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

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Introduction:
Visualizing Sustainability- A Cognos-based Analysis of Global Trends (2022-2023)

The Sustainable Development Report (SDR) annually assesses advancements in the Sustainable Development Goals, which were embraced by 193 UN Member States in 2015. As we reach the midpoint towards 2030, the 2023 Sustainable Development Report evaluates achievements so far and outlines key priorities to enhance and expedite progress on SDGs. Released just before the 2023 Paris Summit for a New Global Financial Pact, this year's report emphasizes the imperative of amplifying development finance and restructuring the global financial framework to bolster the attainment of SDGs.
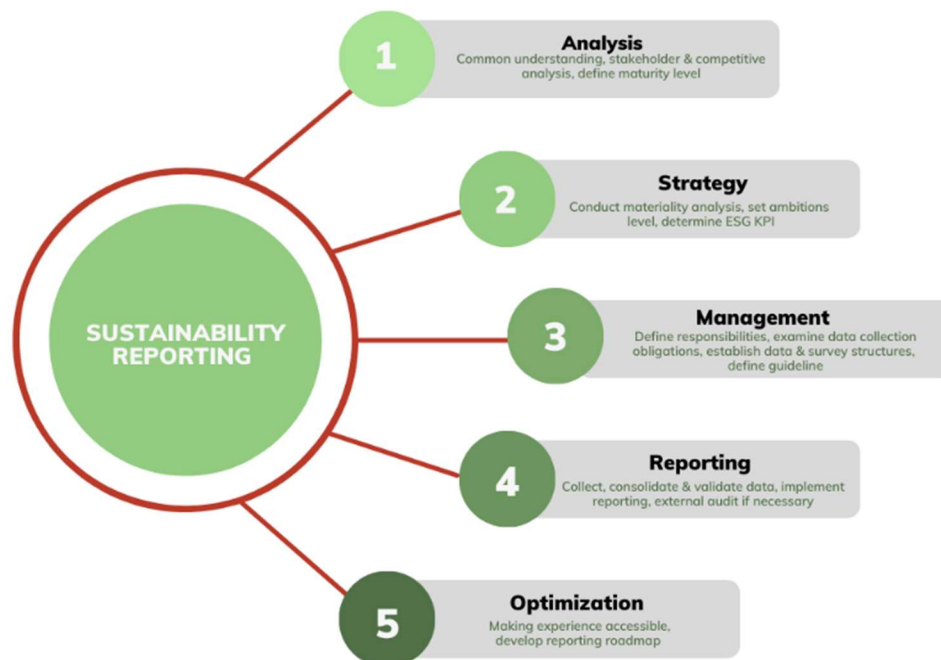
Source: Illustration adapted from IHK, 2021 | Sustainability Reporting – 5 general steps

What is IBM- Cognos analytics?

IBM Cognos Analytics is a business intelligence (BI) and performance management platform developed by IBM. It is designed to help organizations access, analyze, and visualize their data to make informed business decisions. Cognos Analytics provides a comprehensive suite of tools for reporting, dashboards, data exploration, and storytelling. Here are some key features and components of IBM Cognos Analytics:

Key features include:

Reporting:

Cognos Analytics allows users to create interactive and formatted reports from various data sources. Users can design layouts, include charts and graphs, and customize reports to meet specific business requirements.

Dashboards:

The platform supports the creation of interactive dashboards that provide a consolidated view of key performance indicators (KPIs) and other critical business metrics. Dashboards are designed to facilitate data exploration and decision-making.

Data Exploration:

Users can explore and analyze data using self-service capabilities. Cognos Analytics provides tools for ad-hoc querying, exploration, and discovery of insights within the data.

Storytelling:

The storytelling feature enables users to create compelling narratives around their data insights. This involves combining visualizations, text, and multimedia elements to communicate a data-driven story.

Data Integration:

Cognos Analytics supports integration with various data sources, including databases, spreadsheets, and cloud-based data repositories. This allows users to access and analyze data from different platforms within a unified environment.

Security and Governance:

The platform includes robust security features to control access to data and reports. It also supports governance mechanisms to ensure data accuracy, consistency, and compliance with organizational policies.

Natural Language Processing (NLP):

Some versions of Cognos Analytics incorporate natural language processing, allowing users to interact with the system using natural language queries.

Mobile Access:

Users can access reports and dashboards on-the-go through mobile devices, ensuring flexibility and accessibility.

Collaboration:

Cognos Analytics facilitates collaboration by allowing users to share reports, dashboards, and insights with team members. This supports a collaborative approach to decision-making.

Extensibility:

The platform is extensible, enabling organizations to integrate additional features and customize the solution to meet specific business needs.

Theoretical analysis: Project Technical Architecture

Social Impact: The dataset from the Sustainable Development Report 2023 plays a crucial role in creating a positive social influence by encouraging worldwide sustainability and tracking advancements in achieving Sustainable Development Goals (SDGs). It enables nations to evaluate their sustainability ratings, regional positions, and achievements in specific SDGs, thereby facilitating well-informed decision-making.
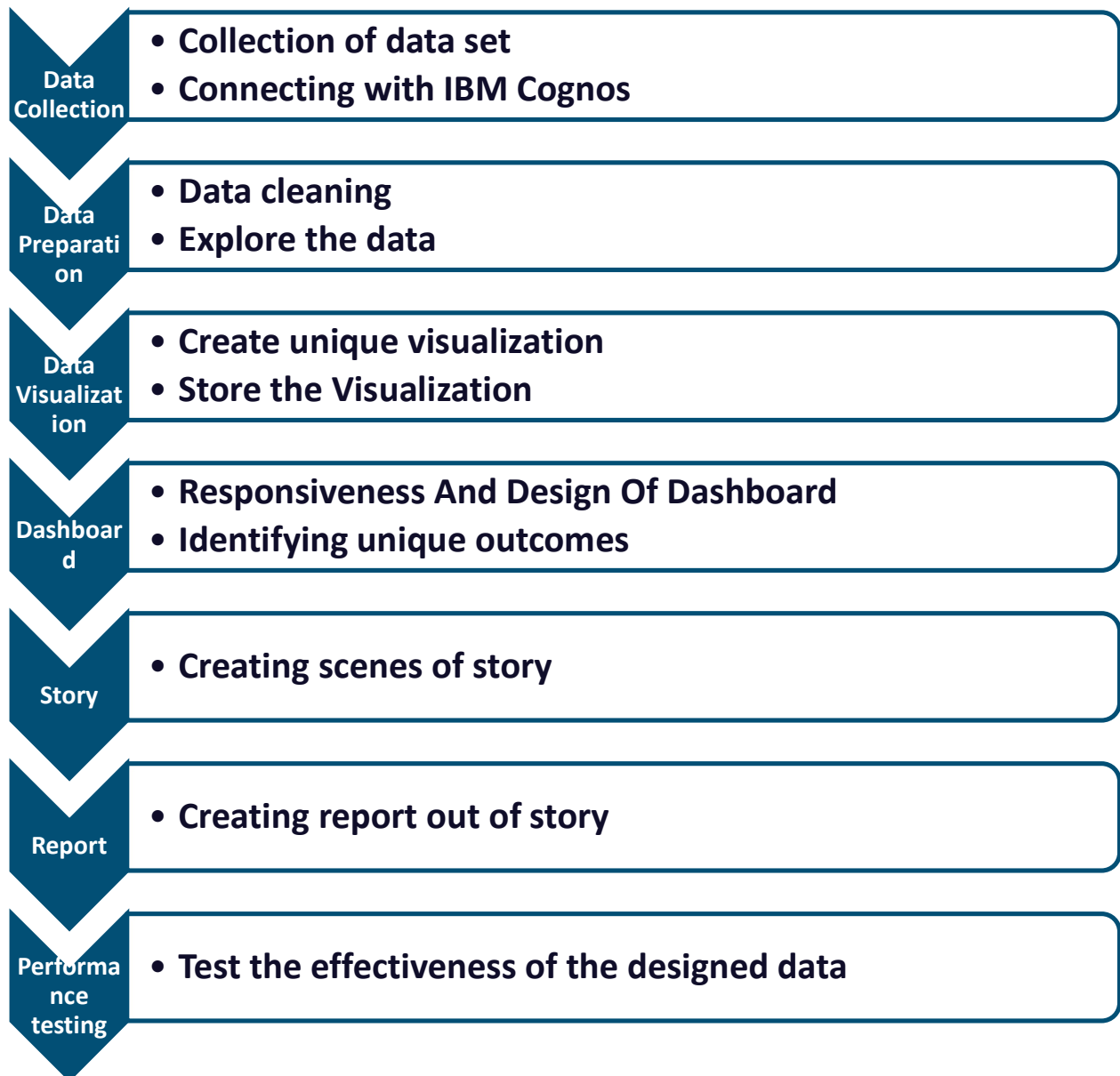
Business Model/Impact: Gaining access to the Sustainable Development Report 2023 dataset can profoundly influence businesses. Organizations can leverage this extensive repository of sustainability information to make well-informed choices related to expanding into new markets, optimizing supply chains, and developing investment strategies.

Diagrammatic overview of the project
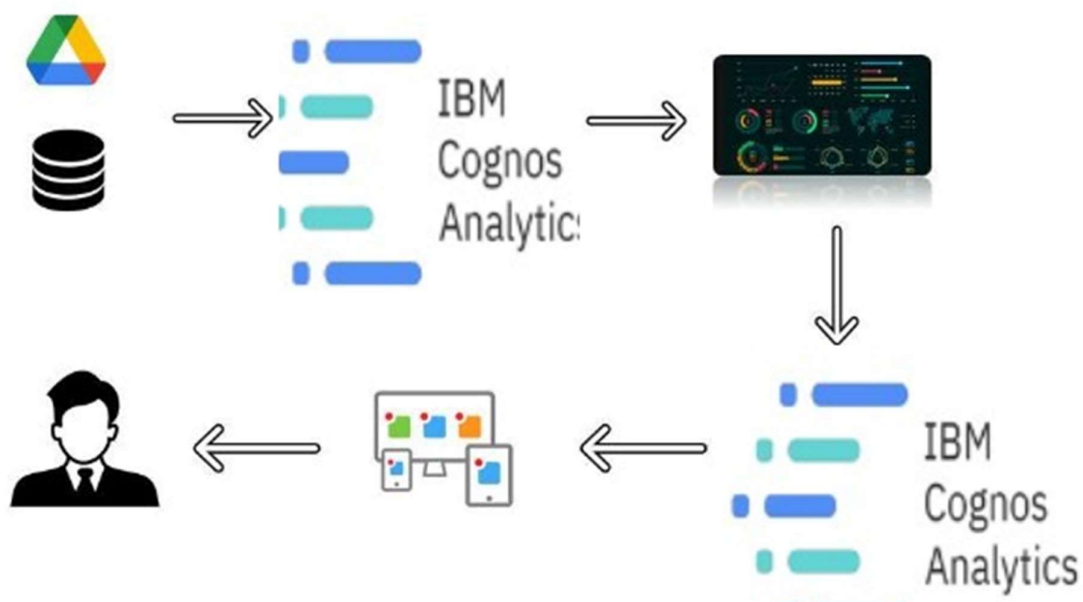
Flowchart depicting the project workflow

The following flowchart depicts the overall sequence of the project.

Data Collection
- **Collection of data set**
- **Connecting with IBM Cognos**

Data Preparation
- **Data cleaning**
- **Explore the data**

Data Visualization
- **Create unique visualization**
- **Store the Visualization**

Dashboard
- **Responsiveness And Design Of Dashboard**
- **Identifying unique outcomes**

Story
- **Creating scenes of story**

Report
- **Creating report out of story**

Performance testing
- **Test the effectiveness of the designed data**

Application: Methods to visualize sustainability report 2023 using IBM-Cognos analytics

1. **Data Collection**

   Data collection was the process of gathering and measuring information on variables of interest, in an established systematic fashion that enabled one to answer stated research questions, test hypotheses, and evaluate outcomes and generate insights from the data. Further the data is loaded in the IBM Cognos analytics platform for visualization and exploration.

2. **Data Preparation**

   Data preparation in IBM Cognos involves the process of getting data ready and suitable for analysis and reporting within the Cognos environment. Here are key aspects of data preparation in IBM Cognos:

   - **Data Connection:** Establishing connections to various data sources such as databases, spreadsheets, or other data repositories.
   - **Data Extraction:** Extracting relevant data from the source systems to be used in Cognos reports and analyses.
   - **Data Transformation:** Transforming and cleaning the extracted data to ensure accuracy and consistency. This may involve filtering, sorting, and aggregating data.
   - **Data Modeling:** Creating a data model that defines the structure and relationships of the data within Cognos, often using a metadata layer for ease of use.
   - **Data Integration:** Integrating data from multiple sources if needed, to provide a unified view for reporting and analysis.
   - **Data Quality Assurance:** Ensuring the quality of data by identifying and handling inconsistencies, errors, or missing values.
   - **Metadata Management:** Managing metadata to provide a clear understanding of the data, including definitions, business rules, and data lineage.
   - **Security Implementation:** Implementing security measures to control access to sensitive data within Cognos.

- **Optimization:** Optimizing data for performance, ensuring that reports and analyses run efficiently.
- **Automation:** Implementing automation where possible to streamline and schedule data preparation tasks.

3. **Data Visualization**

The preparation of data in IBM Cognos encompasses the activities involved in making data suitable for analysis and reporting within the Cognos environment. This process includes connecting to various data sources, extracting relevant information, transforming and cleaning the data, creating a data model, integrating data from different sources, ensuring data quality, managing metadata, implementing security measures, optimizing for performance, and automating tasks where possible. Upon data preparation several unique visualizations have been created as per the following goals of achievement.

- Analysis on overall sustainability on no poverty
- Analysis overall sustainability on quality Education
- Analysis on overall sustainability Life below water
- Analysis on overall sustainability – Partnership for the goals
- Analysis on overall sustainability reduced inequalities
- Analysis on overall sustainability on Industry Innovation and infrastructure
- Analysis on overall sustainability – Life on land

The following picture demonstrates several visualizations prepared as per the given goal using IBM Cognos.

sdg_index_score and goal_1_score by goal_1_score

Measures
● sdg_index_score ● goal_1_score
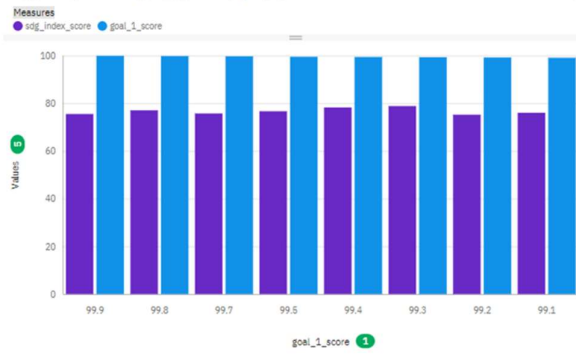
Details

The total number of results for **goal_1_score**, across all **goal_1_score**, is 8.

The average values of **sdg_index_score** range from 75.19, occurring when **goal_1_score** is 99.2, to 78.82, when **goal_1_score** is 99.3.

The average values of **goal_1_score** range from 0, occurring when **goal_1_score** is 99.9, to 7, when **goal_1_score** is 99.1.

The total number of results for **sdg_index_score**, across all **goal_1_score**, is 8.

goal_14_score and goal_4_score by country

Measures
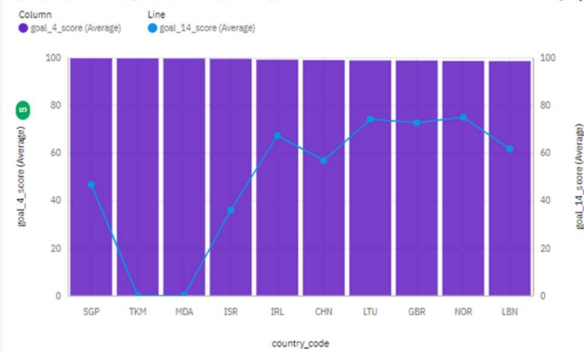● goal_14_score ● goal_4_score
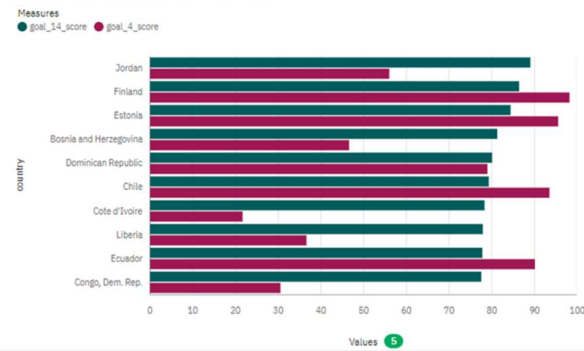
Details

The average values of **goal_14_score** range from 77.64, occurring in Congo, Dem. Rep., to 89.11, in Jordan.

The average values of **goal_4_score** range from 21.76, occurring in Cote d'Ivoire, to 98.3, in Finland.

The total number of results for **goal_14_score**, across all **countries**, is 10.

The total number of results for **goal_4_score**, across all **countries**, is 10.

goal_14_score and goal_4_score by country_code

Column goal_4_score (Average) **Line** goal_14_score (Average)

Details

Over all values of **country_code**, the average of **goal_4_score** is 99.07.

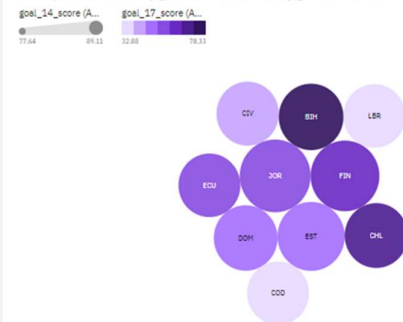The average values of **goal_4_score** range from 98.46, occurring when **country_code** is LBN, to 99.64, when **country_code** is SGP.

country_code weakly affects **goal_4_score** (28%).

goal_4_score is unusually low when **country_code** is LBN.

Over all values of **country_code**, the average of **goal_14_score** is 48.94.

The average values of **goal_14_score** range from 0, occurring when **country_code** is TKM, to 74.85, when **country_code** is NOR.

country_code colored by goal_17_score sized by goal_14_score

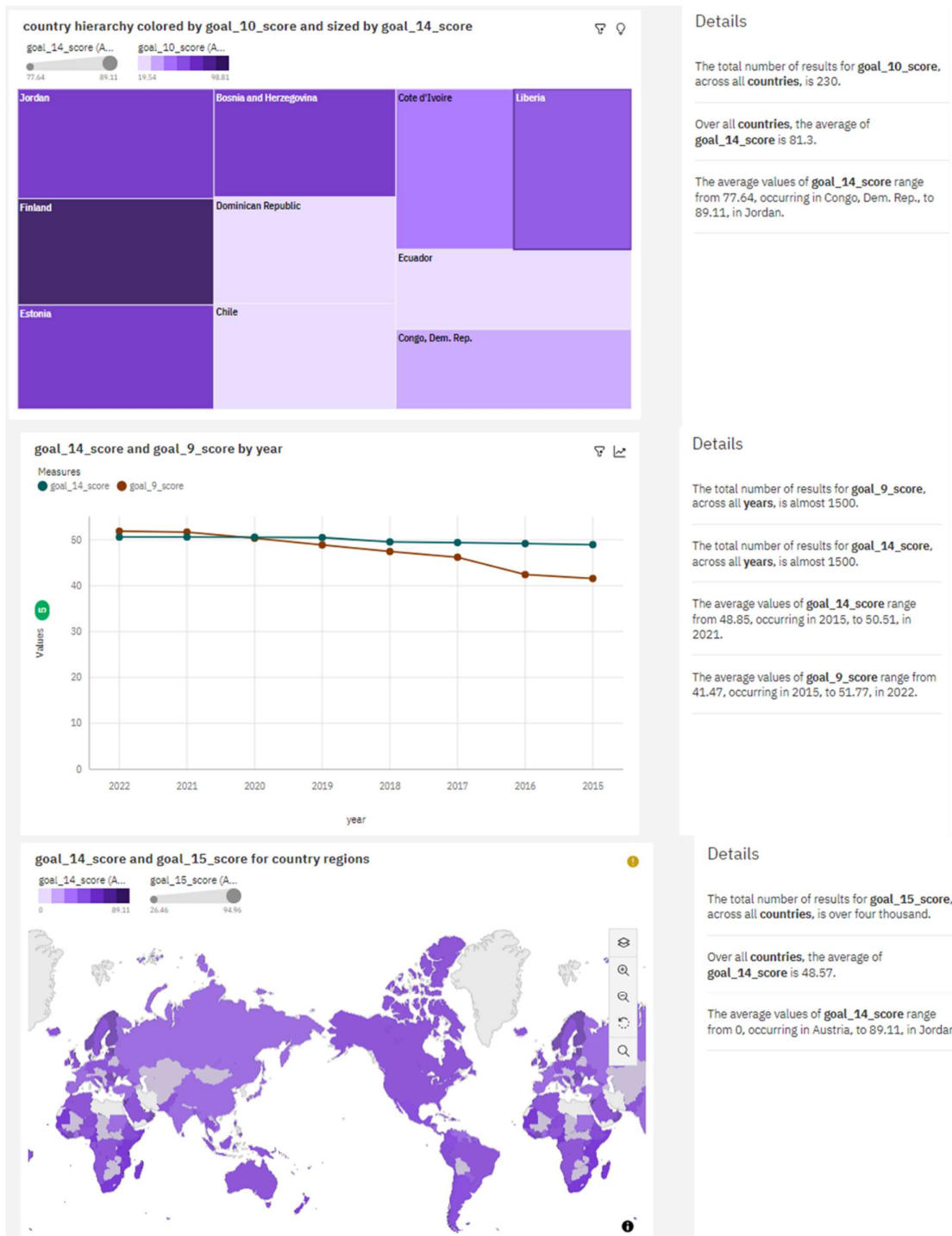goal_14_score (A... 77.64 89.11   goal_17_score (A... 32.88 78.33

Details

The overall number of results for **goal_17_score** is 230.

Over all values of **country_code**, the average of **goal_14_score** is 81.3.

The average values of **goal_14_score** range from 77.64, occurring when **country_code** is COD, to 89.11, when **country_code** is JOR.

country hierarchy colored by goal_10_score and sized by goal_14_score

goal_14_score (A...   goal_10_score (A...

77.64   89.11   19.54   98.81

Jordan Bosnia and Herzegovina Cote d'Ivoire Liberia
Finland Dominican Republic Ecuador
Estonia Chile Congo, Dem. Rep.

Details

The total number of results for goal_10_score, across all **countries**, is 230.

Over all **countries**, the average of **goal_14_score** is 81.3.

The average values of **goal_14_score** range from 77.64, occurring in Congo, Dem. Rep., to 89.11, in Jordan.

goal_14_score and goal_9_score by year

Measures
● goal_14_score ● goal_9_score

Details

The total number of results for **goal_9_score**, across all **years**, is almost 1500.

The total number of results for **goal_14_score**, across all **years**, is almost 1500.

The average values of **goal_14_score** range from 48.85, occurring in 2015, to 50.51, in 2021.

The average values of **goal_9_score** range from 41.47, occurring in 2015, to 51.77, in 2022.

goal_14_score and goal_15_score for country regions

goal_14_score (A...   goal_15_score (A...

0   89.11   26.46   94.96

Details

The total number of results for **goal_15_score**, across all **countries**, is over four thousand.

Over all **countries**, the average of **goal_14_score** is 48.57.

The average values of **goal_14_score** range from 0, occurring in Austria, to 89.11, in Jordan.

4. Dashboard creation

Creating dashboards in IBM Cognos involves the development of visually interactive and informative displays that provide a consolidated view of key metrics, trends, and insights derived from business data. Here are the fundamental steps and concepts related to dashboard creation in IBM Cognos:

- **Data Connection:** Establish a connection to the underlying data sources where relevant information is stored.
- **Query and Report Building:** Create queries and reports to retrieve and organize the data that will be used in the dashboard.
- **Visualization Selection:** Choose appropriate visualizations (charts, graphs, tables, etc.) based on the nature of the data and the insights you want to convey.
- **Dashboard Elements:** Assemble various dashboard elements such as report objects, images, and text items to design a comprehensive and informative layout.
- **Interactive Features:** Implement interactive features like drill-downs, filters, and prompts to allow users to explore and analyze data dynamically.
- **Customization:** Customize the appearance and layout of the dashboard to align with specific branding or user preferences.
- **Performance Optimization:** Optimize the performance of the dashboard to ensure quick loading and responsiveness, especially when dealing with large datasets.
- **Security Implementation:** Implement security measures to control access to sensitive information within the dashboard.
- **Distribution and Sharing:** Define how the dashboard will be distributed and shared with users, whether through the IBM Cognos platform or other channels.
- **Monitoring and Maintenance:** Regularly monitor the performance of the dashboard and make necessary updates or adjustments based on changing business requirements.

The following pictures showcases the dashboard created using the sustainability data,
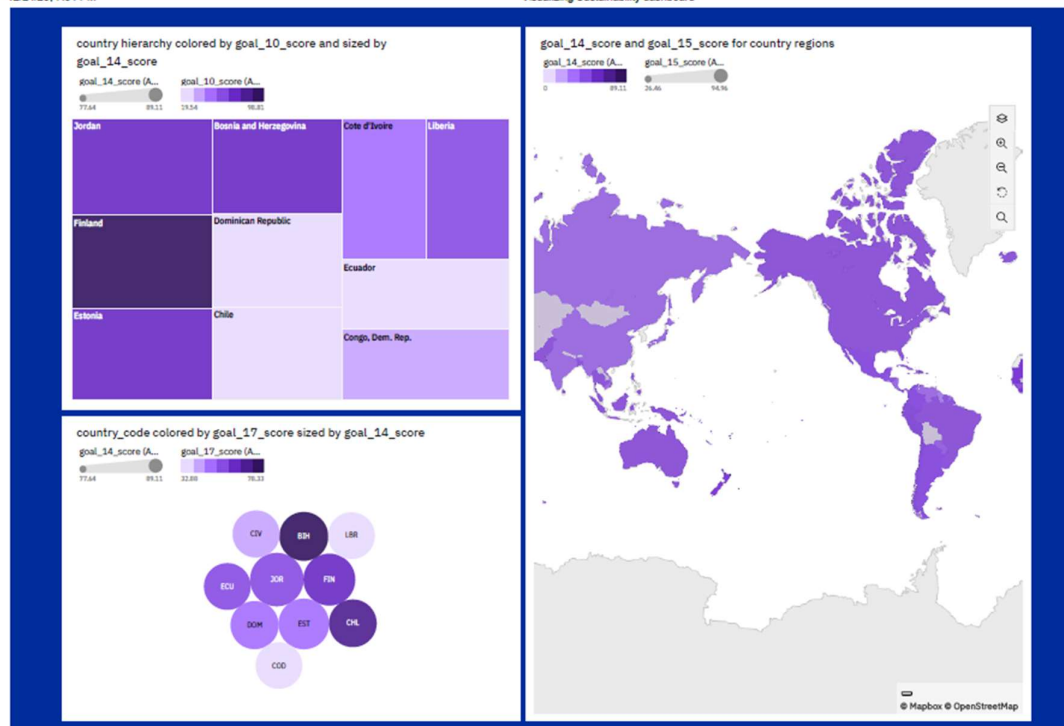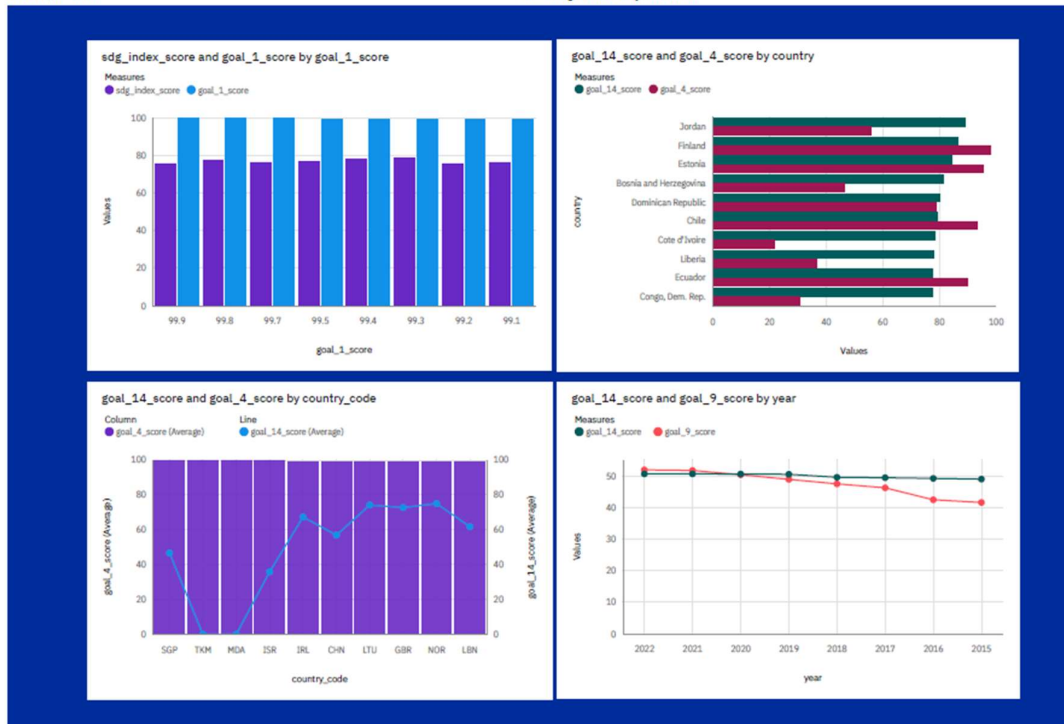
5.   Story creation

In IBM Cognos, a "story" is a feature that allows users to create interactive and narrative-driven presentations of business data. The purpose of a story in IBM Cognos is to enable users to communicate insights, trends, and analysis in a compelling and understandable manner. Here are the key purposes and features of using stories in IBM Cognos:

- **Narrative Communication:** Stories provide a structured way to present data-driven narratives. Users can guide the audience through a series of visualizations, explaining the significance of each and telling a coherent story around the data.
- **Data Exploration:** Stories allow for interactive exploration of data by incorporating charts, graphs, and other visualizations. Users can provide a guided tour through the data, allowing stakeholders to understand complex relationships and trends.
- **Contextual Insights:** Users can add text annotations, descriptions, and comments within a story to provide context and insights. This helps in clarifying data points, explaining anomalies, and offering additional information to enhance understanding.
- **Dynamic Interaction:** Stories can include interactive elements, such as prompts and filters, allowing the audience to dynamically interact with the data and explore different scenarios or perspectives.
- **Multimedia Integration:** Users can enhance the storytelling experience by incorporating multimedia elements like images and videos to further illustrate key points or provide additional context.
- **Collaboration:** Stories facilitate collaboration by allowing users to share their insights with others. Stakeholders can view and interact with the story, fostering a shared understanding of the data and its implications.
- **Presentation Mode:** Stories can be presented in a slideshow mode, making it easy to showcase key findings during meetings or presentations.
- **Adaptive Design:** Stories are designed to be responsive and adaptive, ensuring a consistent and engaging experience across different devices and screen sizes.
- By leveraging the story feature in IBM Cognos, users can go beyond traditional reporting and create a more engaging and informative experience for their audience. It's a valuable tool for business analysts,

data scientists, and other professionals who want to communicate data-driven insights effectively.

The following picture portrays the story creation for the goal 14 score using Cognos analytics.
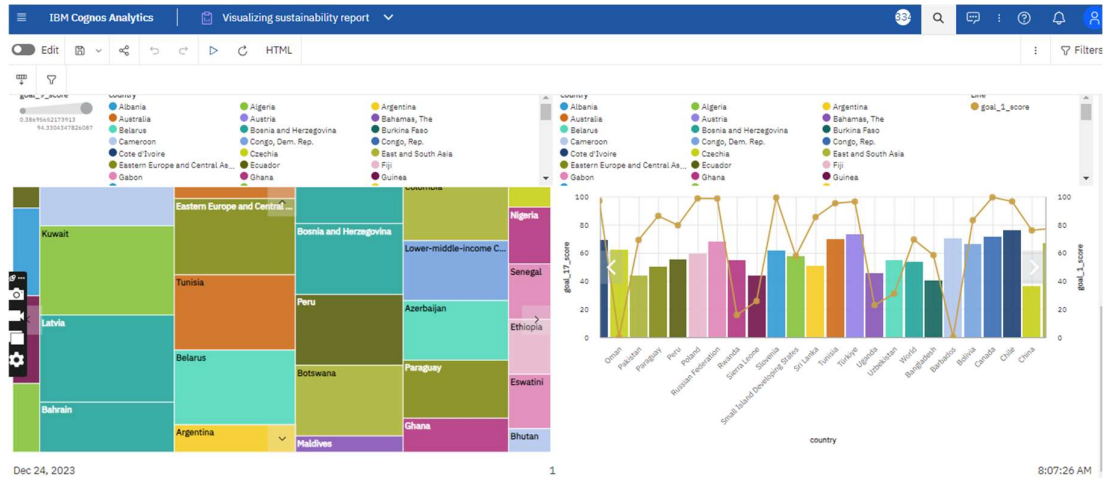

6. Report creation

A report is a structured and formatted presentation of business data that is generated from the underlying data sources. Reports in IBM Cognos serve the purpose of summarizing, analyzing, and presenting information in a visually organized manner. Here are the key characteristics and components of reports in IBM Cognos:

- **Data Retrieval:** Reports are created by retrieving data from various data sources, such as databases, data warehouses, or other data repositories.
- **Query Building:** Users define queries to extract the relevant data needed for the report. These queries can involve filtering, sorting, and aggregating data to meet specific requirements.
- **Report Authoring:** Authors use the IBM Cognos Report Studio or other authoring tools to design and create reports. Report Studio provides a rich set of features for designing complex and interactive reports.
- **Layout and Formatting:** Authors design the layout of the report, specifying how data is presented. This includes formatting options for text, tables, charts, and other visual elements.

- **Visualization Elements:** Reports can include various visualization elements, such as tables, crosstabs, charts, and graphs, to represent data in a meaningful and understandable way.
- **Parameterization:** Reports can be parameterized to allow users to input values or criteria dynamically, enabling flexibility in data analysis.
- **Drill-Down and Interactivity:** Authors can implement drill-down capabilities, allowing users to explore more detailed information by interacting with specific data points in the report.
- **Distribution and Scheduling:** Reports can be distributed through various channels, such as email or a portal, and scheduled for automatic generation and delivery at specified intervals.
- **Security Features:** IBM Cognos provides security features to control access to reports and ensure that sensitive information is only accessible to authorized users.
- **Versioning and History:** Some versions of IBM Cognos offer versioning and history tracking features, allowing users to track changes to reports over time.

The following picture showcases the report creation in the Cognos platform. The story can be integrated to any website by embedding the code to visual studio. Based on the data and the visualization pattern, the story can portray the overall outcome of the given objective.

Bibliography

1. The sustainability data is downloaded from the following link, https://www.kaggle.com/datasets/sazidthe1/sustainable-development-report

2. Discussions on Data retrieval, dashboard and report creation are obtained from the following link, https://www.ibm.com/docs/en/cognos-analytics/11.1.0?topic=guide-overview-dynamic-query-extensibility

3. Introduction about the Cognos Data analytics project is obtained from the Smartinternz-platform, https://smartinternz.com/educator/guided_project_info/660678#

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