MSc Program
Engineering Management

Review and a Methodological Comparison of Green Economy and Green Growth Measurement Tools

A Master's Thesis submitted for the degree of
“Master of Science”

supervised by
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Affidavit

I, **DIPL.-ING. URŠKA MÖREC**, hereby declare

1. that I am the sole author of the present Master's Thesis, "REVIEW AND A METHODOLOGICAL COMPARISON OF GREEN ECONOMY AND GREEN GROWTH MEASUREMENT TOOLS", 93 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted the topic of this Master's Thesis or parts of it in any form for assessment as an examination paper, either in Austria or abroad.

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Abstract

In the last decade, there has been a societal paradigm shift towards sustainability and nations have been transforming their economies by adopting greener practices. Consequently, society members and stakeholders involved in policy design and implementation, need to be acquainted and understand terminology related to sustainable development and emerged green concepts – green economy, green growth and green industry. On the ground that there is no commonly agreed definitions of green economy, green growth and green industry, the author reviews existing literature and recent publications for most cited definitions and outlines the essential relationships between the concepts of sustainable development. Secondly, assessment of data availability is done for fourteen sustainable development indicators from the UN´s Agenda 2030. The assessment confirms the lack of quality data and the need for financial and technical support for monitoring green economy in less developed countries. We review existing green economy and green growth measurement tools and determine that composite indexes are best suited for capturing the complexity of green concepts. We compare country rankings by individually applying five composite indexes (Human Development Index (UNDP), Green Economy Progress (PAGE), SDG Index (SDSN), Environmental Performance Index (Yale) and Global Green Economy Index (Dual Citizen LLC)) and determine frequency of countries ranking top or bottom ten by individually applied composite indexes. We use Pearson correlation method to assess correspondence between the five green economy and green growth composite indexes. Assessment shows highest correspondence score between GEP index and HDI, and we find lowest coherence between GGEI and EPI. This thesis aims to improve the understanding of terminology related to concepts of sustainable development, emphasizes on relevance of monitoring and stresses the importance of choosing the right tools for measuring green concepts – green economy and green growth.

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List of Contents

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List of Figures

List of Tables

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Abbreviations

CI	Composite Index
GEC	Green Economy Coalition
GEP	Green Economy Progress
GGEI	Global Green Economy Index
GGGI	Global Green Growth Insititute
GGKP	Green Growth Knowledge Platform
GMM	Generalized moments method
GNI	Gross National Income
HDI	Human Development Index
IISD	Institute of Inclusive Sustainable Development
OECD	Organization for Economic Cooperation and Development
PAGE	Partnership for Action on Green Economy
SDG	Sustainable Development Goals
SDSN	Sustainable Development Solutions Network
UN	United Nations
UNCTAD	United Nations conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNIDO	United Nations Industrial Development Organization
WB	World Bank
WCED	World Commission on Environment and Development
WE	World Economic Forum

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1 INTRODUCTION

Fast growing population and related increasing pressure on the environment are affecting global sustainability. Key challenges concern global issues connected with environmental change (air and water pollution, soil degradation, water scarcity, collapsing fish stock, biodiversity loss and climate changes) and lack of tools for addressing these concerns. For many years, countries have been disabled in preventing the negative effects of their economic growth on social and environmental dimensions of sustainable development. Reasons for that may also lay in uncertainty of leaders, policy makers and other stakeholders. Firstly, the concept of sustainable development and concepts submerged from it – like green economy, green growth and green industry, are fairly confusing and it may take time for everyone involved to fully understand them. Secondly, policy makers and industry leaders need to be able to choose the right measurement tools for monitoring green concepts for countries or industries. Without successful tracking of trends and analysing the results, progress is not possible, and risks can be ignored for an extended time.

A commonly agreed definition of green economy and green growth do not exist. While reviewing existing literature we found at least nine separate definitions of green economy and at least thirteen separate definitions of green growth. To address the challenging terminology and differences between concepts arisen in the context of sustainable development, we explore the essential relationships between those concepts and highlight most commonly used definitions. All green concepts aim to improve human well-being and social equity, while reducing environmental risks and ecological scarcities. Green growth follows those same principles requesting economic development (growth) to be aligned with environmental sustainability (green) without undermining social equity (inclusive). Nonetheless all similarities, it is important not to use the green concepts interchangeably and to understand in what context one or the other can be used. Similarly, tools for measuring green principles on a national level should be chosen based on good founding and understanding. Without effective monitoring, it will be difficult for countries to assess their green economy status and influence their environmental and industrial policies. An effective “green concept measurement tool” to be used on a national level needs to cover all dynamic interactive relationships between green indicators and safeguard all sustainable development principles – environmental impact, social equalities and economic development.

The measurement tools to assess environmental impact, social equalities and economic development separately are well-documented and well-established. For example – CO_2 emissions for measuring environmental impact, life expectancy to assess social equalities and Gross Domestic Product (GDP) to track economic development, are all used on a daily basis while assessing country standing in regard to those terms. As a contrast, measurement tools (frameworks, composite indexes, dashboards and adjusted economic measure) that cover all dimensions of green concepts are not yet at a stage where one framework, composite index, dashboard or economic adjusted measure would be globally used. Most

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embraced common agenda at the moment is the United Nations (UN) Resolution 70/1, 'Transforming our World: The 2030 Agenda for Sustainable Development'. The 2030 Agenda was adopted in 2015 and at its core are the 17 Sustainable Development Goals (SDGs), which are constituted of 169 indicators. Obviously all goals interact, however the concept of green economy relates mostly to Goal 5 which is 'to achieve gender equality and empower all women and girls', Goal 6 set to 'ensure availability and sustainable management of water and sanitation for all', Goal 7 'ensure access to affordable, reliable, sustainable and modern energy for all', Goal 8 promoting 'sustained inclusive and sustainable economic growth, full and productive employment and decent work for all'; Goal 9 which is 'to build resilient infrastructure, promote inclusive industrialization and foster development', Goal 11 'make cities and human settlements inclusive, safe, resilient and sustainable' and Goal 12 which aims to 'ensure sustainable consumption and production patterns'.

Nevertheless, countries should monitor all SDG´s equally and oversee their performance towards reaching the common goals with quality information (data). That is however, for countries still in development not always accessible, as they lack technical knowledge and financial ability to establish well-running national statistical systems (NSSs). The UN´s pilot project in six countries – three in Africa and three in Asia finds that only data for 40 (20 percent) of the global SDG indicators are currently available. 47 global indicators (23 percent) have a potential data source and could be feasible and the remaining 57 percent of the indicators will only be available through enhancing statistical capacities of countries.

Monitoring efforts and selecting the right measurement tool can be critical on a countries path to successful transformation towards green economy and therefor – sustainable development. Using one or the other tool can give decisions-makers false ideas and bring them to wrongful conclusions. Inaccurate assessment can fail to highlight potential development areas and lead governments and policymakers to false policy design. All participants that can potentially influence a country on its path to sustainable development – governments, industry leaders and general public as well, need to have good understanding of concepts related to sustainable development. Furthermore, participants who are actively involved in social, environmental and industrial policy design and implementation should be aware of the importance of choosing the right tools for monitoring national performance in the context of sustainable development.

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2 CONTEXT OF GREEN ECONOMY AND GREEN GROWTH

2.1 Chapter review

This chapter clarifies main differences between terms sustainable development, green growth and green economy and outlines the essential relationships between them. Green growth, green economy and green industry are only few of the concepts that have evolved through years in the context of sustainable development. Governments and policy makers first recognized green growth as a concept in year 2012 at the Rio + 20 Conference. In the same year, the World Bank published the report titled ´Inclusive Green Growth: The Pathway to Sustainable Development´, to support decision making in this fairly unknown concept. The World Bank's publication emphasizes that greening growth is necessary, efficient and should be affordable. The way forward requires a blend of economics, politics and social psychology and will be diverse, as there is no single green growth model that can be applied globally. Green growth should be accelerated with inclusive policies and cover all dimensions of sustainable development. There is no commonly agreed definition of green economy and at least nine separate definitions were identified in recent publications. Furthermore, at least thirteen separate definitions of green growth were discovered. Green economy and green growth follow the same principles, requesting economic development (growth) to be aligned with environmental sustainability (green) without undermining social equity (inclusive). In this context, inclusive green growth is meant to accelerate investments and innovation that drive green economy and underpin sustainable development. Like green economy and green growth, inclusive green growth requires transformation of economies and a transition towards cleaner, low-carbon, resource efficient and resilient economic systems, while not forgetting about social inequalities.

2.2 Green Economy and Green Growth

Most common and widely cited definition of the term sustainable development was published in United Nation's Report "Our most common Future" in 1987. The concept gained international recognition and interest after the Rio de Janeiro Earth Summit in 1992, where Agenda 21 was adopted. Today, the term sustainable development is widely used and several definitions of it can be found. However, the UN's definition from 1987 remains the most quoted (IISD, 2019). Sustainable development is development "that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED (UN), 1987).

Throughout the years many other concepts – like green growth and green economy, have evolved in the context of sustainable development. These concepts are considered a subset of sustainable development. The term green growth was initially used in June 2009 in South Korea, where the National Strategy for Green Growth and the 5-Year Plan for Green Growth were introduced. At the same time, members of

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Organization for Economic Co-operation and Development (OECD) commenced work on its green growth strategy. Their mission was to encourage economic growth without damaging the environment (UNESCAP, 2012). Twenty years after the Rio de Janeiro Earth Summit at the Rio+20 Conference, the concept of green growth was recognized by governments and policy makers as one of the means towards reaching all dimensions of sustainable development. In the same year – 2012, the World Bank published the report titled Inclusive Green Growth: The Pathway to Sustainable Development, to support decision making in this changing development concept. According to their definition, green growth is growth that is efficient in its use of natural resources, clean in that minimizes pollution and environmental impacts and resilient in that it accounts for natural hazards. Going forward, inclusive green growth attempts to cover economic growth, environmental sustainability and social inclusiveness and provide solutions to the joint objectives of all dimensions of sustainable development (GGKP, 2016 & Narloch et al, 2016). Analytically, inclusive green growth calls for collective action and applies richer and more diverse set of solutions for counterproductive practices. Green growth should be complemented by inclusive policies to cover all dimensions of sustainable development. The World Bank's publication emphasizes that greening growth is necessary, efficient and should be affordable. The way forward requires a blend of economics, politics and social psychology and will be diverse, as there is no single green growth model that can be applied globally (The World Bank, 2012). Kasztelan (2017) describes green growth as followed: "Green growth is economic growth which contributes to rational utilization of natural capital, prevents and reduces pollution, and creates chances to improve the overall social welfare by building green economy, and finally makes it possible to enter on the path towards sustainable development." There is no internationally agreed definition of green growth and at least thirteen separate definitions were identified in publications (UNDESA, 2012).

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities (OECD, 2011b).

Green growth is closely connected with the idea of green economy oriented at increased overall social welfare and social justice and is at the same time considerably reducing environmental risks and ecological deficiencies (UNEP, 2011). The term green economy was first coined in 1989 in the report titled Blueprint for a Green Economy for the Government of the United Kingdom. However, apart from the term being used in the title there is no further explanation of the concept (Pearce et al, 1989). The term was revived in 2008 with UNEP launching its Green Economy Initiative to provide political and policy support for investment in green sectors and greening resource and pollution inefficient sectors (UNEP, 2011). There is no commonly agreed definition of green economy and at least nine separate definitions were identified in recent publications (UNDESA, 2012).

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Green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive (UNEP, 2011).

Aims of both concepts (green growth and green economy) are to identifying possibilities of improving economic activities, without threatening the environment and increasing social inequalities. Both concepts target the existing climate problems and increasing deficiency of natural resources by encouraging resource and energy efficient technological innovations. Furthermore, both concepts have been criticized for the same reasons. Authors question the ability of green growth and green economy to shift paradigm and suggest they are yet another spin to cover up inconsistencies between economic and environmental objectives of the governments. Nonetheless all similarities, using these terms interchangeably is not encouraged. It would be more effective to have one clear and internationally agreed upon concept, as at the moment, relevant terminology is a subject to different and sometimes contradictory interpretations. Ten Brink et al (2012) describe a clear hierarchy of sustainable development concepts in The Economics of Ecosystem and Biodiversity green economy report. Hierarchy describes 'Green New Deal' as a catalyst for green growth, which in turn is a contribution to green economy. Moreover, green economy is then outlined as a mean towards achieving sustainable development. The United States, China and South Korea named their policy packages 'Green New Deal'. These packages included green fiscal stimuli meant to boost green economy.

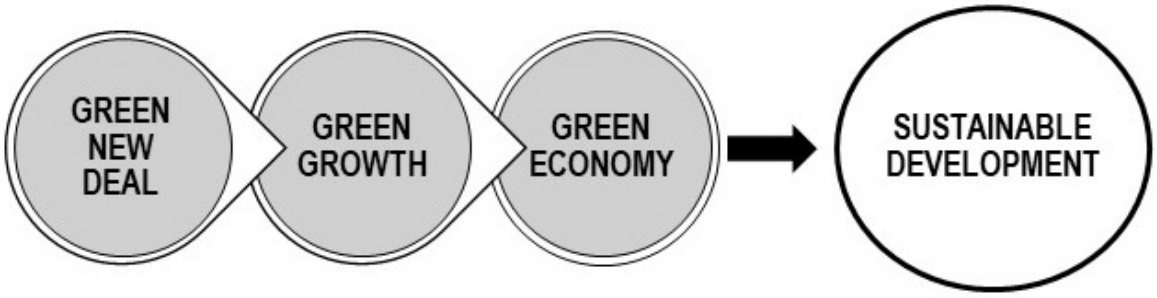

Figure 1: Hierarchy of green concepts (Ten brink, 2012)

Following Ten Brink's hierarchy there is no conceptual inconsistency, however Georgeson et al. (2017) affirm that the terms green economy and green growth are rarely used in alignment with this hierarchy. Differences between green growth, inclusive green growth and green economy have been discussed in research papers and official publications by various international agencies and authors (Bowen et al, 2012; UNDESA, 2012; Ryszawaska, 2015; Kanianska, 2016; Kasztelan, 2017; Georgeson et al, 2017; Dornan et al, 2018).

Green growth and green economy are concepts that developed alongside each other and it is hardly a surprise that they draw so many similarities. The main differences concern the coverage of the

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environmental challenges and the scope of their definition within the relevant concept. Green growth and green economy follow the same principles, requesting economic development (growth) to be aligned with environmental sustainability (green) without undermining social equity (inclusive). In this context, inclusive green growth is meant to accelerate investments and innovation that drive green economy and underpin sustainable development. Like green growth and green economy, inclusive green growth requires transformation of economies and a transition towards cleaner, low-carbon, resource efficient and resilient economic systems, while not forgetting about social inequalities.

Industrialization and manufacturing are known catalysts for growth (Kaldor, 1960). Classical growth theory describes the relationship between human capital (A), physical capital (K) and labour (L), but does not assign any productive role to the environment (Solow, 1956). Classical growth theory is described by the following function:

$$(Y) = f(A, K, L) \quad (1)$$

with

Y … output
A … human capital
K … physical capital
L … labour

The advanced approach to the classical growth theory includes environment (E) that becomes natural capital and is directly needed for growth (OECD, 2011):

$$(Y) = f(A, K, L, E) \quad (2)$$

E … environment

Accelerated industrialization remains the main driver for creating income and jobs. The way countries industrialize matters (Cantore et al, 2017) and literature points out manufacturing is the most important sector in the economy relative to agriculture and service sectors (UNIDO, 2018). Cantore et al (2017) provide evidence supporting the role of manufacturing by employing Generalized Method of Moments (GMM) techniques on a sample of 80 countries for the period 1980-2010. The authors address two questions applying GMM technique:

(1) Is manufacturing still the engine of growth? And

(2) If manufacturing is still the engine of growth, which is the best fuel?

While service sectors have been expanding, the share of manufacturing value added to global value added has steadily declined for the last 30 years. However, this trend mainly describes the situation of high-income countries. Lin et al (2018) rationalize that first, productivity has increased, second, high standards

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in advanced economies have forced many industries to delocalize their production to lower-cost nations and third, demand for services (healthcare, security, transportation) has increased. The latter also reflect on employment, as manufacturing jobs have a multiplier effect on employment in services – development of industries accelerates a variety of economic activities (eg. Housing, hospitality, entertainment). In addition, a study by the US Department of Commerce, Bureau of Economic Analysis, shows than in the US manufacturing has a higher and multiple effect on economy with $1.40 in additional value for every $1.00 in manufacturing value added (WEF, 2014).

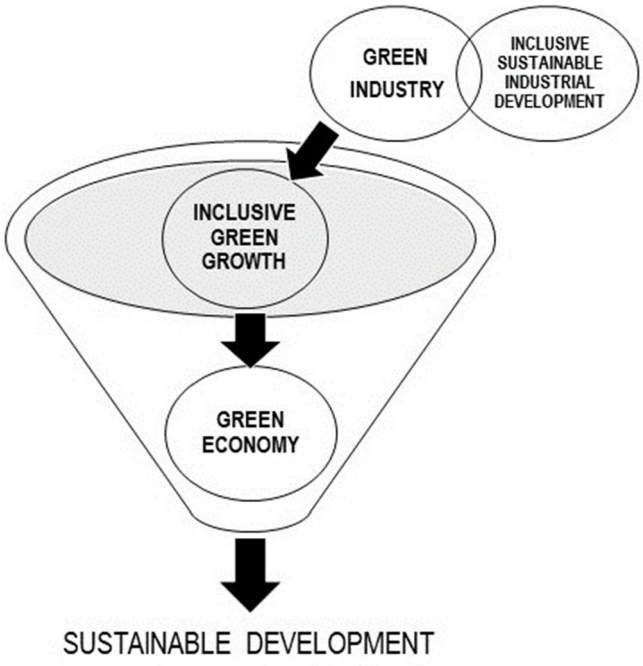

Figure 2: Relationship between green concepts and sustainable development. (OECD, 2012)

Nonetheless, industrial development generally comes with high costs for the environment. The challenge remains to decouple growth and revenues from increasing resource use and pollution. Countries aim to close resource cycles and minimize waste and at the same time utilize renewable resources as input materials and energy. To ensure inclusive green growth and in turn green economy, countries must enable industries with the right incentives. The green industrial policy and how it can be a driver for green economy transformation is outlined in the “Green Industrial Policy: Concept, Policies, Country Experiences” report prepared by UNEP and German Development Institute/Deutsches Institute für Entwicklungspolitik (DIE). The joint publication highlights the social, environmental and economic co-benefits of green industrial policy.

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3 GREEN ECONOMY MEASUREMENT FRAMEWORKS

3.1 Chapter review

Socioeconomic measurements (such as GDP or Life-expectancy) are already well-documented and developed, which is not the case for measurement tools covering interactive relationships of environmental, social and economic dimensions of sustainable development. Mapping green economy is required for defining appropriate policy responses and assess the potential policy impacts (OECD, 2011). Furthermore, without effective measurement, it will be difficult to assess the influence of relevant policies and therefore measure the transformative role of inclusive green growth towards achieving green economy and the common SDGs (Georgeson et al, 2017). Naturally, the complexity of measurement and monitoring of green growth and green economy is high, since it combines measurements of economic, social and environmental dimensions and interactions between them (GGKP, 2016). Approaches to assess green growth vary by methodology and researcher (Narloch et al, 2016). Green Growth Indicators (OECD, 2017) framework is the most widely used green growth assessment tool using dashboard approach and a set of indicators. Ecologic footprints, such as Global ecological footprint (Global Footprint Network, 2018) and Global resource footprint (Tukker et al. 2016) are mostly applied at the national level to serve as a tool for identifying key ecological issues. For measuring green growth and green economy, composite indexes are best suited to capture the multi-dimensional nature of greening and to synthesize the information captured by the aggregated indicators (OECD, 2017). GGKP's Working Paper 'Measuring Inclusive Green Growth at the Country Level' outlines all main measurement themes and approaches relevant for inclusive green growth, followed by identifying indicators available for tracking progress and addresses gaps in investment, indicator development and data (GGKP, 2016).

3.2 The role of green economy measurement frameworks

The definitional examination shows that inclusive green growth is an admirable concept. However, admirable concepts should be supported with policy frameworks that balance the demands of environment and the economy. Green policy requires continual assessment in order to be effective and efficient (OECD, 2011). Georgeson et al (2017) give an example of a feedback loop for the role of measurement in delivering green growth (Figure 3).

Measuring green economy serves a wide range of purposes in the policy making process. To measure the present state, it serves as a tool for running diagnostic and assessing current state. It enables policy makers to identify challenges and opportunities. It serves in creation of baseline against which to compare historical developments and creation of long-term targets aligned with domestic priorities. Based on priorities, the appropriate response in the form of a relevant policy is designed. Measurement informs the

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choice of policy response. Once policy is implemented, indicators can be applied to track progress and assess impacts of policy action. Frequent assessment also helps identifying positive and negative trends and supports further decision making (UNEP, 2014 & GGKP, 2016).

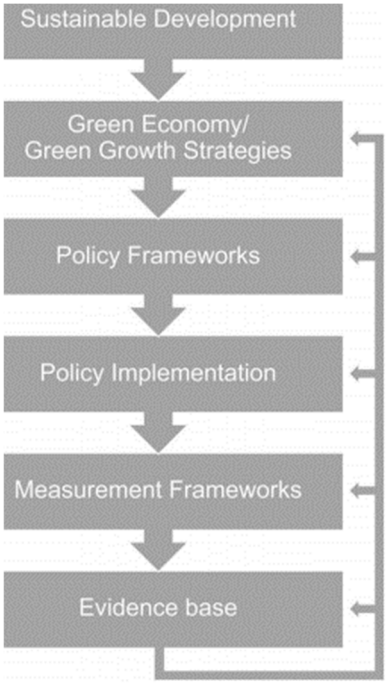

Figure 3: The role of measurement in delivering green growth (Georgeson et al, 2017).

3.3 Green measurement approaches

The complexity of green economy monitoring tools is high, since they need to combine measurements of economic, social and environmental dimensions and need to take into account the interactions between them. Measurement approaches are classified into four categories; (1) Dashboards, (2) Composite Indices, (3) Footprints and (4) Adjusted or extended economic measures of GDP, saving and wealth.

Most widely used measurement approaches with examples of global initiatives are described in Table 1 GGKP (2016).

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Table 1: Green measurement approaches with examples of global application adapted from OECD (2014) and GGKP (2016).

Approach	Global-level initiative examples
(1) Dashboards	Green Growth Indicators (OECD)
	Sustainable Development Indicators (Eurostat)
(2) Composite Indices	Green Economy Progress Index (UNEP)
	Global Green Economy Index (Dual Citizen LCC)
	Yale Environmental Performance Index (Emerson et al)
	WEF Sustainability-adjusted Global Competitiveness Index (Greenhill)
	Competitive Industrial Performance (UNIDO)
	Green Industry Performance (UNIDO)
	Green Industry Progress (UNIDO)
	Human Development Index (UNDP)
	SDG9 (UNIDO)
(3) Footprints	Global Ecological Footprint (Global Footprint Network)
	CO_2 emissions embodies in international trade (OECD)
	Carbon footprint (UNEP)
	Global Resource Footprint (Tukker et al)
(4) Adjusted Economic Measures	Index of Sustainable Economic Welfare (Daly & Cobb)
	Inclusive Wealth (UNEP)
	Environmentally adjusted multifactor productivity (OECD)
	Genuine Progress Indicator (Talberth, Cobb & Slattery)

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3.4 Green economy measurement tools

(A) Dashboards

Dashboards seem to be most widely used measurement tool on a national level. Dashboards can combine various types of indicators from diverse classification and therefor allow a very broad assessment. That means dashboards allow indicators to also be expressed in several different units and combine numerous indices. Dashboard approach allows the user to decide which indicators are important and what are the relevant relationships between them. Dashboards allow even the combination of regional and national data and are not conditioned by converting the data into common metrics. However, large number of diverse indicators in several units means that it can be challenging to read the data and interpret results (GGKP, 2016). OECD suggests limiting dashboards to a subset of headline indicators for simplified interpretation and drawing on trends (OECD, 2012).

Figure 4: Simplified dashboard typology (different units without hierarchy: US dollars ($), kilograms (kg), hectare (ha)) (adapted from GGKP, 2016).

(B) Composite Indexes

Composite indexes work quite differently compared to dashboards, as they require aggregating different metrics into one. Several indicators need to be translated into one single index, through weighting and aggregation. Main criticism of composite indices is that the weighting of relevant indicators is arbitrary and there is no straightforward way to aggregate the relevant indicators. Composite indices on national level have mostly fixed aggregation methods (across time and countries), which does not allow differentiating priorities among countries or even historically (Ravallion, 2012).

'Composite indexes aggregate different metrics into one, by scoring and weighting the underlying indicators.' (OECD, 2014)

Number of researchers claim composite indices (CIs) are best suited for describing high complex concepts such as green economy. CIs are used for describing multiplex relationships and measures, but are defined as a simplistic presentation of performance in given areas (OECD, 2014). CIs are widely used for tracking economic development over time and across countries. Most frequently used and known to general public is GDP (gross domestic product) index (Ravallion, 2011).

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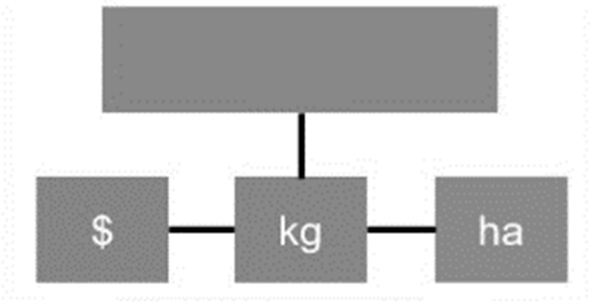

Figure 5: Simplified composite index (monetary value ($) + kilogram (kg) + hectare (ha) = aggregated into one single measure) (adapted from GGKP, 2016).

(C) Footprints

Footprints are similar to composite indices, as they also provide a single measure aggregating more than one indicator. Footprints describe preferred selected phenomena in a selected sector (for example: economy or environment) and can only be calculated on a national level. The theory is that footprints describe a limit of what is sustainable for a country in term of planetary boundaries. General definition of footprints is as follows,

´Footprint is a metric that indicates how much of the existing biological capacity (eg. land) is used to support economic activities and human needs.'

Figure 6: Simplified footprint typology (indicating how much of the biological capacity (land in hectare) is used to support economic activities and human needs) (adapted from GGKP, 2016).

(D) Adjusted Economic Measures

Adjusted or extended economic measures express a single monetary metric derivered through an adjustment of a selected economic variable (eg. GDP, savings and wealth) with monetary valuations of developments related to broader environmental and social sustainability. A simplified example is the improved "green" GDP metric, which is the standard GDP measure corrected with the value of increasing

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or decreasing activities, such as for example, natural resource degradation. If all changes in nature/environment can be valued with exact accuracy in capital form, then this approach can provide a comprehensive metric for tracking the selected status (GGKP, 2016). Notwithstanding, valuation of non-marketed goods and services (eg. scenic landscapes, amenities) is complex and accompanied with many philosophical and political objections. Natural and human capital should not be capitalised or monetized, therefor this praxis is questionable (GGKp, 2016).

Figure 7: Adjusted or extended economic measures (For example: GDP + wealth and savings – debt = single monetary value) (adapted from GGKP, 2016).

3.5 Main themes and actors for measuring green economy on a national level

For measuring green economy there is no general rule, which countries should follow. Each country should choose a measurement approach with indicators that best suit its needs and capacities. Regular assessment of country's performance must be done to track current status and potential risks and only then national progress is possible (GGKP, 2016). This assessment must be done through an appropriate set of indicators, covering all themes connected to sustainable development fit into the context of the specific country.

GGKP (2016) analyzed green measurement approaches and identified five main themes of relevance for measuring green economy on a national level;

Table 2: Five main themes for measuring green economy on a country level adapted from GGKP (2016).

1	**Natural assets**
2	**Resource efficiency**
3	**Risks and resilience**
4	**Economic opportunities/ efforts**
5	**Inclusiveness**

These themes do not come in hierarchical order and they may vary depending on country's priorities. A country may choose indicators relevant to its context and the indicators may fall into one or more categories (themes). Examples of existing indicators with different measurement categories for each

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theme are extensively described in GGKP's Working Paper: 'Measuring Inclusive Green Growth at the Country Level' (2016).

Currently most widely used sets of indicators are from the UN General Assembly's Resolution 70/1, 'Transforming our World: The 2030 Agenda for Sustainable Development'. The agenda was adopted in 2015 and at its core are the 17 Sustainable Development Goals (SDGs), which are constituted of 169 indicators (Figure 4). Several organizations have made propositions for potential indices to measure progress to achieve SDGs – Sustainable Development Network, Inter-Agency Expert Group, United Nations Statistical Division (Alba & Todorov, 2018).

Figure 8: Sustainable Development Goals (UN, 2015).

Main actors in promoting and developing the potential of green concept are international organizations, who also encourage countries to track their green economy status (UNDESA, 2012).

International organizations most active in different branches of sustainable development (UNDESA, 2012):

- United Nations Environment Programme (UNEP),
- United Nations Department of Economic and Social Affairs (UNDESA),
- United nations conference on Trade and Development (UNCTAD),
- United Nations Industrial Development Organization (UNIDO),
- Organisation for Economic Cooperation and Development (OECD),

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- World Bank (WB),

- Global Green Growth Institute (GGGI),

- Green Economy Coalition (GEC),

- The Green Growth Knowledge Platform (GGKP).

All of these agencies have made significant contributions in development of green economy measurement frameworks. OECD proposed a set of green growth indicators (Table 3) (OECD, 2014). The proposed set is regularly reviewed by OECD member countries and updated accordingly, especially with the availability of new data. The OECD indicators require country context to acquire their full meaning. OECD's list of indicators includes main and proxy indicators and each of the indicators is accompanied by an evaluation of the measurability of the underlying data.

Table 3: OECD´s list of green growth indicators (OECD, 2014).

Environmental and resource productivity	CO2 Productivity	Production-based CO2 productivity, GDP per unit of energy-related CO2 emissions
		Production-based CO2 intensity, energy-related CO2 per capita
		Production-based CO2 emissions, index 2000=100
		Production-based CO2 emissions
		Demand-based CO2 productivity, GDP per unit of energy-related CO2 emissions
		Demand-based CO2 productivity, disposable income per unit of energy-related CO2 emissions
		Demand-based CO2 intensity, energy-related CO2 per capita
		Demand-based CO2 emissions
	Energy productivity	Energy productivity, GDP per unit of TPES
		Energy intensity, TPES per capita
		Total primary energy supply, index 2000=100
		Total primary energy supply
		Renewable energy supply, % TPES
		Renewable electricity, % total electricity generation
		Energy consumption in agriculture, % total energy consumption
		Energy consumption in services, % total energy consumption
		Energy consumption in industry, % total energy consumption
		Energy consumption in transport, % total energy consumption
		Energy consumption in other sectors, % total energy consumption
	Non-energy material productivity	Non-energy material productivity, GDP per unit of DMC
		Biomass, % of DMC
		Non-metallic minerals, % of DMC
		Metals, % of DMC
		Nitrogen balance per hectare

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		Phosphorus balance per hectare
		Municipal waste generated, kg per capita
		Municipal waste incinerated, % treated waste
		Municipal waste recycled or composted, % treated waste
		Municipal waste disposed to landfills, % treated waste
	Environmentally adjusted multifactor productivity	Environmentally adjusted multifactor productivity growth
		Contribution of natural capital
		Adjustment for pollution abatement
Natural asset base	Freshwater resources	Total renewable freshwater per capita
		Total freshwater abstraction per capita
		Water stress, total freshwater abstraction as % total available renewable resources
		Water stress, total freshwater abstraction as % total internal renewable resources
		Permanent surface water, % total surface
		Seasonal surface water, % total surface
		Conversion of permanent water to not-water surface, % permanent water, since 1984
		Conversion of permanent to seasonal water surface, % permanent water, since 1984
		Conversion of not-water to permanent water surface, % permanent water, since 1984
		Conversion of seasonal to permanent water surface, % permanent water, since 1984
	Land resources	Natural and semi-natural vegetated land, % total
		Bare land, % total
		Cropland, % total
		Artificial surfaces, % total
		Water, % total
		Loss of natural and semi-natural vegetated land, % since 1992
		Loss of natural and semi-natural vegetated land, % since 2004
		Gain of natural and semi-natural vegetated land, % since 1992
		Gain of natural and semi-natural vegetated land, % since 2004
		Conversion from natural and semi-natural land to cropland, % since 1992
		Conversion from natural and semi-natural land to artificial surfaces, % since 1992
		Conversion from cropland to artificial surfaces, % since 1992
		Built up area, % total land
		Built up area per capita
		New built up area, % since 1990

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		New built up area, % since 2000
	Forest resources	Forests under sustainable management certification, % total forest area
	Wildlife resources	Threatened mammal species, % total known species
		Threatened bird species, % total known species
		Threatened vascular plant species, % total known species
Environmental dimension of quality of life	Exposure to environmental risks	Mean population exposure to PM2.5
		Percentage of population exposed to more than 10 micrograms/m3
		Percentage of population exposed to more than 35 micrograms/m3
		Mortality from exposure to ambient PM2.5
		Welfare costs of premature mortalities from exposure to ambient PM2.5, GDP equivalent
		Mortality from exposure to ambient ozone
		Welfare costs of premature deaths from exposure to ambient ozone, GDP equivalent
		Mortality from exposure to lead
		Welfare costs of premature deaths from exposure to lead, GDP equivalent
	Access to drinking water and sewage treatment	Population with access to improved sanitation, % total population
		Population connected to public sewerage, % total population
Economic opportunities and policy responses	Technology and innovation: Patents	Development of environment-related technologies, % all technologies
		Relative advantage in environment-related technology
		Development of environment-related technologies, % inventions worldwide
		Development of environment-related technologies, inventions per capita
	Technology and innovation: R&D	Environmentally related government R&D budget, % total government R&D
		Environmentally related R&D expenditure, % GDP
		Renewable energy public RD&D budget, % total energy public RD&D
		Energy public RD&D budget, % GDP
		Fossil fuel public RD&D budget (excluding CCS), % total energy public RD&D
	International financial flows: Official Development Assistance	Environmentally related ODA, % total ODA
		ODA - all sectors - biodiversity, % total ODA
		ODA - all sectors - climate change mitigation, % total ODA
		ODA - all sectors - climate change adaptation, % total ODA
		ODA - all sectors - desertification, % total ODA

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		ODA - renewable energy sector, % total allocable ODA
		ODA - water supply and sanitation sector, % total allocable ODA
		ODA - environment sector, % total allocable ODA
		Net ODA provided, % GNI
	Environmental taxes and transfers	Environmentally related taxes, % GDP
		Environmentally related taxes, % total tax revenue
		Energy related tax revenue, % total environmental tax revenue
		Road transport-related tax revenue, % total environmental tax revenue
		Petrol tax, USD per litre
		Petrol end-user price, USD per litre
		Diesel tax, USD per litre
		Diesel end-user price, USD per litre
		Mean feed-in tariff for solar PV electricity generation
		Mean feed-in tariff for wind electricity generation
		Fossil fuel consumption support, % energy related tax revenue
		Fossil fuel consumption support, % total tax revenue
		Fossil fuel consumption support, % total fossil fuel support
		Fossil fuel production support, % total fossil fuel support
		Fossil fuel general services support, % total fossil fuel support
		Petroleum support, % total fossil fuel support
		Coal support, % total fossil fuel support
		Gas support, % total fossil fuel support
		Total fossil fuel support, % of total tax revenue
Socio-economic context	Real GDP, Index 2000=100	
	Value added in agriculture, % of total value added	
	Value added in industry, % of total value added	
	Value added in services, % of total value added	
	Real GDP per capita	
	Population density, inhabitants per km2	
	Labour tax revenue, % GDP	
	Labour tax revenue, % total tax revenue	

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4 DATA AVAILABILITY ASSESSMENT

4.1 Chapter review

Initiatives towards sustainable development and green economy, like the proposed SDGs from the Agenda 2030, need to be founded on good understanding and supported with appropriate information (data). This chapter reviews data availability and reporting for fourteen SDG indicators best suited for monitoring progress towards meeting green industry relevant SDG targets. The author reviews all corresponding databases and available reviews. In some cases (e.g. indicators 6.3.1 and 6.3.2) measures within the SDG framework are not yet available, so we select related measures that best describe progress in the scope of SDG targets. Observations for data availability for the fourteen green economy-related SDG indicators are as follows — 6 (43 percent) have satisfactory data, 3 (21 percent) have capacity for improvement and 5 (36 percent) of indicators have no data available. The findings are in-line with UN´s pilot project in six countries – three in Africa and three in Asia. Data for only 40 (20 percent) of the global SDG indicators are currently available and another 47 global indicators (23 percent) have a data source and should be easily feasible. The remaining 57 percent of the indicators could be made available by enhancing countries' statistical capacity through consultations about additional components of the national statistical system (NSS). The UN's (2019) Sustainable Development Goals Report 2018 confirms that additional resources are required to monitor not just the reviewed targets, but all of the 169 proposed SDG targets. Custodian agencies and countries are aware of challenges that lie ahead in monitoring progress for meeting green economy targets and are working together for the common goal.

4.2 SDG Indicators

The idea of inclusive and sustainable transformation is directly linked to almost half of the SDGs from the UN´s Resolution 70/1, 'Transforming our World: The 2030 Agenda for Sustainable Development'. Green industry relates mostly to Goal 6 'ensure availability and sustainable management of water and sanitation for all', Goal 7 'ensure access to affordable, reliable, sustainable and modern energy for all', Goal 9 which is 'to build resilient infrastructure, promote inclusive industrialization and foster development' and Goal 12 which aims to 'ensure sustainable consumption and production patterns'. All goals should be equally monitored, as they all have interactions and serve a specific role. The indicators described in Table 4 were selected for the assessment of data availability for SDG´s addressing economic development and environmental and social concerns.

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Table 4: SDG Indicators (UNSD, 2019)

Goals	Targets	Indicators	Tier Classification
SDG 6: Ensure availability and sustainable management of water…	**6.3** By 2030, improve water quality by reducing pollution, halving the proportion of untreated wastewater.	**6.3.1** Proportion of wastewater safely treated	**Tier II**
	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals.	**6.4.1** Change in water-use efficiency over time	**Tier II** *Notes: More information on terminology is requested.*
SDG 7: Affordable, reliable and modern energy	**7.3 By** 2030, double the global rate of improvement in energy efficiency	**7.3.1** Energy intensity measured in terms of primary energy and gross domestic product (GDP)	**Tier I**
SDG 9: Infrastructure, industrialization and innovation	**9.2** Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	**9.2.1** Manufacturing value-added (MVA) as a percentage of GDP and per capita MVA **9.2.2** Manufacturing employment as a percentage of total employment	**Tier I** **Tier I**
	9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets	**9.3.1** Proportion of small-scale industries in total industry value-added **9.3.2** Percentage of small-scale industries with a loan or line of credit	**Tier II** *Notes: Request additional work on the definition of small-scale industries.* **Tier II** *Notes: Request additional work on the definition of small-scale industries.*
	9.4 By 2030 upgrade infrastructure and retrofit industries to make them sustainable, with increased resource efficiency …	**9.4.1** CO_2 emission per unit of value added	**Tier I**
	9. b Support domestic technology development, research and innovation in developing countries…	**9.b.1** Proportion of medium and high-tech industry value-added in total value-added	**Tier 1**
SDG 12: Responsible consumption and production	**12.2** By 2030, achieve the sustainable management and efficient use of natural resources	**12.2.2** Domestic material consumption (DMC), DMC per capita and DMC per GDP*	**Tier I**
	12.4 By 2020, achieve the environmentally sound management of chemicals and wastes throughout their life cycle …and significantly reduce their release to air water and soil…	**12.4.2** Treatment of waste, generation of hazardous waste, hazardous management by type of treatment	**Tier III** *Notes: There is no established methodology for the indicator.*

1. Indicator 6.3.1 Proportion of wastewater safely treated

Indicator	**6.3.1** Proportion of wastewater safely treated
Definition	"Proportion of wastewater safely treated" – defines wastewater as water that is of no further immediate value for the purpose for which it had been used or produced because of its quality, quantity or time of occurrence.
Custodian Agency	WHO, UN-HABITAT, UNSD
Tier	II
UN STAT	No data are available

Indicator 6.3.1 comprises two sub-indicators 6.3.1a and 6.3.1b. These sub-indicators may be combined into a single indicator at a later stage, when more data are available on industrial wastewater and the respective pollution loads expressed in biological oxygen demand (WHO, 2018).

6.3.1a: Percentage of safely treated domestic wastewater flows.

This sub-indicator measures the flow of safely treated wastewater (sewage treated at treatment plants, and wastewater from on-site facilities treated on-site or emptied, transported and treated off-site) as a proportion of all domestic wastewater generated based on household per capita water-use data. "Domestic wastewater" is defined as wastewater flow from households and services, unless the service has an International Standard Industrial Classification (ISIC) code. "Safely treated" is defined as meeting national or local treatment standards for discharge of treated effluents.

6.3.1b: Percentage of safely treated industrial wastewater flows.

6.3.1b sub-indicator measures volumes of industrial wastewater flows in compliance with regulations and discharge permits, as a proportion of all industrial wastewater discharged into sewers and the environment. "Industrial wastewater" is defined as flow from industrial premises as defined by ISIC classifications.

WHO records show country files for SDG 6.3.1 "Proportion of wastewater safely treated" for 79 countries (APPENDIX B.1). All of the country files contain data for 6.3.1a, but none of the files include data for 6.3.1b. Sub-division of indicator 6.3.1 into 6.3.1a and 6.3.1b by WHO (2018) can be found in Progress on Wastewater Treatment: Piloting the monitoring methodology and initial finding for SDG indicator 6.3.1. The same report states that at present, there are insufficient data available to estimate industrial wastewater flows into sewers and directly into the environment, for most regions in the world. Treatment data for industrial wastewater are available from Eurostat for 13 countries: Bosnia, Bulgaria, Croatia, Cyprus,

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Czech Republic, Germany, Latvia, Lithuania, Macedonia, Poland, Romania, Slovakia and Turkey. Eurostat industrial effluent data for those 13 countries illustrate potential data sources for 6.3.1b. Data should be interpreted with care as it may include wastewater that does not need to be treated before being discharged (i.e. cooling water) and that may lead to misinterpreted reporting.

OECD reports wastewater treatment data and sewage connection rates, i.e. the percentage of the population connected to a wastewater treatment plants (WWTPs) for 26 countries at irregular intervals between years 1990-2016 (Austria, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Slovak Republic, Slovenia, Sweden, Switzerland, Turkey, United Kingdom). Connected in this case means actually connected to a WWTP through a public sewage network. This indicator is measured in percentage (OECD, 2019) (See APPENDIX B.2).

Mexico's 'Water Statistics 2015' reports data on municipal and non-municipal discharges and is a good example of combining data at the national level to cover all aspects of indicator 6.3.1. 'Water Statistics 2015' disaggregates municipal and non-municipal discharges by flow and tons of five-day BOD. It reports non-municipal (including industry) wastewater generated and non-municipal wastewater (including industry) treated. Non-municipal discharges, including industry are five times greater than discharges from municipal sources. Knowing that industrial wastewater discharge into the environment represents a higher proportion of total wastewater discharge, the country is able to choose policy responses and instruments accordingly (Ministry of the Environment and Natural Resources, 2015; WHO, 2018).

2. Indicator 6.4.1 Change in water-use efficiency over time

Indicator	**6.4.1** Change in water-use efficiency over time
Definition	The change in the ratio of the value added to the volume of water use, over time.
Custodian Agency	FAO
Tier	II
UN STAT	No data are available

Water-use efficiency for indicator 6.4.1 is defined as the volume of water used divided by the value added of a given major sector. Sectors are defined as: agriculture (forestry, fishing), industry (mining and quarrying, manufacturing, electricity, gas, steam and AC supply, and construction) and services (FAO, 2018b). Data for indicator 6.4.1 are not yet available in UNSTAT's SDG Global Database or AQUASTAT.

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Industrial water withdrawal is defined as the annual quantity of self-supplied water withdrawn for industrial uses. It can include water from primary renewable and secondary freshwater resources; water from over-abstraction of renewable groundwater or withdrawal from fossil groundwater; direct use of agricultural drainage water; direct use of (treated) wastewater; and desalinated water. It includes water for cooling of thermoelectric and nuclear power plants, but it does not include hydropower. Water withdrawn by industries that are connected to the public supply network is generally included in municipal water withdrawal. These data are available for 200 countries (APPENDIX B.3) (FAO, 2018b).

Change in water-use efficiency had not previously been monitored, so new computations and interpretation are required of the gathered data. FAO chose five pilot countries (Jordan, Netherlands, Peru, Senegal and Uganda) for testing of monitoring methodologies and other support tools for indicator 6.4.1. In order to implement and test the methodology, working groups were established within each country and led the process of compiling relevant data. Data collection focused on collecting the most recent data available, without excluding any potential source of information. Even though the data-collection was feasible FAO highlights several challenges that should be considered for future reference – economic data handling, data inconsistency, weak monitoring by country institutions, varied reference years, outdated data, different parameters when defining variables, weak reporting into international database and potential double counting. The pilot process shows that monitoring indicator 6.4.1 calls for the involvement of various stakeholders and institutions. Decision makers can also combine information for indicator 6.4.1 and 6.4.2 to understand how increasing water use affects the availability of water resources. Countries are advised to consider a reporting period of no more than two years, as this will allow them to identify early trends and help them detect any potential threats (FAO, 2018b).

FAO (2018b) made a preliminary global analysis for indicator 6.4.1 based on the five pilot countries using available databases from international organizations (AQUASTAT data for water use for agriculture, industry and services; National Government Agencies, World Bank, UNSD and OECD for economic data). They used available data for 168 countries (APPENDIX B.3). Water-use efficiency worldwide is a little over USD 15/m^3. The lowest water-use efficiency is in Central and Southern Asia at USD 2/m^3 and the highest water-use efficiency is in Oceania at USD 50/m^3. Countries with data for water-use efficiency are listed in APPENDIX B.9.

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3. Indicator 7.3.1 Energy intensity measured in terms of primary energy and gross domestic product (GDP)

Indicator	**7.3.1** Energy intensity measured in terms of primary energy and gross domestic product (GDP)
Definition	Energy intensity is defined as the energy supplied to the economy per unit value of economic output.
Custodian Agency	UNSD, IEA
Tier	I
UN STAT	DATA available for 150 economies (APPENDIX B.4)

The International Energy Agency (IEA) and UNSD collect basic energy statistics (and not the derived indicator) from national sources. For each country, all the sources used by IEA are published in IEA's 'Extended World Energy Balances' (IEA, 2016b). Note that for each country data sources may be more than one, as energy statistics cover different fuels (electricity, oil, coal, gas and renewables). UNSD follows a similar data collection process, giving preference to data submitted by national administrations using the UN Energy Statistics Questionnaire, followed by official national publications. In the absence of national sources, UNSD uses data from other international organizations or makes estimations. IEA and UNSD then compile those data into energy statistics and derive energy balances in a comparable way across countries, following international recommendations on energy statistics (IRES) (IEA, 2018).

Countries for which monitoring indicator 7.3.1 is possible are listed in the APPENDIX B.4. For the purpose of calculating regional aggregates, IEA's 'Extended World Energy Balances' (IEA, 2016b) combines data for African and Asian countries that are not reported individually and reports them as 'Other Africa' and 'Other Asia'. Countries that fall into these respective categories are listed in APPENDIX B.4.

4. Indicator 7.3.1a Energy intensity defined as energy use per unit of MVA

Indicator	**7.3.1a** Energy intensity defined as energy use per unit of MVA
Definition	Energy intensity is measured by dividing the amount of energy used by the manufacturing value added.
Custodian Agency	IEA
Tier	II
UN STAT	Only data for energy intensity measured in terms of primary energy and gross domestic product (GDP).

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Manufacturing energy intensity defined as energy use per unit of MVA is measured by dividing the amount of energy used by MVA. The energy intensity of manufacturing is the amount of energy used to produce one unit of value added. Data for energy balances are available for 150 economies (APPENDIX B.4) from IEA and for all non-OECD countries in the world from UNSD (IEA, 2016b). MVA and GDP country data are collected through a national account questionnaire (NAQ) administered by UNSD. Data are available for 200 economies (APPENDIX B.4) from 1990 onwards with two-year lag to the current calendar year. Missing or inconsistent value are verified with national sources (UNIDO, 2019a).

We reviewed the energy data for 47 African countries in the 'Extended World Energy Balances' and found total final consumption data for industry (manufacturing, mining and construction) for 22 out of 47 African countries. There are no individual data for remainder of the countries, except the regional aggregate reported as 'Other Africa'. IEA (2018) states the UN data are the only information for a time series of countries not listed individually and included in the region as Other Africa, whose energy consumption is estimated based on population and GDP. There are also no data for total manufacturing for the 22 countries, but rather data for some of the 11 IEA classified manufacturing industries. Only six out of the 22 countries have data for more than five out of the 11 manufacturing industries and for at least three out of four years (1990, 2010 and 2014). Table 5 shows data availability for the 47 African countries by manufacturing industries.

The most comprehensive database for manufacturing energy consumption is IEA's 'World Energy Statistics and Balances' database, which includes both statistics on energy as well as the energy balances. Countries included in the database are listed in APPENDIX B.4. Based on IEA's energy statistics UNIDO elaborated 'World final energy consumption by sector' and trends in 'World manufacturing energy intensity' – this elaboration is included in the Industrial Development Report 2018 (UNIDO, 2017a).

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Table 5: Data availability for African countries from World Energy Statistics 2018 (IEA)

DATA NOT AVAILABLE DATA AVAILABLE OTHER AFRICA

	IRONSTL	CHEMICAL	NONFERR	NONMET	TRANSEQ	MACHINE	MINING	FOODPRO	PAPERPRO	WOODPRO	CONSTRUC	TEXTILE	INONSPEC	INDUSTRY
Angola														
Benin														
Burkina Faso														
Botswana														
Burundi														
Cabo Verde														
Cameroon														
Central African Republic														
Chad														
Comoros														
Congo														
Côte d'Ivoire														
Democratic Repub. of the Congo														
Djibouti														
Equatorial Guinea														
Eritrea														
Eswatini														
Ethiopia														
Gabon														
Gambia														
Ghana														
Guinea														
Guinea-Bissau														
Kenya														
Lesotho														
Liberia														
Madagascar														
Malawi														
Mali														
Mauritania														
Mauritius														
Mozambique														
Namibia														
Niger														
Nigeria														
Rwanda														
Sao Tome and Principe														
Senegal														
Senegal														
Seychelles														
Sierra Leone														
Somalia														
South Africa														
Togo														
Uganda														
United Republic of Tanzania														
Zambia														
Zimbabwe														

Source: IEA (2018) data; own table

5. Indicator 9.2.1 Manufacturing value added as a proportion of GDP and per capita

Indicator	**9.2.1** Manufacturing value added as a proportion of GDP
Definition	Manufacturing value added (MVA) as a proportion of gross domestic product (GDP) is a ratio between MVA and GDP, both reported in constant 2010 USD.
Custodian Agency	UNIDO
Tier	I
UN STAT	Data are available for 200 economies (APPENDIX B.5)

Indicator	**9.2.1a** Manufacturing value added per capita
Definition	MVA per capita is calculated by dividing MVA in constant 2010 USD by population of a country or area.
Custodian Agency	UNIDO
Tier	I
UN STAT	Data are available for 200 economies (APPENDIX B.5)

The MVA of an economy is the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate inputs. It is a widely used indicator by researchers and policy makers to assess the level of industrialization of a country. The share of MVA in GDP reflects the role of manufacturing in the country's economy and MVA per capita is the basic indicator adjusted to the size of the economy. MVA data are available for 200 economies (APPENDIX B.5) from 1990 onwards with a two-year lag to the current calendar year in UNIDO's Statistics Data Portal. MVA and GDP country data are collected through a national account questionnaire (NAQ) sent by UNSD, missing or inconsistent value are verified with national sources (UNIDO, 2019a).

Monitoring MVA is useful for developing long-term strategies for industrialization. However, the Sustainable Development Solutions Network's SDG Index and Dashboard Report 2018 and SDGCA's Africa SDG Index and Dashboard Report excludes MVA and other industry-related data because it is not possible to define a common global threshold for the industry-related targets. For example, countries specialize in different economic sectors, so there is no "correct" threshold of manufacturing as a share of GDP for all countries (SDSN, 2018 & SDGCA, 2018).

Trend evaluation (regional aggregates, not individual countries) is reported annually in UNIDO's Annual Report (UNIDO, 2018b) and Industrial Development Report (UNIDO, 2017a). MVA is included in UNIDO'S CIP (Competitive Industrial Performance) index (UNIDO, 2017b). CIP index is comprised of ten indicators as follows:

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Manufacturing Value Added Indexes:

(1) *Manufacturing Value Added Per capita Index (MVApc*),
(2) *Share of Manufacturing Value Added in GDP Index (MVAsh),*
(3) *Share of Medium and High-Tech Activities in Total Manufacturing Value Added (MHVAsh)*,
(4) *Industrialization Intensity Index (INDint)*,
(5) *Share of World Manufacturing Value Added Index (ImWMVA)* Manufacturing Export Indexes,
(6) Manufacturing Export per Capita Index (MXpc),
(7) Share of Manufacturing Exports in Total Exports (MXsh),
(8) Share of Medium and High-Tech Activities in Total Manufacturing Export (MHVAsh),
(9) Index Industrial Export Quality Index (MXQual),
(10) *Share in World Manufacturing Export Index (ImWMT).*

The CIP index assists in benchmarking industrial competitiveness across economies and provides valuable information on areas of strength and weaknesses in national manufacturing sectors. As of 2017, the index assesses 144 economies based on the ten (listed above) indicators (UNIDO, 2017b). The existing CIP index has its limitations in not including the negative environmental effects of industrialization. Nonetheless, it can serve as an indication of a country's industrial performance over time and its competitiveness in the world.

MVA in UNIDO's INDSTAT (all revisions) can be further disaggregated into value-added for industries following ISIC Revision 4 (International Standard Industrial Classification of All Economic Activities, Revision 4). Unfortunately, many countries do not report for all industries, therefore the database is not complete. For example, in the case of SSA, less than one third of countries reported value-added for industries for the period 2000 to 2014. For those countries, there are variations in the reported number of industries and inconsistency in yearly coverage. For the remaining SSA countries there are hardly any data.

6. Indicator 9.2.2 Manufacturing employment as a proportion of total employment

Indicator	**9.2.2** Manufacturing employment as a proportion of total employment
Definition	Contribution of manufacturing in total employment.
Custodian Agency	UNIDO
Tier	I
UN STAT	Data are available for 170 economies (APPENDIX B.6)

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Indicator 9.2.2 (Manufacturing employment as a proportion of total employment) reports the share of manufacturing in total employment. This indicator is a measure of the ability of the manufacturing sector to absorb surplus labour from agricultural and other traditional sectors towards production labour with higher wages.

The primary data repository used for 9.2.2 is ILOSTAT, which reports data for manufacturing employment for 170 countries (APPENDIX B.6). Data on the share of manufacturing employment are obtained from a variety of sources, including labour force surveys and other similar types of household surveys, establishment surveys and administrative records. Labour force surveys are the preferred source of data for this indicator as they have the widest coverage – they cover all economic activities within its scope, all status in employment, all establishment sizes and formal and informal employment (ILO, 2018). UNIDO employment data are collected using the General Industrial Statistics Questionnaire which is filled by National Statistical Offices (NSOs) and submitted to UNIDO annually. Data for OECD countries are obtained directly from OECD. Country data are also collected from official publications and official websites (UNIDO, 2018b).

The World Employment Social Outlook Trends 2019 (ILO, 2019) and Industrial Development Report (UNIDO, 2017a) concluded that in developed countries, where emphasis has shifted to reduction of labour in manufacturing, a negative trend is expected as part of cost-cutting measures to promote more capital-intensive industries. Negative trends in manufacturing employment as a percentage of total employment are also observed in less developed countries, for example in the SSA, where more positive employment trends are occuring in the service sector.

Trends in this indicator are reported annually in UNIDO's Annual Reports (UNIDO, 2018b) and Industrial Development Report (UNIDO, 2017a) drawing on INDSTAT4 2019, ISIC Revision 4.

7. Indicator 9.3.1 Proportion of small-scale industries in total industry value added

Indicator	**9.3.1** Proportion of small-scale industries in total industry value added
Definition	Share of manufacturing value added of small-scale manufacturing enterprises in the total manufacturing value added.
Custodian Agency	UNIDO
Tier	II
UN STAT	Data are available for 65 economies (APPENDIX B.7)

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The proportion of small-scale industries in total industry value added is the share of value added of small-scale manufacturing enterprises in the MVA. The main limitation of existing national data is varying size classes by country, indicating that data are obtained from different target populations. Data of one country may not be comparable to another. UNIDO has proposed that all countries compile employment and value-added data by size class of "small-scale industries" being those with less than 20 employed persons. From such data, internationally comparable data on the share of "small-scale industries" in total industry value added could be derived (UNIDO, 2019).

Data on small scale industries using various size classifications are available at national level from official publications, official websites, and from OECD's Structural and Demographic Business Statistics. Data come from annual industrial surveys, where value added is disaggregated by size classes given in terms of number of employees and from surveys focusing particularly on small enterprises, or small and medium enterprises in general. Data are provided on an irregular basis (between 2 and 10 years). UNIDO's INDSTAT reports data for only 65 countries (APPENDIX B.7) (UNIDO 2016; 2019).

8. Indicator 9.3.2 Proportion of small-scale industries with a loan or line of credit

Indicator	**9.3.2** Proportion of small-scale industries with a loan or line of credit
Definition	Number of "small-scale industries" with an active line of credit or a loan from a financial institution in percentage to the total number of such enterprises.
Custodian Agency	UNIDO, WORLD BANK
Tier	II
UN STAT	Data are available for 130 economies (APPENDIX B.8)

This indicator reports the number of small-scale industries with an active line of credit or a loan from a financial institution in the reference year in percentage to the total number of such enterprises. Indicator 9.3.2 is a baseline for increasing the access of small-scale industries, in particular in developing countries, to financial services, including affordable credit. As a pilot study, data were collected from the World Bank Enterprise Survey. Nonetheless, the preferable source remains the data of NSOs (UNIDO, 2019). Challenges encountered while monitoring indicator 9.3.2 remain the same for indicator 9.3.1. For both indicators it is necessary that data are reported by size class, which requires a consensus on the definition of small-scale industry (less than 20 employees). Existing data in UNIDO INDSTAT, similar to indicator 9.3.1, are reported at irregular intervals (two, five or ten years).

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9. Indicator 9.4.1 CO_2 emission per unit of value added

Indicator	**9.4.1** CO_2 emission per unit of value added
Definition	Carbon dioxide (here after, CO_2) emissions per unit value added is ratio between CO_2 emissions from fuel combustion and the value added of associated economic activities.
Custodian Agency	UNIDO, IEA
Tier	I
UN STAT	Data are available for 140 countries (APPENDIX B.9)

The indicator 9.4.1 (CO_2 emission per unit of value added) reports the amount of emissions from fuel combustion produced by an economic activity, per unit of economic output. This indicator can be computed for the whole economy (total CO_2 emissions/GDP) or for specific sectors, notably the manufacturing sector (CO_2 emissions/MVA) (UNIDO, 2019a).

IEA collects energy data at country level (statistical offices, energy ministries, environmental agencies) and uses these data to estimate CO_2 emissions for 150 countries and regions (IEA, 2018). Countries listed in APPENDIX B.5 and the following regions; IEA and Association countries, OECD Total, OECD Americas, OECD Asia Oceania, OECD Europe, European Union, Non-OECD Total, Asia (excluding China), Middle East, G20, World and Africa.

UNIDO in turn uses IEA's CO_2 data and its MVA data to estimate manufacturing energy use intensity. Trends in energy use intensity are reported annually in UNIDO's Annual Reports (UNIDO, 2018b) and Industrial Development Report (UNIDO, 2017a).

10. Indicator 9.b.1 Proportion of medium and high-tech industry value added in total value added

Indicator	**9.b.1** Proportion of medium and high-tech industry value added in total value added
Definition	The proportion of medium and high-tech industry (MHT hereafter) value added in total manufacturing value added.
Custodian Agency	UNIDO
Tier	I
UN STAT	Data are available for 154 countries (APPENDIX B.10).

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This indicator is defined as the percentage of medium and high tech (MHT) industry in total MVA. Data for indicator 9.b.1 are compiled by the NSSs, ministries of finance or economy and collected by UNIDO. Data are available for 154 economies from 1990 onwards with three years lag to the current calendar year (UNIDO, 2019a).

UNIDO's INDSTAT, Revision 3 and Revision 4 are the only databases that report manufacturing value added by industries. Using these two databases it is possible to aggregate data for percentage of low technology industries value-added to the total value-added of all manufacturing industries. Unfortunately, as discussed for indicator 9.2.1, this is not possible for all 154 countries, as not all of them report or report inconsistently value-added for industries.

Indicator 9.b.1 is used to calculate UNIDO's CIP index (UNIDO, 2017b) and reported annually in Annual Report (UNIDO, 2018b) and Industrial Development Report (UNIDO, 2017).

11. Indicator 12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

Indicator	**12.2.2** Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
Definition	Domestic Material Consumption (DMC) is a standard material flow accounting (MFA) indicator and reports the apparent consumption of materials in a national economy.
Custodian Agency	UNEP
Tier	I
UN STAT	DATA available for 200 countries (APPENDIX B.11)

DMC reports the amount of material that needs to be handled within an economy by describing the average level of material use. DMC and MFA (material flow accounting) need to cover the two dimensions of economy – production and consumption. MFA is a well-established methodology with a strong conceptual basis in physical accounting and economics. UNEP proposes enhancing the accounting capabilities for DMC and MF (material flow) within countries and supports the International Resource Panel in continuous efforts for upgrading the global MF database. On some countries, material footprint needs to be corrected as a country can have a very high DMC because of export or a very low DMC because it has outsourced most of the material consumption. International statistical sources for DMC include the IEA, USGS (United States Geological Survey), FAO and COMTRADE databases and compilers of these data are: UNEP, OECD and EUROSTAT (UNEP, 2018).

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DMC data are disaggregated into imports, domestic extraction and exports and by four main material groups (biomass, metal ores, minerals and fossil fuels), but cannot yet be disaggregated by sectors. Neither UNEP's report on Global Material Flows and Resource Productivity or OECD's 'Material Resources, Productivity and the Environment: Key Findings', report DMC data for economic sectors (UNEP, 2016; OECD, 2018).

12. Indicator 12.2.2a Domestic material consumption by the manufacturing sector

Indicator	**12.2.2a** Domestic material consumption by the manufacturing sector
Definition	Domestic Material Consumption (DMC) is a standard material flow accounting (MFA) indicator and reports the apparent consumption of materials in manufacturing sectors.
Custodian Agency	UNEP
UN STAT	No data are available.

For the purpose of improving resource productivity and understanding industrial sector material consumption, we recommend the use of 'Domestic Material Consumption by the manufacturing sector' indicator. A model for a more targeted approach is a study of two of India's economic sectors – construction and automotive. For each of these sectors a material assessment was done, followed by flows in/out of the economy, domestic extraction and flows within the economy for each of five chosen materials. Mapping material flows and material consumption in India's construction and automotive sectors identified barriers, gaps and areas of intervention. Findings of the study also serve as a baseline for improving resource productivity and enhancing the use of secondary raw materials in selected sectors (Federal Republic of Germany, 2016).

13. Indicator 12.4.2 Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment

Indicator	**12.4.2** Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment
Definition	Ratio between hazardous waste generated and hazardous waste treated, by type of treatment.
Custodian Agency	UNSD, UNEP
Tier	III
UN STAT	No data are available

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This indicator is defined as the ratio between hazardous waste generated and hazardous waste treated, by type of treatment. The indicator 12.4.2 has not been monitored before and therefore the methodology is still under development.

First step towards monitoring indicator 12.4.2 is an internationally agreed upon definition of hazardous waste agreed upon by OECD, EUROSTAT and UNSD. UNSD collects underlying data for indicator 12.4.2. Data for 'Hazardous Waste Generated' are collected from official national sources for water and waste statistics through UNSD's biennial Questionnaire on Environmental Statistics. OECD and EUROSTAT also collect this data through the OECD/Eurostat Questionnaire, which is consistent with UNSD's questionnaire, so the reported data is comparable. UNSD reports on 'Hazardous Waste Generated' for 96 countries (APPENDIX B.12) and 'Hazardous Waste Recycled' for 75 countries (APPENDIX B.13). For this indicator, methodology pilot testing is on-going in three countries (Bosnia and Herzegovina, Costa Rica and Mauritius) (UNSD, 2019b).

4.2 Conclusion

The assessment finds that data availability for the 14 green industry-related SDG indicators is as follows — 6 (43 percent) have satisfactory data, 3 (21 percent) have capacity for improvement and 5 (36 percent) of indicators have no data available. Only three of the fourteen indicators (9.2.1 and 9.2.1a 'manufacturing value added as a percentage of GDP and per capita´ and 12.2.2 ´DMC per capita and per GDP') have data for most countries (200 economies).

Table 6: Data availability for selected SDG indicators.

SDG indicator	Data availability
6.3.1	0
6.4.1.	0
7.3.1	150
7.3.1a	0
9.2.1	200
9.2.1a	200
9.2.2	170
9.3.1	65
9.3.2	130
9.4.1	140
9.b.1	154
12.2.2	200
12.2.2a	0
12.4.2	0

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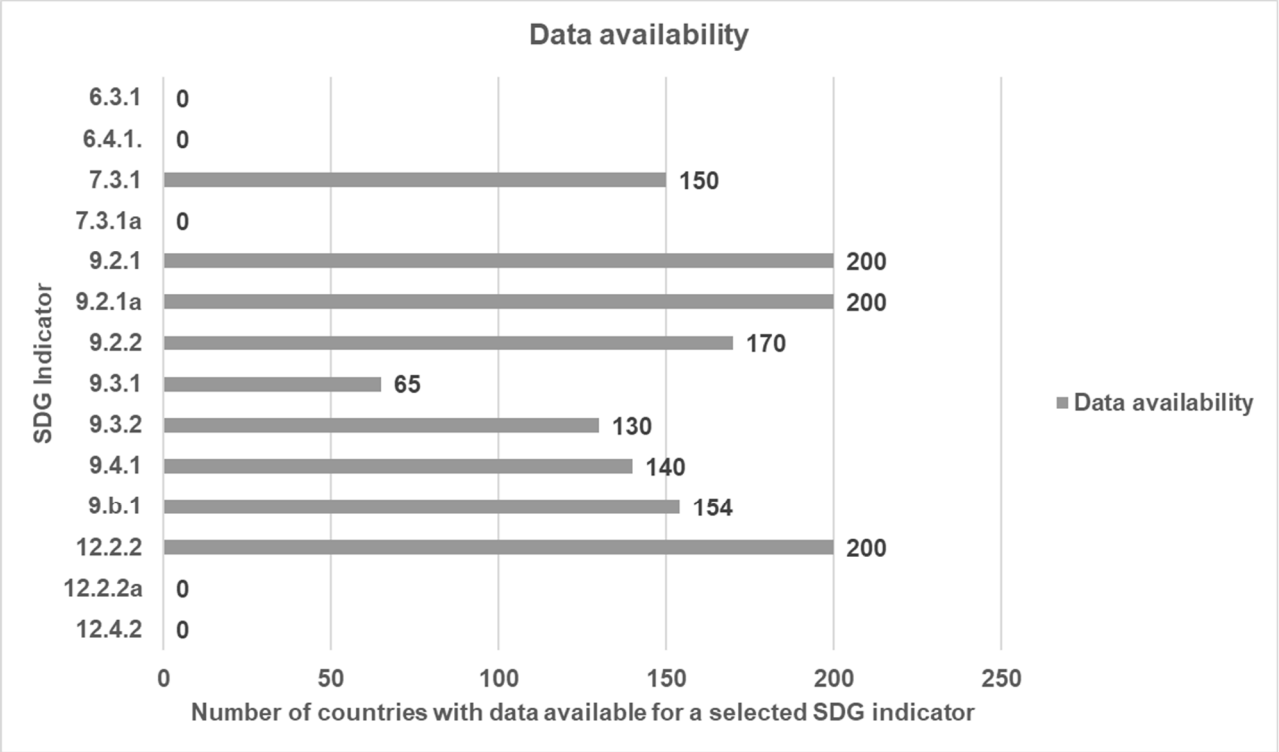
Figure 9: Data availability for selected SDG indicators.



Legend:

6.3.1 'Proportion of wastewater safely treated'
6.4.1 'Change in water-use efficiency'
7.3.1 'Energy intensity measured in terms of primary energy and GDP'
7.3.1a 'Energy intensity defined as energy use per unit of MVA'
9.2.1 'Manufacturing value-added as a proportion of GDP'
9.2.1a 'Manufacturing value-added per capita'
9.2.2 'Manufacturing employment as a proportion of total employment'
9.3.1 'Proportion of small-scale industries in total industry value-added'
9.3.2 'Proportion of small-scale industries with a loan or line of credit'
9.4.1 'Co_2 emission per unit of value-added'
9.b.1 'Proportion of medium and high-tech industry value-added in total value-added'
12.2.2 'DMC per capita and DMC per GDP'
12.2.2a 'DMC per manufacturing sub-sector'
12.4.2 'Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment'

The UN's (2019) Sustainable Development Goals Report 2018 confirms that additional resources are required to monitor not just industry-related targets, but all of the 169 proposed SDG targets. Based on a pilot project in six countries – three in Africa and three in Asia, data for only 40 (20 percent) of the global SDG indicators are currently available and another 47 global indicators (23 percent) have a data source and should be easily feasible. The remaining 57 percent of the indicators could be made available by enhancing countries' statistical capacity through consultations about additional components of the national statistical system (NSS).

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According to UN (2018a) it is estimated that domestic and donor support for data and statistics for 77 of the world's lower-income countries will need to increase up to $1 billion per year to strengthen NSSs for SDG monitoring. The latest data available is for year 2015, when the financial support for developing countries from multi-lateral and bilateral donors reached only slightly more than half of that amount. Support for statistics in less developed countries amounted to $177 million in 2015, compared to $106 million in 2010 (UN, 2019). There are several initiatives to increase support funding, which would enhance data availability and data usefulness. The most widely cited is the Cape Town Global Action Plan for Sustainable Development Data (CTPASD), from the 48th session of UN Statistical Commission (2017). It calls for country leaders and policy makers to invest in modernization of National Statistic Systems (NSSs), which would address gaps in national statistics and statistical coordination needed to monitor progress in meeting The Agenda 2030 (UNSD, 2017). UN agencies show that they hold the technical and operational know-how knowledge needed to assist countries in advancing data collection practices and data quality improvement. However, UN agencies need to make greater efforts towards providing technical support and implement projects that lead to better data collection practices and data quality improvement. The technical support of NSSs will be particularly required in less developed countries, along with additional commitment in terms of domestic and international financial support for development of green economy.

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5 COMPOSITE INDEXES

5.1 Chapter review

Monitoring and evaluation based on clearly defined indicators is essential to the development of successful policies and composite indexes (CIs) are the best tool to describe complex concepts, such as green economy. CIs are a commonly used tool in policy analysis and public communication. However, there has been criticism of CIs, mostly because they could send misleading policy messages, if they are poorly constructed or misinterpreted. Therefore, the construction process and selected indicators should be transparent and based on sound statistical and conceptual principles. Nardo et al (2005) in the 'Handbook on Constructing Composite Indicators' map the effect of each assumption on the quality of the aggregation and again point out the need for a clear conceptual framework that justifies weighting and aggregation.

Second part of this chapter describes five CIs, which are used for measuring green growth or assessing green economy status on a national level. CIs covered are: Human Development Index (UNDP), Green Economy Progress (PAGE), SDG Index (SDSN, Environmental Performance Index (Yale) and Global Green Economy Index (Dual Citizen LLC). Following description of each CI are country rankings (top 10 and bottom 10 countries) by applying each of the index individually. To compare country rankings by using a different composite index, the author selected year 2017, as that is the most recent year for which data for all of the five indexes are available.

5.2 Pros and cons of using CIs

CIs comparing country performance are a common useful tool in policy analysis and public communication. It seems CIs ease communication between governments and general public and have also proven to be useful for benchmarking country performance. Monitoring and evaluation based on clearly defined indicators is essential to the development of successful policies. The extent of policy success (fulfilled objectives) is mainly identified through CIs, which highlight the strengths and weaknesses and provide support in future decision making. In addition, if comparison is made with peer-countries, it allows countries to assess its regional stands (Nardo et al, 2005 & OECD, 2008).

CIs can focus either on progress or performance of countries/regions in the context of the same indicators. Progress indicators focus on the change – trends. By definition progress is development or advancement through time. As an example, a measurement framework can estimate the progress in achieving transition towards a certain goal. Progress CIs allow differences in the level of outcomes and the rate of progress.

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As a contrast, performance CIs evaluate countries/regions in terms of specific outcome variables. Performance does not necessarily mean development.

The use of CIs has also been subject of controversy (Saltelli, 2006) and there is a significant amount of literature describing pros and cons of CI usage (Nardo et al, 2005; Saltelli, 2006; OECD, 2008; Ravallion, 2011). The main pros and cons are outlined in Table 7 (OECD, 2008).

Table 7: Pros and cons of CIs, OECD (2008).

Pros and cons of Composite Indicators	
Pros	**Cons**
• Able to summarize complex, multi-dimensional realities with a view to supporting decision-makers. • Easy to interpret comparing to a number of separate indicators. • Can assess historical progress of countries. • Reduce the visible size of a set of indicators without dropping the underlying information base. • Place issues of country performance and progress at the center of the policy arena. • Facilitate communication with general public (i.e. citizens, media, etc.) and promote accountability. • Help to construct/underpin narratives for lay and literate audiences. • Enable users to compare complex dimensions effectively.	• May send misleading policy messages if poorly constructed or misinterpreted. • May invite simplistic policy conclusions. • May be misused, e.g. to support a desired policy, if the construction process is not transparent and/or lacks sound statistical or conceptual principles. • The selection of indicators and weights could be the subject of political dispute. • May disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action, if the construction process is not transparent. • May lead to inappropriate policies if dimensions of performance that are difficult to measure are ignored.

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5.3 General building scheme for CIs

Nardo et al (2005) in the 'Handbook on Constructing Composite Indicators' map the effect of each assumption on the quality of the aggregation and point out the need for a clear conceptual framework that justifies weighting and aggregation. The handbook provides a set of recommendations on how to design, develop and disseminate CIs. 'The Handbook on Constructing Composite Indicators' has become the reference report for practitioners constructing CIs, as it extensively describes building methodologies. The general building scheme for CIs is outlined in Table 8.

Table 8: General building scheme for CIs (Nardo et al, 2005).

1	Theoretical framework
2	Data selection
3	Correlation analysis
4	Preliminary data treatment
5	Data normalisation
6	Data weighting
7	Data aggregation
8	Robustness/ sensitivity tests
9	Visualisation

The authors emphasise the need for transparency when addressing methodological issues, in order to avoid data manipulation and misrepresentation. Fraudulent practices as such, lead to misinterpretation and can send misleading messages to policy makers or general public. Therefore, indicators must be selected based on their analytical integrity, measurability and coverage and supported with a meaningful theoretical framework. Existing composite indexes can exemplify different approaches – indicators and methodologies used for measuring green economy. Most commonly used indicators for measuring green economy and green growth are listed by themes in Table 3 (OECD, 2017).

5.4 Human Development Index (HDI)

The basis for the Human Development Index (HDI) is definition of human development – a long and healthy life, knowledge and decent standard of living. HDI is the geometric mean of normalized indices for each of these three dimensions (UNDP, 2018).

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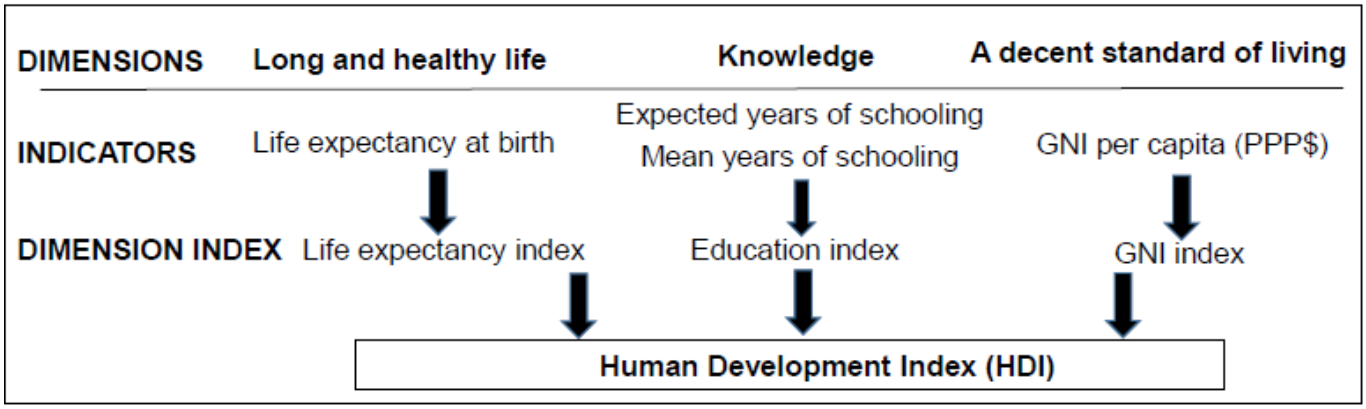

Figure 10: Structure of HDI (adapted from UNDP, 2018).

United Nations Development Programme (2019) developed HDI to emphasize the importance of people and their capabilities for assessing countries progress. The HDI is used to highlight differences in human development (knowledge, healthy living, and living standard) between countries with the same Gross National Income (GNI). Main criticism of HDI are that it does not capture inequalities, poverty, human security and empowerment.

HDI covers 189 countries and data is available for years from 1990 to 2017. Countries are categorized into four groups based on the index value:

1. Very high human development
2. High human development
3. Medium human development
4. Low human development.

Table 9: HDI Ranking 2017 (UNDP, 2019).

Human Development Index 2017			
Highest Ranking Countries		Lowest Ranking Countries	
1	Norway	**180**	Mozambique
2	Switzerland	**181**	Liberia
3	Australia	**182**	Mali
4	Ireland	**183**	Burkina Faso
5	Germany	**184**	Sierra Leone
6	Iceland	**185**	Burundi
7	Hong Kong, China (SAR)	**186**	Chad
7	Sweden	**187**	South Sudan
9	Singapore	**188**	Central African Republic
10	Netherlands	**189**	Niger

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Human Development Index and its methodology is described in Human Development Indicators and Indices: 2018 Statistical Update Team (UNDP, 2018). The top ten and bottom ten ranking countries with application of HDI are in Table 9. Complete scores with rankings of individual countries by applying HDI are in Appendix C.1.

5.5 Green Economy Progress (GEP)

The Green Economy Progress (GEP) Measurement Framework serves as a primary tool for assessing green economy progress. GEP helps policy makers, analysts and other stakeholders evaluate country´s performance and allows cross-country comparison. GEP was designed by the Partnership for Action on Green Economy (PAGE), based on four aspirations (PAGE, 2017):

1. Selecting appropriate SDGs (in the scope of Agenda 2030) and linking them together.
2. Assist countries in monitoring their progress in-line with their goals and priorities.
3. Serve as a key tool for policy makers, governments, analysts and other stakeholders in policy design.
4. Cross-country comparison in terms of green economy progress.

GEP Index covers 102 countries and data span is from year 2004 to 2017. GEP aims to evaluate to what extend is green economy of a specific country included in addressing three global challenges (PAGE, 2017):

1. Persistent poverty,
2. Overstepped planetary boundaries and
3. Inequitable sharing of global prosperity.

GEP Index and its methodology is described in The Green Economy Progress Measurement Framework: Methodology (PAGE, 2017). The top ten and bottom ten ranking countries with application of GEP are in Table 10. Complete scores with rankings of individual countries by applying GEP Index are in Appendix C.2.

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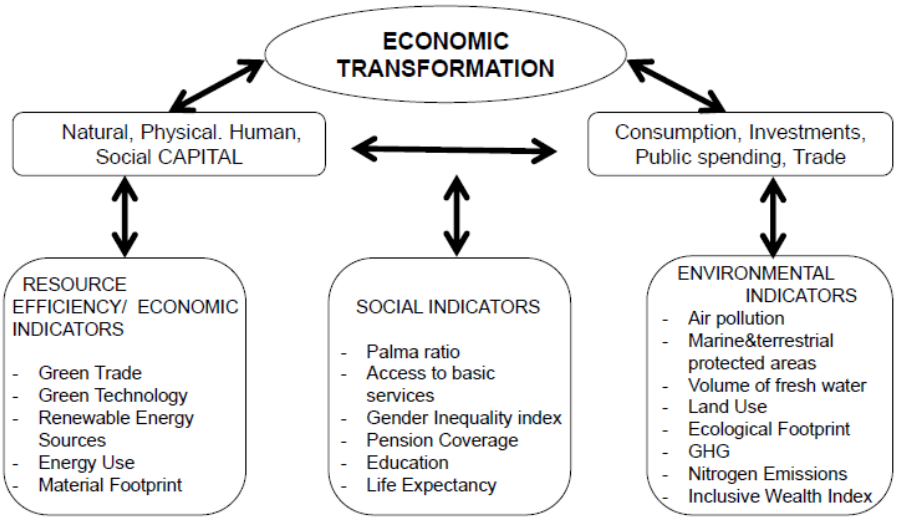

Figure 11: Indicators in the GEP Measurement Framework and the Inclusive Green Economy analytical framework (adapted from PAGE, 2017).

Table 10: GEP Index Ranking 2017 (PAGE, 2019).

Green Economy Progress Index 2017			
Top Ranking Countries		Bottom Ranking Countries	
1	Cyprus	**93**	Togo
2	Portugal	**94**	Yemen, Rep.
3	Spain	**95**	Cote d'Ivoire
4	Italy	**96**	Uganda
5	France	**97**	Ghana
6	Hungary	**98**	Bangladesh
7	Slovenia	**99**	Zambia
8	Japan	**100**	Pakistan
9	Denmark	**101**	Kenya
10	Austria	**102**	Angola

5.6 Sustainable Development Goals Index (SDG Index)

Sustainable Development Solutions Network (SDSN) developed the SDG Index in light of the Agenda 2030 and to provide policy makers a tool for assessing progress towards the common global goals – SDGs. SDG Index is not an official tool for monitoring country progress towards SDGs, but more of an insight towards achieving SDGs (SDSN, 2018).

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SDG Index is constructed out of 217 official SDG Indicators, covering all 17 sustainable development goals. SDG Index was first constructed and used in year 2015 and latest rankings available are for year 2018 (SDSN, 2018). GEP Index and its methodology is described in SDG Index and Dashboards Report 2017: Global responsibilities: International Spillovers in achieving the goals (SDSN, 2018). The top ten and bottom ten ranking countries with application of SDG Index are in Table 11. Complete scores with rankings of individual countries by applying SDG Index are in Appendix C.3.

Table 11: SDG Index Ranking 2017 (SDSN, 2018).

Sustainable Development Goals Index 2017			
Top Ranking Countries		Bottom Ranking Countries	
1	Sweden	**141**	Nigeria
2	Denmark	**142**	Mali
3	Finland	**143**	Malawi
4	Norway	**144**	Gambia
5	Czech Republic	**145**	Sierra Leone
6	Germany	**146**	Afghanistan
7	Austria	**147**	Niger
8	Switzerland	**148**	Liberia
9	Slovenia	**149**	Congo
10	France	**150**	Chad

5.7 Environmental Performance Index (EPI)

Environmental Performance Index (EPI) ranks 180 countries on 24 performance indicators across ten categories and the rankings range from years 1990-2018. EPI integrates indicators covering two essential dimensions (Yale University, 2018):

1. Environmental health and
2. Ecosystem vitality.

EPI focuses on high-priority environmental issues and highlights which countries are doing best in implementing environmentally friendlier practices. EPI aims to draw attention of policy makers and other stakeholders to the environmental issues of a particular country. EPI indicators cover nine issues; health impact, air quality, water scarcity, water resources, agriculture, forests, fisheries, biodiversity & habitat and climate. Nineteen (19) different indicators cover these environmental issues (Yale University, 2018).

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Report 2018 Environmental Performance Index: Global metrics for the environment: Ranking country performance on high-priority environmental issues Report, issued by Yale University (2018) describes EPI and its methodology. The top ten and bottom ten ranking countries with application of EPI are in Table 12. Complete scores with rankings of individual countries by applying EPI are in Appendix C.4.

Table 12: EPI Ranking 2017 (Yale University, 2018).

Environmental Performance Index 2017			
Top Ranking Countries		Bottom Ranking Countries	
1	Switzerland	**171**	Nigeria
2	France	**172**	Mali
3	Denmark	**173**	Malawi
4	Malta	**174**	Gambia
5	Sweden	**175**	Sierra Leone
6	United Kingdom	**176**	Afghanistan
7	Luxembourg	**177**	Niger
8	Austria	**178**	Liberia
9	Ireland	**179**	Congo
10	Finland	**180**	Chad

5.8 Global Green Economy Index (GGEI)

Global Green Economy Index (GGEI) is a performance-based index designed to cover four main dimensions on national-level and each of the dimensions includes multiple indicators (Dual Citizen LLC, 2019):

1. Leadership and climate change,
   - 1.1 Climate Change Performance
   - 1.2 International Climate Forums
   - 1.3 Head of State
   - 1.4 Media Coverage

2. Efficiency sectors,
   - 2.1 Buildings
   - 2.2 Transport
   - 2.3 Tourism
   - 2.4 Energy
   - 2.5 Resource Efficiency

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3. Markets and investments and
   3.1 Renewable Energy Investment
   3.2 Cleantech Innovation
   3.3 Corporate Sustainability
   3.4 Green Investment Promotion & Facilitation

4. Environment.
   4.1 Environmental Performance Index (EPI)

GGEI description and partial methodology is published on Dual Citizen LLC website. Dual Citizen LLC currently does not hand out the full. The top ten and bottom ten ranking countries with application of GGEI are in Table 13. Complete scores with rankings of individual countries by applying GGEI are in Appendix C.5.

Table 13: GGEI 2000-2018 Ranking (Dual Citizen LLC, 2019).

Global Green Economy Index 2000-2018			
Top Ranking Countries		Bottom Ranking Countries	
1	Sweden	**121**	Ukraine
2	Switzerland	**122**	Togo
3	Iceland	**123**	Mauritania
4	Norway	**124**	Trinidad and Tobego
5	Finland	**125**	Congo
6	Germany	**126**	Guinea-Bissau
7	Denmark	**127**	Bosnia and Herzegovina
8	Taiwan	**128**	Benin
9	Austria	**129**	Haiti
10	France	**130**	Bahrain

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6 METHODOLOGICAL COMPARISON OF GREEN ECONOMY FRAMEWORKS

6.1 Chapter review

The following chapter focuses on the comparison of country's green economy status with the application of five green economy composite indexes. Compared green economy CIs exemplify different weighting and indicator aggregation used for measuring green economy with CIs. Comparison of scores is done over the year 2017, as this is the most recent year with data for all CIs. For the rank comparison and normalization of ranks, only countries with complete observations (countries with data for all five CIs) are used. Finally, correlation between the five green economy CIs is determined, based on individual country scores by applying the individual CIs by using Pearson correlation. For Pearson correlation, we normalize the rankings of each country by applying individual CIs, to enable comparing scores of countries by different CIs.

6.2 Thematic comparison of CIs

Each of the composite indexes applied individually for all countries is equipped with a different range of indicators and follows a unique weighting system. Dimensions of the five green economy CIs and number of indicators for each CI are in Table 14.

To take the research of composite indexes for measuring green economy further, it would be interesting to analyze the detailed structure of each CI, by determining weights of each indicator and assess the influence of individual indicators on the final ranking of a country. Furthermore, analysists could apply individual indicators and review those scores to assess status of only one selected area of green economy. Scores by applying individual indicators would highlight areas where a country might be scoring low and therefore draw the attention of stakeholder to potential areas of development.

It would also be worth exploring the environmental and industrial policies of individual countries to see if they are influenced by the choice of a green economy assessment tool an individual country uses (CI, framework, dashboard or adjusted economy measure).

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Table 14: Comparison of dimensions and number of indicators for individual CIs.

	CI	Type	Dimensions	Number of indicators
1	**HDI**	Performance	Long and healthy life Knowledge A decent standard of living	3 + GNI
2	**GEP index**	Progress	Persistent poverty Overstepped planetary boundaries Inequitable sharing of global prosperity, consumption, investments, public spending, trade	19
3	**SDG index**	Performance	17 SDGs	217
4	**EPI**	Performance	Environmental health (health impact, air quality, water scarcity, water resources, agriculture, forests, fisheries, biodiversity & habitat and climate) Ecosystem vitality	19
5	**GGEI**	Performance	Leadership and climate change Efficiency sectors Markets and investments Environment	14 + EPI

6.3 Top and bottom ten ranking countries by an individual CI

Countries with highest scores (top ten ranking) by applying individual CIs are Austria, Denmark, France, Sweden and Switzerland, which all scored highest (between top ten countries) by applying individually four out of five CIs. Ranking highest in three out of five CIs are Finland, Germany and Norway. Iceland, Ireland and Slovenia were ranked top ten for two CIs, followed by the remained of countries, which scored highest by using one out of five CIs. Countries scoring top ten by using one CI are Australia, Cyprus, Czech Republic, Hong Kong China (SAR), Hungary, Italy, Japan, Luxembourg, Malta, Netherlands, Portugal, Singapore, Spain, Taiwan and United Kingdom. Frequency of countries ranking top ten by applying individual CI is in Table 15.

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Table 15: Frequency of countries ranking top ten by applying individual CIs.

Top Ranking Countries						
		Composite Index				
	Country	HDI	GEP	SDG Index	EPI	GGEI
1	Australia	◆				
2	Austria		◆	◆	◆	◆
3	Cyprus		◆			
4	Czech Republic			◆		
5	Denmark		◆	◆	◆	◆
6	Finland			◆	◆	◆
7	France		◆	◆	◆	◆
8	Germany	◆		◆		◆
9	Hong Kong, China (SAR)	◆				
10	Hungary		◆			
11	Iceland	◆				◆
12	Ireland	◆			◆	
13	Italy		◆			
14	Japan		◆			
15	Luxembourg				◆	
16	Malta				◆	
17	Netherlands	◆				
18	Norway	◆		◆		◆
19	Portugal		◆			
20	Singapore	◆				
21	Slovenia		◆	◆		
22	Spain		◆			
23	Sweden	◆		◆	◆	◆
24	Switzerland	◆		◆	◆	◆
25	Taiwan					◆
26	United Kingdom				◆	

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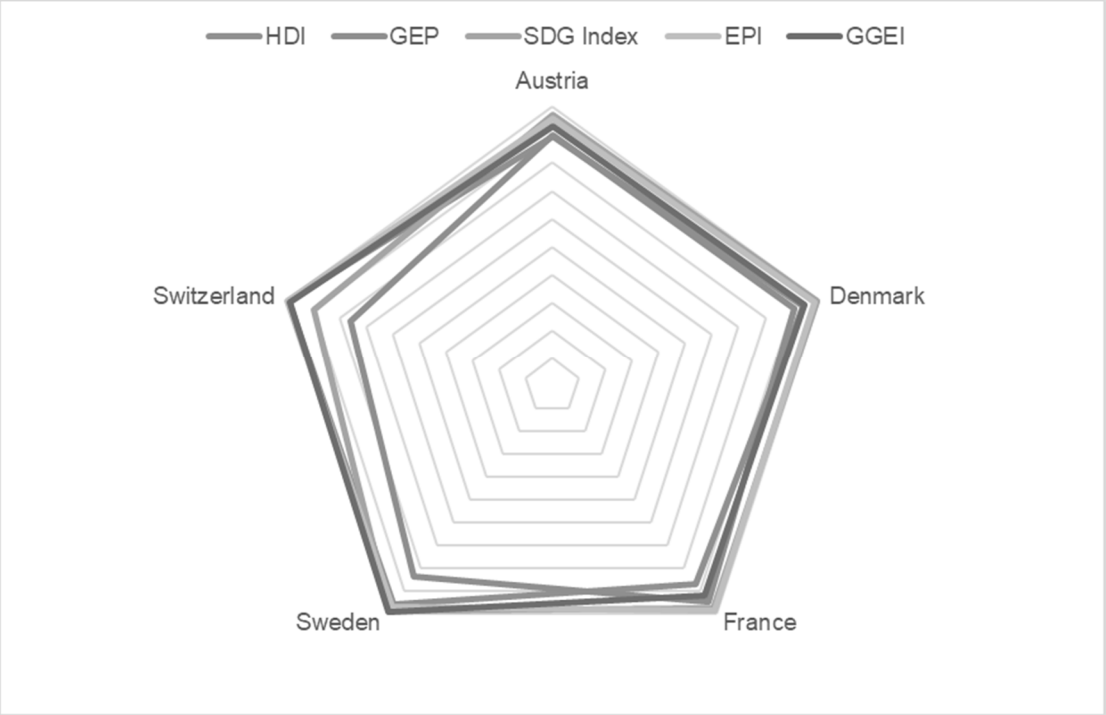
Distribution of scores of top five performing countries by applying individual CIs are in Figure 12. Three countries – Austria, Denmark, France, scored highest by applying Green Economy Progress index, Environmental Performance Index and Global Green Growth index. Highest deviation is by Switzerland that ranked between top ten by using HDI, SDG Index, EPI and GGEI, but ranked twenty-fourth out of one-hundred by using GEP index. However, GEP index describes country progress and not performance like the other four CIs. The twenty-six countries ranking highest in at least one applied CI are consistent with reporting their existing SDG related-data to UN agencies and have complete data for established green economy indicators.

Figure 12: Green economy indexes, top five performers, 2017.



Countries ranked lowest (bottom ten) by applying there indexes are Chad, Congo, Liberia, Mali, Niger and Sierra Leone. Countries ranked bottom ten by applying two indexes are Afghanistan, Gambia, Malawi, Niger and Togo. Other twenty-two countries in Table 16 were ranked bottom ten by applying one out of five CIs.

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Table 16: Frequency of countries ranking bottom ten by applying individual CIs.

Bottom Ranking Countries						
		Composite Index				
	Country	HDI	GEP	SDG Index	EPI	GGEI
1	Afghanistan			◆	◆	
2	Angola		◆			◆
3	Bahrain					◆
4	Bangladesh		◆			
5	Benin					◆
6	Bosnia and Herzegovina					◆
7	Burkina Faso	◆				
8	Burundi	◆				
9	Central African Republic	◆				
10	Chad	◆		◆	◆	
11	Congo			◆	◆	◆
12	Cote d'Ivoire		◆			
13	Gambia			◆	◆	
14	Ghana		◆			
15	Guinea-Bissau					◆
16	Haiti					◆
17	Kenya		◆	◆		
18	Liberia	◆		◆	◆	
19	Malawi			◆	◆	
20	Mali	◆		◆	◆	
21	Mauritania					◆
22	Mozambique	◆				
23	Niger	◆		◆	◆	
24	Nigeria			◆	◆	
25	Pakistan		◆			
26	Sierra Leone	◆		◆	◆	
27	South Sudan	◆				◆
28	Togo		◆			◆
29	Trinidad and Tobego					◆
30	Uganda		◆			
31	Ukraine					◆

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32	Yemen, Rep.		◆			
33	Zambia		◆			

The performance distribution of bottom six countries by applying the five CIs is in Figure 13. All six countries are countries, for which we were not able to find data for most green economy indicators in data availability assessment. For example, none of the six countries has complete energy data, neither are they individually included in the IEAs database ´World Energy Statistics 2018´. Chad, Congo, Liberia, Mali, Niger and Sierra Leone are all included in IEAs country grouping “Other Africa” (Table 4).

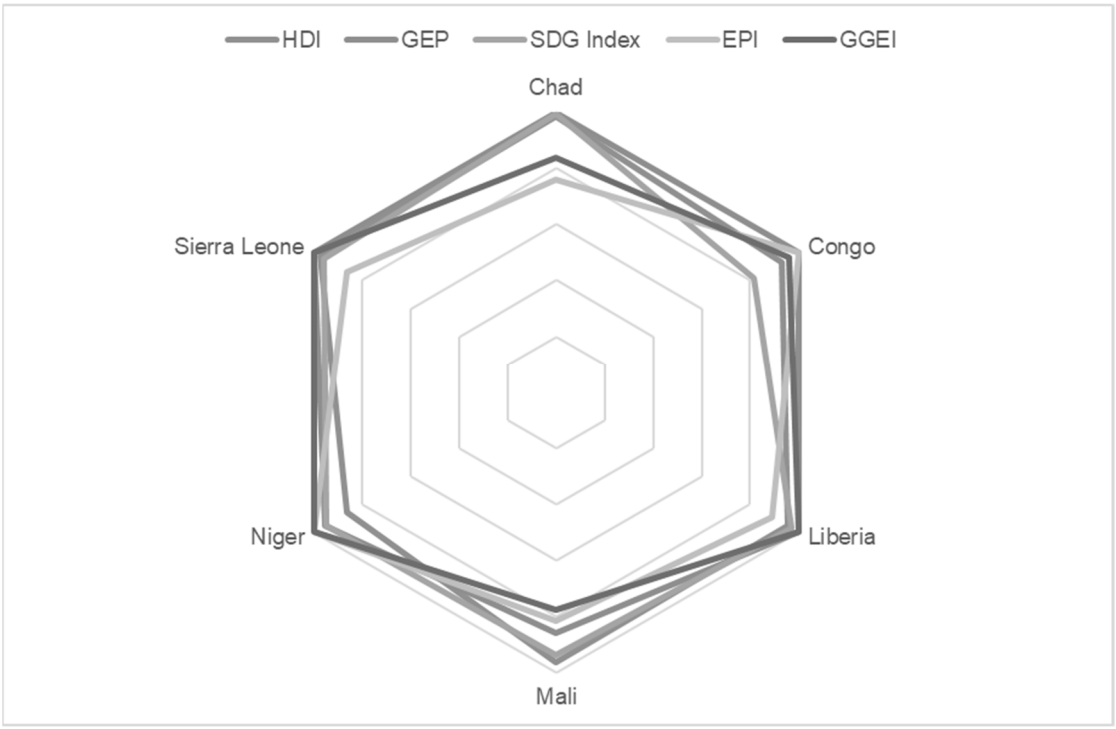

Figure 13: Green economy indexes, bottom five performers, 2017.

6.4 Pearson correlation between selected composite indexes

The rankings of individual countries by applying individually each of the five composite indexes are normalized into the range [0,1], where higher score represents a better outcome (country rank). In contrast, 0 (zero) represents the country scoring lowest (ranking bottom) by applying a specific index. Normalization of rankings is carried out by using the following equation;

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$$Y_{i,j} = 1 - \frac{X_{i,j}}{\max_{i,j}} \quad , \tag{3}$$

where $Y_{i,j}$ is the normalized score of the *i*-composite index of the *j*-country and $X_{i,j}$ is the ranking of the *i*-composite index of the *j*-country. $\max_{i,j}$ is the maximum ranking of *i*-composite index of the *j*-country.

Pearson correlation between the five CIs is in Table 17.

Table 17: Pearson correlation of the CIs.

Pearson correlation					
	HDI	GEP	SDG	EPI	GGEI
HDI	1	0,91	0,90	0,89	0,53
GEP		1	0,83	0,87	0,50
SDG			1	0,83	0,54
EPI				1	0,49
GGEI					1

Pearson correlation and distributions of individual comparisons are in Figure 14.

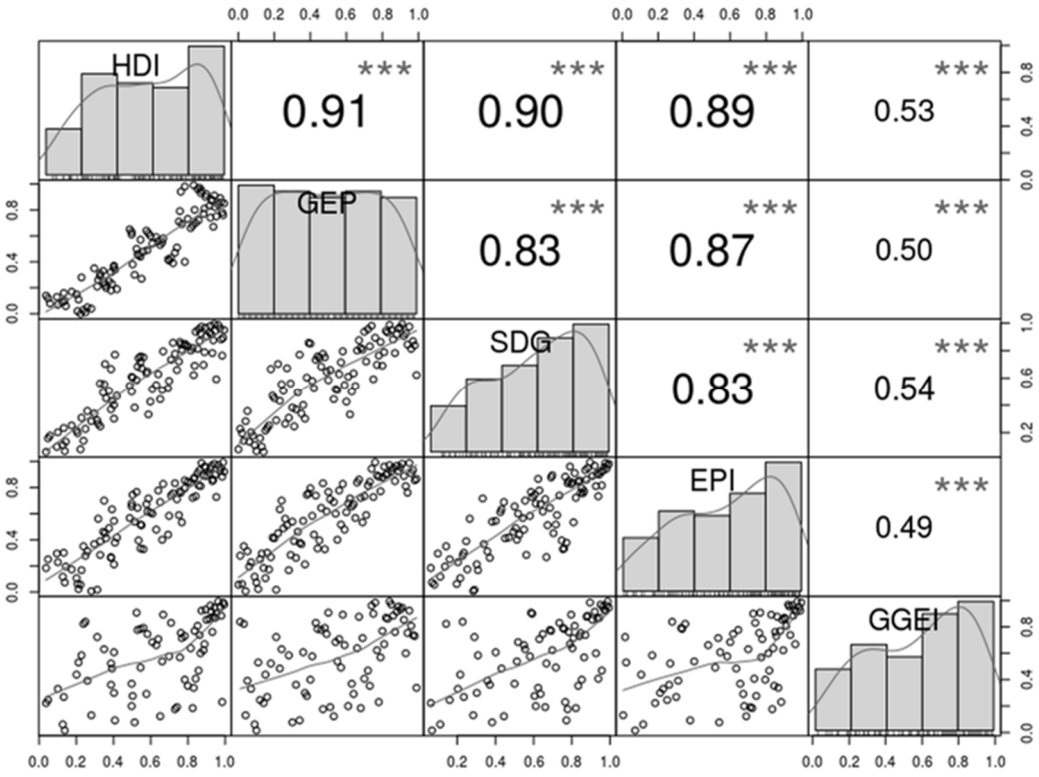

Figure 14: Pearson correlation and distributions of individual comparisons

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By comparing five composite indexes with Pearson correlation, we determine to what extend the countries rankings differ by using one or the other CI. Our findings confirm that there is a deviation in country ranking with applying a different CI. Higher the correlation between two indexes (higher r), lesser the change in the ranking of an individual country by applying a different index. Two most corresponding indexes with correlation score r=0,91 are GEP index and HDI. However, the distribution of countries by applying GEP index is different as distribution of countries with applying other four indexes. GEP index scores countries progress and not performance. GGEI has the highest deviation in ranking scores with comparison to other indexes. GGEI corresponds most with SDG Index (r=0,54) and least with EPI (r=0,49).

To continue the research on impact of composite indexes, it would be interesting to explore which index (or other framework) countries use for assessing their green economy status and how that in turn influences their environmental and industrial policies.

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7 SUMMARY AND OUTLOOK

Industrialization and economic growth are necessary for prosperity of nations – nonetheless, the negative consequences should not be ignored. In the last decade, public has gotten more aware of the negative effects of global industrialization and countries have been transforming their economies and adopting green(er) practices. Governments have designed incentives for accelerating green growth and made progress towards environmental sustainability and reducing social inequalities.

However, many challenges still lay ahead on the global transition to green economy. First obstacle is the limited knowledge about green concepts – green economy, green growth, inclusive green growth, and limited knowledge disables appropriate actions. We reviewed recent publications to the extent where we are able to outline the most important relationships between green concepts that emerged from sustainable development.

Ten Brink et al (2012) describe a clear hierarchy of sustainable development concepts in The Economics of Ecosystem and Biodiversity green economy report. Hierarchy describes 'Green New Deal' as a catalyst for green growth, which in turn is a contribution to green economy. Moreover, green economy is then outlined as a mean towards achieving sustainable development. ´Green New Deals´ were national packages of the United states, China and South Korea with fiscal stimuli meant to boost their green economies.

Following this hierarchy there is no conceptual inconsistency, however, Georgeson et al. (2017) argue that the terms green economy and green growth are rarely used in alignment with this hierarchy. Differences between green growth, inclusive green growth and green economy have been discussed in research papers and official publications by various international agencies and authors (Bowen et al, 2012; UNDESA, 2012; Ryszawaska, 2015; Kanianska, 2016; Kasztelan, 2017; Georgeson et al, 2017; Dornan et al, 2018). While reviewing existing literature in most recent publications we found at least nine separate definitions of green economy and at least thirteen separate definitions of green growth. We found that most cited definition of green economy and green growth are:

Green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive (UNEP, 2011).

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities (OECD, 2011b).

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Second part of the thesis reviews existing green economy and growth measurement tools. Approaches to assess green growth vary by methodology and researcher (Narloch et al, 2016). Green Growth Indicators (OECD, 2017) framework is the most widely used green growth assessment tool using dashboard approach and a set of indicators. Ecologic footprints, such as Global ecological footprint (Global Footprint Network, 2018) and Global resource footprint (Tukker et al. 2016) are mostly applied at the national-level to serve as a tool for identifying key ecological issues. However, by research, we determine that composite indexes with clearly defined indicators are the best tool to measure and evaluate a complex concept like green economy.

Third obstacle on the path to global sustainability is the limited financial and technical support to countries who struggle with successful monitoring of their green transformation. Initiatives towards sustainable development and green economy, like the proposed SDGs, need to be supported with appropriate information (quality data). We selected 14 SDG indicators, which are suited for monitoring progress towards green industry and reviewed all corresponding databases and available reviews. The assessment finds that data availability for the 14-green industry-related SDG indicators is as follows — 6 (43 percent) have satisfactory data, 3 (21 percent) have capacity for improvement and 5 (36 percent) of indicators have no data available. Only three of the fourteen indicators (9.2.1 and 9.2.1a 'manufacturing value added as a percentage of GDP and per capita´ and 12.2.2 ´DMC per capita and per GDP') have data for most countries (200 economies). These findings are in-line with UN´s assessment of three countries in Africa and three in Asia. The findings show that data for only 40 (20 percent) of the global SDG indicators are currently available, another 47 global indicators (23 percent) have a data source and should be feasible and the remaining 57 percent of the indicators could only be available by enhancing countries' statistical capacity through consultations about additional components of the national statistical systems. UN´s report states (UN, 2018a) that domestic and donor support for data and statistics for 77 of the world's lower-income countries will need to increase up to estimated $1 billion per year for efficient strengthening of NSSs for SDG monitoring.

Finally, in the methodological part of the thesis we select five composite indexes, which to authors best belief, can be used for successful monitoring of green economy and green growth on a national level. We review the following composite indexes – Human Development Index (UNDP), Green Economy Progress (PAGE), SDG Index (SDSN, Environmental Performance Index (Yale) and Global Green Economy Index (Dual Citizen LLC), and compare them by thematic coverage, type (performance or progress) and number of indicators. Compared composite indexes exemplify different weighting and indicator aggregation used for measuring green economy and green growth and we review country rankings by applying individual CIs and assess frequency of countries in top and bottom ten by each individual CI. Countries with highest scores by applying individual CIs are Austria, Denmark, France, Sweden and Switzerland, which scored

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highest (between top ten countries) by using fours out of five CIs. Countries ranked lowest most frequently (by applying there indexes out of five CIs) are Chad, Congo, Liberia, Mali, Niger and Sierra Leone.

We adopt Pearson correlation to assess correspondence between the five CIs. The scores of eeach of the five composite indexes are normalized into the range [0,1], where higher score represents a better outcome. In contrast, 0 represents the country scoring lowest by applying a specific index. Two most corresponding indexes with correlation score r=0,91 are GEP index and HDI.

However, the distribution of countries by applying GEP index is different as distribution of countries with applying other four indexes. GEP index assesses countries progress and not performance like the other four CIs. GGEI has the highest deviation in ranking scores with comparison to other indexes – GGEI corresponds least with EPI (r=0,49) and most with SDG Index (r=0,54). We confirm our assumption that it matters which tool the countries choose for monitoring their performance, as the results (rankings) can be misleading and the CIs do not completely correspond with one another.

To continue research on the impact of the choice of a green economy measurement tool, it would be interesting to explore which index (or other framework) countries use for assessing their green economy status and how that in turn influences their design and implementation of environmental and industrial policies. It would also be worth exploring, if there are significant differences between performance and progress composite indexes, and how the aggregation of indicators and weighting systems influences the results (rankings).

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Appendix A.

A.1 List of countries for which preliminary estimates have been made for indicator 6.3.1

Albania, Algeria, Andorra, Argentina, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, China, China, Hong Kong special administration, Colombia, Croatia, Cyprus, Czechia, Denmark, Ecuador, Egypt, Estonia, Finland, France, Germany, Greece, Greenland, Hungary, Iceland, Iraq, Ireland, Israel, Italy, Japan, Jordan, Korea (Republic of), Kuwait, Latvia, Lebanon, Libya, Liechtenstein, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Monaco, Morocco, Netherlands, New Zealand, Niger, Norway, Palau, Peru, Poland, Portugal, Puerto Rico, Qatar, Romania, San Marino, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, Somalia, Spain, Sweden, Switzerland, Tunisia, Turkey, Tuvalu, United Arab Emirates, United Kingdom, United States of America, West Bank and Gaza Strip.

OECD's 'Wastewater generation and discharge database' by variables and their respective country coverage:

Wastewater generation and discharge variables cover industrial wastewater, all sources, total generated: Chile, Korea, Mexico.

Industrial wastewater, all sources, total discharged: Austria, Canada, Chile, Czech Republic, Germany, Korea, Netherlands, Slovak Republic, Spain, Turkey.

Industrial wastewater, all sources, discharged without treatment: Canada, Chile, Czech Republic, Germany, Poland, Slovak Republic, Turkey.

Industrial wastewater, all sources, discharged after treatment in other WWTPs: Canada, Chile, Czech Republic, Germany, Poland, Slovak Republic, Turkey.

Industrial wastewater, all sources, treated in WWTPs, total inflow: Austria, Chile, Czech Republic, Finland, Germany, Greece, Hungary, Mexico, Spain, Switzerland, Turkey.

A.2 List of countries with data available for Industrial water withdrawal

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Eswatini, Ethiopia, Faroe Islands, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Holy See, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Niue, North Macedonia, Norway, Occupied Palestinian Territory,

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Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Togo, Tokelau, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Kingdom, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe

A.3 List of countries for preliminary study country data for the water use efficiency (6.4.1)

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Eswatini, Ethiopia, Faroe Islands, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Holy See, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Occupied Palestinian Territory, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.4 List of countries with data available for indicator 7.3.1

Australia; Austria; Belgium; Canada; Chile; the Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Israel; Italy; Japan; Korea; Luxembourg; Mexico; the Netherlands; New Zealand; Norway; Poland; Portugal; the Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; the United Kingdom and the United States; Algeria; Angola; Benin; Botswana (from 1981); Cameroon; the Republic of the Congo (Congo)4; Côte d'Ivoire; the Democratic Republic of the Congo; Egypt; Eritrea; Ethiopia; Gabon; Ghana; Kenya; Libya; Mauritius; Morocco; Mozambique; Namibia (from 1991); Niger (from 2000); Nigeria; Senegal; South Africa; South Sudan (from 2012), Sudan; the United Republic of Tanzania (Tanzania); Togo; Tunisia; Zambia; Zimbabwe and Other Africa; Bahrain; the Islamic Republic of Iran; Iraq; Jordan; Kuwait; Lebanon; Oman; Qatar; Saudi Arabia; the Syrian Arab Republic; the United Arab Emirates and Yemen; Albania; Armenia; Azerbaijan; Belarus; Bosnia and

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Herzegovina; Bulgaria; Croatia; Cyprus; the Former Yugoslav Republic of Macedonia; Georgia; Gibraltar; Kazakhstan; Kosovo; Kyrgyzstan; Latvia6; Lithuania; Malta; the Republic of Moldova (Moldova); Montenegro; Romania; the Russian Federation; Serbia7; Tajikistan; Turkmenistan; Ukraine; Uzbekistan; Argentina; the Plurinational State of Bolivia (Bolivia); Brazil; Colombia; Costa Rica; Cuba; Curaçao; the Dominican Republic; Ecuador; El Salvador; Guatemala; Haiti; Honduras; Jamaica; Nicaragua; Panama; Paraguay; Peru; Suriname (from 2000), Trinidad and Tobago; Uruguay; the Bolivarian Republic of Venezuela (Venezuela), Antigua and Barbuda; Aruba; the Bahamas; Barbados; Belize; Bermuda; Bonaire (from 2012); the British Virgin Islands; the Cayman Islands; Dominica; the Falkland Islands (Malvinas); French Guiana; Grenada; Guadeloupe; Guyana; Martinique; Montserrat; Puerto Rico (for natural gas and electricity); Saba (from 2012); Saint Eustatius (from 2012); Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Saint Maarten (from 2012); Suriname (until 1999); and the Turks and Caicos Islands; China; Bangladesh; Brunei Darussalam; Cambodia (from 1995); India; Indonesia; the Democratic People's Republic of Korea; Malaysia; Mongolia (from 1985); Myanmar; Nepal; Pakistan; the Philippines; Singapore; Sri Lanka; Chinese Taipei; Thailand; Viet Nam and Other Asia.

Other Africa includes Botswana (until 1980); Burkina Faso; Burundi; Cabo Verde; Central African Republic; Chad; Comoros; Djibouti; Equatorial; Guinea; Gambia; Guinea; Guinea-Bissau; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Namibia (until 1990); Niger (until 1999); Réunion; Rwanda; Sao Tome and Principe; the Seychelles; Sierra Leone; Somalia; Swaziland; Uganda.

Other Asia includes Afghanistan; Bhutan; Cambodia (until 1994); Cook Islands; Fiji; French Polynesia; Kiribati; Lao People's Democratic Republic; Macau.

A.5 List of countries for 9.2.1a and 9.2.1b

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Eswatini, Ethiopia, Faroe Islands, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Holy See, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Niue, North Macedonia, Norway, Occupied Palestinian Territory, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Togo, Tokelau, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Kingdom,

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United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.6 List of countries for 9.2.2 Manufacturing employment as a proportion of total employment

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Eswatini, Ethiopia, Faroe Islands, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Holy See, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Niue, North Macedonia, Norway, Occupied Palestinian Territory, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Togo, Tokelau, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Kingdom, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.7 List of countries with data available for indicator 9.3.1

Luxembourg, Malaysia, Albania, Australia, Malta, Mexico, Australia, Austria, Mexico, Nepal, Netherlands, Austria, Bangladesh, Belarus, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Bulgaria, China, Macao Special Administrative Region, Colombia, Croatia, Cyprus, Czechia, Denmark, Ecuador, Estonia, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Norway, Philippines, Poland, Portugal, Portugal, Republic of Korea, Romania, Singapore, Slovakia, Slovenia, Spain, Sri Lanka, State of Palestine, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Turkey, United Kingdom of Great Britain and Northern Ireland, United States of America.

A.8 List of countries with data available for indicator 9.3.2

Afghanistan, Albania, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Bahamas, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Czechia, Democratic Republic of the Congo, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Eswatini, Fiji, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau,

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Guyana, Honduras, Hungary, India, Indonesia, Iraq, Israel, amaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Senegal, Serbia, Sierra Leone, Slovakia, Slovenia, Solomon Islands, South Africa, South Sudan, Sri Lanka, State of Palestine, Suriname, Sweden, Tajikistan, Thailand, The former Yugoslav Republic of Macedonia, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Republic of Tanzania, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.9 List of countries with data available for indicator 9.4.1

Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Cambodia, Cameroon, Canada, Caribbean, Chile, China, China, Hong Kong Special Administrative Region, Colombia, Congo, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Curaçao, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia, Finland, France, Gabon, Georgia, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Malaysia, Malta, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, The former Yugoslav Republic of Macedonia, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.10 List of countries with data available for indicator 9.b.1

Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, , Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central Africa Republic, Chile, China, China, Hong Kong Special Administrative Region, Colombia, Congo, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Curaçao, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia, Eswatini, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Malta, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Lucia, Saudi Arabia,

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Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, State of Palestine, Tajikistan, Thailand, The former Yugoslav Republic of Macedonia, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, United States of America, Uruguay, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.11 List of countries with data available for indicator 12.2.2

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Cook Islands, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czechia, Democratic People's Republic of Korea, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Eswatini, Ethiopia, Faroe Islands, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Holy See, Honduras, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia (Federated States of), Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Niue, North Macedonia, Norway, Occupied Palestinian Territory, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, Timor-Leste, Togo, Tokelau, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Kingdom, United Republic of Tanzania, United States of America, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

A.12 List of countries for Hazardous waste generated in UNSD database

Algeria, Andorra, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Belize, Benin, Bermuda, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Cabo Verde, Cameroon, China, China, China, Hong Kong Special Administrative Region, Croatia, Cuba, Cyprus, Czechia, Denmark, Dominica, Ecuador, Estonia, Finland, France, French Guiana, Germany, Greece, Guadeloupe, Guatemala, Hungary, Iceland, India, Iraq, Ireland, Italy, Jamaica, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lebanon, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Martinique, Mauritius, Monaco, Monaco, Morocco, Netherlands, Niger, Norway, Panama, Philippines, Poland, Portugal, RÃ©union, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, State of Palestine, Suriname, Sweden, Syrian Arab Republic, Thailand, The former Yugoslav Republic of Macedonia, Togo, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, Yemen, Zambia, Zimbabwe.

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A.13 List of countries for Hazardous waste recycled in UNSD database

Albania, Andorra, Armenia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Bermuda, Bulgaria, Cameroon, China, Hong Kong Special Administrative Region, Croatia, Cuba, Cyprus, Czechia, Denmark, Estonia, Finland, French Guiana, Georgia, Germany, Greece, Guadeloupe, Guatemala, Hungary, Iceland, India, Iraq, Ireland, Italy, Jamaica, Jordan, Kazakhstan, Latvia, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Martinique, Mauritius, Monaco, Netherlands, Niger, Norway, Philippines, Poland, Portugal, Reunion, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Serbia, Slovakia, Slovakia, Slovenia, South Africa, Spain, State of Palestine, Sweden, Thailand, The former Yugoslav Republic of Macedonia, Turkey, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United Republic of Tanzania, Zambia, Zimbabwe.

Appendix B.

B.1 Country ranking by application of HDI

HDI Ranking		
Country	Score	Rank
VERY HIGH HUMAN DEVELOPMENT		
Norway	0,952522	1
Switzerland	0,943998	2
Australia	0,938631	3
Ireland	0,93841	4
Germany	0,936043	5
Iceland	0,934879	6
Hong Kong, China (SAR)	0,932583	7
Sweden	0,932805	7
Singapore	0,932042	9
Netherlands	0,930639	10
Denmark	0,929474	11
Canada	0,925952	12
United States	0,923914	13
United Kingdom	0,921549	14
Finland	0,919653	15
New Zealand	0,916688	16
Belgium	0,916066	17
Liechtenstein	0,916083	17
Japan	0,909153	19
Austria	0,907755	20
Luxembourg	0,903939	21
Israel	0,903245	22
Korea (Republic of)	0,902561	22
France	0,900802	24
Slovenia	0,896224	25
Spain	0,89102	26
Czechia	0,887561	27
Italy	0,879769	28

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Malta	0,878187	29
Estonia	0,871042	30
Greece	0,869934	31
Cyprus	0,868784	32
Poland	0,865075	33
United Arab Emirates	0,862757	34
Andorra	0,857684	35
Lithuania	0,858135	35
Qatar	0,855616	37
Slovakia	0,8552	38
Brunei Darussalam	0,853267	39
Saudi Arabia	0,853299	39
Latvia	0,847143	41
Portugal	0,847113	41
Bahrain	0,846108	43
Chile	0,842859	44
Hungary	0,837845	45
Croatia	0,831102	46
Argentina	0,82485	47
Oman	0,820989	48
Russian Federation	0,816275	49
Montenegro	0,813692	50
Bulgaria	0,813006	51
Romania	0,811192	52
Belarus	0,80753	53
Bahamas	0,807126	54
Uruguay	0,803948	55
Kuwait	0,803066	56
Malaysia	0,801808	57
Barbados	0,800269	58
Kazakhstan	0,800435	58
HIGH HUMAN DEVELOPMENT		
Iran (Islamic Republic of)	0,798057	60
Palau	0,798478	60
Seychelles	0,796529	62
Costa Rica	0,793865	63
Turkey	0,790634	64
Mauritius	0,79012	65
Panama	0,78932	66
Serbia	0,786693	67
Albania	0,784911	68
Trinidad and Tobago	0,783915	69
Antigua and Barbuda	0,779536	70
Georgia	0,779822	70
Saint Kitts and Nevis	0,777845	72
Cuba	0,777268	73

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Mexico	0,774035	74
Grenada	0,771948	75
Sri Lanka	0,77001	76
Bosnia and Herzegovina	0,768451	77
Venezuela (Bolivarian Republic of)	0,760773	78
Brazil	0,759245	79
Azerbaijan	0,756965	80
Lebanon	0,756696	80
The former Yugoslav Republic of Macedonia	0,756687	80
Armenia	0,755113	83
Thailand	0,754684	83
Algeria	0,753768	85
China	0,751704	86
Ecuador	0,7519	86
Ukraine	0,75071	88
Peru	0,749773	89
Colombia	0,747045	90
Saint Lucia	0,747049	90
Fiji	0,740788	92
Mongolia	0,740816	92
Dominican Republic	0,735798	94
Jordan	0,735373	95
Tunisia	0,73472	95
Jamaica	0,732241	97
Tonga	0,725645	98
Saint Vincent and the Grenadines	0,722708	99
Suriname	0,719612	100
Botswana	0,716552	101
Maldives	0,716864	101
Dominica	0,715057	103
Samoa	0,712812	104
Uzbekistan	0,709847	105
Belize	0,707553	106
Marshall Islands	0,707947	106
Libya	0,705599	108
Turkmenistan	0,706257	108
Gabon	0,702216	110
Paraguay	0,701662	110
Moldova (Republic of)	0,699753	112
MEDIUM HUMAN DEVELOPMENT		
Philippines	0,698932	113
South Africa	0,69903	113
Egypt	0,695608	115
Indonesia	0,69398	116
Viet Nam	0,693998	116
Bolivia (Plurinational State of)	0,692537	118

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Palestine, State of	0,685836	119
Iraq	0,685317	120
El Salvador	0,674159	121
Kyrgyzstan	0,672193	122
Morocco	0,666513	123
Nicaragua	0,65774	124
Cabo Verde	0,654031	125
Guyana	0,653637	125
Guatemala	0,650312	127
Tajikistan	0,650015	127
Namibia	0,646525	129
India	0,639833	130
Micronesia (Federated States of)	0,627255	131
Timor-Leste	0,624944	132
Honduras	0,616717	133
Bhutan	0,612418	134
Kiribati	0,611784	134
Bangladesh	0,608156	136
Congo	0,606283	137
Vanuatu	0,602574	138
Lao People's Democratic Republic	0,601276	139
Ghana	0,591738	140
Equatorial Guinea	0,590561	141
Kenya	0,58992	142
Sao Tome and Principe	0,589476	143
Eswatini (Kingdom of)	0,588316	144
Zambia	0,588083	144
Cambodia	0,581975	146
Angola	0,581179	147
Myanmar	0,578263	148
Nepal	0,574038	149
Pakistan	0,561603	150
Cameroon	0,555938	151
LOW HUMAN DEVELOPMENT		
Solomon Islands	0,54596	152
Papua New Guinea	0,544304	153
Tanzania (United Republic of)	0,537715	154
Syrian Arab Republic	0,535704	155
Zimbabwe	0,534553	156
Nigeria	0,53181	157
Rwanda	0,523947	158
Lesotho	0,519729	159
Mauritania	0,519644	159
Madagascar	0,519163	161
Uganda	0,516321	162
Benin	0,51462	163

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Senegal	0,505134	164
Comoros	0,503254	165
Togo	0,50322	165
Sudan	0,502466	167
Afghanistan	0,497695	168
Haiti	0,497945	168
Côte d'Ivoire	0,492305	170
Malawi	0,476553	171
Djibouti	0,476006	172
Ethiopia	0,462664	173
Gambia	0,460067	174
Guinea	0,459111	175
Congo (Democratic Republic of the)	0,457469	176
Guinea-Bissau	0,455304	177
Yemen	0,4519	178
Eritrea	0,439979	179
Mozambique	0,43658	180
Liberia	0,435094	181
Mali	0,426869	182
Burkina Faso	0,423423	183
Sierra Leone	0,418987	184
Burundi	0,417216	185
Chad	0,40397	186
South Sudan	0,387725	187
Central African Republic	0,366809	188
Niger	0,353931	189

B.2 Country ranking by application of GEP

GEP Ranking		
Country	Score	Rank
Cyprus	0,5862	1
Portugal	0,0999	2
Spain	0,2118	3
Italy	0,2598	4
France	0,1664	5
Hungary	0,3902	6
Slovenia	0,4997	7
Japan	0,112	8
Denmark	0,064	9
Austria	0,1031	10
Germany	0,1664	11
United Kingdom	0,1655	12
United States	0,0823	13
Ireland	0,6197	14

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Norway	0,1789	15
Sweden	0,0443	16
New Zealand	0,1482	17
Netherlands	0,1519	18
Luxembourg	0,2536	19
Greece	0,2209	20
Croatia	0,1999	21
Australia	-0,0601	22
Israel	0,0676	23
Switzerland	0,183	24
Singapore	-0,1218	25
Finland	0,1193	26
Slovak Republic	0,0251	27
Czech Republic	0,1637	28
Argentina	0,104	29
Estonia	0,0647	30
Chile	0,1501	31
Poland	0,3607	32
Canada	0,0837	33
Lithuania	-0,1224	34
Jamaica	0,1256	35
Azerbaijan	0,2512	36
Jordan	0,1523	37
Venezuela, RB	-0,0497	38
Tunisia	0,3572	39
Sri Lanka	0,1957	40
Georgia	-0,2141	41
Costa Rica	-0,0891	42
Ecuador	0,0564	43
Albania	-0,2399	44
Turkey	0,0954	45
Mexico	0,227	46
Panama	0,0533	47
Macedonia, FYR	-0,0505	48
Russian Federation	-0,0337	49
Colombia	-0,017	50
Brazil	-0,0059	51
Thailand	0,2018	52
Bulgaria	0,5328	53
Peru	0,305	54
Ukraine	-0,037	55
China	-0,2524	56
Uruguay	-0,2709	57
Kazakhstan	-0,0615	58
Malaysia	-0,013	59
Latvia	-0,3275	60

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Belarus	0,3339	61
Dominican Republic	0,2801	62
South Africa	-0,1977	63
Philippines	0,1978	64
Honduras	0,1329	65
Moldova	0,2619	66
Nicaragua	0,2183	67
Indonesia	-0,0452	68
Guatemala	0,0849	69
Mongolia	-0,7955	70
Tajikistan	0,1505	71
Cambodia	0,5917	72
Algeria	0,0011	73
Namibia	0,2569	74
Bolivia	0,1114	75
Morocco	0,1105	76
Egypt, Arab Rep.	0,1345	77
Kyrgyz Republic	0,1132	78
India	0,0097	79
El Salvador	0,2504	80
Paraguay	0,3182	81
Vietnam	-0,2795	82
Zimbabwe	0,053	83
Senegal	0,1607	84
Cameroon	0,2448	85
Mali	0,1931	86
Malawi	0,2784	87
Mozambique	0,3059	88
Nepal	0,2931	89
Benin	-0,1081	90
Togo	0,2128	91
Yemen, Rep.	0,1525	92
Cote d'Ivoire	0,0197	93
Uganda	0,9029	94
Ghana	0,0497	95
Bangladesh	0,2639	96
Zambia	0,0406	97
Pakistan	0,1872	98
Kenya	0,0867	99
Angola	0,1811	100

C.3 Country ranking by application of SDG

SDG Ranking		
Country	Score	Rank

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Denmark	85,217773	1
Sweden	84,992351	2
Finland	82,822047	3
France	81,493399	4
Austria	81,073703	5
Germany	81,067213	6
Czech Republic	80,736233	7
Norway	80,660824	8
Netherlands	80,378564	9
Estonia	80,220065	10
New Zealand	79,498484	11
Slovenia	79,40812	12
United Kingdom	79,375968	13
Iceland	79,203001	14
Japan	78,917418	15
Belgium	78,891662	16
Switzerland	78,840287	17
Korea, Rep.	78,331815	18
Ireland	78,215979	19
Canada	77,887428	20
Spain	77,840505	21
Croatia	77,79186	22
Belarus	77,444762	23
Latvia	77,134978	24
Hungary	76,886594	25
Portugal	76,425954	26
Slovak Republic	76,214701	27
Malta	76,105312	28
Poland	75,928089	29
Italy	75,790128	30
Chile	75,611489	31
Lithuania	75,103272	32
Costa Rica	74,975052	33
Luxembourg	74,784461	34
United States	74,51961	35
Bulgaria	74,519053	36
Moldova	74,409774	37
Australia	73,886629	38
China	73,211409	39
Thailand	73,000581	40
Ukraine	72,813929	41
Romania	72,730755	42
Uruguay	72,551178	43
Serbia	72,486581	44
Argentina	72,350407	45
Ecuador	72,291182	46

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Maldives	72,12313	47
Kyrgyz Republic	71,617264	48
Israel	71,529392	49
Greece	71,409637	50
Peru	71,185725	51
Uzbekistan	71,130551	52
Algeria	71,099706	53
Vietnam	71,085281	54
Russian Federation	70,940339	55
Cuba	70,819126	56
Brazil	70,615761	57
Iran, Islamic Rep.	70,486409	58
Azerbaijan	70,458904	59
Albania	70,272647	60
Cyprus	70,144018	61
Fiji	70,070842	62
Tunisia	69,987997	63
Dominican Republic	69,761909	64
United Arab Emirates	69,708919	65
Singapore	69,615718	66
Colombia	69,570822	67
Malaysia	69,557891	68
Bosnia and Herzegovina	69,388734	69
North Macedonia	69,383922	70
Tajikistan	69,226565	71
Morocco	69,06973	72
Georgia	68,913411	73
Jamaica	68,79748	74
Armenia	68,773184	75
Bahrain	68,719414	76
Kazakhstan	68,709332	77
Mexico	68,509282	78
Turkey	68,488807	79
Bolivia	68,393174	80
Jordan	68,085264	81
Nicaragua	67,943409	82
Oman	67,855285	83
Bhutan	67,575325	84
Trinidad and Tobago	67,556325	85
Paraguay	67,518447	86
Montenegro	67,250134	87
Suriname	67,033539	88
El Salvador	66,732878	89
Panama	66,30656	90
Qatar	66,279109	91
Egypt, Arab Rep.	66,206091	92

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Sri Lanka	65,841249	93
Lebanon	65,666283	94
Sao Tome and Principe	65,48414	95
Cabo Verde	65,050905	96
Philippines	64,936389	97
Saudi Arabia	64,837987	98
Gabon	64,764913	99
Mongolia	64,693859	100
Turkmenistan	64,257748	101
Indonesia	64,193491	102
Nepal	63,934704	103
Ghana	63,801659	104
Mauritius	63,589159	105
Kuwait	63,511739	106
Honduras	63,414189	107
Venezuela, RB	63,05439	108
Belize	62,548818	109
Myanmar	62,178534	110
Lao PDR	62,029067	111
Cambodia	61,784182	112
South Africa	61,480933	113
Guyana	61,407774	114
India	61,076888	115
Bangladesh	60,875489	116
Iraq	60,792816	117
Vanuatu	59,874249	118
Namibia	59,867205	119
Botswana	59,765427	120
Zimbabwe	59,673524	121
Guatemala	59,647259	122
Syrian Arab Republic	58,127416	123
Senegal	57,301256	124
Kenya	57,028217	125
Rwanda	56,021937	126
Cameroon	56,021189	127
Tanzania	55,820685	128
Cote d'Ivoire	55,701777	129
Pakistan	55,566034	130
Gambia, The	55,001109	131
Congo, Rep.	54,217521	132
Yemen, Rep.	53,702073	133
Mauritania	53,329439	134
Ethiopia	53,249914	135
Mozambique	53,033557	136
Comoros	52,980901	137
Guinea	52,814963	138

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Zambia	52,615084	139
Uganda	52,574663	140
Burkina Faso	52,403842	141
Eswatini	51,687944	142
Papua New Guinea	51,615214	143
Togo	51,596383	144
Burundi	51,546631	145
Malawi	51,381143	146
Sudan	51,363179	147
Djibouti	51,362368	148
Angola	51,320358	149
Lesotho	50,942793	150
Benin	50,853801	151
Mali	50,214733	152
Afghanistan	49,649156	153
Niger	49,448012	154
Sierra Leone	49,240407	155
Haiti	48,435081	156
Liberia	48,18254	157
Madagascar	46,698955	158
Nigeria	46,405792	159
Congo, Dem. Rep.	44,945578	160
Chad	42,787118	161
Central African Republic	39,075146	162

B.4 Country ranking by application of EPI

EPI Ranking		
Country	Score	Rank
Switzerland	87.42	1
France	83.95	2
Denmark	81.60	3
Malta	80.90	4
Sweden	80.51	5
United Kingdom	79.89	6
Luxembourg	79.12	7
Austria	78.97	8
Ireland	78.77	9
Finland	78.64	10
Iceland	78.57	11
Spain	78.39	12
Germany	78.37	13
Norway	77.49	14
Belgium	77.38	15
Italy	76.96	16

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New Zealand	75.96	17
Netherlands	75.46	18
Israel	75.01	19
Japan	74.69	20
Australia	74.12	21
Greece	73.60	22
Taiwan	72.84	23
Cyprus	72.60	24
Canada	72.18	25
Portugal	71.91	26
United States of America	71.19	27
Slovakia	70.60	28
Lithuania	69.33	29
Bulgaria	67.85	30
Costa Rica	67.85	31
Qatar	67.80	32
Czech Republic	67.68	33
Slovenia	67.57	34
Trinidad and Tobago	67.36	35
Saint Vincent and the Grenadines	66.48	36
Latvia	66.12	37
Turkmenistan	66.10	38
Seychelles	66.02	39
Albania	65.46	40
Croatia	65.45	41
Colombia	65.22	42
Hungary	65.01	43
Belarus	64.98	44
Romania	64.78	45
Dominican Republic	64.71	46
Uruguay	64.65	47
Estonia	64.31	48
Singapore	64.23	49
Poland	64.11	50
Venezuela	63.89	51
Russia	63.79	52
Brunei Darussalam	63.57	53
Morocco	63.47	54
Cuba	63.42	55
Panama	62.71	56
Tonga	62.49	57
Tunisia	62.35	58
Azerbaijan	62.33	59
South Korea	62.30	60
Kuwait	62.28	61
Jordan	62.20	62

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Armenia	62.07	63
Peru	61.92	64
Montenegro	61.33	65
Egypt	61.21	66
Lebanon	61.08	67
Macedonia	61.06	68
Brazil	60.70	69
Sri Lanka	60.61	70
Equatorial Guinea	60.40	71
Mexico	59.69	72
Dominica	59.38	73
Argentina	59.30	74
Malaysia	59.22	75
Antigua and Barbuda	59.18	76
United Arab Emirates	58.90	77
Jamaica	58.58	78
Namibia	58.46	79
Iran	58.16	80
Belize	57.79	81
Philippines	57.65	82
Mongolia	57.51	83
Chile	57.49	84
Serbia	57.49	85
Saudi Arabia	57.47	86
Ecuador	57.42	87
Algeria	57.18	88
Cabo Verde	56.94	89
Mauritius	56.63	90
Saint Lucia	56.18	91
Bolivia	55.98	92
Barbados	55.76	93
Georgia	55.69	94
Kiribati	55.26	95
Bahrain	55.15	96
Nicaragua	55.04	97
Bahamas	54.99	98
Kyrgyzstan	54.86	99
Nigeria	54.76	100
Kazakhstan	54.56	101
Samoa	54.50	102
Suriname	54.20	103
São Tomé and Príncipe	54.01	104
Paraguay	53.93	105
El Salvador	53.91	106
Fiji	53.09	107
Turkey	52.96	108

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Ukraine	52.87	109
Guatemala	52.33	110
Maldives	52.14	111
Moldova	51.97	112
Botswana	51.70	113
Honduras	51.51	114
Sudan	51.49	115
Oman	51.32	116
Zambia	50.97	117
Grenada	50.93	118
Tanzania	50.83	119
China	50.74	120
Thailand	49.88	121
Micronesia	49.80	122
Libya	49.79	123
Ghana	49.66	124
Timor-Leste	49.54	125
Senegal	49.52	126
Malawi	49.21	127
Guyana	47.93	128
Tajikistan	47.85	129
Kenya	47.25	130
Bhutan	47.22	131
Viet Nam	46.96	132
Indonesia	46.92	133
Guinea	46.62	134
Mozambique	46.37	135
Uzbekistan	45.88	136
Chad	45.34	137
Myanmar	45.32	138
Côte d'Ivoire	45.25	139
Gabon	45.05	140
Ethiopia	44.78	141
South Africa	44.73	142
Guinea-Bissau	44.67	143
Vanuatu	44.55	144
Uganda	44.28	145
Comoros	44.24	146
Mali	43.71	147
Rwanda	43.68	148
Zimbabwe	43.41	149
Cambodia	43.23	150
Solomon Islands	43.22	151
Iraq	43.20	152
Laos	42.94	153
Burkina Faso	42.83	154

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Sierra Leone	42.54	155
Gambia	42.42	156
Republic of Congo	42.39	157
Bosnia and Herzegovina	41.84	158
Togo	41.78	159
Liberia	41.62	160
Cameroon	40.81	161
Swaziland	40.32	162
Djibouti	40.04	163
Papua New Guinea	39.35	164
Eritrea	39.34	165
Mauritania	39.24	166
Benin	38.17	167
Afghanistan	37.74	168
Pakistan	37.50	169
Angola	37.44	170
Central African Republic	36.42	171
Niger	35.74	172
Lesotho	33.78	173
Haiti	33.74	174
Madagascar	33.73	175
Nepal	31.44	176
India	30.57	177
Dem. Rep. Congo	30.41	178
Bangladesh	29.56	179
Burundi	27.43	180

B.5 Country ranking by application of GGEI

GGEI Ranking		
Country	Score	Rank
Sweden	0,760817	1
Switzerland	0,75941372	2
Iceland	0,71291064	3
Norway	0,70305947	4
Finland	0,69970685	5
Germany	0,68901694	6
Denmark	0,68003548	7
Taiwan	0,66687869	8
Austria	0,64794361	9
France	0,64050038	10
United Kingdom	0,62295319	11
Colombia	0,61875529	12
Singapore	0,61544113	13
Costa Rica	0,61420637	14

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Ireland	0,59928813	15
Canada	0,59656008	16
Netherlands	0,59374792	17
New Zealand	0,59282661	18
Japan	0,59274536	19
Monaco	0,59092151	20
Kenya	0,58093439	21
Uruguay	0,57839082	22
Zambia	0,57402582	23
Belgium	0,5737126	24
Italy	0,56061675	25
South Korea	0,55911552	26
Thailand	0,55511081	27
China	0,55312173	28
Peru	0,55256345	29
Greece	0,54853128	30
United States	0,54712808	31
Hungary	0,5418668	32
Brazil	0,54169795	33
Spain	0,54110612	34
Portugal	0,54052724	35
India	0,53980573	36
Chile	0,53946105	37
Albania	0,53662059	38
Andorra	0,53461257	39
Ethiopia	0,52937943	40
Mexico	0,52626632	41
Cape Verde	0,52548958	42
Luxembourg	0,52307259	43
Georgia	0,51828421	44
Malta	0,5163421	45
Mauritius	0,51623596	46
Lithuania	0,51588334	47
Morocco	0,51283797	48
Israel	0,51198817	49
Rwanda	0,50917909	50
Philippines	0,50782144	51
Slovenia	0,50583648	52
Nigeria	0,50563589	53
Cambodia	0,5022447	54
Malaysia	0,4990112	55
Croatia	0,49121063	56
Tanzania	0,49078368	57
Panama	0,49031033	58
United Arab Emirates	0,4889319	59
Turkey	0,48701688	60

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Nepal	0,48347196	61
Vietnam	0,48270948	62
Laos	0,48128976	63
Gabon	0,48088224	64
Romania	0,47985809	65
Ecuador	0,47939243	66
Egypt	0,47921382	67
Madagascar	0,47752575	68
Czech Republic	0,47725471	69
Guinea	0,47464184	70
Seychelles	0,47230691	71
Qatar	0,47147221	72
Cameroon	0,47084435	73
Burkina Faso	0,46762375	74
Maldives	0,46696687	75
Dominica	0,46673751	76
Estonia	0,46622117	77
Latvia	0,46316943	78
Ghana	0,46032065	79
Democratic Republic of Congo	0,46022528	80
Vanuatu	0,45825585	81
Jordan	0,45698864	82
Indonesia	0,45274699	83
Slovak Republic	0,45267869	84
Myanmar	0,45151856	85
Cyprus	0,45111103	86
Cote d'Ivoire	0,44893274	87
Kuwait	0,44811713	88
Armenia	0,44795184	89
Saudi Arabia	0,44507997	90
South Africa	0,43761347	91
Azerbaijan	0,43658887	92
Central African Republic	0,43594216	93
Dominican Republic	0,43535607	94
Senegal	0,43463216	95
Argentina	0,43408309	96
Macedonia	0,43219782	97
Mozambique	0,43038846	98
Djibouti	0,42994084	99
Australia	0,42591769	100
Mali	0,4226204	101
Montenegro	0,4205378	102
Equatorial Guinea	0,41455484	103
Tunisia	0,41410731	104
Russian Federation	0,41153639	105
Poland	0,410111	106

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Bulgaria	0,40269707	107
Saint Lucia	0,40189924	108
Chad	0,39809873	109
Lebanon	0,39697144	110
Oman	0,39696202	111
Niger	0,39573118	112
Bangladesh	0,39405869	113
Pakistan	0,39348653	114
Serbia	0,39274868	115
Sao Tome and Principe	0,39117588	116
Comoros	0,39116635	117
Moldova	0,38798182	118
Burundi	0,38789075	119
Mongolia	0,38336618	120
Ukraine	0,38126336	121
Togo	0,38023524	122
Mauritania	0,37895341	123
Trinidad and Tobego	0,37779136	124
Congo	0,37643794	125
Guinea-Bissau	0,35099513	126
Bosnia-Herzegovina	0,34410616	127
Benin	0,34336186	128
Haiti	0,33899334	129
Bahrain	0,33040248	130

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