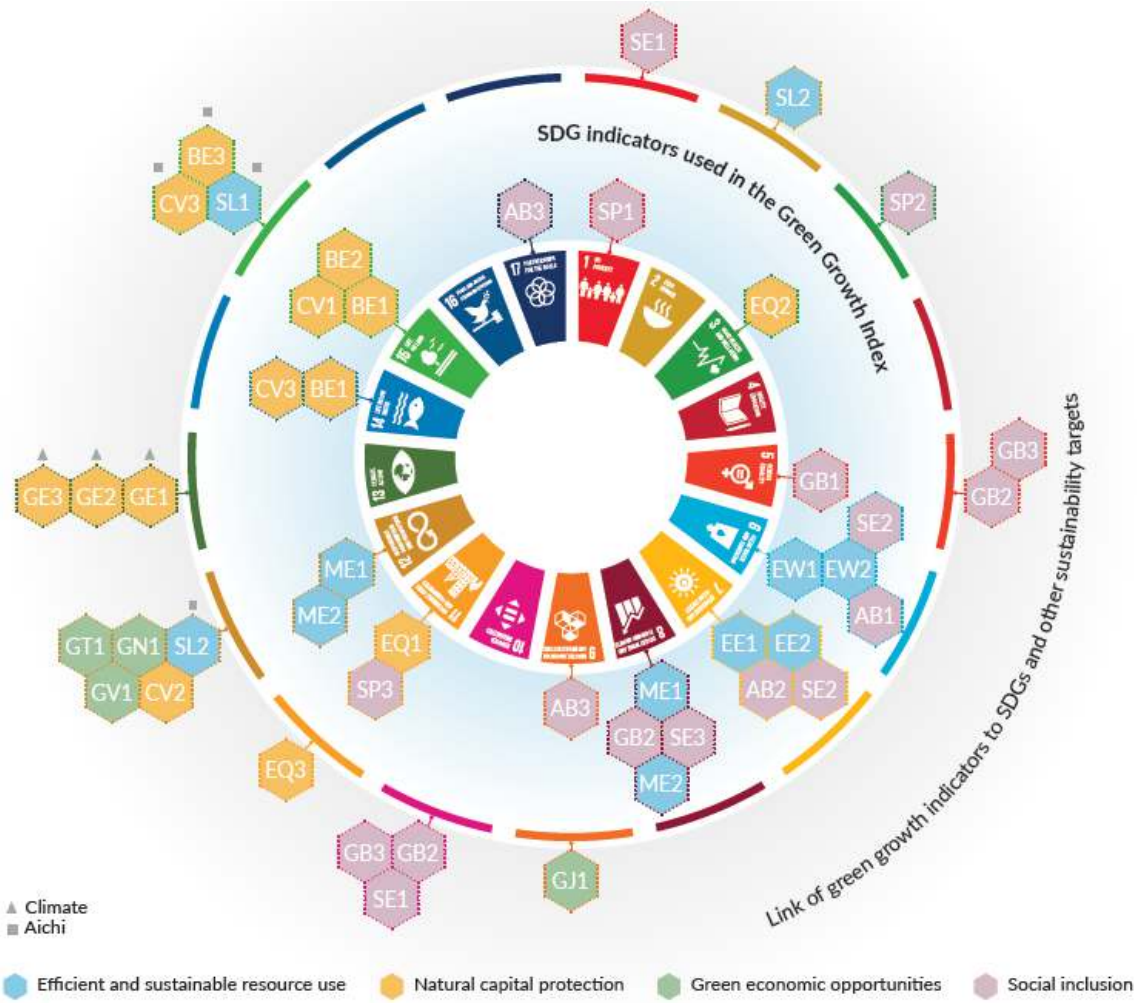


Figure 2. Links of the green growth indicators to SDGs and other sustainability targets
Note: Refer to Figure 1 for the definition of the acronyms of the indicators

3 Green Growth Index—2019 Results

3.1 Key Findings: The World in 2019

Key message

Out of the 23 countries scoring high in the 2019 Green Growth Index, Denmark and Sweden rank highest, both with scores of about 75. But these top scores are still 25 points short of from the green growth target of 100. With 54 countries still halfway to reaching this target and 38 even further behind, there are ample opportunities to improve performance and make the world a greener place.

The Green Growth Index for 2019 covers 115 countries having sufficient data coverage for all four dimensions. Sub-indices for the dimensions, i.e., efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion, are also presented. Except for green economic opportunities, sub-indices for green growth dimensions are available for about 140 countries. Note that the Index was not computed for countries with no scores for green economic opportunities. This is to emphasize that all four dimensions are equally important for green growth transition. The data for the indicators were mainly collected from online sources provided by international organizations to ensure transparency and allow consistent cross-country comparisons.*

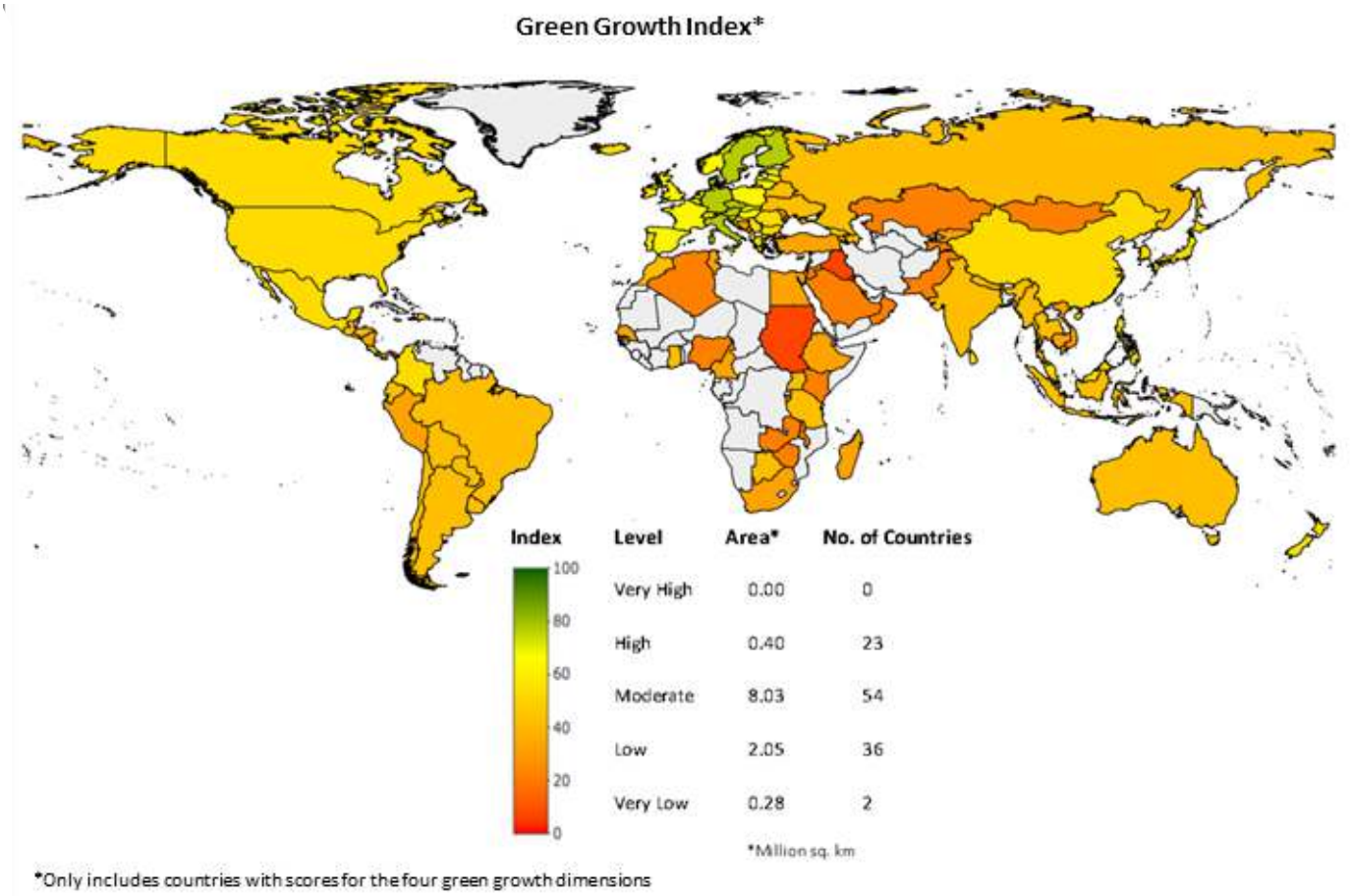
The indicators were benchmarked against the sustainability indicators using methods that normalize values for the indicators with a range of 1 to 100, where 100 indicates that the sustainability target was achieved. As these normalized values were used as inputs to the aggregation model of indicators at level 1, the subsequent scores generated from aggregating the indicator categories (level 2) and dimensions (level 3) are all between 1 and 100. Thus, a score of 100 for the Index, dimensions, and indicator categories means that a country has reached a given target.

Figure 3 provides a global overview of the Green Growth Index and its four dimensions in 2019. No countries have a score between 80 and 100, which indicate that no country has reached, or almost reached, the sustainability targets for the Green Growth Index. With a score ranging from 60 to 80, about 23 countries (or 20%) are taking a strategic position to fully reach the target. Denmark and Sweden have the highest rank with scores of 75.32 and 75.09, respectively.

Performance for more than half of the 115 countries is moderate, with scores between 40 and 60. These countries are finding the appropriate policies to move forward to and avoid moving away from the target. A significant number of the countries (36) have low green growth performance, facing the challenge of getting development policies aligned with achieving the sustainability targets. So far, only two countries remain to have very low score—Sudan in Africa and Iraq in Asia. These countries will require significant actions to improve their position relative to the sustainability targets.

It was not possible to include many countries in Africa in the Green Growth Index due to lack of data on green economic opportunities. Nonetheless, the scores for other the other three green growth dimensions were computed (Figure 3).

**The international organizations collect their data from national agencies and check them for consistency.*



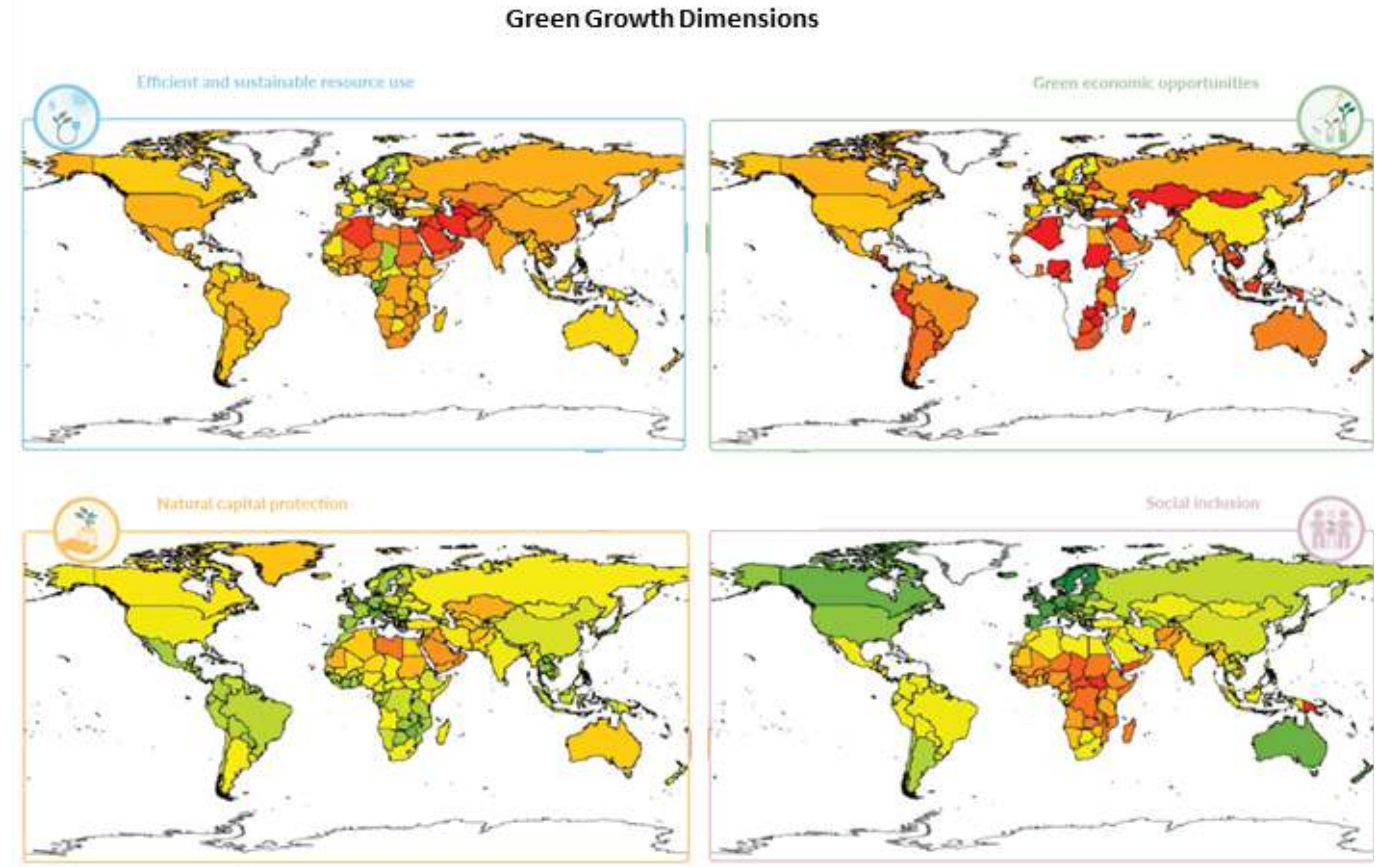


Figure 3. Level of green growth performance and its global distribution for the Index and its dimensions
Note: Interpretation of the scores are as follows: 80-100 are very high scores, having reached or almost reached the target; 60-80 are high scores, taking a strategic position to completely reach 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 right policies to align development to achieving the target; and 1-20 are very low scores, requiring significant actions to improve position relative to the target

Figure 4 provides an overview of the distribution of countries within the Green Growth Index by region and by level of income. In terms of regional distribution, most countries in **Africa** have low green growth performance with scores between 20 and 40. A few of them reach values slightly above 40, or moderate green growth performance. The countries in **Oceania** (New Zealand, Australia and Fiji) have moderate green growth performance with scores falling between 40 and 60. Most of the countries in **the Americas** have also moderate green growth performance. Countries in **Asia** and **Europe** cover a wider range of scores than the other three regions. While Green Growth Indices for Asian countries extend from very low to moderate, those for European countries start from low and end in high level. A high level of green growth performance was only achieved by countries in Europe.

In terms of income level, most **low-income countries** have low green growth performance and only a few have managed to reach moderate performance level. The two countries with very low Green Growth Index results are from **lower and upper middle-income groups**. Many countries at these levels of income have moderate green growth performance, except for Croatia (upper middle-income group), which has high performance. The scores for the Green Growth Index for **high income countries** extend from low to high.

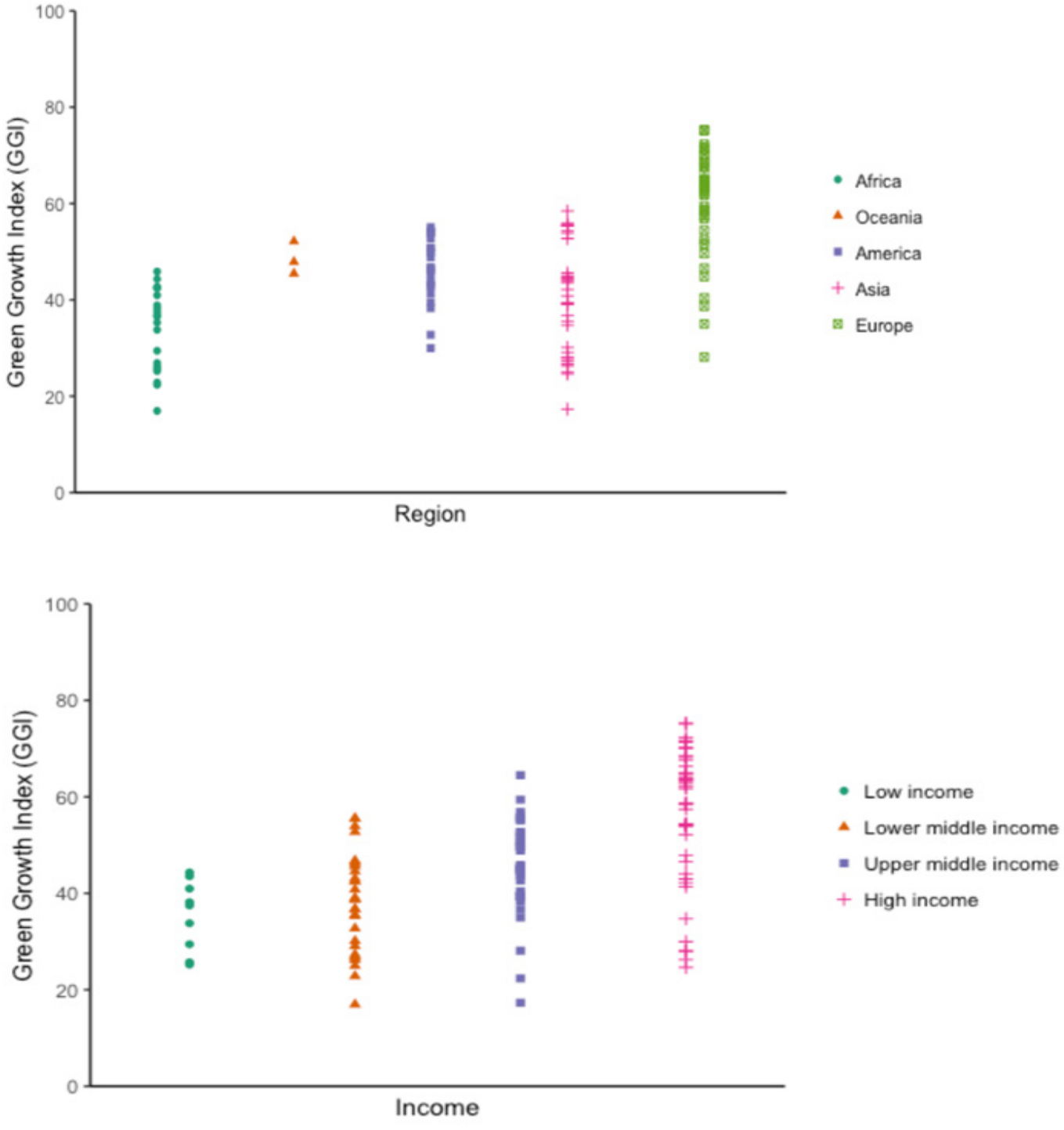


Figure 4. Distribution of the Green Growth Index by region and income level

Figure 5 presents a subregional overview of the distance to target. The subregions in Europe are closest to the target, with Northern and Western Europe only about 34 points away from the target. These subregions have high level of green growth performance. Only Northern America and Southern Europe are closest to the target in other regions. However, they only have moderate levels of green growth performance. Although the Caribbean subregion is farthest to the target in **the Americas**, at 57.85 points away from the target, it reaches moderate green growth performance. In **Asia**, Eastern Asia is closest to the target while Central Asia has the largest gap from the target. Except for Southern Africa, all subregions in the **Africa region** have a very large gap from the target. Eastern, Central, Northern, and Western Africa all have a low level of green growth performance.

The results of the Green Growth Index offer a window into broad environmental, social, and economic conditions across the world and help identify the countries and regions where green growth performance is excelling and faltering.

The following sections describe the green growth performance of each region with regard to each of the green growth dimensions and indicator categories, country-specific performance, and country-level and regional trends in green growth performance in the overall and in the four thematic areas. Only those countries with sufficient data available in all four dimensions are included in the Index.

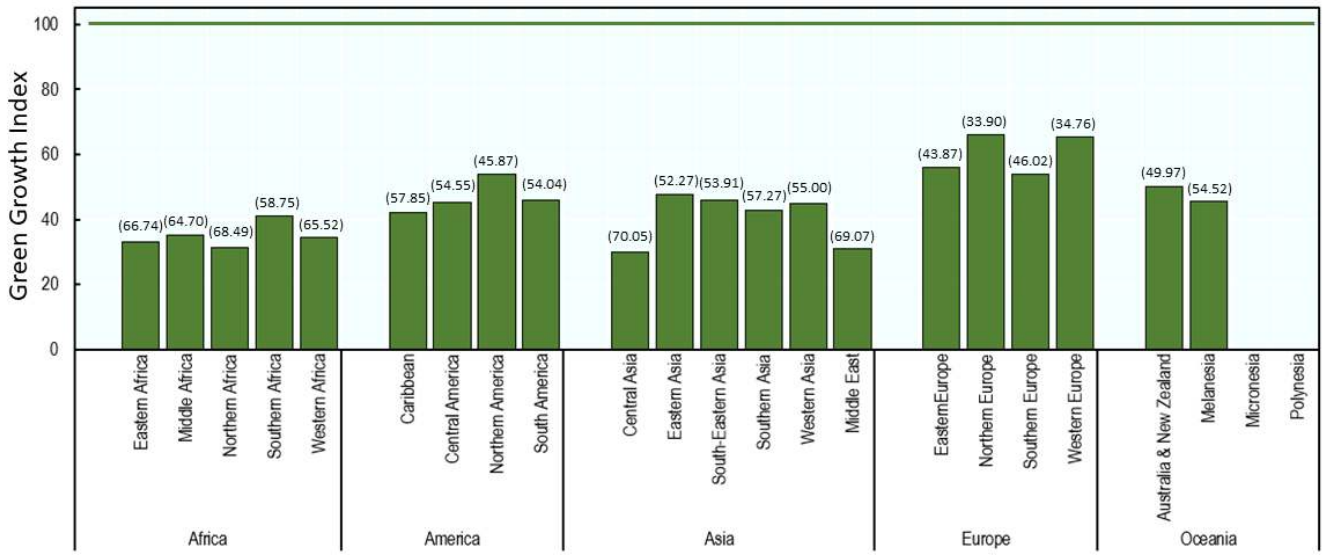


Figure 5. Green Growth Index and distance to targets by region and subregions
Note:Values in parentheses are distance of Green Growth Index to the target (100).
Egypt is included in North Africa; Melanesia only refers to Fiji; Micronesia and Polynesia have no data.

3.2 Green Growth Index Scores and Ranks

Key message

Top ranks in other regions include Singapore in Asia, the Dominican Republic in the Americas, New Zealand in Oceania, and Botswana in Africa, all achieving moderate scores. Like in Europe, top ranks in the Americas and Africa are highly challenged by countries next in line. In contrast, Singapore and New Zealand firmly secure top ranks in their respective regions, at least 2 points ahead of other countries.

Green Growth Index rankings are provided for countries within five geographic regions—Africa, the Americas, Asia, Europe, and Oceania, several of which include subregions. Note that the groups of countries used in the Index are based on UN geoscheme (Table 1).

Europe has the highest overall regional Green Growth Index score, and the results are primarily high or moderate scores (Figure 6). It is the only region where any country achieves an Index score above 70, including Denmark, Sweden, Austria, Finland, Czech Republic, Italy, and Germany. The region's strong performance is largely the result of high ratings in social inclusion.

The regional Index results for **Asia** are primarily moderate to low. Singapore, Malaysia, Philippines, Georgia, China, Republic of Korea, Japan, and Sri Lanka lead the region in green growth performance with scores above 50. Similar to Europe, social inclusion and natural capital protection are the dimensions that elevate the scores of Asian countries while results under the resource efficiency and green economic opportunities dimensions are comparatively lower.

The American region has primarily moderate scores, with seven countries reaching a score of 50 or more. Scores for **Africa** range from moderate (six countries with 40 or above) to very low. Both regions demonstrate relatively strong natural capital protection.

While the other regional Green Growth Indices represent data for at least 20 countries per region, there are only three countries in **Oceania**—Australia, Fiji, and New Zealand—which have data for all four dimensions. Despite the lack of data in the region, the results within the dimensions are consistent with those of other regions. Natural capital protection and social inclusion remain as the dominant factors.

EUROPE	Rank	Index
Denmark	1	75.32
Sweden	2	75.09
Austria	3	72.32
Finland	4	71.69
Czech Republic	5	71.29
Italy	6	70.22
Germany	7	70.04
Estonia	8	68.50
Latvia	9	68.24
Slovakia	10	67.60
Portugal	11	66.32
Belgium	12	64.94
Hungary	13	64.82
France	14	64.66
Croatia	15	64.49
Slovenia	16	64.00
Spain	17	63.67
Lithuania	18	63.65
Netherlands	19	63.38
United Kingdom	20	63.30
Switzerland	21	62.72
Norway	22	62.10
Poland	23	61.67
Romania	24	59.41
Ireland	25	58.68
Luxemburg	26	58.64
Greece	27	57.42
Bulgaria	28	56.87
Iceland	29	54.42
Serbia	30	52.43
Albania	31	51.66
Russia	32	49.60
Ukraine	33	46.56
Belarus	34	44.76
Montenegro	35	40.41
Republic of Moldova	36	38.68
Bosnia and Herzegovina	37	34.98
Malta	38	28.13

ASIA	Rank	Index
Singapore	1	58.43
Malaysia	2	55.88
Philippines	3	55.54
Georgia	4	55.45
China	5	55.41
Republic of Korea	6	54.31
Japan	7	53.86
Sri Lanka	8	52.74
India	9	45.58
Azerbaijan	10	44.98
Myanmar	11	44.55
Thailand	12	44.36
Cyprus	13	44.03
Nepal	14	43.54
Israel	15	42.14
Indonesia	16	40.81
Lebanon	17	39.45
Turkey	18	39.22
Viet Nam	19	39.05
Kyrgyzstan	20	36.74
Armenia	21	35.55
Qatar	22	34.73
Cambodia	23	30.13
Pakistan	24	29.08
Kazakhstan	25	28.10
Saudi Arabia	26	27.92
Mongolia	27	27.33
Jordan	28	26.71
Oman	29	26.25
Tajikistan	30	25.00
Kuwait	31	24.62
Iraq	32	17.32

OCEANIA	Rank	Index
New Zealand	1	52.17
Australia	2	47.89
Fiji	3	45.48

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

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

Country classification by region is based on the United Nations geoscheme
(Source: https://unstats.un.org/unsd/methodology/m49/)

Figure 6. Scores and ranks for the Green Growth Index, by region

Table 1. 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, Congo Democratic Republic, Congo Republic, 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, US 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, Korea Democratic People's Republic, Korea Republic, Mongolia
	South-eastern 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/
*Includes countries with scores for at least one green growth dimension

3.3 Green Growth Dimensions by Region

Key message

Among the four green growth dimensions, performance is lowest for many countries for efficient and sustainable resource use and green economic opportunities. Average scores for efficient and sustainable resource use are lowest for countries in Northern Africa as well as in Central and Western Asia.

Africa have five subregions— Eastern, Middle, Northern, Southern, and Western Africa (Figure 7) — and at least 21 countries for which data are sufficient for the different dimensions. 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.[15] 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, resulting in Africa having the lowest score for social inclusion globally. Similar to most other African subregions, Southern Africa has a very low score for green economic opportunities.

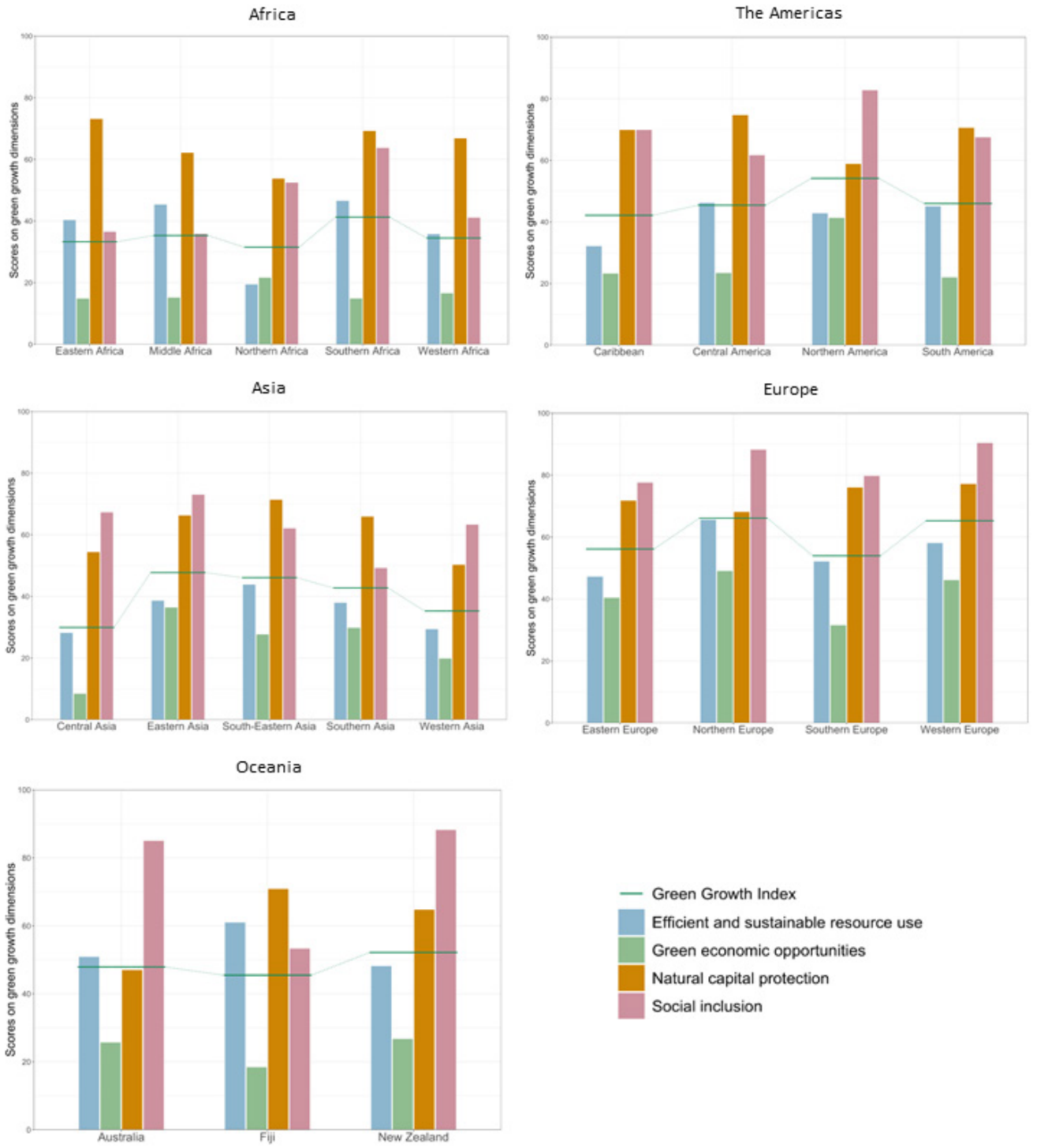


Figure 7. Green Growth Index and dimension sub-indices, by region

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. Similar to many parts of Africa, the Eastern subregion has a rich natural resource base. In contrast, Northern Africa lags behind the other subregions with the lowest score for natural capital protection. The United Nations Economic Commission for Africa reported that the Northern subregion has limited natural resources compared to other African subregions[16], and most countries in the subregion remain natural resource-dependent.[17]

In almost all African subregions, performance in green economic opportunities is the lowest among the four green growth dimensions. In North Africa, the slightly higher score for green economic opportunities is mainly due to high green investment in Egypt and Morocco.[18]

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 7). This can be attributed to the United States and Canada leading the region in the social inclusion dimension with scores of over 80.[19] But Northern America's performance in natural capital protection lags behind the continent's other subregions, due mainly to low scores in GHG emission reductions.[20] Meanwhile, as in two other subregions, Northern America's performance in efficient and sustainable resource use is only moderate mainly attributed to the lack of sustainable land use in the United States and Canada, with scores of only 12 and 22, respectively, for the land use indicators.[21]

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. 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.[22] 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.

Excluding the scores for efficient and sustainable resource use, South America's scores are comparable to 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. 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.[23] About 80% of the country's power system is based on renewables and, similar to Costa Rica, almost all its electricity is generated through renewable energy.[24]

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 7), with Japan scoring 83, the highest in the region after Singapore.[25] 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.[26] On the other hand, Southeastern Asian countries have the highest score for natural capital dimension, mainly due to the subregion's rich biological diversity. The ASEAN Centre for Biodiversity has reported that Southeastern Asia has the highest mean proportion of country-endemic bird (9%) and mammal species (11%), compared to other world regions.[27]

After Eastern Asia, Central Asia has the second highest score for social inclusion in Asia. 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% access to basic services, such as electricity. The population of the Republic of Korea also has 100% access to fiber Internet subscriptions, demonstrating full accessibility of information, communication, and technology services.[28]

While Central Asia shows promising scores for the social inclusion dimension, it has low performance 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 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.[29] Except for Nepal, the scores for the proportion of seats held by women in national parliaments are less than 50.[30] Sri Lanka scores 60 in access to health care, but many other countries in South Asia have scores below 30 for this indicator. Sri Lanka's government provides universal health coverage.[32]

Europe has the strongest overall performance, with scores that are mostly high.[33] The four subregions — Eastern, Northern, Southern, and Western Europe — have scores for the natural capital protection and social inclusion dimensions ranging from high to very high (Figure 7). 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. Intensive resource use has propelled economic development in Europe. Although members of the European Union support resource efficiency through the Europe 2020 strategy[34], the overall score for efficient and sustainable resource

use is only high in Northern Europe. Although the share of organic farming in the food market has increased in Western Europe and stimulated organic agriculture exports to the subregion[35], agricultural production in Western European countries remains predominantly intensive.

All the subregions, except for Southern Europe, have moderate ratings for green economic opportunities. The main reasons for this are the lack of green innovation and little opportunities for green employment in several countries in this subregion. 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. On social inclusion, its score is slightly lower than Southern Europe's. This is caused by only moderate scores for gender balance in Ukraine (40), Russian Federation (52), and Moldova (56).[36] 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.[37]

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 confine 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 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. 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.

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.[38] The Pacific islands and territories have unique and diverse ecosystems, which are traditionally integrated in the ways of living of the local and indigenous communities.[39] 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.[40] 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.[41]

3.4 Indicator Dashboards

Turning to the indicator categories within each dimension, several dashboards help visualize performance by region, income, and Human Development Index (HDI) groups.

3.4.1 Performance by Region

Key message

Lack of green trade and innovation is the main constraint to reaching the targets for green economic opportunities across all regions. In addition, poor sustainable land use hinders efforts to improve performance in efficient and sustainable resources use, particularly in many countries in Africa, the Americas, and Asia.

Figure 8 presents a green growth dashboard summarizing the performance on 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).

The overall score of efficient and sustainable resource use is highly influenced by low scores in sustainable land use (SL) for many countries in Africa.[42] Indeed, land degradation in countries like Ghana, Algeria, Nigeria, Tanzania, and Tunisia has become extensive.[43] Soil degradation in sub-Saharan Africa is increasing at an alarming rate, causing a decrease in agricultural and livestock productivity in the region.[44] Along with decreasing agricultural yields, lost organic matter resulting from land degradation disproportionately affects soil nutrient supply and water absorption.[45] Land-use intensification has resulted in widespread mining of soil organic matter and most of the croplands are now characterized by low organic carbon matter,[46] influencing the overall score for efficient and sustainable resource use in Africa.

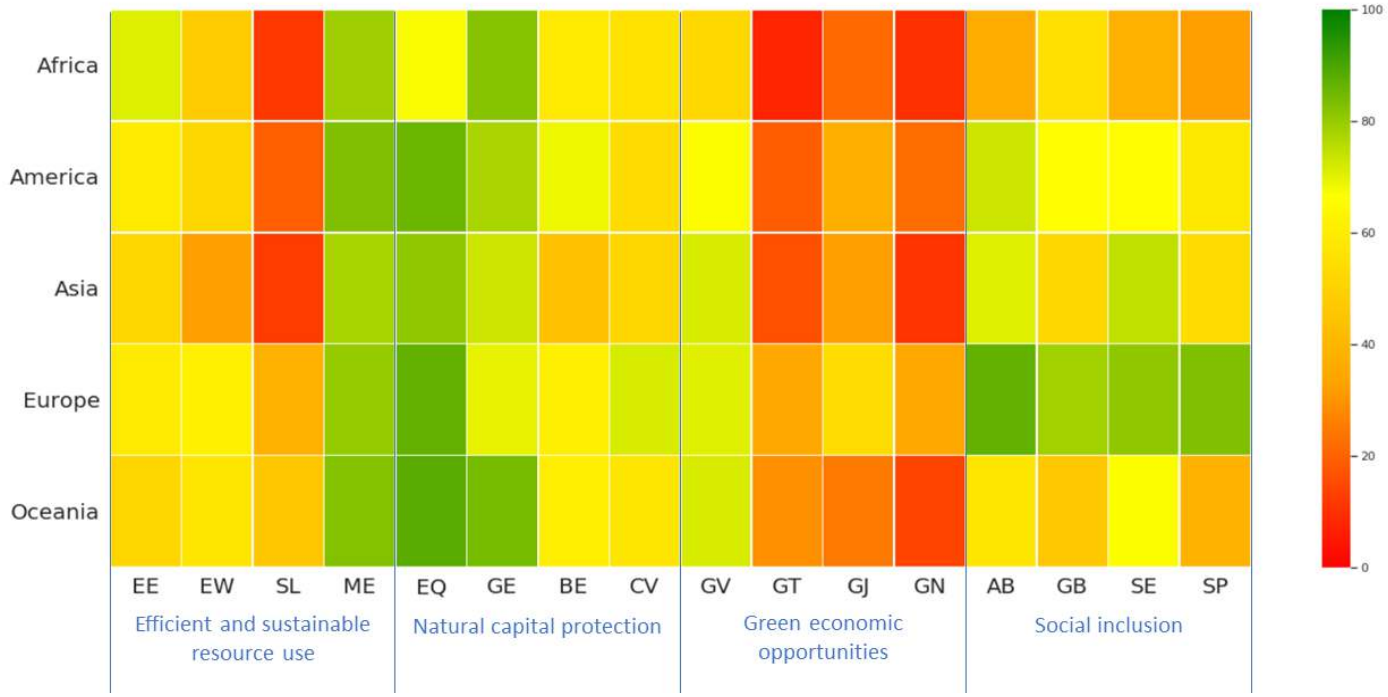
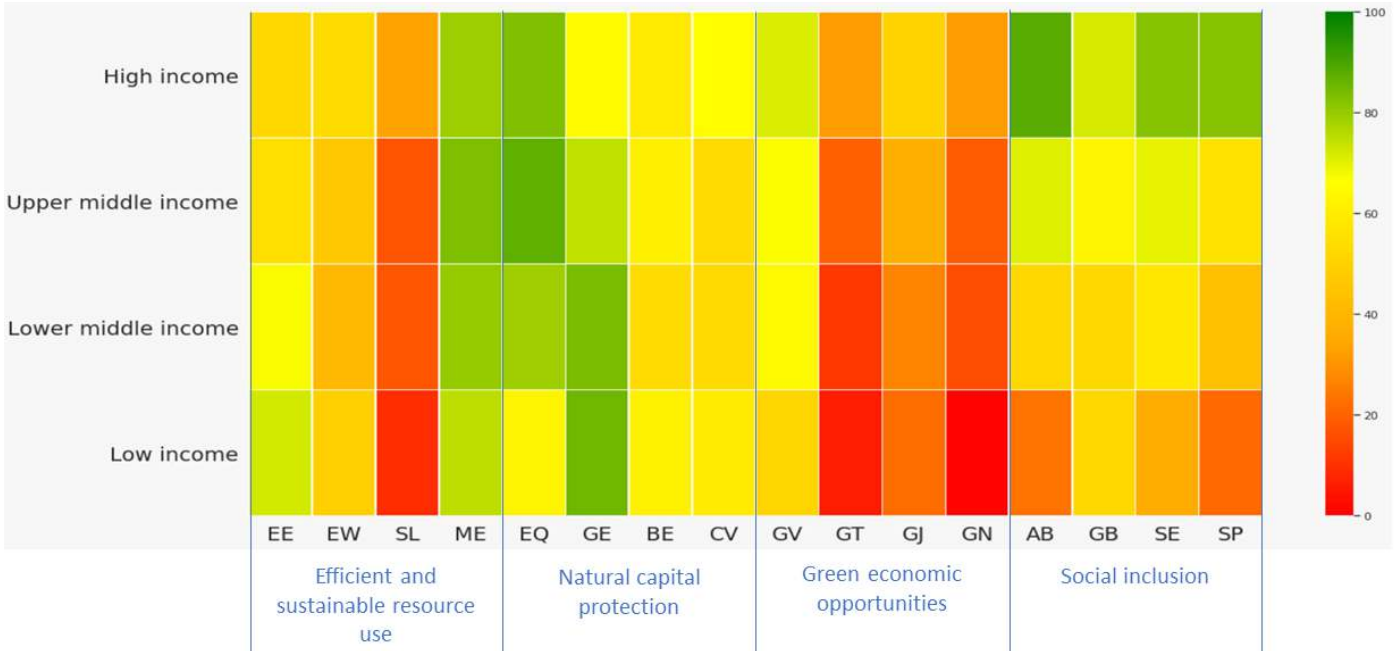


Figure 8. Dashboard of indicator categories in each green growth dimensions, by region
Legend:
Efficient and sustainable energy (EE), efficient and sustainable water use (EW), sustainable land use (SL), material use efficiency (ME), environmental quality (EQ), GHG emissions reduction (GE), biodiversity & ecosystem protection (BE), cultural and social value (CV), green investment (GV), green trade (GT), green jobs (GJ), green innovation (GN), access to basic services and resources (AB), gender balance (GB), social equity (SE), and social protection (SP).

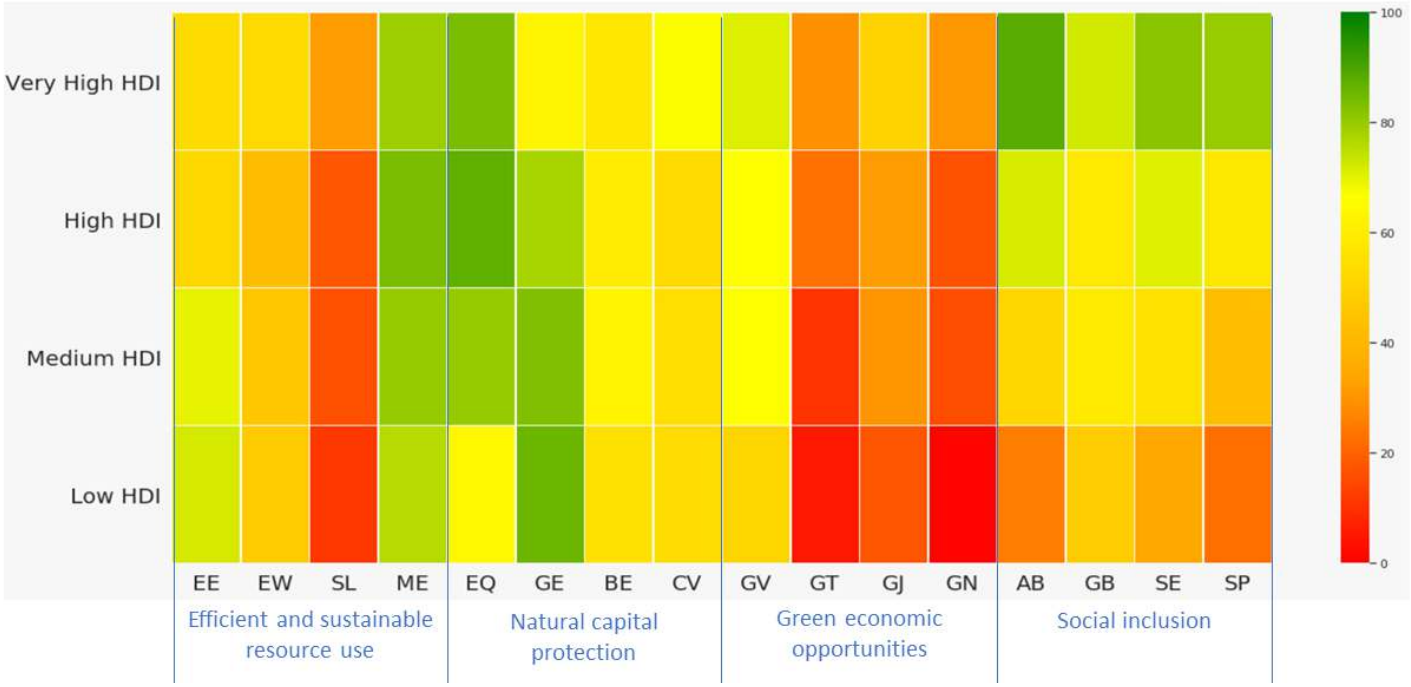
3.4.2 Performance by Income and HDI Groups

Figure 9 shows the country performance in indicator categories based on income and HDI groups, respectively. Countries with high income and very high HDI excel in social inclusion with high to very high scores in the other indicator categories. While the countries in these income and HDI groups have very high scores for access to basic services and resources (AB), they only have high scores for gender balance (GB). However, the scores for gender balance are still significantly higher in comparison to groups with lower income and HDI. Regardless of the levels of income and HDI, all countries receive only low to very low scores for green trade (GT) and green innovation (GN).

The scores for low-income countries are skewed more towards the lower end of the data range, scoring particularly lower in indicator categories such as sustainable land use, green trade, green jobs, green innovation, access to basic services, and social protection (Figure 9a). The trend for upper and lower middle-income countries is quite similar as they perform well in indicator categories such as environmental quality, material use efficiency, and greenhouse gas emission reduction while performing worse in most of the indicators for green economic opportunities. The average performance of low-HDI countries is comparatively low particularly on indicator categories from the dimension for green economic opportunities, sustainable land-use from sustainable and efficient resource use, and access to basic services and social protection from the dimension for social inclusion (Figure 9b). The medium and high HDI groupings follow a similar trend except for the indicator category—sustainable and efficient energy where medium HDI score is skewed towards a higher end of the data range than the high HDI grouping.



(a) Income group



(b) HDI group

Figure 9. Dashboard of indicator categories in each green growth dimensions, by (a) income and (b) HDI groups
Legend:
Efficient and sustainable energy (EE), efficient and sustainable water use (EW), sustainable land use (SL), material use efficiency (ME), environmental quality (EQ), GHG emissions reduction (GE), biodiversity & ecosystem protection (BE), cultural and social value (CV), green investment (GV), green trade (GT), green jobs (GJ), green innovation (GN), access to basic services and resources (AB), gender balance (GB), social equity (SE), and social protection (SP).

3.5 Distance to Targets

3.5.1 Performance on indicators by region

Figure 10 presents average score of the indicators for each green growth dimension by region – Africa, the Americas, Asia, Europe and Oceania. The diagrams show values of 0 to 100, where the latter implies reaching sustainability targets for the indicators.

Efficient and sustainable resource use is essentially about increasing social, economic, and environmental well-being by reducing the per unit of energy, water, land, and raw materials—in other words, doing more and better with less. Africa exhibits the highest level of renewable energy resource use (EE2) and most efficient level of material use (ME2), with the latter very close to reaching sustainability target of 100. This is in part due to a high share (around 70% since 1990) of renewable energy in the total final energy consumption of Sub-Saharan African countries, almost four times the world's total share.[47] In terms of freshwater withdrawal (EW2), most world regions have ratings of at least 60, with Oceania and the Americas being the most efficient and sustainable in using and managing their limited freshwater resources. Domestic material consumption (ME1) and engagement in organic agriculture (SL2), on the other hand, are higher in Europe compared to other world regions. In fact, in 2016, 13.5 million hectares of land in Europe were organically managed,[48] which is almost three times higher than in Asia and almost double that in Latin America and the Caribbean.

Natural capital protection plays a key role in sustaining economic productivity and ensuring social well-being, as the environment provides products and services ranging from timber to fish and even to absorbing pollutants and regulating the climate. Compared with other regions, natural capital protection in Oceania is very promising. The region scores highest in terms of environmental quality (EQ1), greenhouse gas emissions (GE2), biodiversity and ecosystem protection (BE2), and value of cultural and social resources (CV2). The average level of exposure of Oceania's population to concentrations of suspended particulates measuring less than 2.5 microns is 11.27 in 2017 compared to 39.75 in East Asia, 55.67 in Middle East and North Africa, and 44.60 in Sub-Saharan Africa.[49] Further, with a combined coastline of more than 42,000 kilometers, it is not surprising that Australia, New Zealand, and Fiji have high scores for the indicator on cultural and social values, particularly with respect to tourism and coastal recreation.

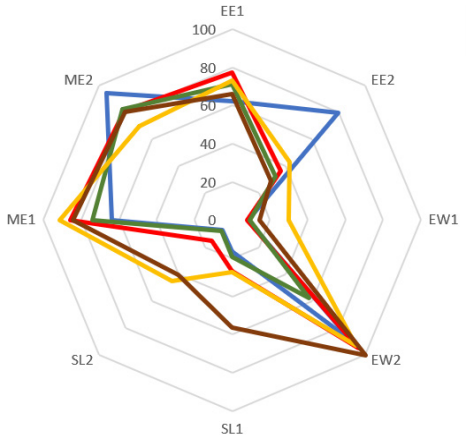
Europe performs highest in indicators for Red List Index (CV1) and Disability-Adjusted Life Years (DALY) rate as affected by unsafe water sources (EQ2). Findings from a spatial analysis showed that the rate of species survival for some mammals, birds, reptiles, amphibians, and fish species in Europe is relatively stable in the region.[l] While having the lowest performance in DALY rate, Africa has an edge over other world regions in reaching its target in municipal solid waste management (EQ3) and carbon dioxide emissions (GE1). In 2014, Sub-Saharan Africa accounted for less than 3% of global average emissions.[li] In terms of solid waste generation, besides the Middle East, North Africa and Sub-Saharan Africa had the lowest level of solid waste generated in 2016.[lii]

Green Economic Opportunities are created through green growth strategies that promote sustainable investments and innovations. Overall, Europe performed best in green economic opportunities, reaching a higher target in green investment (GV1), trade (GT1), employment (GJ1), and innovation (GN1) than other regions. However, the region's target scores in green economic opportunities, with the highest score below 80, are lower compared to those for other dimensions. All regions stand to gain in their efforts to promote green economic opportunities. The African region, which scores lowest, has the greatest potential for improvement,[liii] particularly in development of skills and capacity, and strengthened physical infrastructure.

Social Inclusion, as a multi-dimensional concept, broadly includes but is not limited to having access to basic resources and services (AB1, AB2, AB3), as well as social equity (SE1, SE2, SE3), social protection (SP1, SP2, SP3), and gender balance (GB1, GB2, GB3). In most areas of social inclusion, Europe has reached its target, as most European countries implement programs and initiatives supporting social and economic inclusiveness. Following Europe, the Americas is the next best performing region in terms of social inclusion, with Canada and the United States leading the region. While Asia and Oceania require some improvement in social inclusion indicators, Africa performs poorly relative to other regions in all the social inclusion indicators. In particular, access to quality healthcare and basic services in the rural areas require attention for the region to reach its green growth targets.

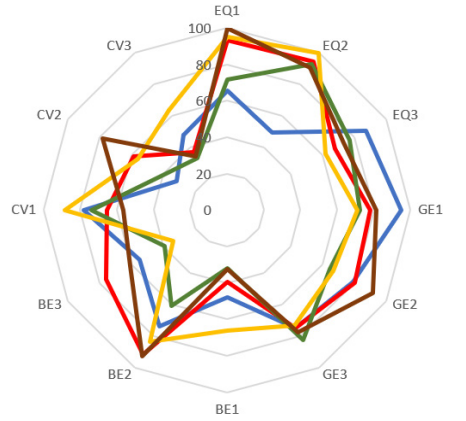
Regions: Africa, America, Asia, Europe, Oceania

Name of Indicators



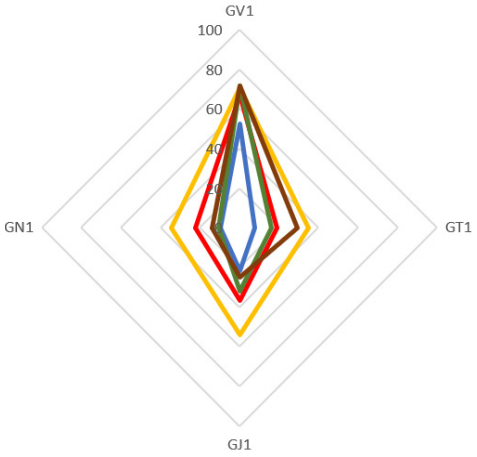
Efficient and sustainable resource use

EE1: Energy intensity (primary energy)
EE2: Share of renewable to total final energy consumption
EW1: Water use efficiency
EW2: Share of freshwater withdrawals to available freshwater resources
SL1: Average soil organic carbon content
SL2: Share of organic agriculture to total agricultural land area
ME1: Total domestic material consumption (DMC) per unit of GDP
ME2: Total material footprint (MF) per capita



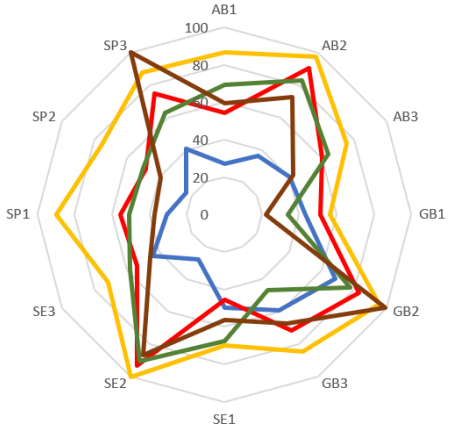
Natural capital protection

EQ1: PM2.5, measured as mean annual population-weighted exposure
EQ2: Disability-Adjusted Life Years (DALY) rate as affected by unsafe water sources
EQ3: Municipal solid waste (MSW) generation per capita
GE1: Ratio of CO2 emissions excl. AFOLU to population
GE2: Ratio of non-CO2 emissions excl. AFOLU to population
GE3: Ratio of non-CO2 emissions in Agriculture to population
BE1: Average proportion of Key Biodiversity Areas in protected areas
BE2: Share of forest area to total land area
BE3: Soil biodiversity, potential level of diversity living in soils
CV1: Red List index
CV2: Tourism and recreation in coastal and marine areas
CV3: Share of terrestrial and marine protected areas to total territorial areas



Green economic opportunities

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



Social Inclusion

AB1: Population with access to safely managed water and sanitation
AB2: Population with access to electricity and clean fuels/technology
AB3: Fixed Internet broadband and mobile cellular subscriptions
GB1: Proportion of seats held by women in national parliaments
GB2: Share of females to males with account in financial institution
GB3: Getting paid, laws and regulations for equal gender pay
SE1: Inequality in income, based on Atkinson
SE2: Ratio of urban-rural access to basic services
SE3: Share of youth not in education, employment or training
SP1: Proportion of population above statutory pensionable age receiving a pension
SP2: Healthcare access and quality index
SP3: Proportion of urban population living in slums

Figure 10. Scores of indicators for the green growth dimensions, by region

3.5.2 Top Country Performance by Region

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 11). Figure 11 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 a score of 100 means the target was reached. Note that many of the targets refer to the SDG targets for 2030 (Appendix 1). Moreover, other targets are not based on the SDGs but on mean values of top 5 performers for a given indicator; this implies that at least three countries have already reached the targets.

Denmark has reached targets for efficient and sustainable water use and green employment. The country 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.[liv] Green jobs are rapidly increasing in Denmark, particularly in the industrial sector.[lv] It 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.[lvi] 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, 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.[lvii] 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. The country is considered unique as far as protection of natural resources is concerned, with protected areas making up 25% of its land area and 54% of its territorial seas.[lviii] It 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% of its GDP to innovation.[lix] 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. The need to promote equal opportunity for indigenous peoples has driven the country's social policy.[lx] 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 GHG emission reductions. Agriculture contributes significantly to GHG emissions and industrial practices contribute to biodiversity degradation. [lxi] 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. The government is actively taking part in preserving wildlife and habitats as part of a strategy for sustainable tourism. [lxii] 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[lxiii] will lead to reduced scores in this area. Moreover, 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[lxiv], 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%), mainly on indicators for social inclusion.[lxv] 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.

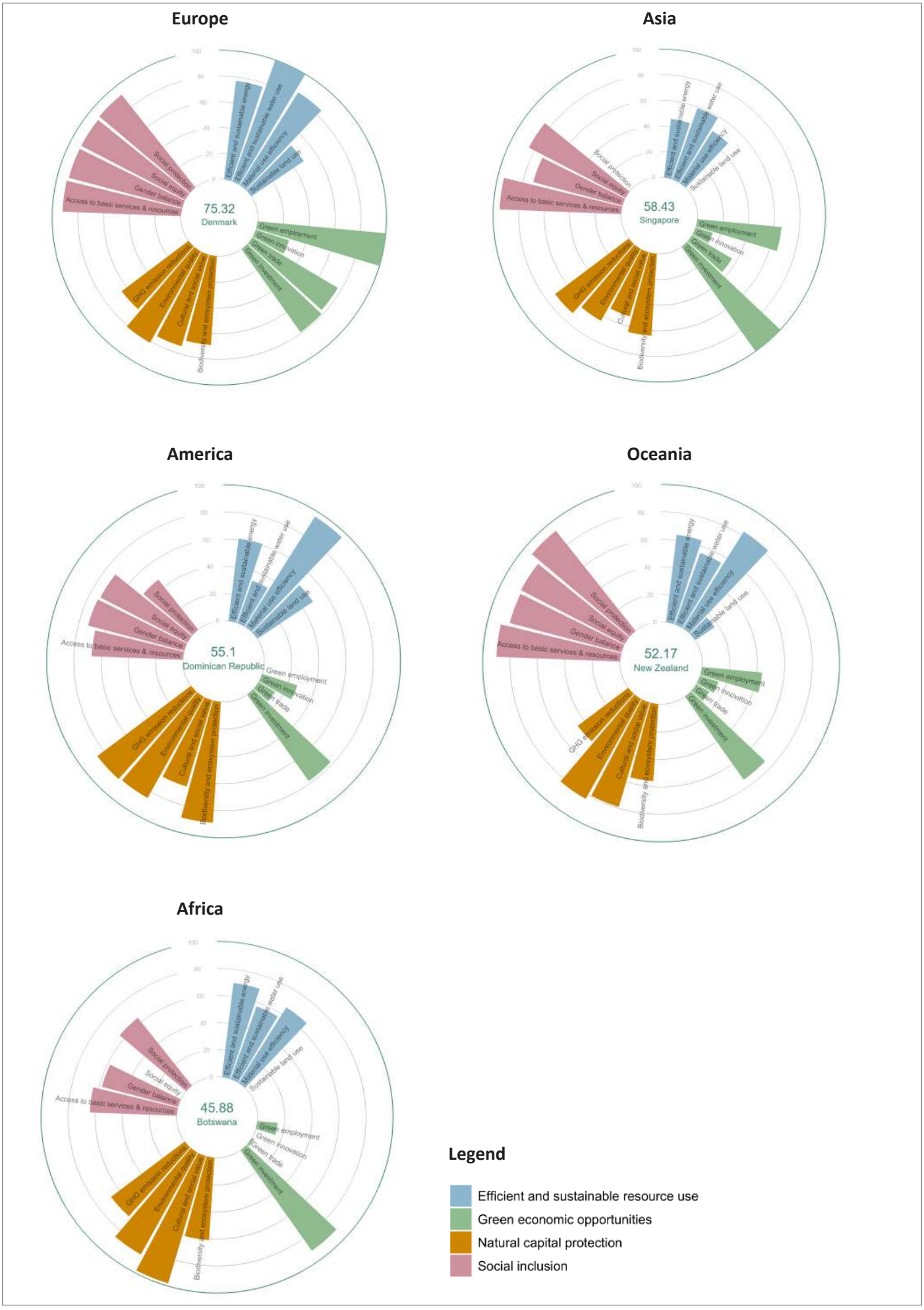


Figure 11. Distance to targets of green growth indicators in top performing countries by region

4 Opportunities for Collaboration

Key message

• Experts from many international development and research organizations have joined the international expert group for the Green Growth Performance Measurement Program, which GGGI formed to support the development of the Index. GGGI will continue to work with the expert group not only to further improve the Index framework and highlight data gaps in green growth indicators, but also to initiate collaboration such as with the United Nations Environment Programme and African Development Bank.

• Experts who participated in the consultation process reflected on opportunities for applications of the Index in their respective countries and regions. GGGI is committed to supporting policymakers and practitioners in applying the Index at the regional, national, and sub-national levels to catalyze green growth transition.

Several opportunities exist for applying and building on the Green Growth Index through new collaborations with international organizations and national governments, including, for example:

1. **Green Growth Index-related Simulation Tool.** The Green Growth Index will be applied to the pilot versions of the GGGI's proposed Simulation Tool, which would depend on the policy relevance of indicators that frame the Green Growth Index. The Simulation Tool provides a link between the green growth indicators and policy scenarios using relevant models. The Tool will allow users to better understand the underlying factors that affect performance, especially at a sectoral level, thus providing them with better knowledge of green growth and the links between policies and performance. Unlike the Index, the Tool will not have global coverage but mainly cover GGGI member countries.

2. **Enhancing the African Green Growth Index.** GGGI and AfDB are collaborating on several green growth-related projects in the Africa region, including the AfDB's African Green Growth Index. The main objectives of the African Green Growth Index collaborative project are to apply GGGI's conceptual and methodological frameworks for green growth to the African context and encourage the use of the Index to measure green growth performance across the region.

3. **Complementing UNEP's Green Economy Progress (GEP) Index.** The GGGI and UNEP have identified interesting complementarity between the Green Growth Index and the GEP Index. Whereas the GEP Index focuses more on progress, the Green Growth Index focuses more on performance. The progress index works with weighting related to working towards specific thresholds, using international standards and conventions (within a relative peer group). The Green Growth Index also uses these standards and conventions as targets for its benchmarking approach. 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 baseline (current) year and past trends. In view of the complementarities, two important opportunities for collaboration could be identified. Going forward, GGGI and UNEP plan to enhance the complementarity of the Green Growth Index and GEP Index, particularly in terms of the indicators, and develop case studies comparing applications in one or two countries.

Sub-national Green Growth Indices. During the in-country and regional consultation workshops, several GGGI member countries expressed interest to apply the frameworks of the Green Growth Index at the national level, identifying indicators and targets that are useful for national planning and policymaking and applying GGGI's consultative process of developing the Index. GGGI is exploring opportunities to support such initiatives at the request of its member countries.

Appendix A. Developing and Validating the Green Growth Index

A.1 Index Development Process

Key message

More than 300 experts representing different organizations from various regions around the world participated in the review of the green growth framework for the Index. Expert feedback was assessed through iterative steps during three phases of Index development since 2017. This feedback was collected through workshops, expert group meetings, consultations, and an online survey.

Iterative Approach

GGGI adopted a thorough process in designing the Green Growth Index through iterative activities including expert consultations, assessment of expert feedback, and quality improvements. GGGI pursued two complementary strategies to enhance the relevance and practicality of the Index in policy making:

1. A stepwise scientific approach through rigorous research to understand the complexity and multi-dimensionality of green growth; and

2. A consultative process involving experts and other stakeholders to determine the policy relevance of the indicators at the national and regional contexts.

Participatory Approach

The stakeholder engagement process was initiated in 2016 and completed in early 2019. The three main phases included:

1. **Phase 1 – Pilot:** GGGI developed a pilot version of the Index covering 34 GGGI member and partner countries.[4] The Index was presented in an international expert workshop at GGGI headquarters in Seoul, South Korea, three in-country stakeholder workshops (in Vietnam, Indonesia, and the Philippines), and an international stakeholder consultation during Global Green Growth Week 2017 in Addis Ababa, Ethiopia. These consultative activities aimed to inform GGGI member countries about the ongoing process of developing the Index and collect initial feedback.

2. **Phase 2 – Regional Consultations:** GGGI presented the revised framework incorporating the preliminary feedback in 2018 in four regional consultation workshops for the Asia-Pacific Region (Bangkok), Middle East (Dubai), Africa (Addis Ababa), and Latin America and the Caribbean (LAC) (Mexico City), as well as an international expert meeting in Geneva. These workshops served as a platform for dialogue and interaction among the stakeholders to ensure a transparent process for improving the Index. Outcomes of the workshops, which were presented during an international expert meeting in Rome, Italy.

3. **Phase 3 – Expert Consultations:** The last phase of the Index development process involved the circulation of the draft technical report on the concept, methods, and applications of the Index to internal and external experts for their review and feedback. GGGI collected expert feedback through an online survey. GGGI also conducted two additional expert consultations—the first with GGGI thematic experts to align the Index to the priority areas of the Institute and the second with selected research institutions and international organizations[5] to validate the sustainability targets. These expert inputs from the online survey and consultations were used to finalize the Index.

[4] *"Members" refer to countries that have submitted their instrument of accession to GGGI and formal membership has commenced while "partner countries" include countries where GGGI has operations and those that have formally communicated their intent to become a Member.*
[5] *IASS, PIK, FAO, SDSN and OECD*

A.1.1. Analytical and Empirical Methods

Stepwise Analytical Approach

In building the Green Growth Index, GGGI applied a stepwise approach that conforms to "good practices" in developing composite indices[lxvi] (Figure A.1). A composite index combines a number of indicators into a single score, which facilitates the comparison, ranking, benchmarking, and monitoring of progress for multifaceted, complex phenomena.

The development of the Green Growth Index followed four key steps:

1. **Concept building** entails defining the objectives of the Index, conceptualizing green growth, and identifying its dimensions and indicators;
2. **Empirical application** requires addressing methodological issues such as indicator selection, data preparation (i.e., scaling, imputation, outliers, correlation), normalization, weights, and aggregation of indicators;
3. **Robustness check** involves assessing explanatory power of the Index through correlation analysis and changes in model inputs and its impacts on aggregation through sensitivity and uncertainty analyses; and
4. **Presentation** focuses on communicating the results at the global, regional, and country scale using various diagrams and tables.

Figure A.1. Stepwise approach for developing the Green Growth Index

Empirical Steps

The Green Growth Index was constructed through aggregation of the indicators (metrics), indicator categories (pillars), and dimensions (goals) (Figure A.1). Prior to the aggregation, several steps were necessary to select, prepare, and validate the indicators included in constructing the Index:

1. **Indicator selection:** Several criteria were applied in the selection of indicators, including the relevance of the data to the green growth dimensions based on conceptual and empirical evidence; the coverage of more than 140 countries (including most GGGI member and partner countries); the availability of time-series data to allow updates of the Index on a regular interval; the accessibility of the data to ensure replication of methods and credibility of their sources; and acceptable level of association with other indicators in the same dimension. In a few cases, however, the criteria for country coverage and time-series data were waived due to a significant lack of data. All data were collected from online sources, mainly published by international organizations.
2. **Data preparation:** Scaling and imputation are the most important methods to prepare the data and improve comparability of the indicators. Scaling the data by an appropriate denominator (e.g., population, gross domestic product [GDP], land area, etc.) allows an objective comparison across small and large countries. Available data for all the indicators were scaled except for the GHG emissions, export of environmental goods, and patents of environmental technology. Imputing data based on available time-series data helps improve the country coverage of the indicators. To minimize effects of imputation on data uncertainty, the simple method of imputing data from the closest years was applied.
3. **Data validation:** The most important methods to validate the statistical appropriateness of the indicator data are to check for outliers and correlation. Since outliers can distort statistical properties and normalized values of the indicators,[lxvii] their values were capped using lower or upper fences based on the interquartile range (IQR) from 75th and 25th percentiles. The aims of the correlation analysis are to identify redundant indicators with very strong correlation to improve explanatory power of the indicators and verify whether indicators have acceptable levels of association in their respective dimensions. Indicators with very strong correlation were excluded from the framework and replaced with ones having acceptable levels of association.

4. **Indicator weights:** The indicators have implicitly equal weights (i.e., no weights are attached to them). The explicit weights of the indicators are not equal because the number of indicators in each indicator category (or pillar) is not equal. The results from Principal Component Analysis (PCA) validated the level of inequality in the explicit weights of the indicators. The results from Analytic Hierarchy Process revealed that there is low consensus among experts on the weights to be assigned to the indicators.

5. **Indicator normalization:** To translate the indicators with different units into a common scale, it is necessary to apply a normalization method. Through normalization, the indicator values measured in different units can be adjusted to a single scale to make the data comparable across the indicators. The re-scaling method (min-max transformation) for normalization was applied for the following reasons: it is the simplest and most widely used method that will facilitate ease of comprehensibility and replication; using upper and lower bounds will reduce issues related to outliers; and integrating targets will allow benchmarking against sustainability targets.

The normalized indicators were used as inputs to the aggregation model (i.e., level 1) as presented. The two most common and simple methods of aggregation include linear aggregation using arithmetic mean and geometric aggregation using geometric mean. These two methods have different underlying assumptions. Linear aggregation allows full and constant compensability, i.e. low values in one indicator can be traded off (substituted) by high values in another. On the other hand, geometric aggregation allows only partial compensability, limiting the ability of the indicators with very low scores to be fully compensated by indicators with high scores. The two methods were applied in the different aggregation models so that, as the level of aggregation increases, the level of substitutability decreases:

1. **Level 1:** Arithmetic mean was applied to linearly aggregate the normalized indicators, allowing compensability of the individual indicators in each indicator category. Moreover, at level 1 of aggregation, countries with more than 25% missing values were dropped.

2. **Level 2:** Geometric aggregation was applied to the indicator categories to allow only partial compensability between indicators in each dimension. Like in level 1, the 25% rule on missing values was applied to dimensions with more than four indicator categories, i.e., resource efficiency and green economic opportunities.

3. **Level 3:** Geometric aggregation was applied on the dimensions and the 25% rule on missing values was not applied. At this level of aggregation, no dimension was allowed to easily substitute the other dimensions to improve the Green Growth Index.

Detailed discussion on the steps involved in constructing the Green Growth Index is provided in chapter 5 of GGGI Technical Report Number 5, *Green Growth Index: Concepts, Methods, Applications* (2019).

A.1.2 Validating and Improving the Index

Composite indices often face criticism because they can be misleading if badly constructed and interpreted.[lxviii] An important final step in developing a composite index is thus the evaluation of the confidence in the model and its underlying assumptions (i.e. robustness check).

Three different types of analyses were conducted to validate the robustness of the Green Growth Index:

1. **Explanatory power:** Using regression models, the ability of the indicators and their aggregated values (i.e., indicator categories, dimensions) to explain the structure of the Index was analyzed.

2. **Sensitivity analysis:** The sensitivity of the Green Growth Index to changes in the input variables of the aggregation model at level 1 was analyzed.

3. **Uncertainty analysis:** The uncertainty analysis evaluates the impact of the assumptions made and methods used to build the model on the Index.

The results from regression models suggested that sufficient variation in the Green Growth Index is explained by the dimensions, indicator categories, and indicators, while those from sensitivity and uncertainty analyses showed that the Green Growth Index is robust with respect to changes in model inputs and assumptions.

Details of the results are provided in chapter 5 of GGGI Technical Report Number 5, *Green Growth Index: Concepts, Methods, Applications* (2019) and GGGI Technical Report Number 9, Green Growth Index: Robustness Check (2019).

A.2 Updating the Index

Key message

There is a large information gap for the green economic opportunities dimension. First, there is no single indicator for it with sufficient data in the SDGs. Second, due to lack of data, only four indicators outside the SDGs could be included for this dimension. Third, among the four dimensions, indicators for green economic opportunities have the largest data gap across all regions. Finally, the concept of "green" economic opportunities remains ill-defined.

Although the necessary steps to validate the indicators and models were practiced, there remain several limitations that need to be addressed when updating the Index in the next years. These limitations are mainly influenced by the lack of data and relevant indicators as well as sustainability indicators.

1. **Indicators and proxy variables:** A big challenge in applying the conceptual framework of the Green Growth Index is finding appropriate indicators to directly measure performance in different green growth dimensions. Out of the 36 indicators, 67% are represented by desired data and the rest are considered "proxy variables." The proxy variables are expected to be replaced as desired data become available. Likewise, additional indicators for efficient and sustainable resource use as well as green economic opportunities will be included 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 lesser number of indicators.

2. **Data availability:** Availability of data is another important challenge that affects not only the inclusion of the indicators (i.e., country coverage, time-series, available to public) but also the scores of the Index (missing data can increase or decrease aggregated values). Due to missing values, the Green Growth Index can be computed only for 115 instead of 207 countries. The data gap is largest for the indicators in green economic opportunities, with Oceania and Africa having as high as 83% and 61% missing values, respectively.

3. **Sustainability targets:** A quarter of the targets for the Index are currently based on mean values of top 5 performing countries, which allow countries to already reach the targets regardless of their performance on the given indicator (e.g., the target for share of export of environmental goods to total export is only 20%, and the target for share of green employment in total manufacturing employment is only 14%). Moving forward, sustainability targets for the indicators that are not included in the SDGs should have valid and sufficient basis. There will also be a need for a common interpretation of implicit SDG targets.

4. **Data scaling:** Whenever relevant and available, SDG indicators were used in the framework of the Green Growth Index. Using SDG indicators has an advantage with respect to policy relevance and by providing sustainability targets. However, some of SDG indicators do not have the appropriate denominator (e.g., population, GDP) to measure green growth performance. For example, domestic material consumption (DMC) per GDP and material footprint (MF) per capita are low in low-income countries. Low values in these indicators do not reflect material use efficiency but low development of materially inefficient industries, and the dependence of the economies on agriculture or oil production. The SDG indicators will need to be validated in terms of their alignment to the concept of green growth and, if necessary, improve the unit for data scaling.

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