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

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Platform used: IBM Cognos Analytics on Cloud

INTRODUCTION

Overview

The Sustainable Development Report (SDR) reviews progress made each year on the Sustainable Development Goals since their adoption by the 193 UN Member States in 2015. At the halfway mark to 2030, the Sustainable Development Report 2023 takes stock of progress made and discusses priorities to restore and accelerate SDG progress. Published on the eve of the 2023 Paris Summit for a New Global Financial Pact, this year's edition focuses specifically on the need to scale up development finance and to reform the global financial architecture to support the SDGs.

Purpose

1. The core requirement to enhance and project the data in more precise way is by developing a user-friendly dashboard that showcases the Sustainable Development Report to provide a simplified, interactive and accurate analysis of countries progress for achieving Sustainable Development Goals (SDGs).

2. Secondly, we need to display a ranking of all countries which is thoroughly dependent on the overall sustainability points.

3. To allow users for region wise filtering of ranking, income group, or specific SDGs. Provide detailed profiles for each country, including its sustainability score, regional classification, and performance on individual SDGs.

4. Users should also be able to access past data to highlight a country's progress over time period accordingly.

5. Enable users to compare the sustainability scores and SDG achievements of countries within a specific region. This feature should allow for visual comparisons and trend analysis.

6. 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.

LITERATURE SURVEY

Existing problem

1. Reveals a growing body of Research and Analysis centred around sustainability and progress of countries towards achieving the United Nations sustainable development goals.
2. Scholars and party makers have recognised the significance of the data set in accessing and advancing the sustainability efforts on the Global scale.
3. Data set has become critical research for policy makers guiding development and adjustment of policies and strategies to address specific sustainable development goals.
4. Visualization Sustainability assist in identifying areas requiring improvements and successful strategies.
5. Researchers emphasize the importance of transparent and reliable data for meaningful sustainability assessments.
6. SDR sustainable development report progress made each year on sustainable development goals since their adoption by the 193 UN members states in 2015.
7. At Halfway mass to 2030 the sustainable development report 2023 take stock of progress made and discuss its priorities to restore and SDG progress. published on the eve of the 2023 Paris Summit for a new global financial fact.
8. This year's edition focuses specialization the need to scale up Development Finance and to perform the global financial architecture to support SDG.

Proposed solution

1.IBM Cognos can be used to analyze past data such as goals achieved by different countries in specified years, analysis on sustainability with respect to life on land, under water, quality education, reduced inequalities etc with various visualizations with the help of bar charts, bubble charts, combined column chart,line chart,tree map, pie chart etc.

2. A brief analysis of the following factors can also be presented:

- Analysis on Sustainability SDG Index
- Analysis On Sustainability No Poverty
- Analysis On Sustainability Industry, Innovation and Infrastructure
- Analysis On Sustainability Partnerships for the Goals

3. Analysis of various variables can be displayed through dashboards,story and report. These observations can be embedded into web applications using FLASK.

THEORETICAL ANALYSIS

Block diagram
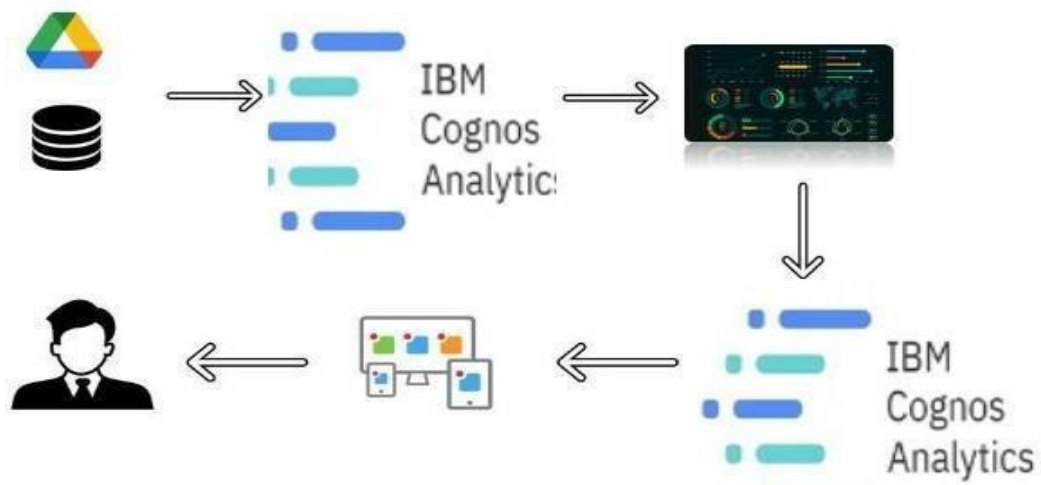
Hardware / Software

designing Hardware:

Operating system: Linux- Ubuntu 16.04 to 17.10, or Windows 7 to 10, with 2GB RAM (4GB preferable)

Software:

    Python,

    Python For Data Analysis,

    Python For Data Visualization,

IBM Cognos Analytics

Exploratory Data Analysis,

EXPERIMENTAL INVESTIGATIONS

Research Question Formulation: Define clear research questions or hypotheses that you want to investigate through experiments. These questions could relate to student engagement, learning outcomes, user satisfaction, etc.

Experimental Design:

    Controlled Variables: Identify the variables that you will control during the experiment to maintain consistency.

    Independent Variable: Determine the variable you are manipulating, such as different teaching methods or interface designs.

    Dependent Variables: Identify the variables you will measure as outcomes, like student performance, engagement metrics, etc.

Participant Selection:

    Sample Size: Determine the number of participants needed for statistical significance.

    Randomization: Randomly assign participants to different experimental conditions to reduce bias.

Data Collection:

    Quantitative Data: Gather quantitative data, such as test scores, completion rates, time spent on tasks, etc.

    Qualitative Data: Collect qualitative data through surveys, interviews, or focus groups to understand user experiences and perceptions.

Experiment Execution: Administer the experiment to participants, ensuring consistent procedures across all conditions. Use the virtual classroom platform to deliver educational

content and interactive activities.

Data Analysis: Analyze the collected data using appropriate statistical methods. Compare outcomes across different experimental conditions to assess their impact.

Interpretation of Results: Interpret the statistical findings to answer the research questions or test the hypotheses. Consider both quantitative and qualitative data to provide a comprehensive understanding.

Discussion and Conclusion: Discuss the implications of the results for the effectiveness of the virtual classroom platform. Address any limitations and suggest areas for further research or improvements.

Reporting: Compile your findings in a research report, academic paper, or presentation. Clearly present the methodology, results, and conclusions of the experimental investigations.

Iterative Process: If necessary, refine your research questions or experimental design based on the results obtained.

Ethical Considerations: Ensure that the experimental investigations adhere to ethical guidelines, especially when involving human participants.

Peer Review: Consider submitting your findings to peer-reviewed journals or conferences in the field of education or technology.
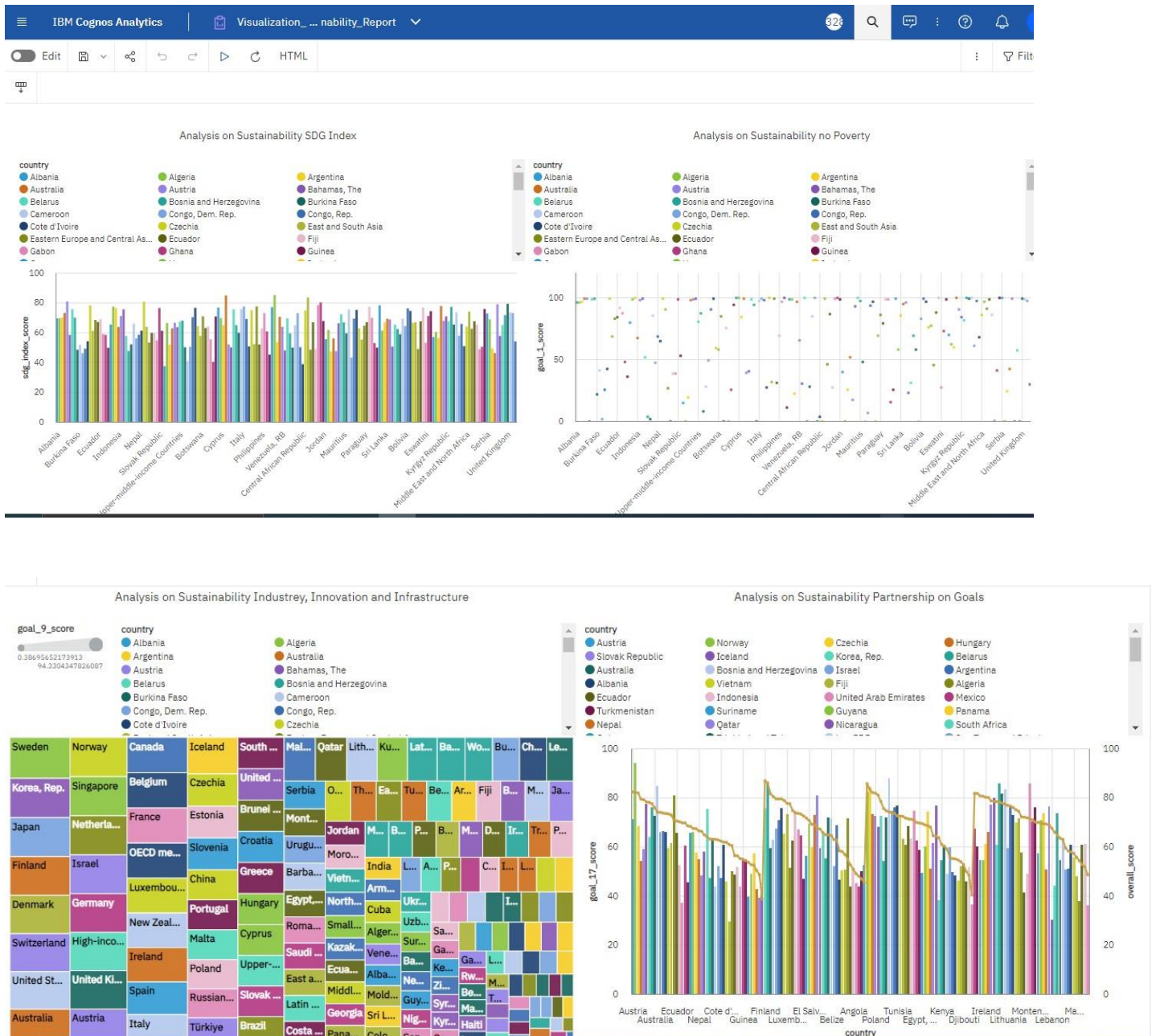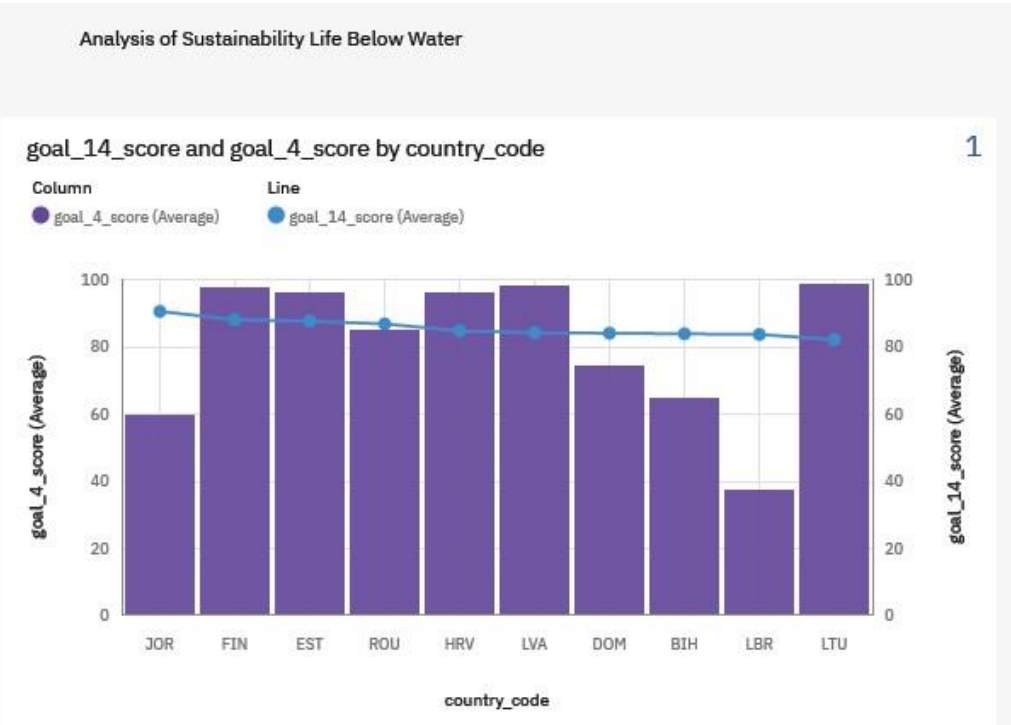
FLOWCHART

```
                    ┌─────────────┐
                    │    Start    │
                    └─────────────┘
                           │
                           ▼
        ┌──────────────────────────────────────┐
        │  Identify Sustainable Development Goals │
        └──────────────────────────────────────┘
                           │
                           ▼
        ┌──────────────────────────────────────┐
        │   Define Sustainable Development Goals │
        └──────────────────────────────────────┘
                           │
                           ▼
        ┌──────────────────────────────────────┐
        │  Design Hardware and Software Components │
        └──────────────────────────────────────┘
                           │
                           ▼
        ┌──────────────────────────────────────┐
        │  Analysis through Dashboard, Stories and │
        │                Reports                  │
        └──────────────────────────────────────┘
                           │
                           ▼
        ┌──────────────────────────────────────┐
        │     Test System and Gather feedback    │
        └──────────────────────────────────────┘
                           │
                           ▼
        ┌──────────────────────────────────────┐
        │     Test System and Gather feedback    │
        └──────────────────────────────────────┘
                           │
                           ▼
                    ┌─────────────┐
                    │     End     │
                    └─────────────┘
```

RESULT

Fig. Report Section

Fig: Dashboard Section

Numeric Analysis
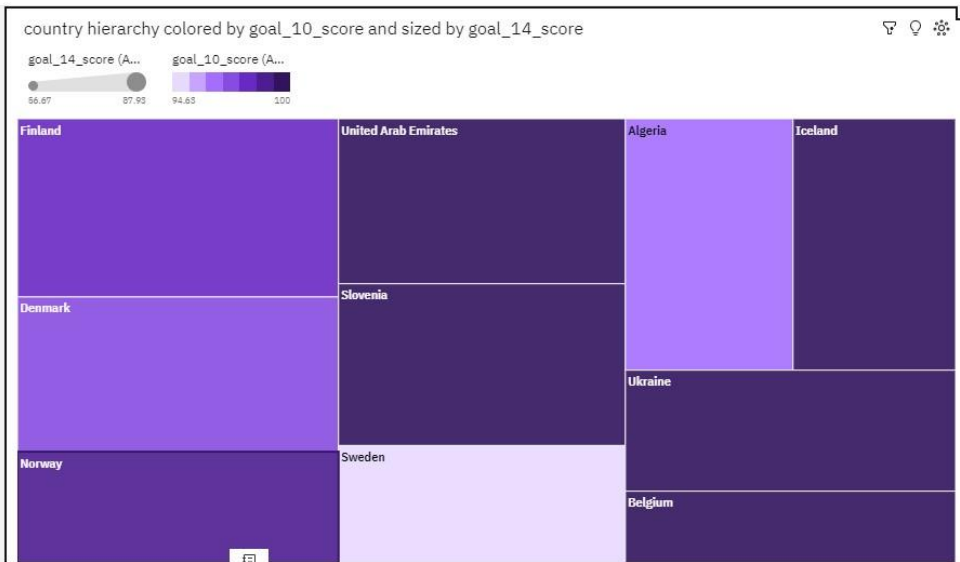
Fig: Story Section

Analysis of Sustainability Life Below Water

- "Life below water", a key component of the Sustainable Development Goals (SDG's).
- It supports the evaluation of marine eco system health and responsible ocean practices, aiding researchers and policy makers in ocean conservation efforts.
- This database is a vital resource for global initiatives aimed at protective and enhancing the sustainability of our oceans.

•

goal_14_score and goal_4_score by country_code   1

Column
● goal_4_score (Average)

Line
● goal_14_score (Average)

- "Reduced Inequalities" a key component of sustainable Development Goals (SDG's).
- It offers a comprehensive view of disparities and socio-economic inabilities between countries, aided researchers and policymakers in their efforts to create more equitable societies world wide.
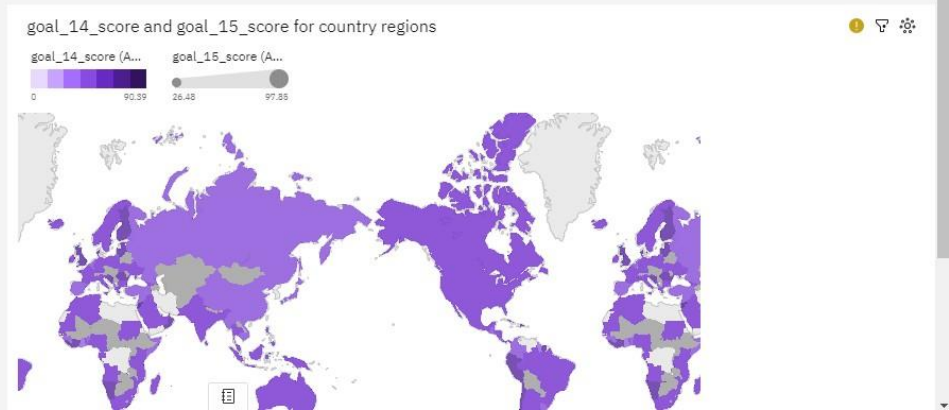- This dataset plays a pivot role in prompting social justice and ensuring inclusive development.

country hierarchy colored by goal_10_score and sized by goal_14_score

goal_14_score (A...   goal_10_score (A...
56.67   87.93   94.63   100

Analysis Sustainability on Quality Education

- "Quality Education", A fundamental Sustainable Development Goal (SDG). This dataset is a valuable resource for assisting educational access, quality and equality around countries.
- Researchers, Policymakers and educational institutes can utilize this data in monitoring progress, identify areas of Improvement, and develop strategies for enhancing the global education standards.
- By focusing on "Quality Education", this dataset plays a significant role in advancing the mission of ensuring inclusive, equitable and quality education for all.

goal_4_score and goal_14_score by country

Measures
● goal_4_score ● goal_14_score
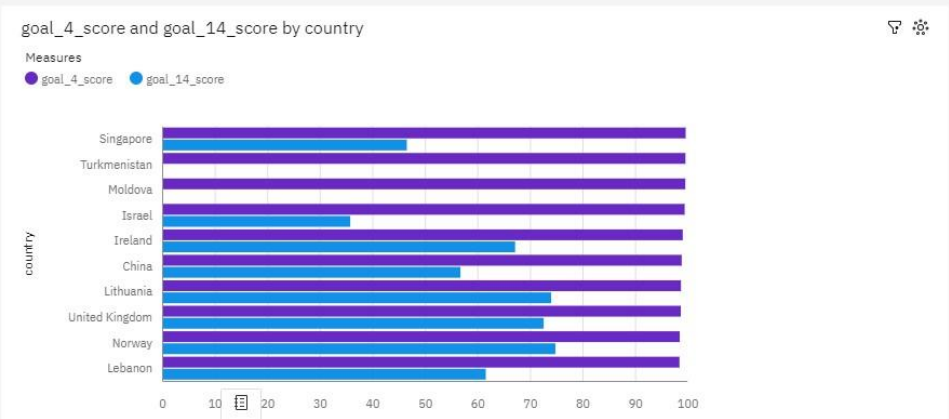
Analysis of Sustainability Life on Land

- "Life on Land", offering a detail view of sustainability and progress towards the related SDG's.
- This data aids researchers, Policy makers, and environment organizations in monitoring and enhancing land ecosystem health and biodiversity.
- It plays a crucial role in global effort to preserve terrestrial environment and achieve sustainable development goals.

goal_14_score and goal_15_score for country regions

goal_14_score (A...   goal_15_score (A...
0   90.39   26.48   97.88

ADVANTAGES & DISADVANTAGES

Advantages:

Accessibility: Since the dataset can be stored on the cloud, the user can access and analyze it easily.

Flexibility: Cloud access provides flexibility to the user to access and process in the IBM Cognos tool from anywhere and through any platform.

Global Reach: It provides global availability.

Diverse Analyzing Resources: Various types of explorations allows the user to analyze various types of data.

Personalization: Efficient analysis can be made through dashboard, story and report.

Disadvantages:

Digital Divide: Not all users have equal access to necessary resources.

Isolation: Lack of face-to-face interaction can lead to feelings of isolation.

Technical Challenges: Technical issues such as connectivity problems, software glitches, and compatibility issues can disrupt analysis.

Lack of Hands-On Experience: A lack of knowledge regarding resources of Cognos Tool may suffer in a virtual environment.

Dependence on Technology: Technical failures can halt the analysis process and create frustration for users.

Screen Fatigue: Extended screen time can lead to digital eye strain and other health issues.

APPLICATION

Due to the digital era, a huge amount of data is generated which leads to a tedious process of analysis of data. This problem can be solved using IBM Cognos tool. This tool provides efficient analysis of huge data with the help of various explorations, dashboards, stories and reports.

CONCLUSION

Virtual Faculty Build-A-Thon is a project development activity where participants are enrolled in a project listed under distinct technology categories after acquiring crucial knowledge on the IBM cloud services and open source technologies in the Bootcamp. Thus, under this activity a project on IBM cognos was built where various data visualization and exploration was learnt.

The dashboard, story and reports created in IBM cognos were integrated with the UI using flask in VS Code and run on the system localhost.

FUTURE SCOPE

In future, an AI supported chatbot can be embedded which would automate the task of analysis of various data.

APPENDIX

A. Source Code (Important Snippets)

```html
<main id="main">

    <!-- ======= About Section ======= -->
    <section id="about" class="about">
      <div class="container">

        <div class="row content">
          <div class="col-lg-6">
            <h2>Eum ipsam laborum deleniti velitena</h2>
            <h3>Voluptatem dignissimos provident quasi corporis voluptates sit assum
perenda sruen jonee trave</h3>
          </div>
          <iframe
src="https://us3.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FVisualizing%2BSustainab
ility%2BReport&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&a
mp;shareMode=embedded&amp;action=run&amp;format=HTML&amp;prompt=false" width="1100"
height="1000" frameborder="0" gesture="media" allow="encrypted-media"
allowfullscreen=""></iframe>        </div>

      </div>
    </section><!-- End About Section -->

    <!-- ======= Services Section ======= -->
```

```
<section id="services" class="services">
  <div class="container">
```

```html
        <iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders
%2FVisualizing%2BSustainability%2Bdashboard%2B1&amp;closeWindowOnLastView=true&amp;ui_a
ppbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboa
rd&amp;subView=model0000018cb4b2b2a2_00000000" width="1100" height="1000"
frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>


        </div>
      </div>

    </div>
  </section><!-- End Services Section -->
```

```html
<!-- ======= Portfolio Section ======= -->
    <section id="portfolio" class="portfolio">
      <div class="container">



        <iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=story&amp;pathRef=.my_folders%2FV
isualizing%2BSustainability%2BStory%2B1&amp;closeWindowOnLastView=true&amp;ui_appbar=fa
lse&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;sceneId=model0000018
cb51a373c_00000000&amp;sceneTime=5000" width="1100" height="1000" frameborder="0"
gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>



        </div>

      </div>

    </div>
  </section><!-- End Portfolio Section -->
```