

SCA 2024 - Sustainability Championship of America 2024

Fabian Hildebrandt

Matriculation Number: 23392857

Email: fabian.hildebrandt@fau.de

Analysis Report

Abstract—‘Drill, baby, drill’ is an old republican slogan that became famous during the recent election campaign of Donald Trump - the future president of the USA. Despite countless extreme weather incidents and the visible effects of climate change, many American countries decide to further expand non-sustainable energy supplies, deforest the rain forests, and cause harm to nature. The Sustainability Championship of America 2024 (SCA 2024) presents a comparison of the national sustainability performance of the Americas in three dimensions: environmental, economical, and social. The analysis uses carefully selected comparative indicators that avoid penalizing smaller or economically emerging nations. The report introduces two distinct recognition categories: overall champions demonstrating consistent high performance and rising stars with significant recent improvements. It will also show which countries are latecomers struggling with sustainability challenges. The scope of this project report is to show an overview of the used data, the metrics and the discuss the results of the SCA 2024.

I. INTRODUCTION

The Americas have been the sacred lands for explorers on their pursuit of happiness, home of many natural wonders, large resource occurrences and the earth’s richest biodiversity. Over centuries, American countries have prospered through the exploitation of these resources. Economies and societies developed. In recent years, the visible effects of climate change - rising temperatures, extreme weather events and shifting ecosystems - have created a change of thinking in many countries. A recent example are Colombia’s Biodiversity Bonds, which were proposed in October 2024 during COP16. The bonds are dedicated to funding biodiversity projects to protect, conserve and restore natural ecosystems and are the first of its kind in Latin America [1]. Another example is Chile’s National Green Hydrogen Strategy aiming to produce up to 160 million tons of clean hydrogen annually by 2050 making Chile a key player in the hydrogen production and export [2]. However, other countries continue to expand nonrenewable energy sources and deforest critical habitats. A negative example is the direction the future president of the USA pursues. He aims to implement an energy and resource strategy centered on expanding domestic fossil fuel production and rolling back environmental regulations from Joe Biden’s current administration after inauguration[3]. Recent years showed, that the news don’t show the full pictures. Many companies have been accused of greenwashing. Greenwashing is a practice, where products, policies, or initiatives are marketed environmentally

friendly to improve its public image. That’s why, it is necessary to use data to draw the full image.

Which countries are America’s current sustainability champions, the rising stars and latecomers?

II. USED DATA

A. Data overview

The Sustainability Championship of America 2024 (SCA 2024) presents a comparison of the national sustainability performance of the Americas in three dimensions: environmental, economical, and social. Each dimension consists of equally weighted categories and has been inspired by the *Sovereign ESG Data Portal* from the *World Bank Group* [4] (WBG) and the article ‘CO₂ and Greenhouse Gas Emissions’ by *Our World in Data* (OWID) [5]. The table I shows an overview of the different categories and the source of the indicators used.

Category	Data Source
(1) Emissions per capita	WBG
(2) Renewable energy share	WBG
(3) Emissions related to land use change (e.g. deforestation)	OWID
(4) Water stress levels	WBG
(5) Waste equivalent emissions	WBG
(6) Health expenditure	WBG
(7) Air pollution	WBG
(8) Education efficiency	WBG
(9) Carbon intensity (emissions per GDP)	WBG
(10) Economical development	WBG
(11) (Climate risks)	WBG
(12) Natural resource depletion	WBG

TABLE I
INDICATORS AND DATA SOURCE IDS

The categories (1) - (5) and (11) are part of the environmental pillar, the categories (6) - (8) belong to the social pillar and the categories (9), (10) and (12) belong to the economic pillar of the ranking.

The goal is to have a comprehensive data set for most of the 43 countries of North America, Latin-America, and the Caribbean over the last years. Therefore, the two data sources WBG [6] and OWID [5] are evaluated, and all indicators that correspond to one of the categories are considered for a data quality check. Most of the indicators are not yet reported for the recent years 2022, 2023 and 2024. To avoid missing data and short-term effects in the data (like energy crises, warm temperatures, single events), the data of the past six years is queried (2018-2024) and an average for that period is calculated. To take recent initiatives and policies into account, the

rising stars ranking is created. The ranking highlights countries with recent improvements towards more sustainability. For this ranking, the rate of change of each indicator is calculated. After querying the data using the data pipeline described in the Data Report, each indicator is evaluated for its quality. The indicators should be accurate, relevant, consistent, complete and timely. Therefore, two metrics are used. The first metric is the ratio of missing values for the defined time range and scope of countries. The second metric should make sure that a high ratio of country reported the specific indicator. These two metrics help to narrow down the number of possible indicators. The reason, why the WBG is relatively overrepresented in the final table I is that it has a larger number of indicators to choose. The category (11) Climate risks is not considered for the ranking. The reason for that is the lack of available indicators, that cover all countries. The selected indicators have an insufficient data quality, because they are only reported on world level and country level.

The transformed data is stored in an SQLite database in a generic long format. This allows easy and intuitive querying using SQL identical for both data sources. Each query includes a selection of countries, years and indicators.

B. License conditions

Generally, both data sources (WBG and OWID) have an open data policy using the Creative-Commons Attribution 4.0 international licenses (CC-BY 4.x) for most of the indicators [7], [8]. These licenses allow a free usage. However, an attribution to the original data source is required when using, adapting, or reproducing the data. Changes to the data must be indicated. The licenses of all indicators, their origin and performed changes are shown in a license file in the project GitHub repository (*licenses.xlsx*) [9].

The only changes performed to the data are the calculation of the indicator's average for a country for the selected time period (2018-2024) and the calculation of the rate of change. The rate of change is the change between consecutive years in percent. Further information on the used data sources is available in the Data Report of the SCA 2024. All results of the SCA 2024 and its findings are published under the Creative-Commons Attribution 4.0 international licenses (CC-BY 4.x).

III. ANALYSIS

A. Methods

The SCA 2024 has the goal to provide a fair comparison between the countries of the America's with respect to their sustainability performance. Therefore, comparative metrics are chosen. The ranking consists of indicators with relative units. Exemplary indicators are *Total greenhouse gas emissions excluding Land Use, Land Use-Change and Forestry (LULUCF) per capita (t CO₂e/capita)* or *Level of water stress: freshwater withdrawal as a proportion of available freshwater resources*. Relative units ensure that countries are ranked based on their true performance and not only based on their size. The different categories aim to provide a broad comparison

not only focusing on a country's energy strategy or the total greenhouse gas emissions.

The code for the data analysis is modular and configurable allowing fast adaptations for further analyses with different countries. All indicators of interest can be added to a configuration *yaml* file. The country coverage, the indicators used for the ranking and the year range can be easily changed in the configuration. This way, it is possible to perform the same analysis for other continents (e. g. Europe, Asia, Africa) too. The configuration only requires the name of the indicator, the description, which is displayed in the plots and the rankings and whether the indicator is ranked ascending/ descending. For some indicators it is desirable for a country to have low value (e. g. *Total greenhouse gas emissions per capita*). For other indicators are ranked, such that large values result in a good ranking (e. g. *Renewable energy consumption in % of total energy consumption*).

To visualize the country rankings on a map, the GeoPandas library [10] is used. GeoPandas is an open source project, which extends the datatypes used by pandas to allow spatial operations (like country shapes) and which uses matplotlib for plotting. It comes with a *BSD 3-Clause "New" or "Revised" License* which is a permissive license that allows commercial use, modification, distribution, private use without liability/ warranty and under the condition that the user includes a license and copyright notice [11]. The high-resolution map data of the countries is downloaded from the *Natural Earth* project [12], which publishes all map data to the public domain allowing a full use without accreditation [13].

The preparation phase consists of reading the configuration *yaml* file and extracting and cleaning the geodata from the *shp* file. During the cleaning process, countries, that are not part of the ranking and additional information is dropped and the columns are renamed. In the next step, the data of all configured indicators is queried. Each query contains the configured countries and the year range of the indicator. Afterwards, the rate of change is calculated. The calculation is only performed for consecutive years (e. g. 2021-2022) and it is skipped, if there is a gap of more than one year (e. g. 2018-2021). This step is followed by a ranking for the single indicator and a visualization of the results on the map. This helps to create more transparency by breaking down the overall score in the different categories. The rankings of all indicators in the overall competition and rising stars competition are collected and finally combined to a full ranking in a single *DataFrame*. This is done by calculating the average ranking of each country in all categories. To make sure, that only countries that have valid data for most of the categories are considered for the final ranking, the ratio of available categories is checked against a threshold. The threshold is set to 70 %. Due to the threshold, eight of the forty-three countries are excluded from the overall ranking and nine countries from the rising stars ranking ¹.

¹Aruba, Bermuda, Curaçao, Cayman Islands, Puerto Rico, Sint Maarten, Turks and Caicos Islands, Virgin Islands (U.S.), Venezuela

All excluded countries but Venezuela have in common that they are territories or constituent countries associated with other nations and therefore are accounted for in other national statistics of non-American countries. The final ranking is then stored as an Excel sheet and visualized on the map.

The described data processing pipeline can be used to create any other ranking. It offers a good toolbox for future analyses.

B. Results

The goal of SCA 2024 is to provide a broad image of the sustainability performance of different countries. The countries of North, Middle, and South America and the Caribbean are evaluated on the basis of economic, social, and environmental metrics in 11 different categories. The result are two rankings: Overall champions and Rising stars.

Overall champion The overall champions have demonstrated consistent performance across all categories in the years 2018-2024. And the winners are...

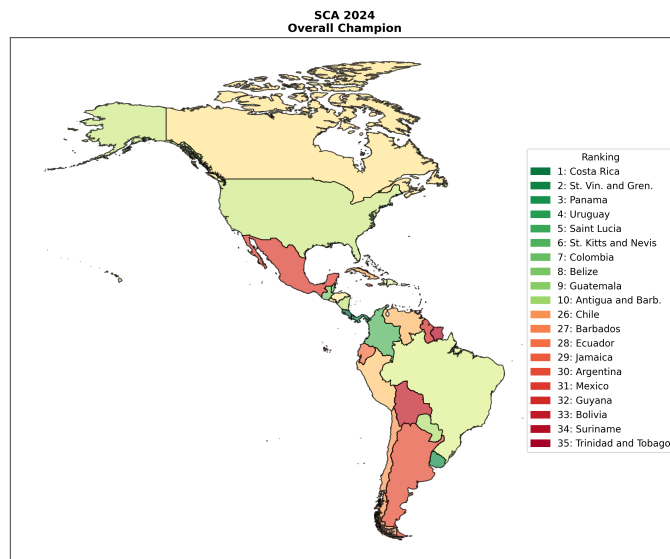


Fig. 1. Overall champion ranking

Costa Rica is the overall champion of this year's SCA 2024 by achieving a ranking in the top third in 8 out of 11 categories. Costa Rica reached the third place in the category (12) Natural resource depletion, the sixth place in the category (10) Economic development and the eighth place in the categories (2) Renewable energy share and (8) Education efficiency.

Preserving its environment is deeply embedded in the Costa Rican constitution. Costa Rica, covering only 0.03 % of the Earth's surface, is home to nearly 6 % of all known species and prioritizes conservation, dedicating a quarter of its land to protected areas under the 1994 Law of Conservation Areas and Wildlife. It leads in sustainable practices, banning open-pit mining and trawl fishing, and aims for net-zero emissions by 2050 with its National Decarbonization Plan, supported by 99 % renewable energy generation. Costa Rica abolished its military in 1949 to invest the resources into healthcare and

education systems. According to the Social Progress Index, Costa Rica ranks as the second Latin American nation in social progress. Economically, the nation has implemented the free trade zone regime in 1982 drawing in foreign investment (from big companies like Intel), creating jobs and boosting exports. This shows, that small nations can have a substantial impact on the global stage and that the pursuit of sustainable policies can lead to significant progress in all three sustainable dimensions: environmental, social and economical [14].

Trinidad and Tobago is the southernmost island country in the Caribbean located in the northeast of Venezuela. It has the highest greenhouse gas emissions and the lowest percentage of renewable energy consumption of all American and Caribbean countries (below 1 %). The total greenhouse gas emissions of more than 30 t CO₂-equivalent per capita are more than four times of the world average [6]. Trinidad and Tobago has a high dependence on fossil fuels. The reliance originates from the natural gas resources, that drive the nation's economy and energy sector for years. The export of petroleum products accounts for nearly 80 % of Trinidad and Tobago's export revenues. The cheap availability of the fossil fuels is encouraging the current administration to further pursue this path [15]. Thus Trinidad and Tobago is the latecomer of the overall SCA ranking.

Rising stars The rising stars may not be on the podium of the overall champions of this year's SCA, but they show significant improvements across most categories indicating that they are on their way of becoming more sustainable. And the rising stars are...

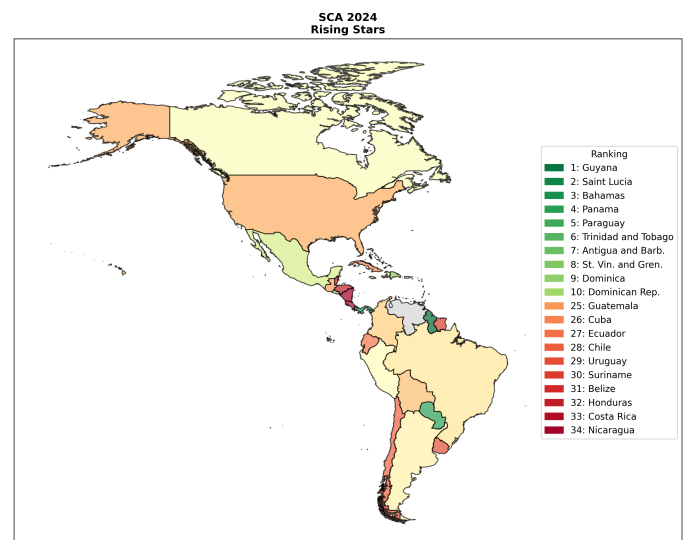


Fig. 2. Rising stars ranking

Guyana is the rising star showing great improvements in the social dimension: It ranks first in the category (6) health expenditure and (8) school enrollment. Social security and improved education are part of the foundation that drives economic development. Guyana shows the strongest transition to reducing the carbon intensity of its economy (category (9)).

In addition to that, it shows a positive development in the categories (3), (5), (7) and (10). Guyana allocated the UN investments across various Sustainable Development Goals (SDGs), with a significant funding towards environmental sustainability, social welfare, and infrastructure development [16]. Almost one half of the funds were invested in social SDGs explaining the great improvements in the social categories of the SCA 2024.

Venezuela (coloured in grey) is the only sovereign country in the ranking, that didn't report enough data to be included in the rising stars competition. Therefore it can be considered as the true latecomer in the rising stars ranking. In the past couple of years, Venezuela experienced an economic collapse, political instability, and humanitarian emergencies. Many analysts therefore describe Venezuela as a failed state [17]. This might explain the lack of reporting.

IV. CONCLUSIONS

The Sustainability Championship of America 2024 (SCA 2024) presents a comparison of the national sustainability performance of the Americas in three dimensions: environmental, economical, and social. The three dimensions are evaluated using 11 categories. The countries are compared in two rankings: Overall champions showing robust performance across all categories and the Rising stars, which demonstrate great improvements towards becoming more sustainable. While the SCA 2024 provides quantitative insights into the national sustainability performance of the Americas, it may not capture the full image of a country's sustainability efforts. The SCA tells the stories of a few selected countries, but each country has its own story to tell, explaining the sustainability performance. Furthermore, many of the indicators used were last reported in 2021 or 2022, limiting the relevance and timeliness of the data. Therefore, the indicator data has been averaged for the last six years (2018-2024). The presented methods can be applied not only to other countries, but also to create all kinds of other rankings based on data from the WBG. All visualizations, results and sources can be found on the project's GitHub repository [9].

The overall champion is Costa Rica. Costa Rica demonstrates how sustainable policies can lead to significant progress in all three sustainable dimensions. Trinidad and Tobago draws the opposite image. The country is heavily dependent on the natural gas resources, which results in high emissions and a low percentage of renewable energies. Guyana is this year's rising star. Throughout the last years it has invested a lot of development funding into social development resulting in great improvements in all social categories. The collapse of Venezuela, from a prospering petrostate to a failed state, highlights how a lack of sustainable, future-oriented politics can damage a country's welfare [17]. However, also the largest economies have a high relevance for America's sustainability. The five largest countries in terms of CO₂ emissions—USA, Canada, Brazil, Mexico, and Argentina, together represent 92 % of America's total emissions, with the USA alone contributing 69 % (based on data from 2022 taken from [5]).

This highlights that the major economies have the greatest potential to drive change by setting ambitious sustainability targets, investing in technology to mitigate climate change, and serving as role models for other emerging nations.

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