Sustainable Development Goals under a Business as Usual Scenario for Colombia and Peru

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Introduction

World leaders have committed to tackle the multiple and complex challenges humankind is facing to ensure societal well-being, economic prosperity and environmental protection by endorsing the 2030 Sustainable Development Goals (SDGs). The SDGs universally apply for all countries and are intended to leave no one behind, reaching all income and social groups.

The seventeen SDGs consist of a combination of 169 social, economic and environmental targets to be reached by 2030 (UN 2016a). For the monitoring of the goals, 246 indicators are proposed, some of which represent more than one target, which include 100 global indicators and 146 complementary national indicators (SDSN 2015). While the former are universally applied across countries, the latter focus on domestic priorities and needs which might not be suitable for all countries. Some indicators represent more than one target.

Uneven progress was observed in regards to achieving the preceding Millennium Development Goals (MDGs), which were established mainly for developing countries (UN 2015). Few countries managed to achieve a large number of goals, while many countries were able to attain a few of the MDGs. In light of this, it is essential to identify the SDGs that require alternative pathways to be met by 2030. Therefore, our analysis focuses on finding which of the SGDs are feasible to be reached by 2030 under a business as usual (BAU) for Colombia and Peru, our project countries.

Data and Method

Data Selection

For monitoring the SDGs, a preliminary set of 230 indicators was endorsed based on the work carried out by the Inter-Agency and Expert Group on SDG Indicators (UN 2016b). However, data and statistical methodologies are currently not available for all the indicators, e.g. global data are only regularly available for 98 indicators (Sachs et al. 2016). Hence, we first focus on the availability and consistency of the data for Colombia and Peru in order to choose a suitable set of indicators for our analysis.

To build the indicator set, two indicators per goal were chosen, representing different targets of the goal based on some of the 246 proposed indicators (SDSN 2015). The priority was to identify the indicators which cover the goal in a broad sense or could function as a headline indicator (Kroll 2015). In order to keep a broader variability of indicators and since some indicators are used to monitor more than one target, special consideration was applied to avoid using any given indicator twice. However, due to lack of data availability, in a few cases only one indicator per goal was chosen (SDG 10, 12, 13, 15 and 17). Annex Table A1 provides the set of chosen indicators. From the 32 indicators, disaggregated data is only available for five indicators (e.g. for urban and rural population).

SDGs' Target

The SDGs consist of a mixture of quantitative and qualitative targets. For example, the SDG 12 consists of the quantitative target of halving the per capita global food waste by 2030 and the qualitative target of achieving the sustainable management and efficient use of natural resources by 2030. Hence, we consider a mixed approach to relate the SDGs' targets to the 32 selected indicators. When a quantitative target is provided for an indicator, we select the defined SDG's target. For the qualitative cases, and when it is worthwhile to reach as a target, the most recent year's OECD average value of that indicator was used. This approach has some exceptions where the OECD average did not appear to be desirable to attain. First, for the indicator "Share of energy from renewables" of SDG 7, the 2020 EU target of achieving at least a 20% of renewable energy share was taken. Second, for indicator "Total energy and industry-related GHG emissions" of SDG 13, the country specific values of the Nationally Determined Contributions (NDC) was considered. Third, we were not able to relate quantitative value for the three indicators for which qualitative targets were given.

Business as Usual Scenario

To identify the SDGs which require alternative pathways to be attained, we extrapolated the selected indicators and compared them to their respective targets. However, when projections are available in literature, e.g. for demographic data (Wittgenstein Centre 2016), we used the projected data.

We applied the generalized additive models (GAM) provided in R's ggplot2 package (Wickham 2009) for extrapolating the indicators. A GAM is a generalized linear model with an integrated smoothness estimation based on an unknown smooth function based on some predictor variables. A 0.95-confidence interval was also added for this model to estimate uncertainty.

We tested the data for outliers before applying the GAM for extrapolation. Outliers are not representative for a sample and big deviations of the mean can cause a distortion of the sample. For this, we applied a 4-sigma test, considering all values outside the range of the mean plus/minus 4-sigma as the outliers. This range was chosen because it includes 99.99% of values for normal distributions, for symmetric and unimodal distributions it includes 97% and with any other distribution at least 94%. The mean and sigma range were calculated for the whole data set. We applied this outlier test for the indicators that have at least 10 data points. However, the indicator "Losses from natural disasters, by climate and non-climate-related events" of SDG 13 was excluded from this outlier assessment, since it focuses precisely on extremes.

SDG Index

For comparing the overall attainment of SDGs under the BAU scenario, we estimated a SDG Index by adopting the methodology provided by Kroll (2015). The index was calculated for the three time periods of 2000, 2015 (or based on the most recent available data) and 2030 (based on the projected data). For this, we initially normalized the data between 0 and 1 for all the indicators. The SDG target for each indicator is assigned as value 1. Based on the available data (all countries and time period), the value that is furthest from the target for each indicator is set to 0. Since we were not able to relate quantitative value for the three qualitative targets, we did not consider these targets' indicators while estimating the SDG Index.

We took the arithmetic mean of the normalized data for each goal for 2000, 2015 and 2030 to obtain SDG Index. When an indicator exceeds the target, the normalized value can be greater than one. In such cases, we assigned value 1 for the indicator while calculating the index. Furthermore, attention was taken in regards to having equal weights for all the seventeen goals because of the interdependencies among the SDGs. When a country fails to achieve a SDG, this will propagate through the other goals and will hinder fulfillments of all SDGs. In light of this, before averaging the SDG index, we obtained the average value for the disaggregated indicators and multiplied the normalized value by 2 for the SDGs for which only one indicator was selected. By performing this important step, in the end each goal was equally weighted to calculate the overall SDG Index.

Results

Colombia

Under a BAU scenario, our projections show that Colombia may reach seven out of the seventeen SDGs based on the 32 considered indicators (Figure 1). These goals are SDG 1 (No poverty), SDG 3 (Good health), SDG 4 (Quality education), SDG 5 (Gender equality), SDG 7 (Renewable energy), SDG 15 (Life on land) and SDG 17 (Partnerships for the goals). To secure the attainment of these goals, Colombia needs to strengthen the implementation of ongoing local policies that focus on reducing poverty, improving health and education, achieving gender equality, promoting renewable energy, conserving biodiversity, and participating in global partnerships.

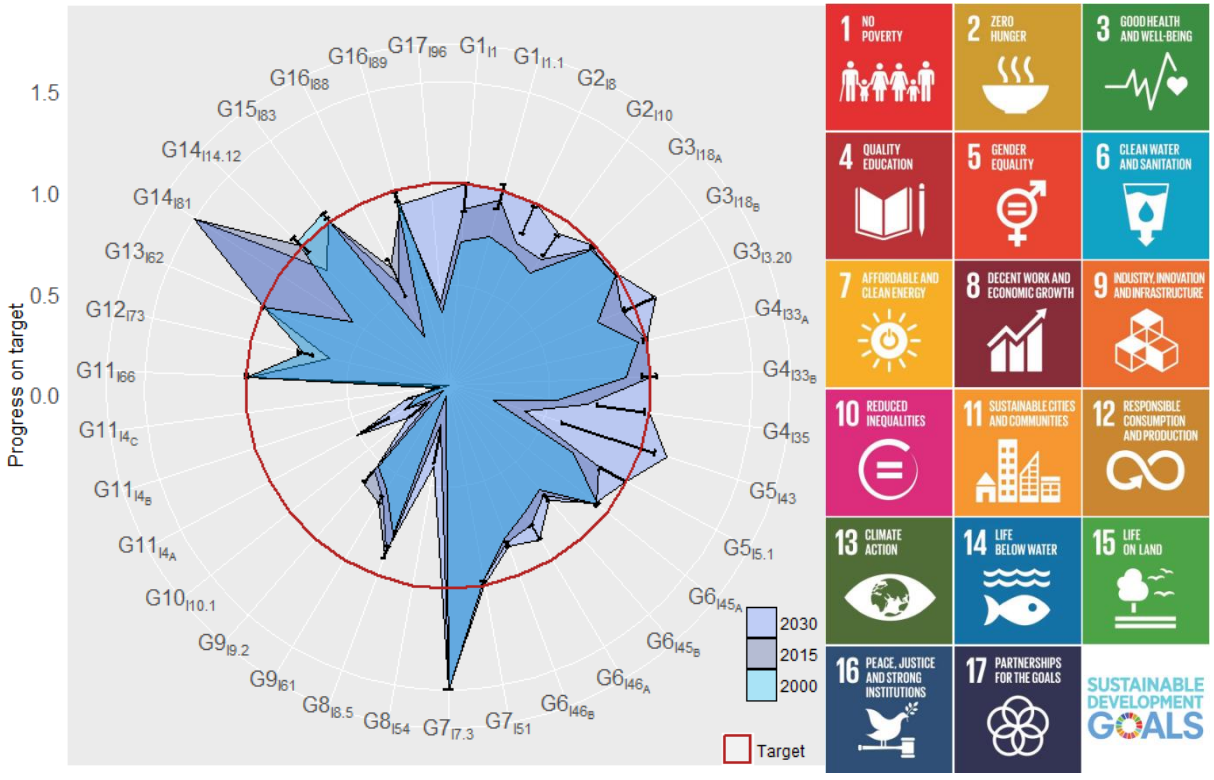

Figure 1: Attainability of SDGs under a business as usual scenario for Colombia by 2030 in comparison to where the country stands now based on the recent data (2015) and data for the year 2000 (left) and the list of SDGs (right). SDGs are denoted by "G" and "I" represents used indicator (see Annex Table A1). The red line in the diagram depicts the SDG targets for Colombia, which are represented by value 1 during normalization. A value greater than one for an indicator is obtained when it exceeds the target. The black bar represents 95% confidence interval to estimate uncertainty.

Two other SDGs may nearly be attained, which are SDG 2 (No hunger) and SDG 6 (Clean water and sanitation). Among two indicators used for SDG 2, one indicator (proportion of population below a minimum level of dietary energy consumption) may reach the target while the other (prevalence of stunting in children) is projected to meet the target a few years after 2030. Hence, exiting policies might not be enough to eliminate hunger and to achieve targets on clear water and sanitation in Colombia by 2030. Here, current policies need to be strengthened with additional efforts to meet these two SDGs.

Colombia may hardly reach the other eight SDGs under a BAU scenario. Therefore, Colombia needs to prioritize these goals and to revise local policies in a direction that makes rapid progress on achieving these SDGs. For some SDGs, progress can be expected towards meeting their targets, whereas other SDGs may progress in the undesired direction. For example, SDG 10 (Reduce inequalities) may carry out little progress towards achieving the target. In contrast, development of SDG 12 (Responsible consumption) may deviate further from the target. Such contrasting projections can also be observed for different indicators of the same SDG e.g., SDG 11 (Sustainable cities and communities), SDG 14 (Life below water) and SDG 16 (Peace and justice). In order to meet SDGs that are increasingly deviating from the targets in a BAU, Colombia requires alternative development pathways.

Peru

Under a BAU scenario, Peru may only reach four out of the seventeen SDGs (Figure 2). These goals are SDG 1 (No poverty), SDG 3 (Good health), SDG 13 (Climate action) and SDG 16 (Peace & justice). For attaining the goals, Peru needs to continue with ongoing local policies.

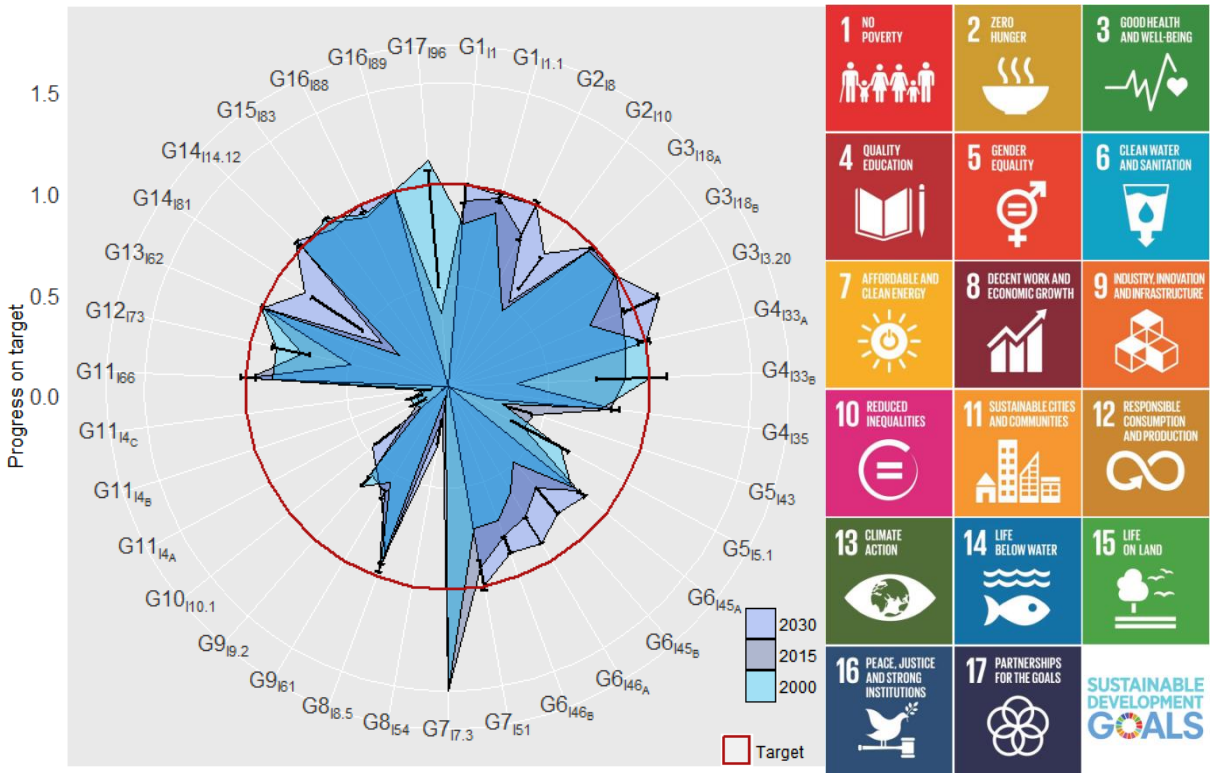

Figure 2: Attainability of SDGs under a business as usual scenario for Peru by 2030 in comparison to where the country stands now based on the recent data (2015) and data for the year 2000 (left) and the list of SDGs (right). SDGs are denoted by "G" and "I" represents used indicator (see Annex Table A1). The red line in the diagram depicts targets of SDGs target for Peru, which are represented by value 1 during normalization. A value greater than one for an indicator is obtained when it precedes the target. The black bar represents 95% confidence interval to estimate uncertainty.

Three other SDGs may nearly be attained, which are SDG 2 (No hunger), SDG 6 (Clean water and sanitation) and SDG 14 (Life below water). One indicator (proportion of population below a minimum level of dietary energy consumption) used for SDG 2 may reach the target, while another indicator (prevalence of stunting in children) may only fulfill the target a couple of years after 2030. Hence, exiting policies might not be sufficient to eliminate hunger, to achieve the targets on clear water and sanitation or to conserve life below water in Peru by 2030. Peru needs to strengthen current policies by speeding up the ongoing progress to meet these three SDGs.

Peru may hardly reach the other ten SDGs under a BAU scenario. This shows that Peru needs to perform additional efforts in comparison to Colombia in order to meet the SDGs. Similar to Colombia, progress can be expected towards meeting some SDGs, whereas other SDGs are projected to deviate from their targets. SDG 4 (Quality education), SDG 5 (Gender equality), SDG 12 (Responsible consumption), SDG 15 (Life on land) and SDG 17 (Partnerships for the goals) may develop in the opposite direction rather than towards the desired targets. For these cases, local policies need to focus on changing the current development paths. Similarly, an indicator for SDG 7 (Renewable energy), SDG 8 (Good jobs and economic growth) and SDG 11 (Sustainable cities and communities) may progress in an undesired direction, while another indicator of these same goals may achieve the fulfillment of the targets. SDG 9 (Innovation and infrastructure) and SDG 10 (Reduced inequalities) may carry out little progress toward attaining the targets. For achieving these goals, Peru needs to revise local policies in regards to achieving faster progress.

Overall Performance

The SDG index is used to understand the overall performance of the countries on achieving the SDGs (Figure 3). For Colombia, the estimated SDG index is expected to increase following the trend observed during the MDGs. However, the overall progress towards the SDGs will not be sufficient to fulfill all the targets under a BAU scenario. Therefore, as mentioned in the above section, Colombia requires additional policy measures to attain all the SDGs by 2030.

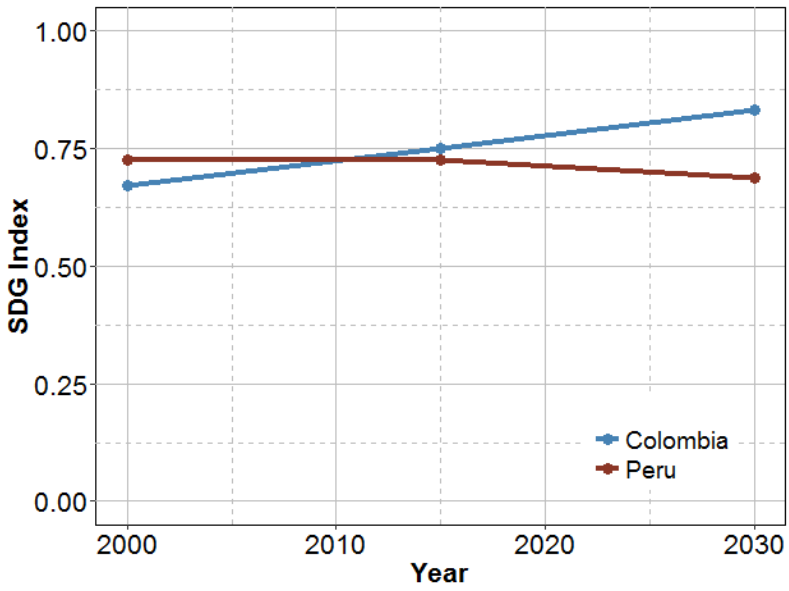

Figure 3: Estimated development of the SDG Index for Colombia and Peru. Overall, Colombia may progress towards attaining the SDGs but not at the sufficient rate required to meet all the targets. Contrastingly, in a BAU scenario Peru's overall SDG performance could slightly worsen.

For Peru, the estimated SDG index stays almost constant between 2000 and 2015 and may decrease by 2030, deviating further from the goal under a BAU scenario rather than achieving it. This is a consequence of Peru's negligible or negative progress towards achieving most of the SDGs, as shown in Figure 2. Hence, Peru needs additional efforts and alternative development pathways to achieve the SDGs by 2030.

Discussion

Our analysis provides new insights on how far Colombia and Peru can meet the SDGs by 2030 under a BAU scenario. For both countries, we observed three distinctive characteristics related to the SDGs. First, some SDGs can be met for both countries under a BAU scenario. For these SDGs the continuation of the current policies would be sufficient. Second, both countries will progress towards achieving some of the SDGs, though not fast enough to attain these goals by 2030. Hence, additional efforts are required to increase the rate of progress to meet these goals. Third, both countries may deviate further from the attainment of few SDGs. For these cases, a BAU would not be an option and, therefore, an alternative course is required to fulfill the SDGs.

The interpretation of our results requires understanding the limitations of our analysis. First, the indicators used for our analysis are based on the proposed SDG indicators by SDSN (2015). The Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) has recently finalized the official list of SDG indicators. However, there are large overlaps between the indicators provided by SDSN and IAEG-SDGs. Second, we used headline indicators for each SDG instead of all the indicators because of data limitations and in order to represent all SDGs as equally as possible. Further comprehensive analysis could consider all indicators; however, our analysis provides a good overview on Colombia and Peru under a BAU scenario. Third, our analysis largely relies on the extrapolation of past trends to represent the BAU scenarios, though projected data from literature was used whenever projections were available. Further analysis could also consider alternative scenarios.

In summary, consolidated efforts are needed to achieve the 2030 agenda for sustainable development, SDGs, which is also highlighted by our analysis for Colombia and Peru. Building up on the momentum from the MDGs, additional efforts and in a few cases completely changing the direction of current development paths are prerequisites for attaining the SDGs by 2030. This leads to a list of country specific SDGs that require additional attention and prioritization. Further, trade-offs and synergies among the SDGs needs to be understood based on a systematic investigation on compatibilities and incompatibilities among the SDGs.

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Annex Table A1: A list of SDGs' indicators used in our analysis.

SDGs	Indicator	Title
1	1	Proportion of population below $ 1.25 (PPP) per day
1	1.1	Poverty gap ratio
2	8	Proportion of population below minimum level of dietary energy consumption
2	10	Prevalence of stunting in children under 5 years
3	18	Under-5 mortality rate
3	18	Neonatal mortality rate
3	18	Infant mortality rate
3	3.20	Healthy life expectancy at birth
4	33	Primary completion rates for girls
4	33	Primary completion rates for boys
4	35	Secondary completion rates
5	43	Percentage of seats held by women in national parliaments
5	5.1	Gender gap in wages
6	45	Percentage of urban population using safely managed water services
6	45	Percentage of rural population using safely managed water services
6	46	Percentage of population using safely managed sanitation services
6	46	Percentage of urban population using safely managed sanitation services
7	51	Share of population using reliable electricity
7	7.3	Share of energy from renewables
8	54	GNI per capita (PPP)
8	8.5	Employment to population ratio, 15plus
9	61	Manufacturing value added (MVA)
9	9.2	Employment in industry
10	64	Income share of the richest 10%
10	10.1	Gini coefficient
11	4	Percentage of population covered by social insurance programs
11	4	Percentage of population covered by social protection programs
11	4	Percentage of population covered by social safety programs
11	66	Percentage of urban population using reliable electricity
12	73	Global food loss index
13	6	Total deaths from non-climate-related natural disasters
13	6	Total deaths from climate-related natural disasters
13	6	Total damage from non-climate-related natural disasters
13	6	Total damage from climate-related natural disasters
13	62	Total energy and industry-related CO2-emissions
14	81	Share of coastal areas that are protected
14	14.12	Area of mangrove deforestation
15	83	Annual change in land under cultivation
15	83	Annual change in forest area
16	88	Violent deaths per 100.000 population
16	88	Cases of sexual violence per 100.000 population
16	89	Number of refugees
17	96	Official development assistance
17	17.8	Value of exports as a percentage of global exports