PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

South African Green Economy Progress Measurement Framework

Environment, Forestry and Fisheries
Trade, Industry and Competition
Science and Innovation

UN environment United Nations Environment Programme

ILO

UNDP

UNIDO

unitar United Nations Institute for Training and Research

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1. Introduction

In 2016, during the identification of the priority focus areas under Outcome 1 of the PAGE Country Log Frame (2016-19), consultations with both the PAGE National Steering Committee (NSC) and key stakeholders identified green economy indicators in South Africa as a focus area for PAGE's support.

Developing a national framework on green economy indicators would allow South Africa to monitor its progress toward a green economy, across a certain period of time, in the context of the Sustainable Development Goals and the Africa Agenda 2063. PAGE would assist South Africa in elaborating a Green Economy Progress National Framework as per PAGE's Green Economy Progress (GEP) Measurement Framework (PAGE 2017a and PAGE 2017b).

The GEP Measurement Framework allows countries to measure progress toward achieving development priorities at national and/or sub-national levels. In addition, the methodology helps track progress towards achieving key Sustainable Development Goals. The framework is set up based on two main components; on the one hand the Green Economy Progress Index i) measures the accumulation of capital –be it social, human, or natural and resource efficient, which serves as input for producing goods and services in an environmentally friendly manner; and ii) captures the transition in consumption, investment, government spending and trade toward such goods and services. The GEP Framework also includes a Dashboard of Sustainability, which comprises of indicators that monitor key stocks of capital that are essential for sustaining life on the planet including planetary boundary indicators such as ecological footprint, greenhouse gas emissions, land use and freshwater withdrawal.

In 2012, the Department of Planning, Monitoring and Evaluation (DPME) launched South Africa's National Development Plan (NDP), a detailed blueprint for how the country can eliminate poverty and reduce inequality by the year 2030. The NDP is structured around 14 priority outcomes, which cover focus areas including education, health, safety and security, economic growth and employment, skills development, among others. Both Outcome 4, Decent Employment through Inclusive Economic Growth, and Outcome 10, Protecting and enhancing environmental assets and natural resources are of prime importance to an inclusive green economy transition in South Africa.

Despite NDP's relevance to a green economy transition, a national framework on indicators that monitor NDP's progress on green economy is currently unavailable. PAGE is able to assist DPME in establishing a national framework on green economy indicators that is customized to monitor the implementation of the NDP, while using the targets put forth by the MTSF. The indicators framework's results can also potentially inform the update of the next five-year MTSF in 2019.

This report will present the results of the indicators stocktaking workshops, where we conducted a mapping of related green economy policy indicator frameworks and data currently available in South Africa and identify needs and learning gaps. One of the main results of this exercise will be to establish a National Framework for green economy indicators, based on PAGE's Green Economy Progress Measurement Framework. The framework would monitor progress toward a green economy transition, based on South Africa's National Development Plan (NDP) and Medium-Term Strategic Framework while integrating SDG targets and the Africa Agenda 2063. Finally, the report will present the application for South Africa of the Green Economy Progress Framework, by calculating the GEP Index for South Africa and discussing their main results and policy implications.

2. Indicator Selection Process

2. 1 Process description

Section 2 provides key methodological details about the indicator selection process developed in South Africa, as a prior step to the implementation of the GEP Measurement Framework (PAGE 2017) at the national scale (see section 3). The goal of such a selection process was to elucidate in a consistent and inclusive way which are the most pertinent indicators for measuring Green Economy (GE henceforth) progresses in South Africa.

Section 2 is structured sequentially, following the main stages on which the selection process has relied (see figure 1).

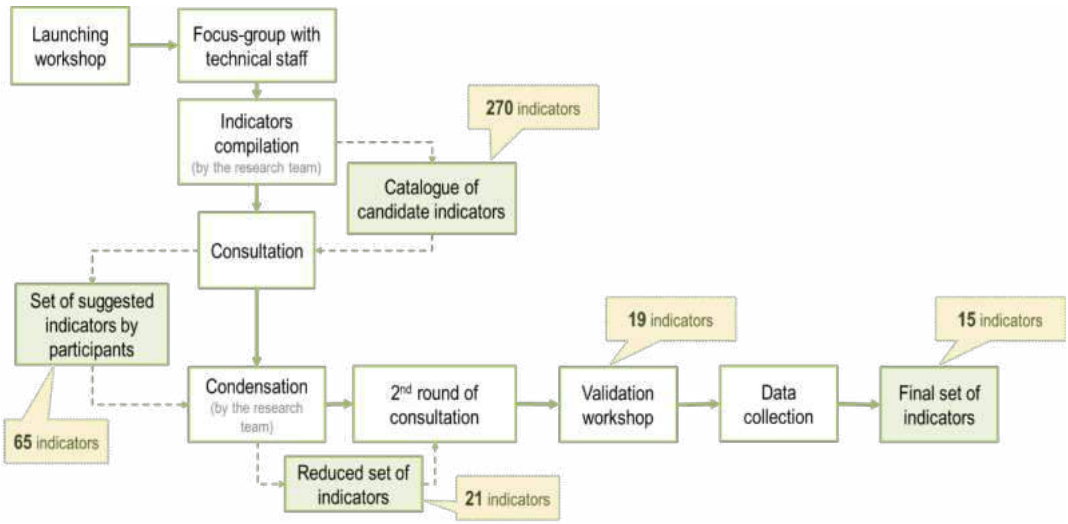


Figure 1. Indicator selection process in South Africa: Main stages and outputs

2.2 Launching Workshop (May 2018)

On May 2018, a PAGE mission involving the authors of the present report organized a preliminary scoping workshop titled, “Establishment of a South African National Green Economy Progress Framework” with national stakeholders (DEA, Pretoria). The objective of the workshop was to start engaging with key stakeholders on the potential forms that a National Green Economy Indicators for South Africa could take form in line of national priorities and local contexts. The workshop was also the occasion to present the GEP Framework’s methodology and how the indicators for the South African application could be selected (for further details, see: PAGE 2018).

2.3 Focus-group with local actors (February 2019)

The indicator selection process stricto sensu started on February 2019, through an online focus-group. During such a meeting, local actors and the research team agreed on a tentative agenda, identified potential participants and clarified respective roles. Strong emphasis was placed on the data sources that could be used to both select most pertinent indicators and provide the required data for the implementation of the measurement framework. Local actors insisted on the need to use already available indicators (instead of creating new ones, with the subsequent load for national services in terms of data collection and storage).

2.4 Indicators compilation (February 2019)

The search for candidate indicators started by looking at the reports that local actors had shared with the project team during the focus-group; i.e. Outcome 10 Environment (DEA 2010) and Indicator Baseline Report (StatsSA 2017). Given the limited scope of these two reports and the lack of additional inputs from actors (despite several enquiries), it was agreed to look for complementary sets recently published by other South African Departments. A third report was found: the so-called Development Indicators (DPME 2016), whose contents appeared to match particularly well to the two other reports. The three sets yielded altogether to a net catalogue of 270 candidate indicators). In order to make the catalogue more user-friendly and structure the diversity of potential metrics, the project team systematically characterized and classified each indicator according to the SDGs it refers to (see Merino-Saum 2018 for further details).

Such a catalogue was the (tangible) starting point of the indicator selection process. Since all collected indicators had been selected at some point by National Offices/Departments for their closeness to Sustainable Development and Environmental Sustainability, they were all deem to be -at least partially- policy relevant.

2.5 Consultation (March 2019)

The consultation process was accomplished through a survey sent by email to each potential participant. The process started in mid-February (18.02.2019) and lasted over 4 weeks. The last survey was received on 14.03.2019. In total, 9 participants filled the survey in, representing four different Departments (DEA, DPME, EDD and DST) and one National Service (StatsSA).

Participants were given the catalogue of 270 candidate indicators described in section 2.4 (EXCEL file). They were invited to select up to 20 indicators to monitor GE in South Africa. They were also given the opportunity to choose among their own selection up to 5 key indicators (i.e. those they deemed as being particularly relevant).

Such a consultation process was seen as a second filter on policy relevance. Indeed, although all candidate indicators had been taken from frameworks related to GE issues, their concrete closeness to the concept of GE had to be verified more in-depth. We thus directly asked local actors to apply this filter considering both the GE notion and context-specificity.

We strongly invited participants to do their own selection by reasoning in terms of SDGs (the 270 candidate indicators had been screened by SDGs, so it was possible for them to select their preferred indicators sequentially, using filters within the EXCEL sheet, and subsequently checking and eventually re-considering the choices done beforehand).

In practical terms, the survey on itself was presented as a basic WORD file with a simple and intuitive table to be fulfilled by each participant. Indeed, the latter had simply to copy and paste their preferred indicators and send us the survey back once completed.

The project team progressively collected the indicators suggested by the participants and methodically added them into a new catalogue finally made of 65 indicators (after checking explicit duplicates; see annex 1).

It is important to note that the consultation stage was the one during which the amount of candidate indicators was compressed the most (see figure 2). Very concretely, 76% candidate indicators were kept out from the process. Hence, policy relevance played a key role among all the selection criteria considered in the entire process.

Figure 2: Complexity compression during the consultation process

2.6 Condensation by the research team (March 2019)

The condensation stage was achieved by the project team. It relied on four selection criteria: (i) salience; (ii) parsimony; (iii) comprehensiveness; and (iv) measurability.

2.6.1 Salience

As a way to reduce the complexity inherent to the 65 indicators suggested by the participants, it was agreed to consider only those being particularly salient. Salience is one of the most common selection criteria applied in the development of indicator sets for sustainability and GE (see for instance: Parris & Kates 2003; Reed et al. 2006). In the particular context of this project, salience was measured as follows: each suggested indicator was attributed 1 point (one for each survey in which it had been included), and 3 points when it had been selected as a crucial one. We then aggregated the points from all the surveys and obtained an overall level of salience.

The rule applied to filter the indicators was to retain only those of them with at least 3 points. In other words, we exclusively kept the indicators fulfilling at least one the two following principles: (i) the indicator at hand had been suggested as crucial by at least one participant; (ii) the indicator at hand had been selected by at least three participants. Such a filtering led us to a set of 33 indicators (see annex 2).

2.6.2 Comprehensiveness

Given the amount of indicators excluded through the 'salience filtering' (see previous sub-section), we decided to look for potential gaps in the resulting set; i.e. to check global comprehensiveness (see: Guy & Kibert 1998; Mascarenhas et al. 2015). To do that, the project team systematically screened the 33 indicators through a multi-dimensional framework taken from Merino-Saum et al. (2018) (see figure 3). Each indicator was scanned by: (i) most related Natural Resources -NRs- ; (ii); most related Environmental Functions -EFs- (comparable to the ecosystem services considered in the Millennium Assessment) ; and (iii) most related SDGs. Such a triptych specifies for each indicator:

(i) *what* human society is using from natural systems; i.e. which NRs are being used (substantial dimension);

(ii) *how* such resources are being used; i.e. how NRs are concretely use (instrumental dimension);

(iii) *why* such resources are used; i.e. which particular goals does human society targets when using the resources (teleological dimension).

Thanks to these complementary perspectives, the information conveyed by each GE indicator was pertinently depicted and mapped into a tridimensional space (the

so-called 'Green Cube') simultaneously expressing most related NRs, EFs and SDGs.

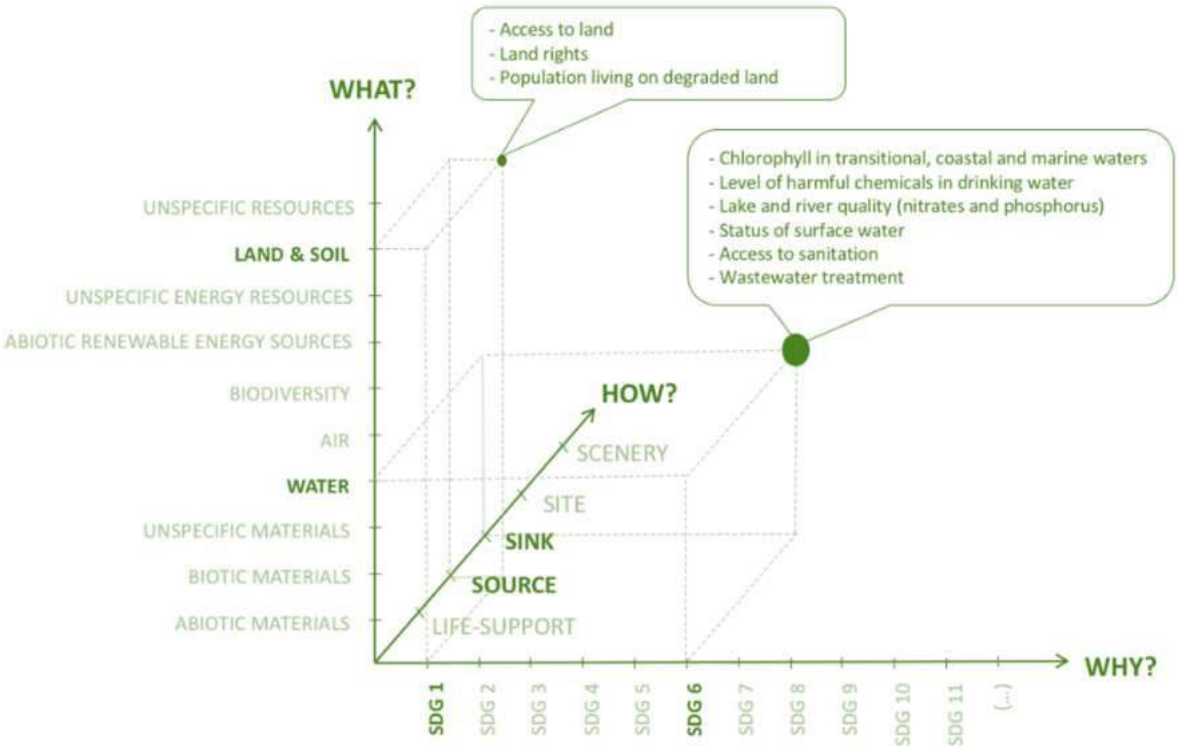


Figure 3: Conceptual Framework used in the indicator selection process (*source: Merino-Saum et al. 2018)*.

The scanning revealed several gaps, notably in terms of SDGs and NRs. It is important to precise that the goal of such a comprehensiveness test was not necessarily to have a final set covering all the SDGs or all NRs. Indeed, that would lead an excessively large final set with probably low relevance for decision-makers and the general public. The objective was rather to signal existing gaps to local actors and check whether they purposely decide to keep the gaps as they are or if they rather deem necessary to fulfill them with additional/alternative indicators.

As figure 4 illustrates, within the reduced set of indicators (n=33) no indicator was referring to SDGs 2 (No hunger), 5 (Gender equality) and 17 (partnerships for the goals). The project team suggested to include "Food insecurity" (SDG 2) and "Median earnings of female and male employees" (SDG 5), both having been selected during the consultation process but excluded after the 'salience filtering'. Alternative indicators such as "Protection of high potential agricultural land" (SDG 2) or "Representation of women in legislative bodies" (SDG 5) were also suggested.[1]

[1] **"Representation of women in legislative bodies" (SDG 5) seems a better option since it captures also SDG 16. The latter is only (very partially) covered by "Implementation of National**

Given the amount of indicators that were target for the application of the GEP Measurement Framework and the scale of analysis (national level), we suggested not to add indicators for SDG 17.

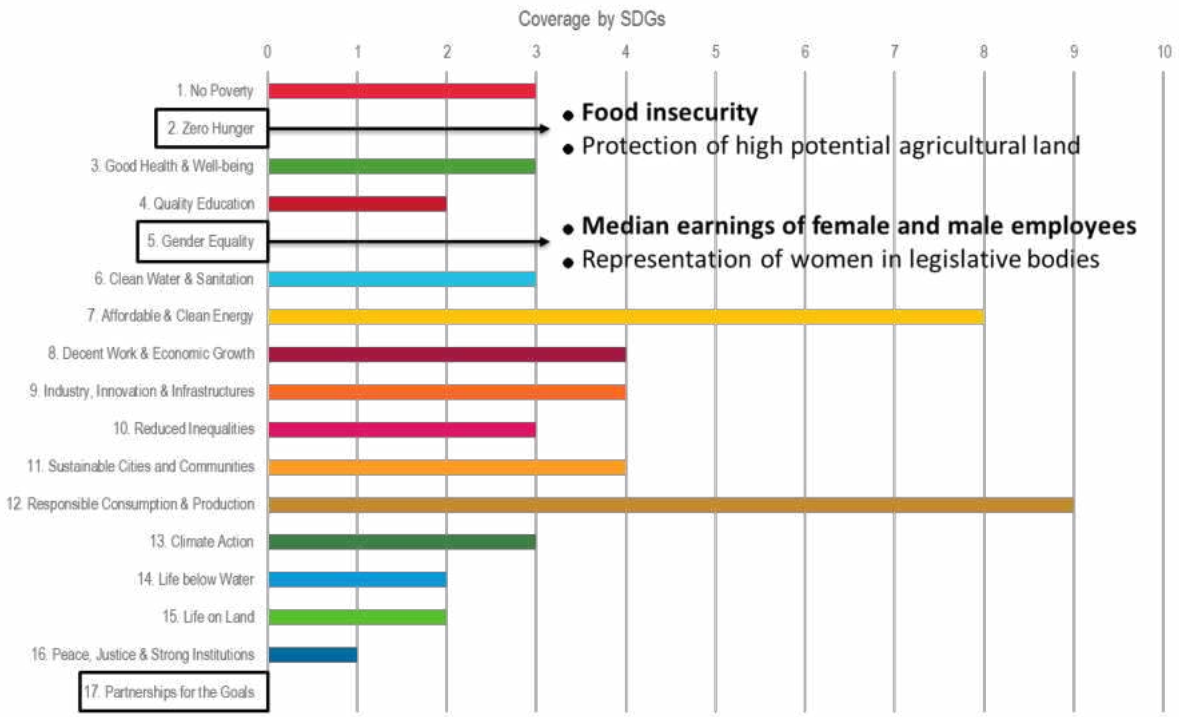


Figure 4: Comprehensiveness in terms of SDGs

In terms of NRs, the scanning also revealed a gap: no indicator from the reduced set was referring to land & soil (see figure 5). Again, the project team suggested to add one indicator among the following: “Land mass under conservation”; “Protection of high potential agricultural land”; “Rehabilitation of land affected by degradation” or “Wetlands under protection”.

Strategy for Sustainable Development and Action plan”, an indicator which overlapping with another one (see section 5.3) and whose measurability is limited (the indicator is measured as a binary variable).

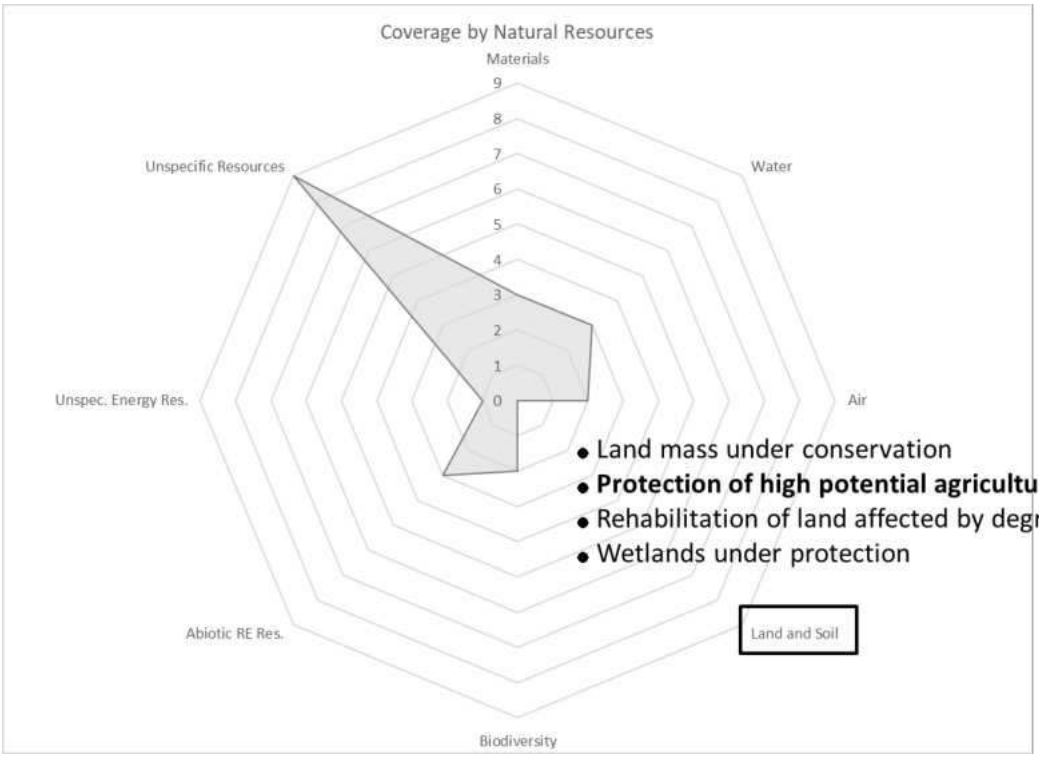


Figure 5: Comprehensiveness in terms of NRs

2.6.3 Parsimony (non-redundancy)

Once gaps were identified, the analysis focused on elucidating potential redundancies among the selected indicators, the idea being to build a set with as few indicators as possible (see: Spangenberg et al. 2002; Binder et al. 2010). To do that, the project team used the same conceptual framework (the so-called 'Green Cube') and built up a similarity matrix (see figure 6). The latter, which must be understood as a heat map, expresses the level of similarity between each pair of indicators according to the SDGs, NRs and EFs they refer to. Those pairs of indicators with a level of similarity equal to or greater than 3 were considered as potential redundancies. The threshold was decided by the project team according to the goals of the selection process (the purpose being to have at the end around 20 indicators).

Based on these results, the research team suggested several clusters (see table 1), which subsequently led to the removal of 12 indicators whose information was already conveyed by other indicators.

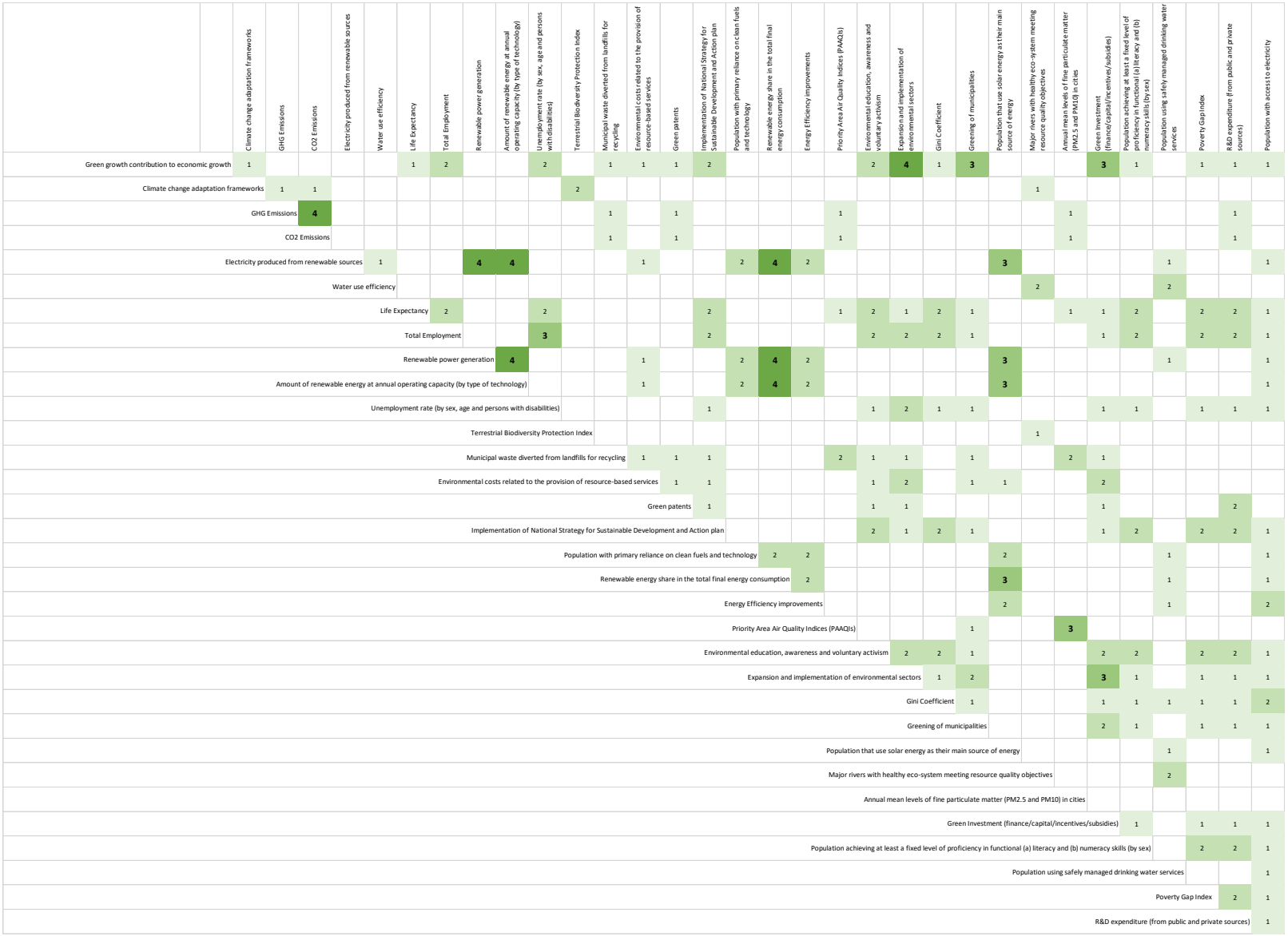


Figure 6: Similarity Matrix (identifying potential overlappin

indicators	Condensation suggested by the research team	Suggested indicators
● GHG Emissions	select only one of them	● GHG Emissions
● CO2 Emissions		
● Total Employment	select only one of them	● Unemployment rate (by sex, age and persons with disabilities)
● Unemployment rate (by sex, age and persons with disabilities)		
● Climate change adaptation frameworks	select only one of them	● Climate change adaptation frameworks
● Implementation of National Strategy for Sustainable Development and Action plan		
● Expansion and implementation of environmental sectors	select only one of them	● Expansion and implementation of environmental sectors
● Green growth contribution to economic growth		
● Green Investment (finance/capital/incentives/subsidies)		
● Priority Area Air Quality Indices (PAAQIs) (PM10 and SO2)	select only one of them	● Priority Area Air Quality Indices (PAAQIs) (PM10 and SO2)
● Annual mean levels of fine particulate matter (PM2.5 and PM10) in cities		
● Electricity produced from renewable sources	Select only 3 indicators dealing with: (i) renewables; (ii) energy efficiency; and (iii) energy accessibility	● Energy Efficiency improvements
● Renewable power generation		
● Amount of renewable energy at annual operating capacity (by type of technology)		
● Population with primary reliance on clean fuels and technology		● Population with access to electricity ● Renewable power generation
● Renewable energy share in the total final energy consumption		
● Energy Efficiency improvements		
● Population with access to electricity		

Table 1: Clusters suggested by the research team (parsimony filter)

2.6.4 Measurability

Finally, the project team identified several indicators whose application within the GEP Measurement Framework seemed difficult -if not impossible- in terms of measurability, sensitivity and/or temporal coverage.

We thus recommended local actors to keep them out or alternatively, to provide the data that could be used to include them in the measurement framework. The indicators at hand are:

(i) Environmental costs related to the provision of resource-based services (# tools developed for economic valuing);

(ii) Environmental education, awareness and voluntary activism (binary: Environmental Plan in place or not);

(iii) Greening of municipalities (# decent jobs)

(iv) Major rivers with healthy eco-system meeting resource quality objectives (# rivers).

The condensation stage led to the following list of 21 indicators (see table 2).

#	Indicators	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Climate change adaptation frameworks (i) for major biomes & aquatic ecosystems; (ii) integrated into national sectoral plans	# biomes; # sectors													1	1	1		
2	GHG Emissions	Mt CO2-eq									1				1				
3	Water use efficiency	effective water use / actual water withdrawal						1											
4	Life Expectancy	years			1														
5	Renewable power generation	GW/hour							1										
6	Terrestrial Biodiversity Protection Index	index															1		
7	Municipal waste diverted from landfills for recycling	% municipal waste											1	1					
8	Unemployment rate (by sex, age and persons with disabilities)	percentage								1									
9	Green patents	# patents in green technologies									1			1					
10	Expansion and implementation of environmental sectors	# work opportunities								1				1					
11	Energy Efficiency improvements	% improvements							1										
12	Priority Area Air Quality Indices (PAAQIs) (PM10 and SO2)	index			1								1						
13	Gini Coefficient	index										1							
14	Population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills (by sex)	% population; rate of improvement				1													
15	Population using safely managed drinking water services	% population						1				1							

16	Population with access to electricity	% population	1 1 1
17	Poverty Gap Index	index	1
18	R&D expenditure (from public and private sources)	% GDP	1
19	Protection of high potential agricultural land	% of land considered high potential	1
20	Food insecurity in population (based on the Community Childhood Hunger Identification Project -CCHIP- Index)	% - index	1
21	Median monthly earnings of female and male employees (by occupations)	monetary units	1 1

Table 2: Suggested set of indicators to be discussed and validated by local actors

2.7 Second round of consultation

The reduced set of 21 indicators presented in Table 2 was sent by email to local actors for feed-backs, who were invited to read the short report enclosed to the set and comment the suggested selection. Unfortunately, the participation rate at this stage of the selection process was rather low and only a few actors got involved in the consultation. All the remarks and suggestions were carefully considered by the project team, who addressed them one by one and replied in-depth to each participant. The inputs collected through this second round of consultation were used to foster discussion during the validation meeting (see section 2.8).

2.8 Validation Workshop (July 2019)

An online workshop was held in July 2019 with all involved parties in order to validate the final set of indicators. During this meeting, participants discussed the suitability of each suggested indicator one by one, raising potential concerns and making any eventual suggestion they deemed necessary. A summary of the discussions is presented in table 3. As can be noticed, most of the indicators were validated either as they were suggested in the preliminary set or in an alternative version (e.g. with different units, as relative measures). Two indicators were rejected: (i) “Climate change adaptation frameworks” and (ii) “Food insecurity in population”, leading to a set of 19 indicators before the data collection process.

Indicators selected by the participants (with salience score equal or greater than 3)

	Suggested indicators	Feed-backs from local actors during the validation workshop
1	Climate change adaptation frameworks (i) for major biomes & aquatic ecosystems; (ii) integrated into national sectoral plans	The topic covered by this indicator is seen as a crucial one. Unfortunately, the existing indicators focus on public efforts, not on actual impact or the effectiveness of such measures/plans. Furthermore, the suggested indicators involve problems of data availability. So, the final report should emphasize the importance of the topic and point out the gap in terms of data availability. The indicator **won't be included** in final set to be applied for the quantitative assessment.
2	GHG Emissions	Indicator **validated but in an adapted version**. The indicator should be transformed into an intensity measure revealing the decoupling degree of South African economic system (i.e. GHG/GDP)
3	Water use efficiency	The indicator is pertinent, but we actors not sure to have the data for previous years. The first option is to look for these data (the project team should explain how the indicator is concretely measured). If missing data is not found, the indicator **could be replaced by "water stress"**.
4	Life Expectancy	The indicator is **validated**, but the values should be expressed by sex.
5	Renewable power generation	Indicator **validated**. Recent data should be available on the Energy Department website. In the final report, disaggregated data (by energy sources) could be provided in annexes.
6	Terrestrial Biodiversity Protection Index	Indicator **validated**. Local actors asked an additional indicator focusing on marine biodiversity.
7	Municipal waste diverted from landfills for recycling	Indicator **validated**. More recent data could be available...
8	Unemployment rate (by sex, age and persons with disabilities)	Indicator **validated**. Local actors decided to use ILO definition. A note should be added in the final report about the "expanded" definition of unemployment.

	9	Green patents	Indicator **validated**. The project team suggested to present the values obtained for South Africa through the methodology used in the GEPI global application. Local actors agreed on further validating or not the resulting data.
	10	Expansion and implementation of environmental sectors	Local actors identified a **gap** between the label of the indicator and the suggested units of measurement. They suggested to include in the final set "Green Growth contribution to economic growth" (as a percentage of total GDP). They also suggested to reveal in the final report the gap regarding "Green Jobs" (not available data).
	11	Energy Efficiency improvements	Indicator **validated, but with different units**. The focus shouldn't be on the improvements, but rather on the absolute values of energy efficiency.
	12	Priority Area Air Quality Indices (PAAQIs) (PM10 and SO2)	Indicator **validated, but the label must be changed**
	13	Gini Coefficient	Indicator **validated**.
	14	Population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills (by sex)	**Validated**. Ideally, local actors would like to measure functional literacy, but this is not operational (no data available). Literacy rate appeared to be a good subsidiary proxy.
	15	Population using safely managed drinking water services	Indicator **validated**. Data available until 2018.
	16	Population with access to electricity	Indicator **validated**. The Department of Energy publishes annual data.
	17	Poverty Gap Index	Indicator **validated**. Actors agreed on looking for the data published by Stats SA on "multidimensional" poverty. If data is not available, it was agreed to measure it with the standard formula.
	18	R&D expenditure (from public and private sources)	Indicator **validated**.
Indicators suggested to fill in existing gaps	19	Protection of high potential agricultural land	Problems with data… It is not seen as a pertinent indicator. Actors agreed on **rather including an indicator on land use/cover**. They agreed on looking for data.
	20	Food insecurity in population (based on the Community Childhood Hunger Identification Project -CCHIP- Index)	The data that is available makes the indicator somewhat redundant with "poverty gap index". **To be removed**.
	21	Median monthly earnings of female and male employees (by occupations)	Indicator **validated**

Table 3: Main remarks made on the suggested indicators during the validation workshop

3. Application of the GEP Measurement Framework to South Africa

This section discusses the application of the GEP Measurement Framework to the case of South Africa, to offer an assessment at progress towards an Inclusive Green Economy that the country have achieved over the past few years. We do this assessment based on the **GEP index** –by assessing progress from individual and multi-dimensional perspectives.

The GEP index reflects weighted progress achieved by countries with respect to targets, set within relevant thresholds, across a combination of social, economic and environmental indicators. The application of this Framework to South Africa was done using the indicators validated with the relevant actors in South Africa, with information on indicators and policy targets following several official sources.[2] One of the most important challenges for this application has been obtaining data, not only because many of the indicators proposed are innovative and data has not been collected yet, but also because need to have enough information over time so that the evolution of the indicator can be tracked.[3] The final number of indicators used for this application is 15: GHG Emissions/GDP; Life Expectancy; Renewable energy share in the total final energy consumption; Share of terrestrial area protected; Share of marine area protected; Municipal waste diverted from landfills for recycling; Unemployment rate; Energy intensity measured in terms of primary energy and GDP; PM_{10} National; Gini Coefficient; Literacy rate; Population using safely managed drinking water services; Population with access to electricity; Poverty Gap Index; and Research and development expenditure as a proportion of GDP. Following PAGE (2017) we can clasify nine indicators as goods while six as bads (see Table 4).

Due to data unavailability, several indicators validated during the validation workshop (see section 2.8) were finally not included in the application of the GEP Measurement Framework; namely: “Water use efficiency”; “Green Patents”; “Green Growth contribution to economic growth" and “Median monthly earnings by sex”. They were all judged pertinent by local actors, but data limitations prevented their inclusion on this application. Another example of critical indicators that are not available but that are critical to the overall assesment of progress on green economy for South Africa is green jobs. This indicator was requested as part of the conversation with the authorities and unfortunately it was not available at the time of this application. All of these indicators represent important data gaps that

[2] See the data validation report. Data on particular indicators were derived from the SDG´s Country Report 2019 South Africa, and data directly provided by the authorities.

[3] For the complete analysis of the application of the GEP measurement framework at the global level see PAGE (2017b), and the concept note developed for this project (September 2018).

prevents to have a fuller assesment of progress towards a green economy for South Africa, so significant efforts should be done to close these gaps (in the final considerations of this report there are some potential suggestions on how to close some of these gaps, particularly on green jobs). Dispite these limitations, the present application has a rich set of indicators that will allow to have a very good, although less than ideal, picture on how South Africa is making progress towards a green economy. The rest of this report explains in more details how the application was done, their main results and policy implications.

"Goods"	"Bads"
Literacy	Energy intensity
Municipal waste recycled	Inequality (Gini Coefficient)
Renewable energy	Air pollution (PM_{10})
Access to water/electricity	GHG Emissions/GDP
Protected areas (terrestrial and marine)	Poverty Gap Index
Research & Development/GDP	Unemployment rate
Life expectancy	

Table 4: Classification of indicators of the Application to South Africa of the GEP Index

Calibration of targets and critical thresholds were done by using the general guidance provided in official documents,[4] while specific numbers were derived following the methodology applied on PAGE 2017, using data on the same indicators globally from the World Bank's World Development Indicators. For a "good", the **target** of a country is calculated on the basis of the 10 per cent best performing countries in the distribution[5]. In other words, a country should achieve a target that is based on an increase in *y* that is at least as good as the one achieved by the 10 per cent best performing countries in its relevant comparison group. In the particular case of South Africa, the relevant comparison group is the High Human

[4] See the section on the Green Economy Progress Index Application: South Africa's Goals that presents goals for particular indicators from the SDG´s Country Report 2019 South Africa, and South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. March 2018.

5 For a "good", we calculate λ, which represents the ratio between the final (y1) and initial (y0) values for each indicator for the 90th percentile of the distribution. A country's target is calculated by multiplying its initial value with the λ of the 10 per cent best performing countries. See PAGE (2017b).

Development Index Group.[6] Similarly, for a "bad", the target of the country is set to achieve a reduction as significant as the reduction of the 10 per cent best performing countries in the relevant comparison group[7]. In other words, a country should have as a target a reduction in *y* that is as big as the one achieved by the 10 per cent best performing countries in the relevant comparison group, which as previously said for South Africa is the High Human Development Index Group.

Thresholds are determined based on the data and internationally recognized scientific sources. For "goods" ("bads"), the value of the threshold is set at the value of the 25th (75th) percentile of the distribution in 2010. Countries should never go below (or above) the value achieved by the bottom 25 per cent (top 75 per cent) of countries in 2010 for this indicator. Internationally recognized scientific sources are used for environmental indicators, including recommendations on air pollution from the World Health Organization, and on protected areas from Aichi Biodiversity Targets.[8]

3.1 Green Economy Progress Index Application: South Africa's Goals

1. GHG Emissions/GDP

South Africa's vulnerability to the effects of climate change9 implies that this country faces the great challenge of balancing higher economic growth with a sustainable use of natural resources, which mitigates the effects of climate change in the country. To overcome this challenge, the reduction of Greenhouse Gases (GHG) is a key aspect in order to reduce the negative consequences of climate change in different sectors such as infrastructure, ecosystems, water provision, food security and public health. Consequently, the reduction of Greenhouse Gases (GHG) in South Africa is an essential aspect of its strategy to achieve environmental sustainability and resilience to climate change and the transition to a low carbon economy. To achieve this goal, South Africa has set itself the following goals10:

- Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

[6] **See http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/ZAF.pdf.**

[7] For a "bad", we calculate β, which represents the ratio between the final (y^1) and initial (y^0) values for each indicator for the 10th percentile of the distribution. A country's target is calculated by multiplying its initial value with the β of the 10 per cent best performing countries. See PAGE (2017b).

[8] **See PAGE (2017b).**

[9] **Climate change broadly describes the process whereby there is an increase in the frequency and intensity of extreme weather events such as heat waves, droughts, floods. These changes are linked to increasing levels of greenhouse gases (GHG) that intensify the greenhouse effect. See SDG´s Country Report 2019 South Africa, page 192.**

[10] **SDG´s Country Report 2019 South Africa, page 192.**

- Integrate climate change measures into national policies, strategies and planning.
- Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.
- Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing states, including focusing on women, youth and local and marginalized communities.

The most recent data on South Africa's progress in reducing greenhouse gas (GHG) emissions, indicate that this country managed to reduce emissions of this type of gas (measured as the intensity of carbon on the economy-Co2-eq / GDP) between 2000 and 2012 by 21%. This was achieved thanks to significant growth in the services and finance sectors and the reduction and stagnation of the manufacturing and mining sectors.11

2. Life Expectancy

Ensuring healthy lives and promoting well-being for the entire population regardless of age, is another of the primary objectives included in the South African National Development Plan, framed within the strategic area of providing health care for the entire population. This strategy seeks to address the challenges that this area presents in South Africa such as high disease burden, improvement in the performance of key indicators of medical care, quality and inclusive health care, and improvement in medical infrastructure, equipment and supplies. To achieve this objective South Africa has proposed the following goals12:

- By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases
- By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.
-
- Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.

[11] **South Africa's Third National Communication under the United Nations Framework Convention on Climate Change. March 2018, page 78 Figure 2.7.**
[12] **SDG´s Country Report 2019 South Africa, page 177.**

- By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs.
- By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
- Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.

The progress of South Africa in this regard can be seen in the growth in life expectancy of the population of South Africa, which went from 2010 to 2018 from 59.4 years to 64.4 years, a growth in life expectancy of 5 years.

3. Unemployment rate

Promoting full, productive and quality employment through inclusive economic growth is another central objective of the South African National Development Plan, which is framed within the strategic area of Economy and Employment. Through this strategy, the country tries to face the challenge of low economic growth, high levels of unemployment, relatively low performance of doing business, and relatively low levels of innovation and entrepreneurship. To achieve this purpose, South Africa has set itself the following goals13:

- Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sectors.
- Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.
- By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.
- By 2020, substantially reduce the proportion of youth not in employment, education or training.
- By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products.

[13] **SDG´s Country Report 2019 South Africa, page 115.**

- By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labor Organization.

The data shows that South Africa presents a serious problem of unemployment14, both total, and by age and gender, which confirms the difficulties that the country has presented in meeting the objective of achieving high levels of employment, which is productive, inclusive and of high quality. Indeed, between 2008 and 2017 female unemployment increased from 25.8% to 29.4%, while men's unemployment went from 19.7% to 25.5% in the same period. Likewise, the data shows that unemployment rates increased significantly for people between the ages of 15 and 24, going from 45.6% in 2008 to 53.4% in 2017, while for those between 15 and 34 years the variation was from 35.7% in 2010 to 38.7% in 2017. In short, the total unemployment level in South Africa increased from 22.4% in 2008 to 27.5% in 2017, which represents a significant increase in this indicator in the country of 4.8% for that period15.

4. Renewable energy share in the total final energy consumption.

One of the main objectives contained in the South African National Development Plan is the transition to an environmentally sustainable and low carbon economy. In this sense, access to affordable, reliable, sustainable and modern energy for the population of South Africa, becomes the main catalyst to achieve this goal, for which South Africa has set the following goals 16:

- By 2030, ensure universal access to affordable, reliable and modern energy services
- By 2030, increase substantially the share of renewable energy in the global energy mix
- By 2030, double the global rate of improvement in energy efficiency
- By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services.
- By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.

[14] Unemployed individuals are defined as those of working age, who were not employed and were actively seeking job opportunities and available to pursue them.
[15] SDG´s Country Report 2019 South Africa, pages 119-120, Figures 68 and 69.
[16] SDG´s Country Report 2019 South Africa, page 177.

The empirical evidence that supports South Africa has been progressing in this regard, we find it in the information obtained from the Energy Balances 2013–2015, DoE of South Africa17, which indicates that the participation of renewable energies in the country's total energy consumption was in 2013 at 14.56%, while in 2015 it was 26.2%, which represents an increase of 11.64 percentage points between 2013 and 2015. The authorities estimate that this participation will be 24,1% for 2030, according to the Integrated Plan Resource Plan 2010-2030 (IRP) and the South African National Development Plan, so South Africa has exceeded this specific goal18.

The following are some of the more specific objectives that will contribute to improving this indicator19:

- Contracting at least 20 GW of renewable energy by 2030;
- Decommissioning 11 GW of ageing coal-fired power stations and stepping up investments in energy efficiency;
- At least 90% of South Africans to have access to grid electricity by 2030, and the remainder to utilize alternative off-grid solutions;
- A 15% energy efficiency improvement in the mining and mineral processing sector by 2030; and
- Hybrid and electric vehicles to be widely used by 2030.

5. Share of terrestrial area protected

One of the strategic objectives of the South African National Development Plan is environmental sustainability and resilience to climate change. This guideline is part of both the National Law on Protected Areas of Environmental Management (NEMPA) (Law No. 57 of 2003), and in the National Strategy for the Expansion of Protected Areas (NPAES)20, published for the first time in 2008, reviewed every 5 years, and which presents South Africa's 20-year strategy for the expansion of protected areas, whose main objective is the profitable expansion of protected areas focused on achieving ecological sustainability and resilience to the challenges of climate change.

To achieve this objective South Africa proposes the following goals 21:

[17] **SDG´s Country Report 2019 South Africa, page 180, Figure 99.**
[2] IRP 2019 South Africa, page 42, Table 5: IRP 2019.
[19] IRP 2019 South Africa, page 155.
[20] **SDG´s Country Report 2019 South Africa, page 209.**
[21] **SDG´s Country Report 2019 South Africa, page 203.**

- By 2030, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.
- By 2030, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.
- By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.
- By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.
- By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.
- By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

Other goals that do not specify, however, the deadline are the followings:

- Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.
- Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.
- Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.
- Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.
- Mobilize significant resources from all sources and at all levels to finance sustainable forest management, including for conservation and reforestation.

- Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.

The progress in this sense of South Africa, to achieve this goal, can be seen from the information obtained from the SAPAD 2010–2018, DEA and SANBI of South Africa22, which shows that between 2010 and 2018 the share of protected terrestrial areas increased by 2 percentage points, from 26% to 28% respectively.

6. Share of marine and coastal area protected

South Africa's National Development Plan (NDP) recognizes that the ocean environment is strongly related to the process of climate change and the achievement of broader economic and social development goals. In this sense, NDP of South Africa raises as one of its central strategic development objectives to protect, conserve and rehabilitate the ecosystems and environmental assets of the country, specifically those that have to do with the resources found in the marine and oceanic space to put them at the service of national development.

To achieve this objective South Africa proposes the following goals:[23]

- By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.
- By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.
- By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.
- By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.
- By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal,

[22] SDG´s Country Report 2019 South Africa, page 209, Figure 111.
[23] SDG´s Country Report 2019 South Africa, page 196.

unreported and unregulated fishing and refrain from introducing new such subsidies.

Another goal that does not specify, however, the deadline, are followings:

- Minimize and address the impacts of ocean acidification, including through increased scientific cooperation at all levels.
- Provide access for small-scale artisanal fishers to marine resources and markets.

The progress of South Africa in this regard, to achieve this objective, can be seen from the information obtained from SAPAD, DEA and SANBI of South Africa, through the indicator Proportion of marine and coastal ecosystem types that are well-represented in protected areas24, which indicates that the percentage of coastal ecosystems that are well protected in South Africa increased by one percentage point between 2010 and 201825.

It is important to note that South Africa is already exceeding the goal of the 2030 Sustainable Development Goals of 10% marine protected areas, since the proportion of marine ecosystem types that are well represented in protected areas has a value of 15% since 2010.26

7. Municipal waste diverted from landfills for recycling

South Africa's National Development Plan (NDP) also emphasizes the creation of environmentally sustainable cities and human settlements, this is also contemplated in legislation as la National Environmental Management: Waste Act (No. 59 of 2008) and Municipal Systems Act (No. 32 of 2000)27.

To achieve this objective South Africa proposes the following goals28:

- By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

[24] This indicator is defined as the percentage of marine (benthic and pelagic) and coastal (including estuaries) ecosystem types which are Well Protected (defined as those ecosystem types for which the full biodiversity target falls within a protected area). This indicator is computed using the number of well-protected ecosystem types divided by the total number of ecosystem types multiplied by 100. Targets are set at 20% for marine and coastal ecosystem types (SANBI, n.d.), Extracted from SDG´s Country Report 2019 South Africa, page 199.

[25] SDG´s Country Report 2019 South Africa, page 200, Figure 108.

[26] SDG´s Country Report 2019 South Africa, page 202, Table 39.

[27] SDG´s Country Report 2019 South Africa, page 184, Table 34.

[28] SDG´s Country Report 2019 South Africa, page 159, 247.

- By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.
- By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

Another goal that does not specify, however, the deadline, are followings:

- Promote public procurement practices that are sustainable, in accordance with national policies and priorities.
- Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

South Africa's progress in achieving this goal is seen in DEA SAWIS 2015–2017, through the indicator of the percentage of waste generated and recycled at the municipal level, which indicates that between 2015 and 2017 the percentage of generated and recycled waste increased from 1.3% to 7.5% respectively, evidencing a significant improvement in achieving this objective29.

8. Energy intensity measured in terms of primary energy and GDP

Energy efficiency is one of the key objectives within the South African National Development Plan and essential in the main objective of achieving a transition towards an environmentally sustainable and low carbon economy. Given that energy efficiency cuts across different economic sectors and social aspects of the population, the objective is to achieve greater investment in this area, which, accompanied by regulations and regulations, promote and increase the country's energy efficiency.

To achieve this objective South Africa proposes the following specifics goals[30]:

- By 2030, double the global rate of improvement in energy efficiency
- By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy

[29] **SDG´s Country Report 2019 South Africa, page 189-190, Figure 106.**
[30] **SDG´s Country Report 2019 South Africa, page 177.**

efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

The progress in this sense of South Africa, to achieve this goal, can be seen from the information obtained from the National Energy Balances 2011–2015, DoE; Financial Statistics of National Government 2011–2015, Stats SA[31], in which it is observed that the energy efficiency of the South African economy improved between 2011 and 2015, going from an energy intensity rate [32] of 2.07 to 1.89, respectively.

9. PM_{10} (National)

Another relevant aspect framed within the objective of promoting environmentally sustainable cities and human settlements in South Africa, is the one that has to do with air quality within cities, Development Plans such as the National Transportation Master Plan 2050. In this sense, by promoting an inclusive, massive and environmentally sustainable or green transport system that contributes to reducing carbon emissions to air and improving its quality within cities.

Consequently, to achieve this specific objective South Africa has established the following goal33:

- By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.
- By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.
- By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

South Africa's progress in achieving this goal is seen in SAAQIS 2013–2015, DEA, through the indicator, Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted), which shows that between 2013 and 2015, it has been a decrease in fine particles (PM10 levels) in city air.

[31] SDG´s Country Report 2019 South Africa, page 182, Figure 102.
[32] Energy intensity as a measure of energy use efficiency is measured as the amount of energy supplied per unit of value of economic output or GDP.
[33] SDG´s Country Report 2019 South Africa, page 142,237.

Furthermore, data from 2013 to 2015 indicate an improvement in the NAAQS standard. The data shows a decline of PM10 measured at the national level from 40.2 in 2013 to 35.2 in 2015.[34]

10. Gini Coefficient

One of the key objectives of the South African National Development Plan adopted in 2012 is to eliminate poverty and reduce exclusion by 2030, definitively overcoming the effects of the Apartheid that this country experienced until 1994. Increasing decent employment through growth inclusive, and the implementation of job creation, education and job training programs and access to quality public services, becoming the leverage elements to achieve this objective, for which South Africa has proposed the following goals35:

- By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day.
- By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.
- By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.
- By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

Another goal that does not specify, however, the deadline, are followings:

- Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.
- Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions.

[34] SDG´s Country Report 2019 South Africa, page 190, Figure 107.
[35] SDG´s Country Report 2019 South Africa, page 38, Table 4.

- In the short term, the achievement of this objective pursues the following goals 36:
- Introduce active labor market policies and incentives to grow employment, particularly for young people and in sectors employing relatively low-skilled people.
- Expand public employment programs to one million participants by 2015 and two million by 2020.
- Strengthen primary health-care services, broaden district-based health programs, such as community health worker and midwife programs.
- Expand welfare services and public employment schemes, enabling the state to service and support poor communities, especially those with high levels of crime and violence.
- Improve the quality of education in underperforming schools and in further education and training colleges.
- Promote mixed housing strategies and more compact urban development to aid with access to services.
- Invest in public transport to benefit low-income households facilitating mobility.
- When turning to South Africa's national programs aimed at addressing inequality and poverty, two large-scale initiatives stand out.

Based on the data on global inequality, request from Poverty Trends in South Africa, Stats SA (2017), this country obtained a Gini coefficient of 0.68 (using per capita income) for 2015 (a small reduction from 2006, where this value was 0.72), which makes it one of the most unequal countries in the world. Likewise, it is observed that income inequality is greater than consumption inequality, this may suggest that the greater consumption inequality is driven by high income inequality, but that public policies affecting consumption in South Africa are a progressive37.

11. Population in a given age group achieving at least a fixed level of proficiency in functional. Literacy grade 9

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all is one of the main strategic areas of South Africa's National Development Plan, with which the country intends to address one of its main challenges, such as the low quality of education specifically, especially for black

[36] **SDG´s Country Report 2019 South Africa, page 25-26.**
[37] **SDG´s Country Report 2019 South Africa, page 22, Figure 4.**

South Africans and the low relevance of education programs in relation to the needs of the new era of innovation and knowledge in the industry and work. In achieving this goal, South Africa has set the following goals.38

- By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.
- By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education.
- By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.
- By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.
- By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.
- By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy.
- By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

Another goal that does not specify, however, the deadline, is:

- Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all.

The progress of South Africa in achieving this objective can be seen through the indicator Proportion of children and youth in Grades 2/3; (b) at the end of primary school; and (c) at the end of lower secondary school achieving at least a minimum level of proficiency in (i) reading and (ii) mathematics, by sex39, in which it is observed that South Africa improved this indicator for the ninth grade of education in the minimum reading skills between 2012 and 2014, when this

[38] **SDG´s Country Report 2019 South Africa, page 40, Table 4.**
[39] **SDG´s Country Report 2019 South Africa, page 96.**

indicator went from 39% to 48%, but decreased in the case of minimum reading skills. Mathematics for the same grade, when this indicator went from 29% in 2011 to 3% in 2014.

12. Population using safely managed drinking water services

An infrastructure to support production that provides quality public services to the population, specifically guaranteeing the availability and sustainable management of water and sanitation for the entire population is another of the primary objectives of the South African National Development Plan, and through the which country tries to face the challenges it presents in this area such as water scarcity, climate change and proper management of this resource. In achieving this goal South Africa has set the following goals40:

- By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
- By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
- By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
- By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
- By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
- By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Another goal that does not specify, however, the deadline, is:

- Support and strengthen the participation of local communities in improving water and sanitation management.

[40] **SDG´s Country Report 2019 South Africa, page 161.**

South Africa's progress towards achieving this goal can be seen through the results obtained by this country in the provision of safely managed drinking water services between 2015 and 201741. These results also indicate that South Africa has achieved coverage significant of the water supply infrastructure, with a percentage that goes from 93% in 2015 to 95% in 2017. However, the greater coverage of infrastructure between 2015 and 2017 does not translate into a safely managed water supply, which emerges from the relatively lower figures for safe water management compared to the coverage of water supply infrastructure between 2015 and 2017.

It is also noted the progress made in the provision of safely managed drinking water services between 2015 and 2017. It is also observed that South Africa has achieved significant coverage of the water supply infrastructure. Nationwide, 95% of the population had access to water supply infrastructure in 2017. However, this increased infrastructure coverage does not translate into a safely managed water supply, as evidenced by the relatively small number less safely managed water in relation to the coverage of the water supply infrastructure.

On the other hand, between 2015 and 2017 the percentage of the national population of South Africa, which had managed water services safely increased from 77% to 80% respectively. Analyzing the same component in rural areas between 2015 and 2017, an increase of 5% is observed, while in urban areas the increase was 1% between 2015 and 2017.

13. Population with access to electricity

Electricity is a key and transversal element to achieve almost all the sustainable development objectives set out in the National Development Plan of South Africa, it is framed within the strategic areas of providing an infrastructure to support production and environmental sustainability and resilient. Through the management and provision of quality and sustainable electricity, the country seeks to face the challenges it presents in this area such as insufficient data on electrification interventions in favor of the poor population, the slowdown in electrification outside of network and inadequate electrification in informal settlements. Consequently, in achieving this goal South Africa has set the following goals.42

- By 2030, ensure universal access to affordable, reliable and modern energy services.
- By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to

[41] **SDG´s Country Report 2019 South Africa, page 164, Figure 92.**
[42] **SDG´s Country Report 2019 South Africa, page 43, 177.**

basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.

Between 2015 and 2017 it is evident that the percentage of the South African population with access to electricity increased from 93.12% to 95.27% respectively 43. With which it can be affirmed that South Africa has made solid progress towards achieving universal access to electricity for its population.

14. Poverty Gap Index

Overcoming poverty in its various manifestations is a central objective of the National Development Plan of South Africa, and is part of the strategic economic area of inclusive and quality job creation, and seeks to address the challenges that South Africa presents in this area as high poverty, high levels of inequality, high unemployment, social exclusion and high burden of disease, as well as improving social protection and access to services for the population. To achieve this objective South Africa has set the following goals44:

- By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day.
- By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.
- By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.

Another goal that does not specify, however, the deadline, are followings:

- Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.
- Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions.

Between 2006 and 2015 South Africa made significant progress in the goal of eradicating poverty, by reducing the percentage of the population living on the

[43] **SDG´s Country Report 2019 South Africa, page 179, Figure 97.**
[44] **SDG´s Country Report 2019 South Africa, page 43.**

lower limit of the poverty line in relation to the total population, going from 51% to 40%45.

15. Research and development expenditure as a proportion of GDP

Research and Development (R&D) constitutes an increasingly knowledge-based world and economy, a fundamental tool to achieve the development of a country. In this sense, the South African National Development Plan includes this objective within the strategic development area referred to the improvement of education, training and innovation, with which the country intends to meet the challenge of relatively low levels of innovation and undertaking. In order to achieve this objective South Africa has set the following goal46:

- By 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.

However, South Africa's efforts to achieve this objective have not been entirely satisfactory, given that between 2007 and 2015 the ratio of R&D expenditure in relation to this country's GDP decreased from 0.89 to 0.8, which shows that the country remains stagnant in improving this indicator and overcoming the low levels of innovation and entrepreneurship it presents47.

3.2 Interpretation of the results

The GEP measurement framework offers the possibility of analysing results not only at the aggregate level (using the index) but also at the level of individual indicators. In this regard, a simple way to see whether South Africa has made progress on a particular area is by reviewing whether the value of the index of the concerned indicator is positive, indicating progress, or negative, indicating regress.

Table 5 shows that South Africa made **progress** on 10 of 15 total indicators (indicators with positive value as part of the top row), 4 indicators showed regress while one indicator experienced no change.[48] The indicator where progress was the

[45] **SDG´s Country Report 2019 South Africa, page23, Table 3.**
[46] **SDG´s Country Report 2019 South Africa, page 125.**
[47] **SDG´s Country Report 2019 South Africa, page 132, Table 22.**
[48] **The indicator experiencing no change was marine protected areas, for which South Africa was already above the critical threshold. In Annex 2, we present a modified version of the calculations where both indicators of protected areas are taken out, since they are already well above the critical threshold and achieving further progress will be not only less feasible but also a lower priority according to the GEP Index weighting system.**

highest, responsible for more than 70% of the overall progress was the share of municipal waste diverted from landfills for recycling (increasing from 1.3% in 2015 to 7.5% in 2017). This significant progress occurred in an area where progress was significantly needed, as refelected on its second weight of around 12%. So, the high contribution of this indicator to the overall progress is the combination of very high progress in an area of high priority. South Africa also managed to experience progress on two other high priority indicators: Gini coefficient, Energy intensity and PM_{10}. However, progress on these indicators were relatively low (particularly for Gini coefficient), making their overall contribution to the index is modest. See Figure 7 for a visual representation of the different contributions to the GEP index for South Africa.

Notice that the value of progress on municipal waste is higher than *1 (3.32)*, which it means that progress in this area exceeded the target more than three times. The other nine indicators where South Africa experienced progress have values lower than one, so progress was lower than the established target. Renewable energy was the second largest area of progress that was close to the target achieving progress of 076.

Results also show that South Africa experienced regress on four indicators (progress has a negative value for the indicator). Regress on the unemployment rate and the poverty gap index are the most important. The case of unemployment is particularly troublesome because this is an area where South Africa was already needing significant improvements.

The general overall progress on green economy, measured by the **GEP index**, for South Africa is 0.49, indicating that although positive progress was observed it was only about half of the ideal progress, given the observed change relative to the target or desired change,[49] and the relative priorities given by the weighting system. The **weight1 ($\hat{\pi}$)** of the GEP index help us to interpret the results. If the weight value is greater than *1,* it is the result of: (a) the initial condition was exceeding the threshold for an indicator that is a bad (and must be kept below a certain critical threshold) or (b) the initial condition was below the threshold for an indicator that is a good (and must be kept above a certain critical threshold).

Table 5 also shows the results for the **weight2 ($\hat{\pi}$)** indicating that South Africa is within the threshold for 9 out of the 15 indicators (e.g. the initial level of literacy was above the critical threshold, the share of renewable energy was above the critical threshold, R&D expenditure as share of GDP was above the critical threshold, etc). The areas in which South Africa is beyond the threshold were life expectancy (initial condition was 61.2, 1.01 time lower than the critical threshold); municipal waste recycled (initial condition was 1.3%, 1.89 time lower than the critical threshold); unemployment rate (initial condition was 25.1%, 2.6 time lower than the critical threshold), energy intensity (initial condition was 2.04, 1.5 time higher than the critical threshold); PM_{10} (initial condition was 40.2, 2.02 time higher than the critical

[49] **The word ideal reflects the performance relative to ambitious but feasible targets established following PAGE (2017b).**

threshold); and the Gini coefficient (initial condition was 0.69, 1.5 time higher than the critical threshold).

The previous analysis indicated the areas where progress was more urgent in these indicators, since this indicate that these areas are not sustainable under the business as usual scenario. The second weight takes this information into account and assign relative priorities across the 15 indicators. So, progress will be more relevant the higher is the weight2 π.[50] Table 5 shows that of these six critical areas, South Africa made progress on five (life expectancy, municipal waste, energy intensity, PM_{10}, and Gini coefficient (although very marginal)), but it regressed on unemployment. This is particularly worrisome since this is the indicator with the highest second weight (16% of weight, more than twice the equal weighting share of 1/15 or 6.67%), which indicates that was the indicator where progress was needed the most.

One interesting feature of the GEP index is its dynamic nature. Today's values are the initial conditions for tomorrow's assessment process. In this regard, the results show that the significant progress made on municipal waste will reduce its weight from 16% to 3.3%, while indicators like unemployment rate, Gini coefficient and poverty gap index will increase their weight by 3.7, 1, and 1.2 percentage points, respectively. This highlights the usefulness of the framework for assessment and planning purposes, by providing guidance on policy priorities.

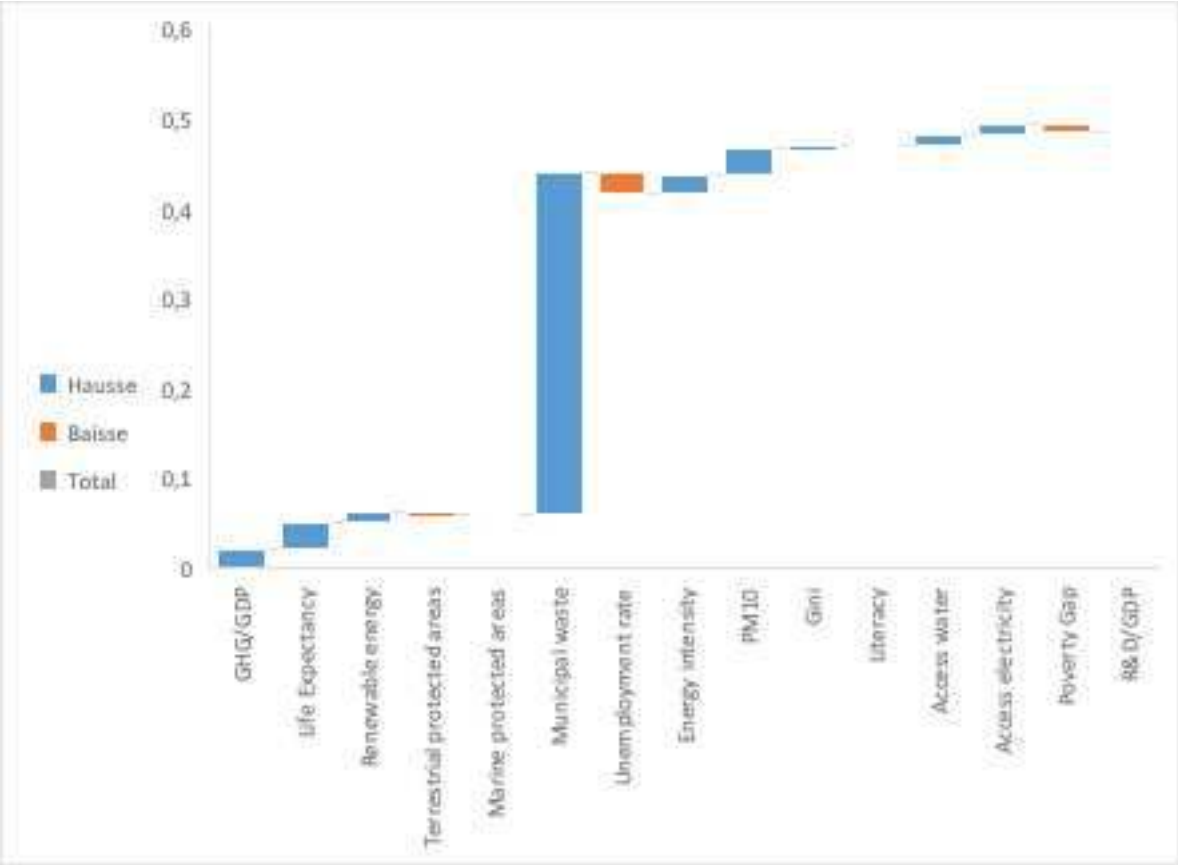
Table 5: GEP Index and progress on individual indicators for South Africa

	GHG/GDP	Life Expectancy	Renewable energy	Terrestrial protected areas	Marine protected areas	Municipal waste	Unemployment rate	Energy intensity	PM10	Gini	Literacy	Access water	Access electricity	Poverty Gap	R&D/GDP	GEP Index
Progress	**0.35**	**0.47**	**0.76**	**-0.09**	**0.00**	**3.25**	**-0.11**	**0.22**	**0.248**	**0.04**	**-0.02**	**0.27**	**0.31**	**-0.16**	**-0.07**	
Weight1 ($\hat{\pi}$)	*0.917*	*1.054*	*0.262*	*0.642*	*0.667*	*1.887*	*2.573*	*1.509*	*2.020*	*1.545*	*0.713*	*0.725*	*0.612*	*0.827*	*0.176*	**0.49**
Weight2 (π)	*0.057*	*0.065*	*0.016*	*0.040*	*0.041*	*0.117*	*0.160*	*0.094*	*0.125*	*0.096*	*0.044*	*0.045*	*0.038*	*0.051*	*0.011*	

Note: Progress in bold. Weights in italics. Dashes indicate missing values.
Source: Onw calculations based on PAGE (2017b)

[50] This weight is a final re-weighting, so it gives information of priorities across the different indicators. The first weight ($\hat{\pi}$) gives information at the indicator level with respect to the critical threshold, while the second weight (π) gives information about priorities across indicators. Indicators will receive a higher second weight the higher their first weight (the further they are from the critical threshold).

Figure 7: Waterfall figure of Application of GEP Index for South Africa



Source: Onw calculations based on PAGE (2017b)

4. Final considerations

The application of the Green Economy Progress (GEP) Index to South Africa has been a rich process of discussion between experts and local actors, but more importantly a rich process of discussion among local stakeholders about what a green economy means for South Africa and what could be the best set of indicators to capture it. After a series of consultantions and the application of the best practice framework for working with green economy indicators a set of 19 indicators were selected. A final review of the list of indicators were done on a meeting on june 18, 2020 where 15 indicators were selected to be included in the application of the methodology developed by PAGE(2017).

For targets we use the general guidance given by critical official documents and the methodology ssuggested by PAGE (2017) for targets and critical thresholds. Results show that South Africa made progress on 10 of 15 total indicators (indicators with positive value as part of the top row), 4 indicators showed regress while one indicator experienced no change, for a final GEP index of 0.49. This indicates that South Africa has been able to achieve progress towards a green economy, which is positive news and should build momentum for strengthening the green economy agenda in the country. However, the results also indicate that significant additional efforts are needed to fully achieved the desired ambitious policy targets on the different green economy areas, given the relative priorities signalled by the GEP Index's weighting system.

The results show evidence that guides the set of policy priorities that South Africa needs to take into account to improve its overall performance. In particular, the results show that policy efforts may need to refocus from the areas where progress was more significant (e.g. municipal waste) to areas like unemployment inequality and poverty where the methodology is assigning higher weights for establishing the next cycle of policy priorities.

Finally, this application illustrates the importance of having a measurement framework able to reflect policy priorities and quantify progress not only at the individual level but also at the aggregate level, where priorities and trade offs are taken into account. One important challenge for this application was the fact that due to data unavailability, several indicators validated during the validation workshop were not included; namely: "Water use efficiency"; "Green Patents"; "Green Growth contribution to economic growth" and "Median monthly earnings by sex". They were all judged pertinent by local actors, but data limitations prevented their inclusion on this application. As more discussion occurs among relevant stakeholders and more efforts are made on generating the relevant data to capture the different policy priorities for the green economy agenda, the application of the GEP Index and its methodology will provide a richer set of information to better guide the policymaking process. To advance on the collection of some of these indicators, particularly those related with Outcome 4, it may be advisible to strengteng partnerships with PAGE partners like the International Labor Organization (ILO),

which in the past has mplemented capacity building in the area through the ILO's International Training Centre , in collaboration with the Department of Public Works and the ILO's Decent Work Support Team for Eastern and Southern Africa. Taking advantage of the original work done in this area will facilitate the construction of specific indicators that, once available, could easily be incorporated into the index.

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Annex 1: Indicators suggested by at least one participant during the consultation stage (total=65)

Indicators	Source			Units
Amount of renewable energy at annual operating capacity (by type of technology)	IBR 7.2.1			MW
Annual amount of electricity produced from renewable sources	IBR 7.2.1			GWh
Annual mean levels of fine particulate matter (PM2.5 and PM10) in cities	IBR 11.6.2			% micrograms/m³
Climate change adaptation frameworks (i) for major biomes & aquatic ecosystems; (ii) integrated into national sectoral plans		Out 4.2.1		# biomes; # sectors
CO2 Emissions		Out 2.1.1		m tons
Derelict and ownerless mines rehabilitated and closed in line with environmental best practice		Out 3.4.1		# mines
Desalination and recycling, re-use strategies		Out 1.1.3 (b)		# strategies
Ease of doing business index - Impacts on the ability to deploy new innovations			DI 81	index
Electricity produced from renewable sources	IBR 7.2.1			GWh / %, per year
Energy Efficiency improvements		Out 2.5.1		% improvements
Energy intensity (measured in terms of primary energy and GDP)	IBR 7.3.1			MJ/$
Environmental costs related to the provision of resource-based services		Out 4.4.1		# tools developed for economic valuing
Environmental education, awareness and voluntary activism		Out 2 cc		binary (Environmental Plan in place or not)
Expansion and implementation of environmental sectors		Out 2 cc		# work opportunities
Food insecurity in population (based on the Community Childhood Hunger Identification Project - CCHIP- Index)	IBR 2.1.2			% - index
GHG Emissions			DI 82	Mt CO2-eq
Gini Coefficient			DI 21	index
Green growth contribution to economic growth		Out 4 cc		percentage
Green Investment (finance/capital/incentives/subsidies)				monetary units
Green patents			DI 12	# patents in green technologies / GERD
Greening of municipalities		Out 2 cc		# decent jobs
Implementation of National Strategy for Sustainable Development and Action plan		Out 2 cc		binary (NFSD approved or not)

Increase of total EEZ area in which fishing and any form of harvesting that are detrimental to the benthic environment are prohibited		Out 4.3.2		% offshore
Infant mortality rate (IMR)	IBR 3.2.2		DI 33	# children younger than one-year-old who die per 1 000 live births
Integrated and coordinated regulatory system for environmental management of mining		Out 3.4.3		binary?
International multilateral environmental agreements on hazardous waste, and other chemicals that South Africa has committed to	IBR 12.4.1			% agreements
Land mass under conservation		Out 4.1.1		% land
Life Expectancy			DI 32	years
Major rivers with healthy eco-system meeting resource quality objectives		Out 1.2.3		# rivers
Manufacturing employment	IBR 9.2.2			% total employment
Median monthly earnings of female and male employees (by occupations)	IBR 8.5.1			monetary units
Men, women and children of all ages living in poverty (according to national definitions)	IBR 1.2.1			% population
Municipal recycled waste	IBR 11.6.1			% municipal recycled waste
Municipal waste diverted from landfills for recycling		Out 3.3.3		% municipal waste
National and local disaster risk reduction strategies adopted by South Africa	IBR 13.1.2			# strategies
Net deforestation		Out 3.2.1		m ha per year
Non-compliance with national ambient S02 and PM10 standards in various air pollution hotspots		Out 2.2.1		% hotspots
Official Development Assistance (ODA) and public expenditure on conservation and sustainable use of biodiversity and ecosystems	IBR 15.a.1			monetary units
Passenger and freight volumes (by mode of transport)	IBR 9.1.2			# passengers
Percentage of youth and adult university graduates (by field of study)	IBR 4.4.1			% population at the same age
Permitted landfill sites		Out 3.3.2		% landfill sites
Population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills (by sex)	IBR 4.6.1			% population; rate of improvement
Population that use solar energy as their main source of energy	IBR 7.1.2			% population
Population using safely managed drinking water services	IBR 6.1.1			% population
Population with access to electricity	IBR 7.1.1			% population
Population with primary reliance on clean fuels and technology	IBR 7.1.2			% population
Poverty Gap Index			DI 23	index

Priority Area Air Quality Indices (PAAQIs) (PM10 and SO2)			DI 83	index
Protection of high potential agricultural land		Out 4.5.1		% of land considered high potential
R&D expenditure (from public and private sources)	IBR 9.5.1			% GDP
Rehabilitation of land affected by degradation		Out 3.1.1		ha per year
Renewable energy share in the total final energy consumption	IBR 7.2.1			% total final energy consumption
Renewable power generation		Out 2.3.1		GW/hour
Representation of women in legislative bodies			DI 54	# women; %
Technical, Vocational Education & Training (TVET) enrolment students			DI 50	# students
Terrestrial Biodiversity Protection Index			DI 84	index
Time dedicated for environmental crimes in mainstream courts		Out 1 (cross-cutting)		# days?
Total Employment			DI 16	# employees; # jobs created/year
Total number of SET (Science, Engineering & Technology) under and post-graduates			DI 47	# students
Unemployment rate (by sex, age and persons with disabilities)			DI 17	percentage
Wastewater safely treated	IBR 6.3.1			% waste water
Water use efficiency		Out 1.1.2		ratio between effective water use and actual water withdrawal
Wetlands under protection		Out 1.2.2		# wetlands
Youth (aged 15–24/15-34 years) not in education, employment or training	IBR 8.6.1			% youth
Youth aged 15 – 24 and 15 – 34 years who dropped out of school without completing Grade 12	IBR 4.1.1			% youth

Annex 2: Indicators selected after the salience filter

Indicators	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Importance	# participants
Green growth contribution to economic growth	3	3	1		1		3	3		14	●●●●●●
Climate change adaptation frameworks (i) for major biomes & aquatic ecosystems; (ii) integrated into national sectoral plans	1	3		3	3			3		13	●●●●●
GHG Emissions	3	3	1		3	3				13	●●●●●
CO2 Emissions			3	3	3		1	1		11	●●●●●
Electricity produced from renewable sources	3		3					3		9	●●●
Life Expectancy			1	3		3				7	●●●
Renewable power generation	3				1				3	7	●●
Total Employment	3				1		3			7	●●●
Water use efficiency	1	3	1	1	1					7	●●●●●
Amount of renewable energy at annual operating capacity (by type of technology)		1					1	3	1	6	●●●●
Terrestrial Biodiversity Protection Index			3	3						6	●●
Unemployment rate (by sex, age and persons with disabilities)	3		1	1		1				6	●●●●
Environmental costs related to the provision of resource-based services		1				3		1		5	●●●
Green patents		1	3				1			5	●●●
Implementation of National Strategy for Sustainable Development and Action plan		1			3			1		5	●●●
Municipal waste diverted from landfills for recycling	1	1		1			1	1		5	●●●●●
Population with primary reliance on clean fuels and technology					1			1	3	5	●●●
Renewable energy share in the total final energy consumption				1				1	3	5	●●●
Energy Efficiency improvements		1			1		1	1		4	●●●●
Environmental education, awareness and voluntary activism					1			3		4	●●
Expansion and implementation of environmental sectors	3	1								4	●●
Gini Coefficient			3	1						4	●●
Greening of municipalities		1			3					4	●●
Population that use solar energy as their main source of energy								1	3	4	●●

Priority Area Air Quality Indices (PAAQIs) (PM10 and SO2)				1	1	1		1		4	●●●●
Annual mean levels of fine particulate matter (PM2.5 and PM10) in cities						3				3	●
Green Investment (finance/capital/incentives/subsidies)							3			3	●
Major rivers with healthy eco-system meeting resource quality objectives	1	1		1						3	●●●
Population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills (by sex)							3			3	●
Population using safely managed drinking water services				3						3	●
Population with access to electricity									3	3	●
Poverty Gap Index						3				3	●
R&D expenditure (from public and private sources)		3								3	●

Annex 3. Indicators Description

Based on the Inclusive Green Economy analytical framework, the application of the GEP Index to South Africa includes 15 indicators that are associated with the three challenges of Inclusive Green Economy (persistent poverty, overstepped planetary boundaries and inequitable sharing of growing prosperity).[51]

GHG Emissions/GDP, as measured by Mt CO2-eq/(1000 PPP constant 2017$). This indicator measures how carbon intensive is the production process in the economy.

Life expectancy is measured as the average number of years that a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life.

Renewable energy supply measures the percentage of renewable energy in total energy supply. To enable the use of renewable energy sources, incentives that change price signals towards investing in new infrastructure need to be in place.

Protected areas (marine and terrestrial) are measured as the percentage of marine and land areas that are protected in a total area. Increasing the coverage of protected areas reflects a country's recognition of the value of conserving natural capital for its current well-being and development. Protected areas contribute to the maintenance of natural capital stock.

Municipal waste diverted from landfills for recycling measures the percentage of municipal waste that is send for recycling instead of landfills. In the past, all municipal waste was disposed of in a landfill, but green economy policies promote recycling programs to divert waste from the local landfills.

Unemployment rate is measures as the proportion of the labor force that is jobless, expressed as a percentage. This indicator captures the ability of the green economy to create jobs.

Energy use, as measured by the kilograms of oil equivalent consumed per USD 1,000 of GDP (constant 2011 PPP), captures the degree of energy intensity of an economy. A decreasing energy intensity trend can be the result of the implementation of a more stringent environmental policy or the result of companies trying to reduce their costs in response to high input prices. A more energy efficient economy is one that sets natural capital free for the conservation of ecological and biodiversity services.

Air pollution, as measured by the concentration of atmospheric particulates of 10 micrometres or less in diameter (PM_{10}). Routine air quality measurements typically describe such PM concentrations in terms of micrograms per cubic meter ($\mu g/m^3$). It is included to capture the nexus between the economic and the social/environmental components of sustainability. WHO guidance on this indicator is 20 $\mu g/m^3$ annual mean.[52]

[51] **See PAGE (2017).**
[52] **https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.**

Gini Coefficient is a measure of statistical dispersion intended to represent the income inequality or wealth inequality within a nation or any other group of people. Policies that promote the transition to an Inclusive Green Economy by creating jobs and generating new income for a wider share of the population should result in reduced inequality.

Access to water and access to electricity, both measured by the percentage of the population. It is included in the GEP Index in order to capture some of the different forms of absolute poverty [53]. Access to basic services affects citizens' ability to experience direct (e.g. consumption, health) and indirect (e.g. educational and entrepreneurial) development opportunities.

- **Population using safely managed drinking water services:** Making progress in providing access to basic services requires new investments in, among other infrastructure, pipelines and water distribution and purification systems. Impacts on the environment should also be considered, including how to avoid water stress.
- **Access to electricity:** Enabling greater access to electricity will require investments in the electricity grid, transmission and distribution, as well as decentralized electricity systems. Electricity generation from low-carbon and renewable sources should also be promoted.

Literacy rate is measured as the number of literate persons 15 years or above, expressed as a percentage of the total population in that age group.[54]

Poverty Gap Index is defined as average of the ratio of the poverty gap to the poverty line. The poverty gap index is an improvement over the poverty measure headcount ratio which simply counts all the people below a poverty line, in a given population, and considers them equally poor. Poverty gap index estimates the depth of poverty by considering how far, on the average, the poor are from that poverty line.

Research and Development expenditure as a proportion of GDP, is measured as the gross domestic expenditures on research and development (R&D), expressed as a percent of GDP.

[53] **Access to water, electricity and sanitation are treated as a single index (access to basic services) in the GEP index.**

[54] **This replaces the SDG indicator Population in a given age group achieving at least a fixed level of proficiency in functional. Literacy, 9 grade, since data at the global level is lacking. Only 27 overall observations for this indicator at the SDG global database. Also, information for SA only available from 2012 to 2014 (no end of period information).**

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