

**AICTE BUILD A THON 2023**

**21.11.2023 – 04.12.2023**

**Project Report**

**under**

**the title**

**Visualizing Sustainability: A Cognos-based Analysis of Global Trends (2000-2023)**

**Submitted by**

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**Vellore Institute of Technology**  
(Deemed to be University under section 3 of UGC Act, 1956)  
CHENNAI

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## **1. Introduction**

### **1.1. Overview**

The sustainable development goals (SDGs) are practiced presently in all higher educational institutions in order to end poverty, protect the environment, clean energy initiatives, gender equality etc. The 17 SDGs are united for the development of social, economical and environmental sustainability. It is an urgent call for all developed and developing countries for action.

### **1.2 Objectives (Purposes)**

The main objectives of the project work are to:

- Display a ranking of countries based on their overall sustainability scores.
- Allow users to filter the rankings by region, income group, or specific SDGs.
- Provide detailed profiles for each country, including its sustainability score, regional classification, and performance on individual SDGs.
- Access historical data to track a country's progress over time.
- Compare the sustainability scores and SDG achievements of countries within a specific region.
- Offer in-depth analysis for each SDG, showing how countries are performing in areas such as poverty reduction, healthcare access, gender equality, climate action, etc.

## **2. Literature survey**

### **2.1 Existing approaches**

A systematic literature review on sustainability development goals was presented in 2020 by Chiara Mio and his co-authors [1]. A review on sharing economy and sustainability development goals was published for sharing economy [2]. An advanced research article on UN SDG goals was presented with respect to accounting scholarship [3].

### **2.2 Proposed solution**

To get the overview on SDGs, each country's progress for the past years is needed. A literature survey on the sustainable development report 2023 dataset [4] reveals a growing body of research and analysis centred around sustainability and the progress of countries toward achieving the United Nations' Sustainable Development Goals (SDGs). Scholars,

policymakers, and organizations have recognized the significance of SDG dataset available in kaggle.com in assessing and advancing sustainability efforts on a global scale. It assists in identifying areas requiring improvement and highlighting successful strategies. Some studies critically evaluate the dataset itself, discussing data accuracy, sources, and limitations. Researchers emphasize the importance of transparent and reliable data for meaningful sustainability assessments.

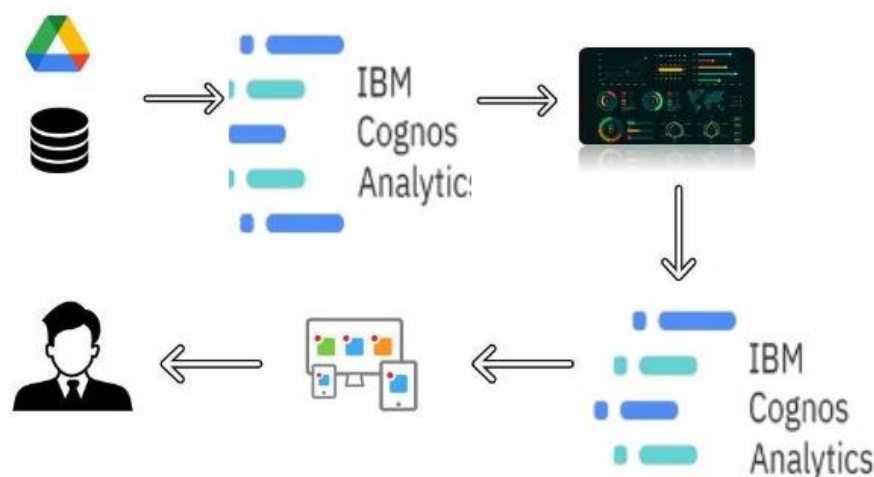
The Sustainable Development Report 2023 dataset holds significant social impact by promoting global sustainability and monitoring progress toward Sustainable Development Goals (SDGs). It empowers countries to assess their sustainability scores, regional standing, and performance on specific SDGs, fostering informed decision-making.

Access to the Sustainable Development Report 2023 dataset can have a profound business impact. Companies can utilize this rich source of sustainability data to make informed decisions regarding market expansion, supply chain optimization, and investment strategies.

### 3. Theoretical Analysis

#### 3.1 Block diagram

The block diagram of the sustainability analytics in IBM Cognos is presented in Figure 1. The data is collected from Kaggle website. It is pre-processed by data cleaning method in IBM Cognos. After data cleaning, the visualization of the data is presented which is needed for dashboard creation.



**Figure 1 block diagram for sustainability analytics using IBM Cognos**

### 3.2 /Software Designing

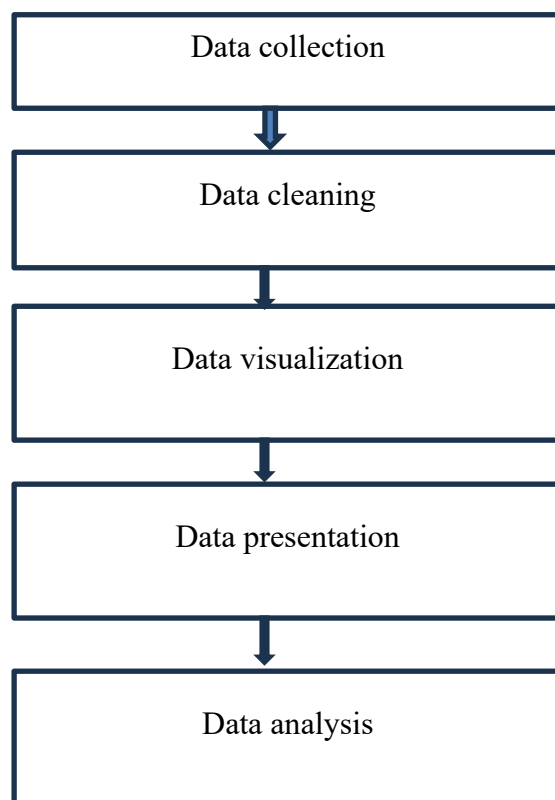
The IBM data analytics cognos tool is used to perform data analytics in order to study the SDG score and index details of each country in different regions.

#### The necessary steps

- Data cleaning
- Visualization
- Dashboard
- Story
- Report
- Performance testing

#### 4. Flowchart

The SDG report and index analysis is represented in the flow chart in Figure 2

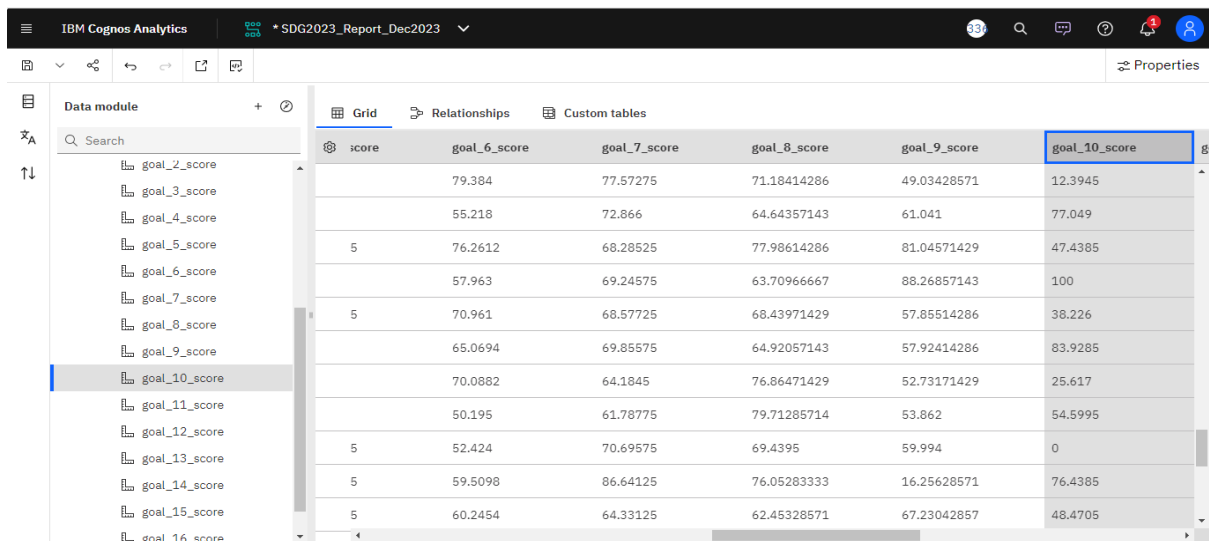


**Figure 2 Flow chart for sustainability data analysis**

## 5. Experimental Investigations

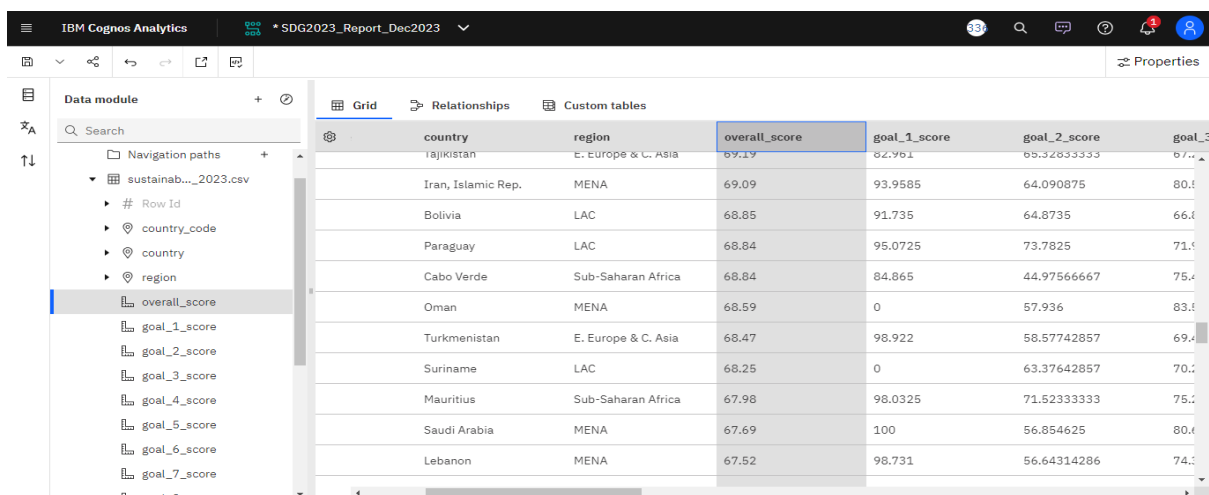
### 5.1 Data cleaning

The data provided in the sustainability development score in each SDG is checked in all aspects. The null data in each SDG is replaced by zero by data cleaning command ‘replace null by zero’. The data in all 17 SDGs are under different decimal point approximation. It is converted to 2 decimal point approximation for data comparison and analysis. The screenshot for null data replaced by zero and 2 decimal approximations are provided in Figure 3 and Figure 4 respectively.



score	goal_6_score	goal_7_score	goal_8_score	goal_9_score	goal_10_score
	79.384	77.57275	71.18414286	49.03428571	12.3945
	55.218	72.866	64.64357143	61.041	77.049
5	76.2612	68.28525	77.98614286	81.04571429	47.4385
	57.963	69.24575	63.70966667	88.26857143	100
5	70.961	68.57725	68.43971429	57.85514286	38.226
	65.0694	69.85575	64.92057143	57.92414286	83.9285
	70.0882	64.1845	76.86471429	52.73171429	25.617
	50.195	61.78775	79.71285714	53.862	54.5995
5	52.424	70.69575	69.4395	59.994	0
5	59.5098	86.64125	76.05283333	16.25628571	76.4385
5	60.2454	64.33125	62.45328571	67.23042857	48.4705

Figure 3 Null data replacement by zero in SDG 10



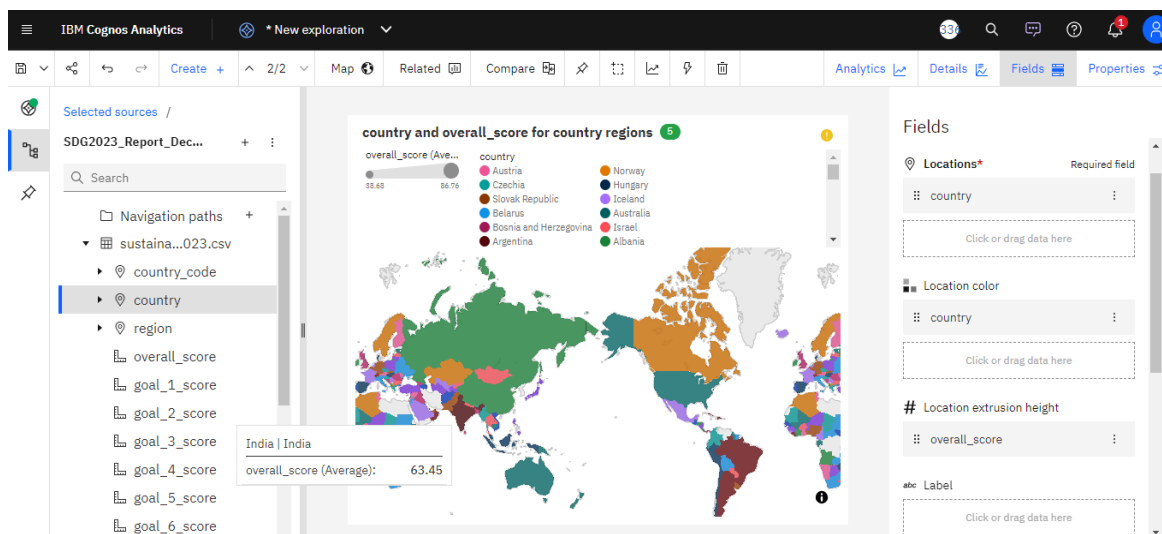
country	region	overall_score	goal_1_score	goal_2_score	goal_3_score
Tajikistan	E. Europe & C. Asia	69.19	62.961	65.32833333	67.0
Iran, Islamic Rep.	MENA	69.09	93.9585	64.090875	80.1
Bolivia	LAC	68.85	91.735	64.8735	66.6
Paraguay	LAC	68.84	95.0725	73.7825	71.1
Cabo Verde	Sub-Saharan Africa	68.84	84.865	44.97566667	75.4
Oman	MENA	68.59	0	57.936	83.1
Turkmenistan	E. Europe & C. Asia	68.47	98.922	58.57742857	69.4
Suriname	LAC	68.25	0	63.37642857	70.2
Mauritius	Sub-Saharan Africa	67.98	98.0325	71.52333333	75.2
Saudi Arabia	MENA	67.69	100	56.854625	80.6
Lebanon	MENA	67.52	98.731	56.64314286	74.2

Figure 4 Two decimal approximation by format data command in data cleaning process

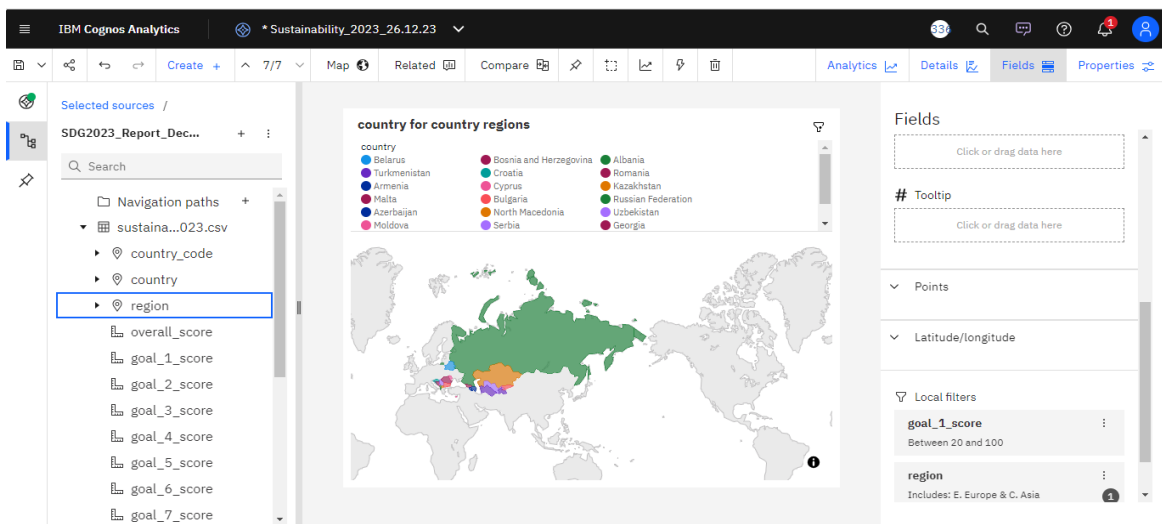
## 6. Results and Discussion

### 6.1 Data Exploration

After data cleaning process, the data is represented in visual form in charts, columns, lines, points etc. It is termed as data exploration. The overall score of SDGs in each country is represented in Figure 5. It can be viewed region-wise and country-wise also. The data is viewed country-wise with respect to region, SDG overall score and individual score as in Figure 6. It is observed that the SDG score of India is displayed in Figure 6 and the region is mentioned as East & South Asia. The SDG index of MENA region is shown in Figure 7 and the SDG 1 score is given in Figure 8.



(a) Country-wise



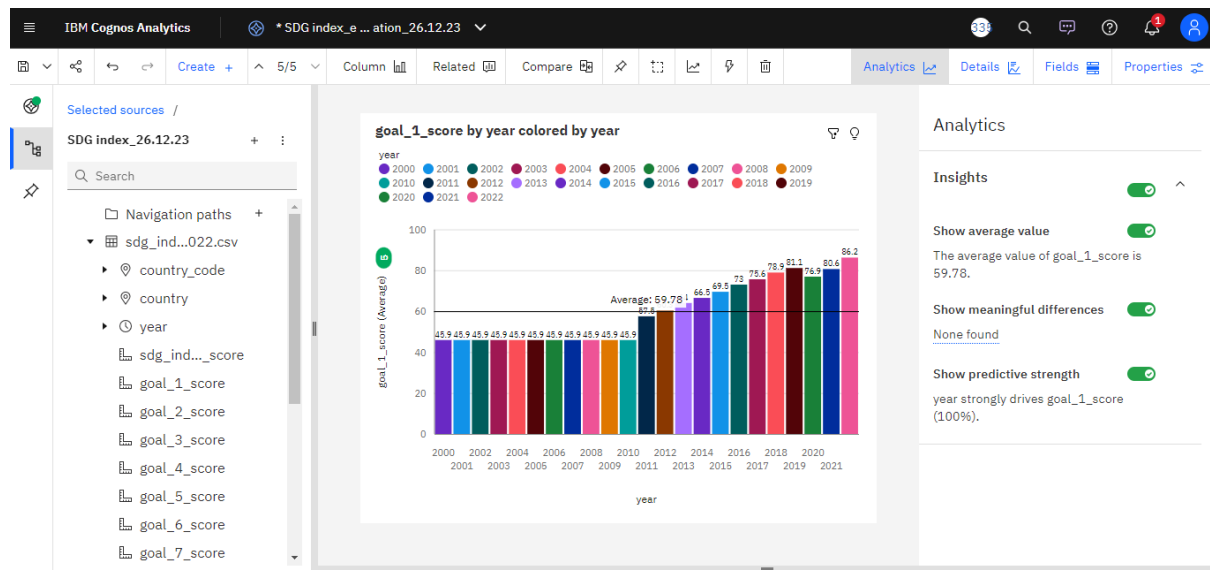
(b) Region-wise

**Figure 5 Overall SDG scores**



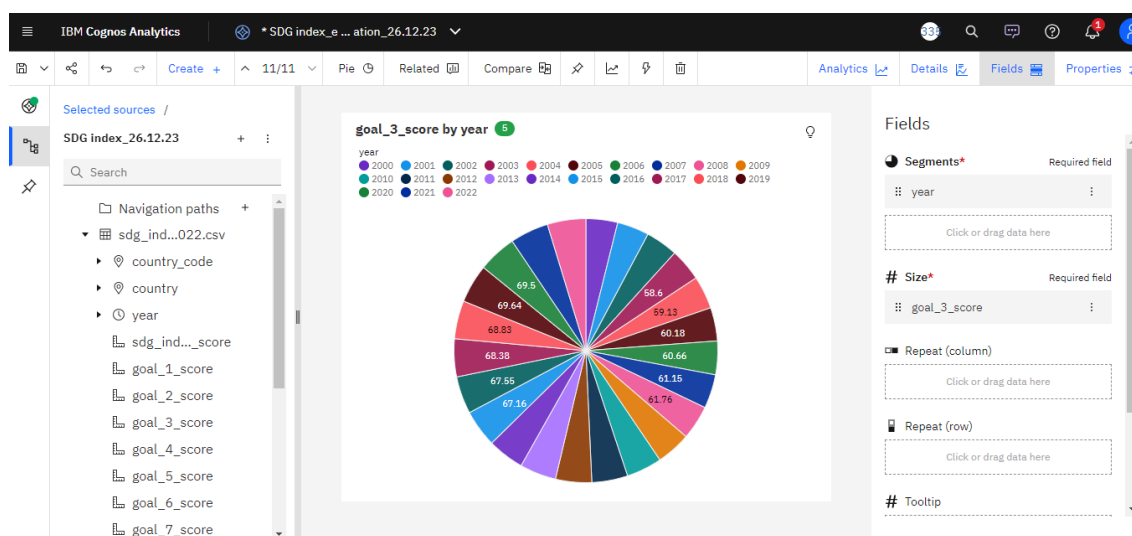
The year-wise SDG 1 score of India is presented in Figure 9. The average values of SDG 1 score (poverty) range from 45.9, occurring in 2000, to 86.2, in 2022 in India. Overall years and years, the average of SDG 1 score is 59.78.

The average values of SDG 3 good health and well-being score range from 57.23, occurring in 2000, to 69.64, in 2019. The score is most unusual when the values of year are 2000, 2001, 2002, 2019, 2020 and more as in Figure 9.



**Figure 9 SDG 1 score data visualization for India – no poverty**

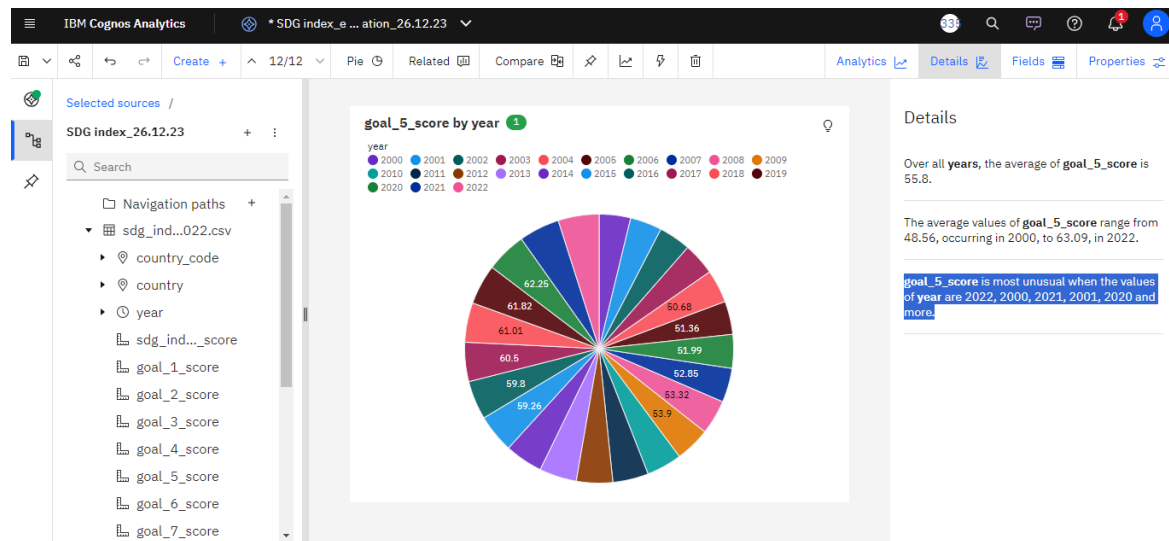
The average values of goal\_3\_score range from 57.23, occurring in 2000, to 69.64, in 2019. goal\_3\_score is most unusual when the values of year are 2000, 2001, 2002, 2019, 2020 and more in Figure 10



**Figure 10 SDG 3 score data analysis - good health and well-being**

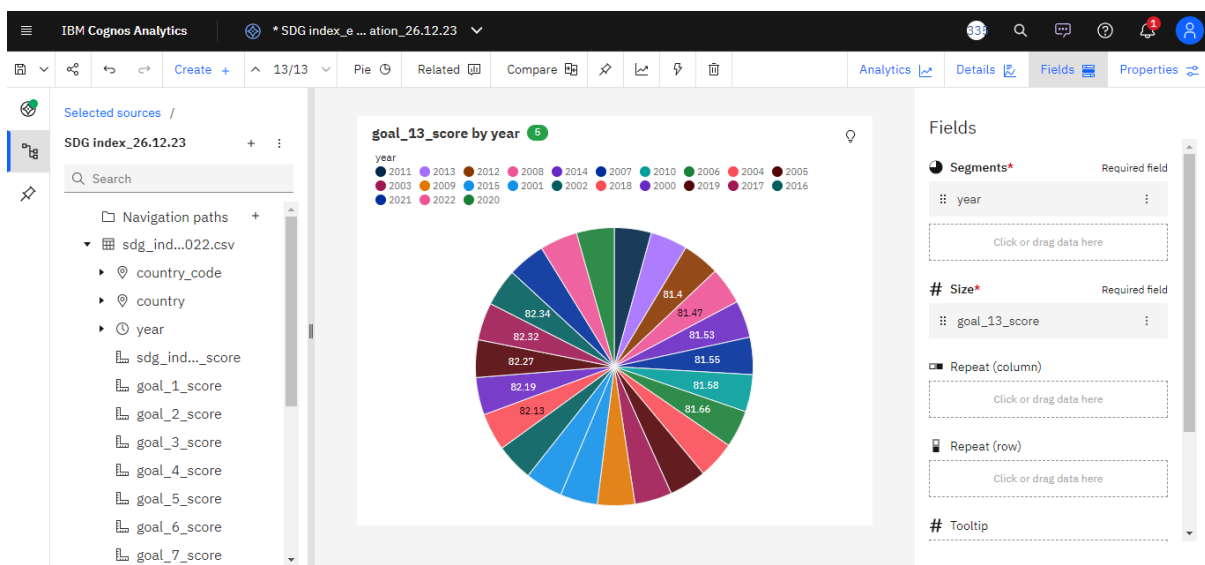


Overall years, the average of gender equity score is 55.8 in Figure 11 The average values of goal\_5\_score range from 48.56, occurring in 2000, to 63.09, in 2022. The score is most unusual when the values of year are 2022, 2000, 2021, 2001, 2020 and more.



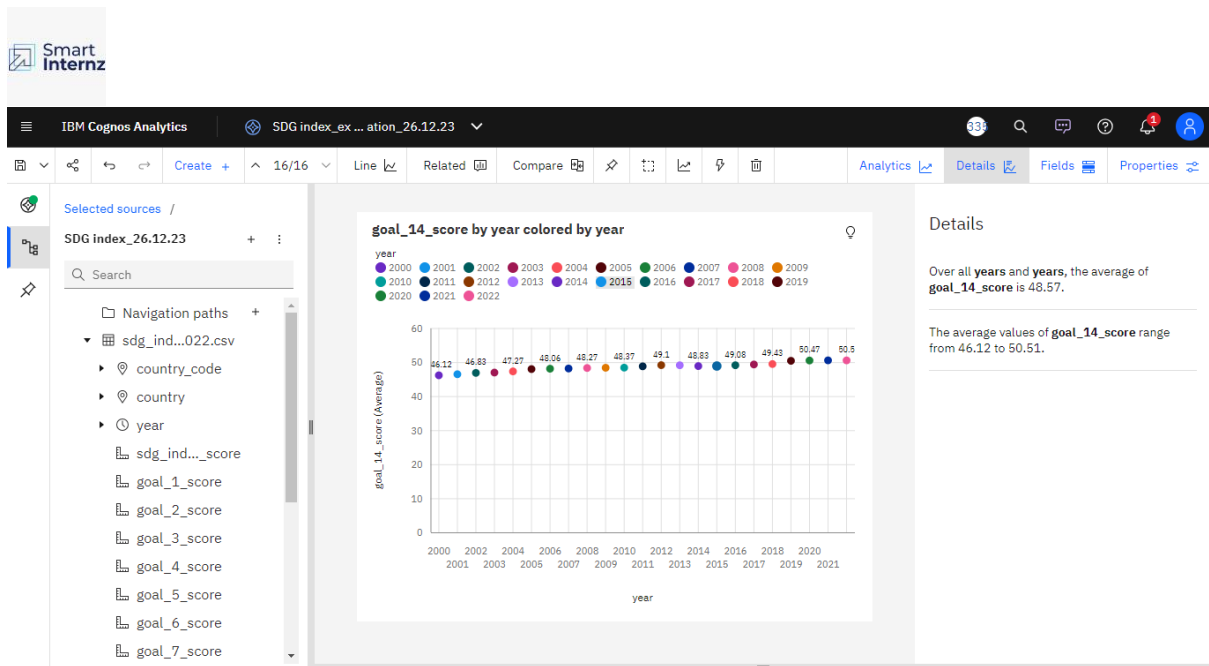
**Figure 11 SDG 5 score analysis - gender equity**

Overall years, the average of climate action score is 81.93. The average values of climate action score range from 81.22, occurring in 2011, to 82.71, in 2020. It is shown in Figure 12.



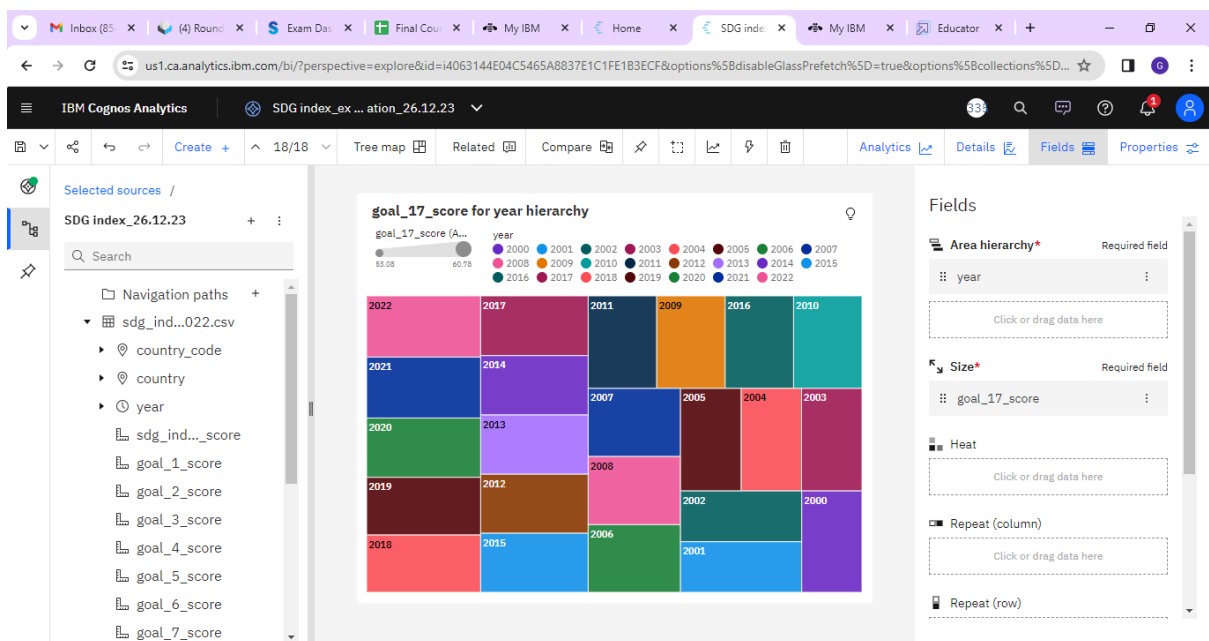
**Figure 12 SDG 13 score analysis – climate action**

Overall years and years, the average of goal\_14\_score (SDG -life below water) is 48.57. The average values of goal\_14\_score range from 46.12 to 50.51. It is depicted in Figure 13.



**Figure 13 SDG 14 score analysis – life below water**

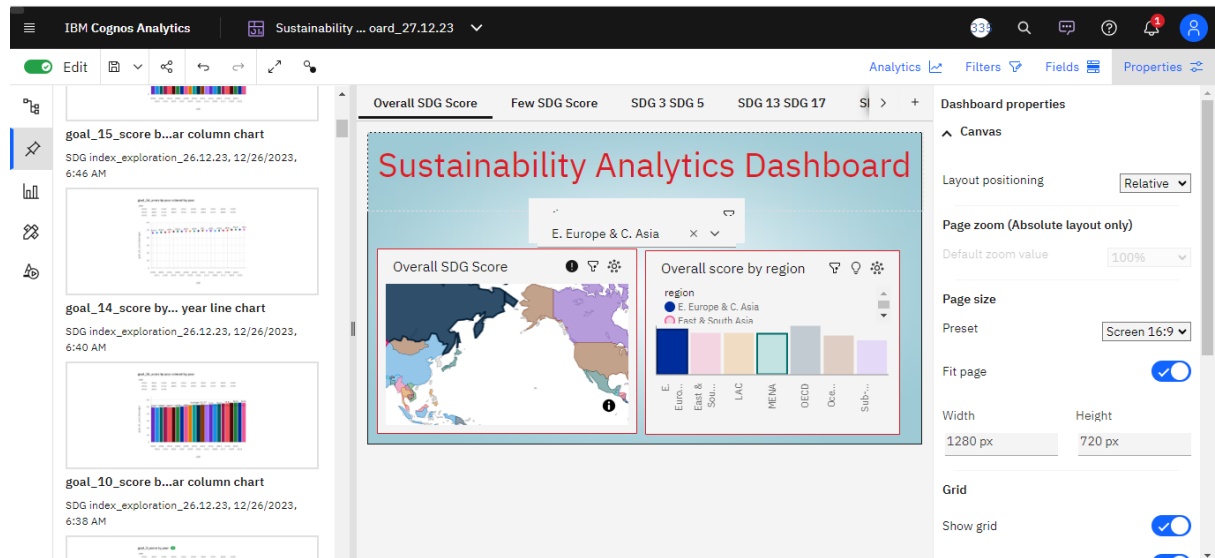
Overall years, the average of goal\_17\_score is 55.54 in Figure 14. The average values of goal\_17\_score range from 53.08, occurring in 2000, to 60.78, in 2022. The goal\_17\_score is unusually high in 2022, 2021 and 2020.



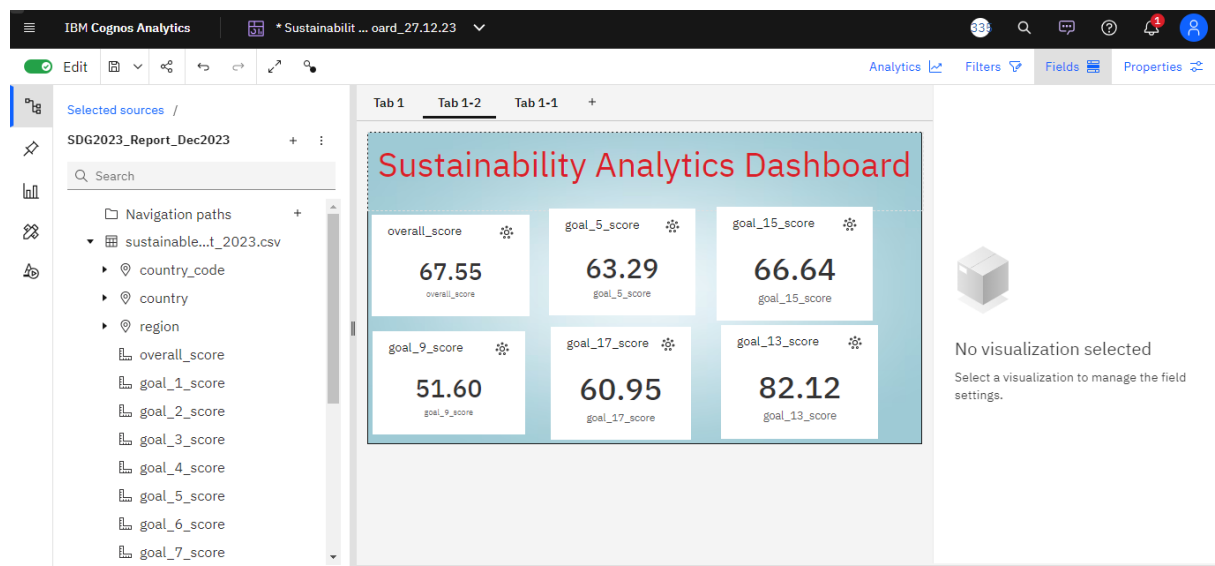
**Figure 14 SDG 17 score analysis – sustainable partnership for goals**

## 6.2 Dashboard

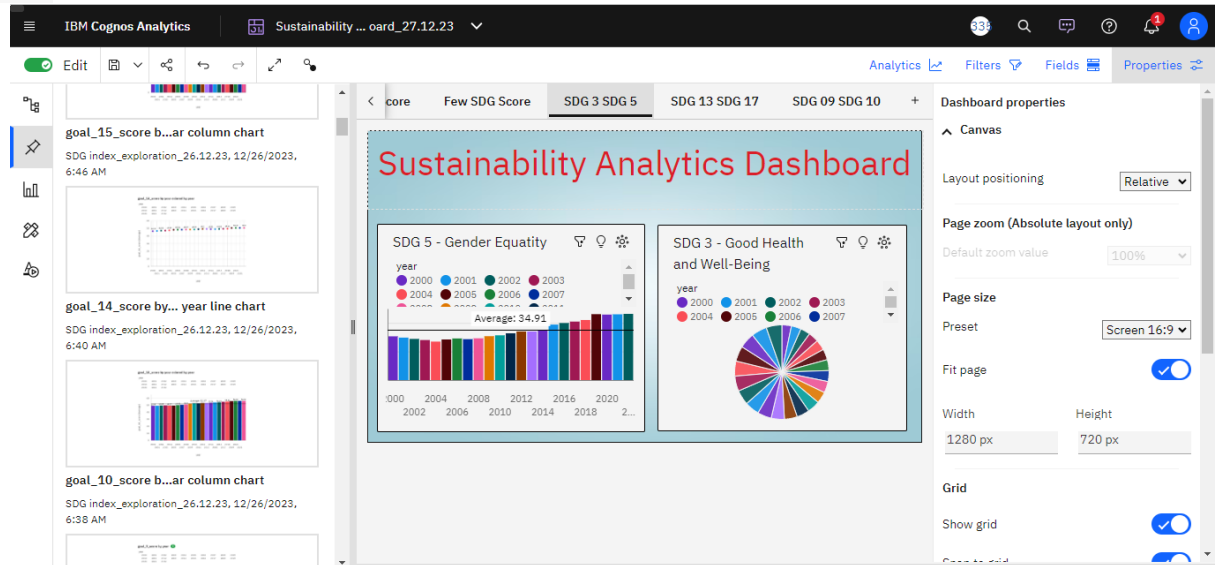
The visual data is provided in the dashboard. The sustainability data report is used for creating the dashboard. The pins created by both sustainability data and SDG index are used for creating the dashboard. Few sample dashboards are provided in Figure 15 to Figure 18.



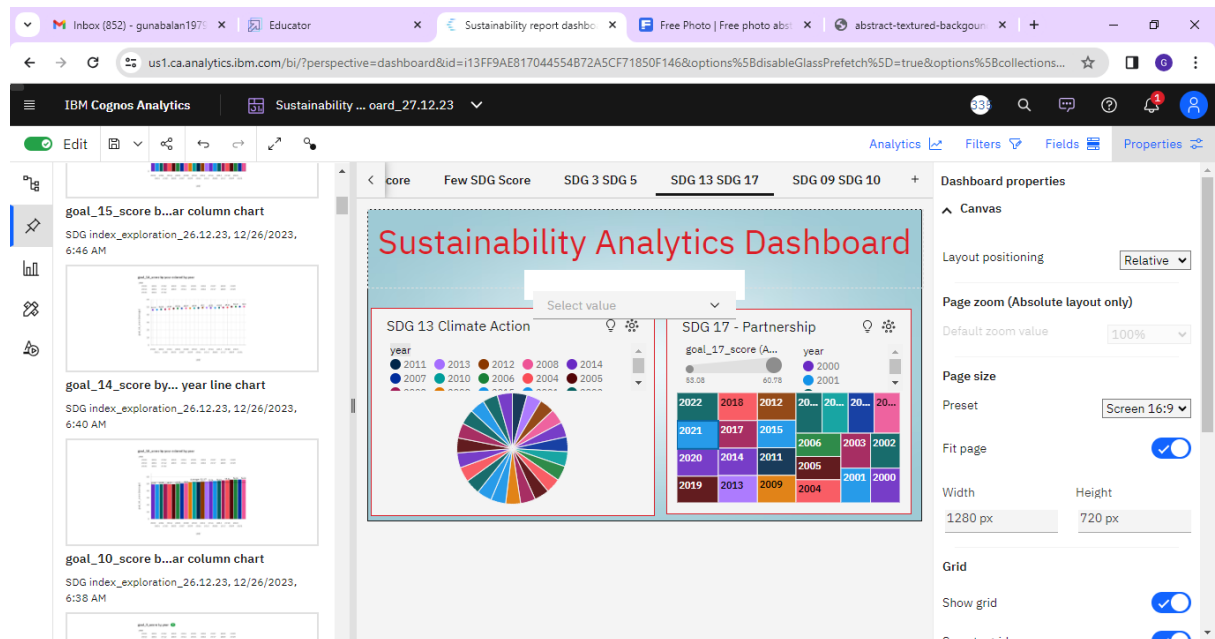
**Figure 15 Dashboard creation for overall SDG score with filter option**



**Figure 16 Dashboard creation for SDG scores**



**Figure 17 Dashboard creation for SDG 3 and SDG 5 analysis**



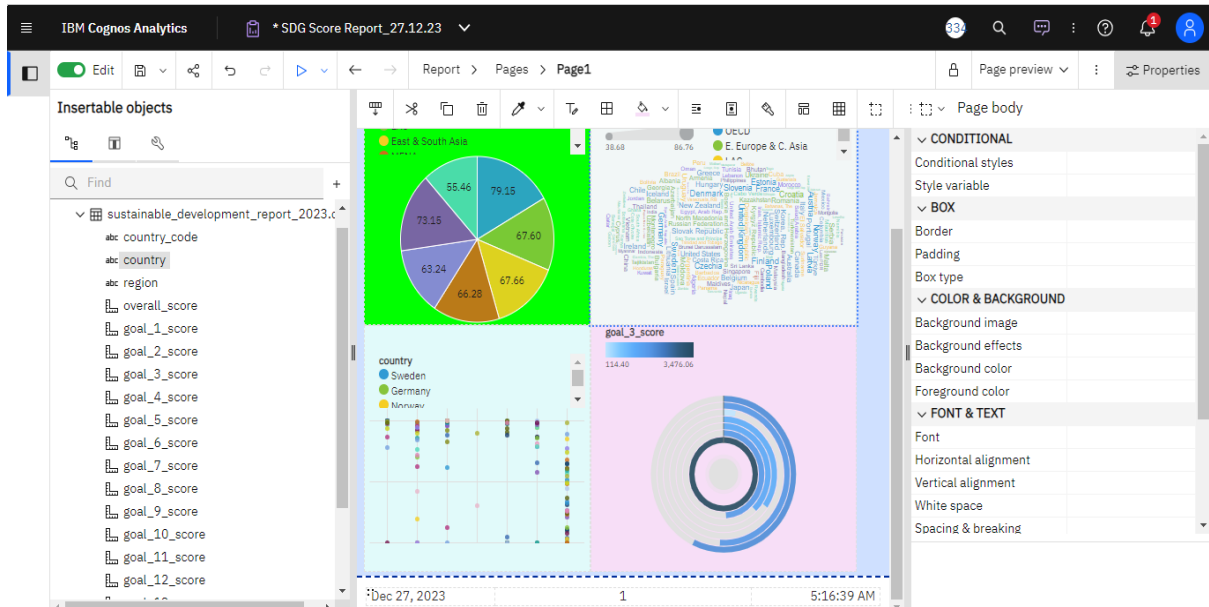
**Figure 18 Dashboard creation for SDG 13 and SDG 17 analysis with filter option**

### 6.3 Report

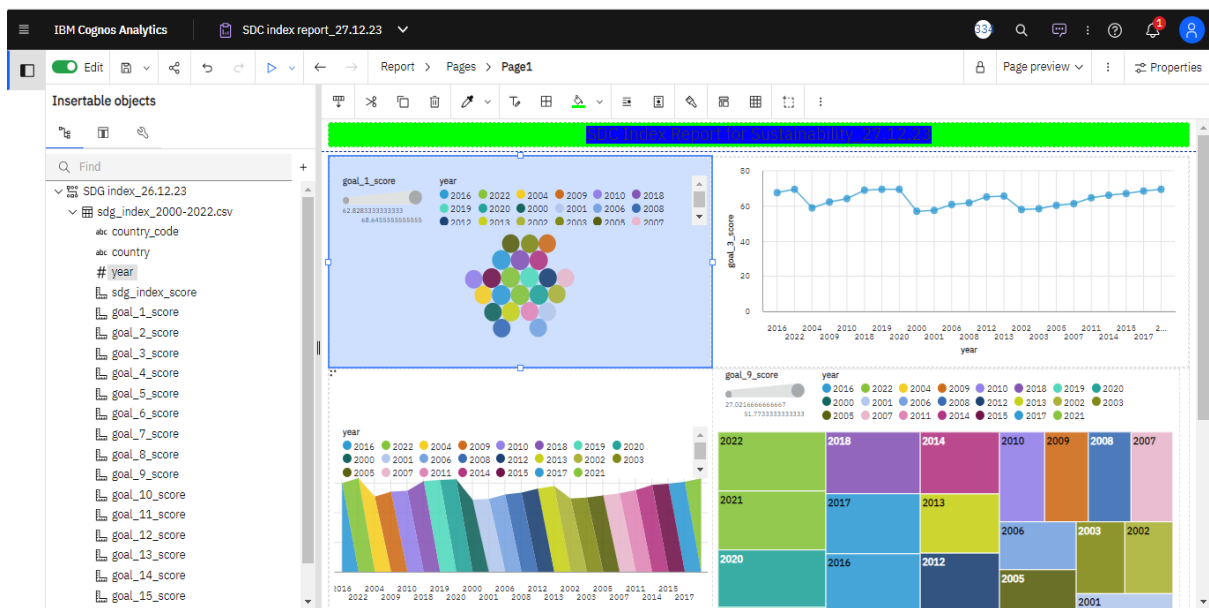
The one-page data visualization abstract of the sustainability is provided in the report. It is created by inserting objects from the data source. There are 3 different reports are created.

1. SDG score report
2. Sustainability report
3. SDG index report

The screenshots of SDG score report and index report are presented in Figure 19 and Figure 20 respectively.



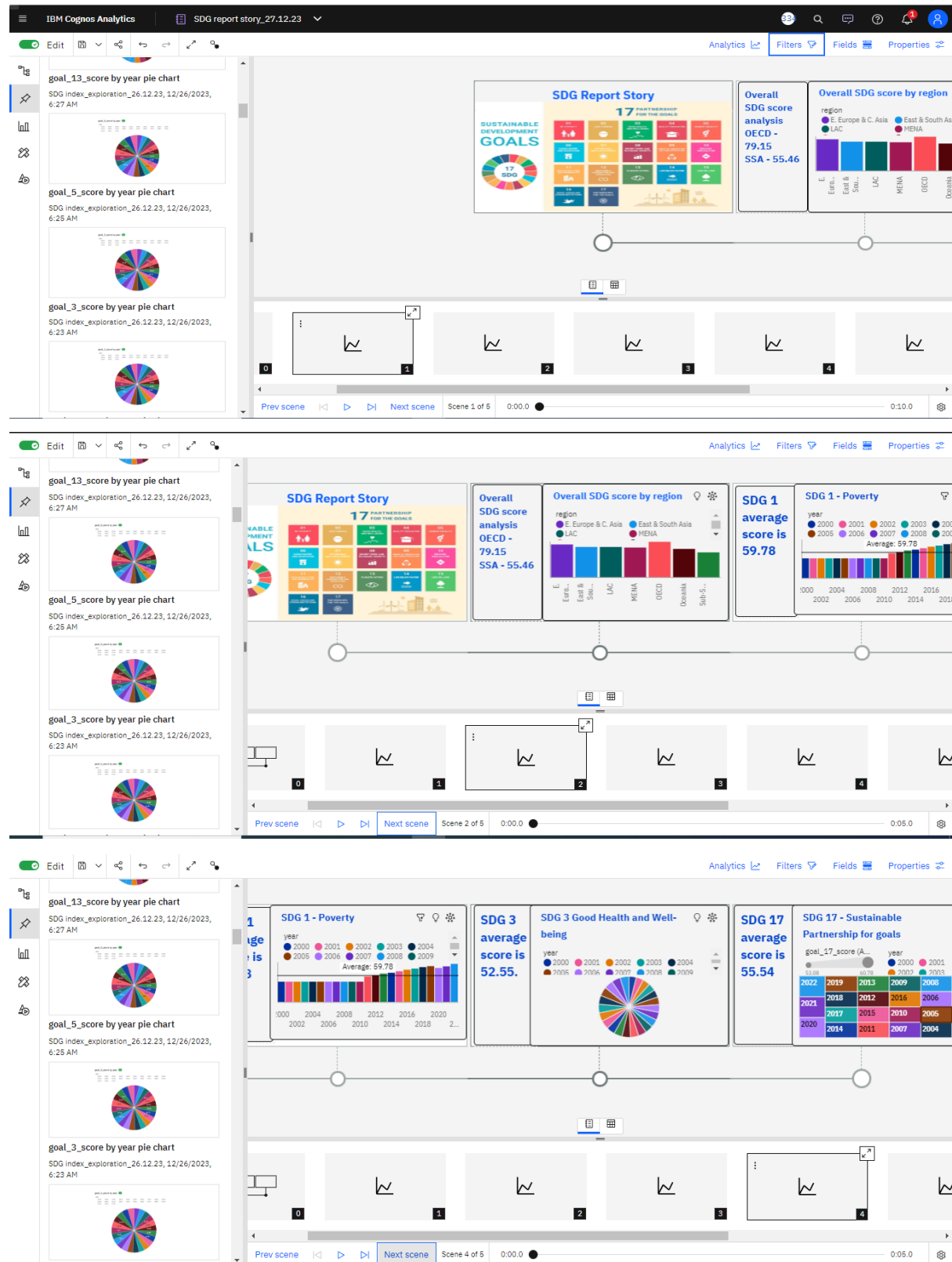
**Figure 19 SDG score report**



**Figure 20 SDG index report**

## 6.4 Story

Story is a visual narrative of a data. The story of the SDGs is presented in Figure 21.



**Figure 21 Story of SDG report and index 2023**

## **7. Advantages and Disadvantages**

### **Advantages**

- Easy connection of multiple data sources.
- Easy integration with any other tool.
- Flexible

### **Disadvantages**

- Training is needed

## **8. Applications**

- QS world university ranking data analysis
- THE ranking analysis
- NIRF ranking analysis
- Shanghai ranking analysis
- Impact ranking analysis

## **9. Conclusion**

The SDG data analysis is carried out in IBM data analytics with Cognos Poverty, good health and well-being, gender equity, quality education, innovation, reduced inequalities, climate action, life below water and life on water, sustainable partnership for goals are the major SDGs where analysis is carried out. The progress in each SDG is analysed. The average score in SDG 13 - climate action is above 90% over the years. The procedural steps are explained in detail. It is a good experience and learnt about IBM data analytics with Cognos.

## **10. Future scope**

In future, the various national and international ranking analysis can be carried out using Cognos data analytics tool.

## **11. Bibliography**

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6. <https://www.youtube.com/watch?v=hMdwsGdyoiA&list=PLjlJFFiCdXMIvYkdWnV7cN26IDThPTnyF&index=3>
7. <https://www.youtube.com/watch?v=IIaK66jvhQ0&list=PLjlJFFiCdXMIvYkdWnV7cN26IDThPTnyF&index=4>
8. [https://www.youtube.com/watch?v=V\\_O\\_OE\\_OdHE&list=PLjlJFFiCdXMIvYkdWnV7cN26IDThPTnyF&index=5](https://www.youtube.com/watch?v=V_O_OE_OdHE&list=PLjlJFFiCdXMIvYkdWnV7cN26IDThPTnyF&index=5)
9. <https://www.youtube.com/watch?v=xxoS1t9m4RU&list=PLjlJFFiCdXMIvYkdWnV7cN26IDThPTnyF&index=6>
10. <https://www.youtube.com/watch?v=D9e-QBzpQNg&list=PLjlJFFiCdXMIvYkdWnV7cN26IDThPTnyF&index=7>