IS6051

Data analysis and Visualisation: Eco-Tech

GROUP 23

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Analysis and Recommendations Report

Evaluation of Dashboard Design and Graphical Choices

This dashboard employs several charts to provide trends, waste constitutions, and viable recycling options of solar panels. To meet the visualization principles, the design is precise and relevant to the content of the text. Every graph and the very design of the dashboard were discussed through the lens of such principles as simplicity, emphasis, and consistency. Two dashboards which are used to demonstrate the data display solar panel waste generation over the period of 2010 to 2025. The older ones will not be in use anymore when the panels get to their effective lifespan. We predicted the data of waste generation with the help of GPT for the country, as the data provided was till the year 2022 (*ChatGPT*, 2024).

1. Graphical Design Choices

Line Graphs (Waste Trends Over Time): The “Waste Trends by Year” chart employs a multi-line graph to demonstrate the units sold, the total waste generated and the hazardous waste from year 2001 to year 2007. Here this type of visualization is fine for time series because it easily compares variables over time very clearly. Different line types are used to differentiate variables; sometimes the trends might be slightly overlapping hence confusing the interpretation of results if used for closely related lines. Another option that could have been using, for example, area charts with certain levels of transparency was discarded in order not to overload the viewer with information presented in such a manner.

Bar Charts (Waste by Country and Panel Type): Bar Chart used in ‘EcoTech Contribution Analysis by Waste Type’ can be best for pointing out categorical distinctions especially by countries. It makes strategic sense to disaggregate bar data by panel type – residential and/or commercial – since it allows for broad growth and detailed cheques. But it can be inconvenient to use the horizontal scrollbar. Which is overcome by the use of philtre. Another layout that could have been thought viable for all countries’ representation is the grouped bar chart. From this bar chart, it is possible to analyze the sale of the solar panel and the type of panel which will be beneficial in the future to address the issues of recycling panels.

Pie Charts (Panel Type Breakdown & Recovered Materials): Pie charts are popular when analyzing relative frequencies, for instance, the proportion of residential and commercial panels, as well as the rate of material recovery. Pie charts are somewhat difficult to analyze particularly for the slices that have been compared to others; nevertheless, the data obtained here is simple. Although, for more detailed comparisons, an option of Stacked bar charts could have been used.

Map Visualization (Units Sold by Country): A key benefit of the map is that it understands the spatial characteristics, and gets connections to show units sold. There is potential in the application of proportional circles that enables the construction of a map that can be easily read at first glance about significantly larger markets such as Poland and Spain. Nevertheless, there are disadvantages as well by means of which the comparisons are slightly tricky due to its lesser interactivity and the cue of perceiving the sizes. Using exact numbers increases the degree of precision when tooltips are added. Using the tooltip feature to enhance the details which will help to compare the sales in a better way.

2. Overall Dashboard Design

The dashboard layout adheres to best practices in visualization design by prioritizing clarity, usability, and logical flow:

Clarity and Structure: The design is perfectly logical because the section presents information from the general to the specific, point by point. The first part of the chart contains trends over time and by country, while the second part contains information on the panel breakdown, end of life panel, and recovery.

Color Choices: The application of different colors wisely determines the category (for instance, blue is used for the residential area, and orange is used for the silicon recovery area). Although the design looks pleasing to the eyes and easy to navigate, the use of colors could pose a problem to color blind users; the risk could be reduced by the provision of patterns or labels.

Interactivity: Philtre options for countries further extend the opportunities for navigation by users. For all the others, scroll bars are used which although acceptable is slightly less usable than if they were not incorporated in some of the visualizations such as bar charts. Making all pieces fall into place, would enhance integration within a single view.

Typography and Space Usage: They are summarized in short texts and labels, that do not overwhelm with their quantity, which can be explained by the presence of large blank spaces. This is in accordance with the principles of visualization, where cognitive load is considered.

3. Analysis of Visualized Data

The dashboard reveals significant insights regarding waste trends, panel breakdowns, and recycling opportunities:

Market Dominance: Poland and Spain are key markets for units sold in particular in the commercial segment. This could be attributed to larger infrastructure spending undertaken in these regions, a viewpoint that has been supported by other authors.

Waste Management Challenges: Commercial panels make up more than three quarters of the PV panels in their last year of efficiency guarantee, suggesting that small-scale installments may benefit more from waste management frameworks designed specifically for commercial installations.

Recycling Potential: Glass makes up 83.52% of the materials that can be retrieved from waste panels hence its high recyclability factor. Still, recovery rates of plastic and silicon are still poor, this indicates that the effectiveness of material recovery is still a problem.

4. Recommendations

Based on the insights derived from the dashboard, the following recommendations are proposed for EcoTech:

Improve Recycling Processes: For the non-hazardous components, diligence should be directed to improving the recovery technologies hence increasing the recovery of products such as silicon and plastics which do not have higher rates of recovery. Recycling efforts could improve if firms choose to invest in new and more efficient recycling technologies or if they outsource waste management to recycling firms exclusively.

Country-Specific Strategies: Adapt them to high-growth markets such as Poland and Spain by implementing market-specific recycling programmes or the partnership with the authorities on the implementation of even more stringent waste rules.

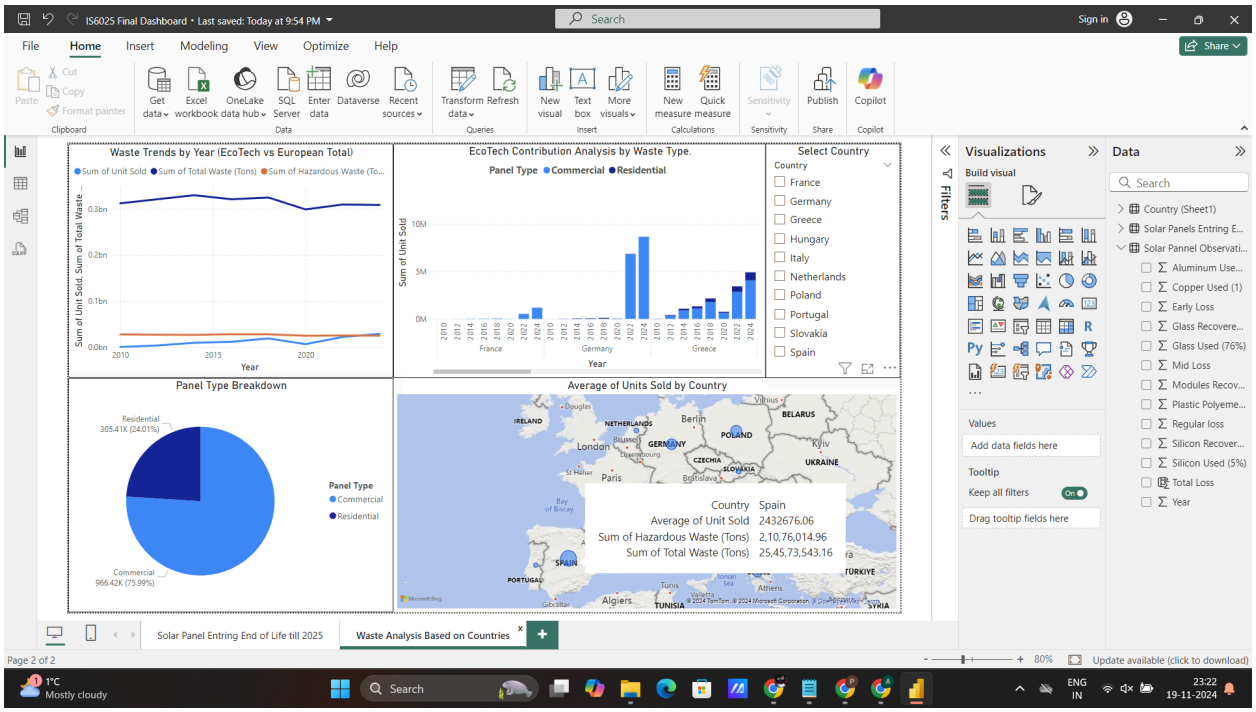
Residential Panel Growth: This means that non-residential consumers make up a smaller percentage of panel usage which implies that general incentives that are given towards the use of residential panels such as subsidies or awareness creation may go a long way in evening out the load of waste management distribution.

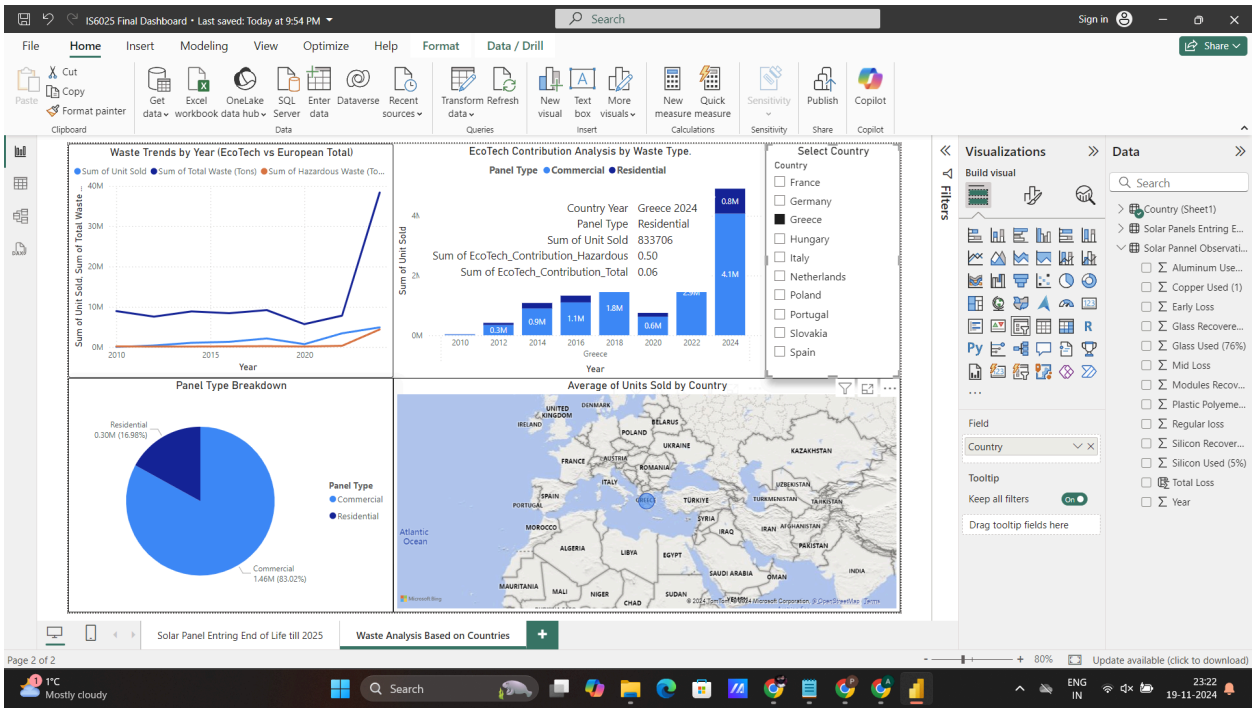
Dashboard Refinement: Increasing interactivity by improving filtering options such as a dynamic comparison of different countries. Incorporating other attributes such as environmental impact (for example CO2 reductions) would even offer a better picture to stakeholders.

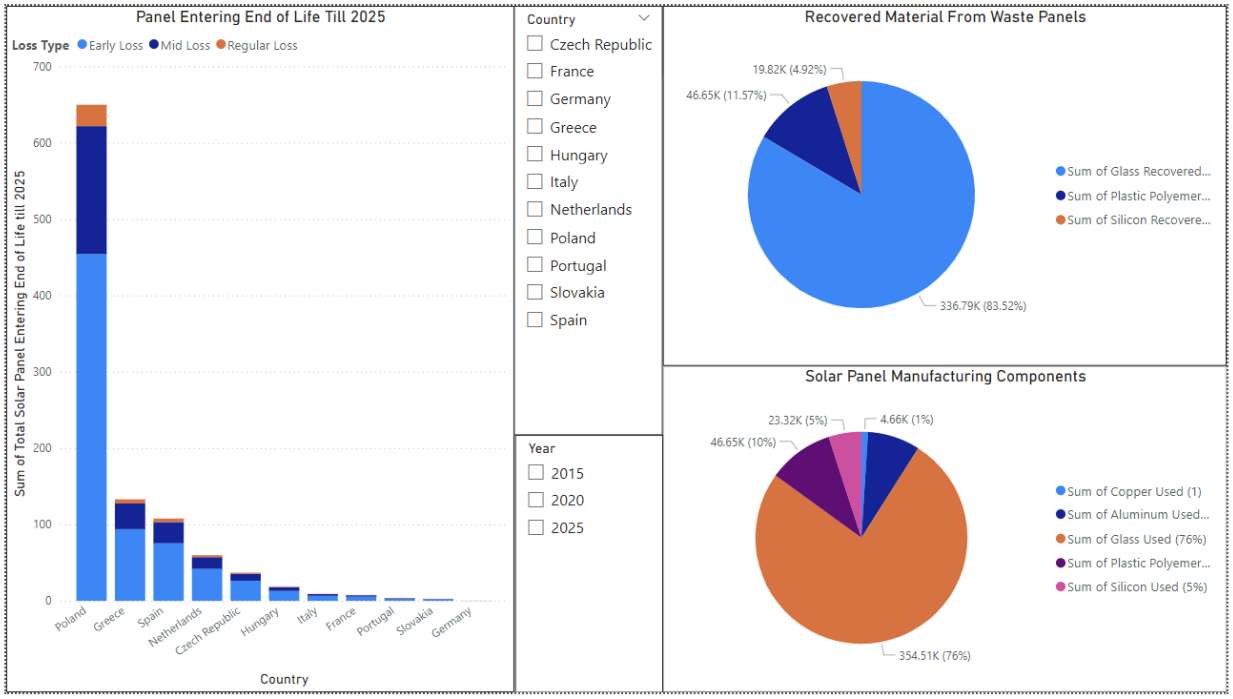
5. Conclusion

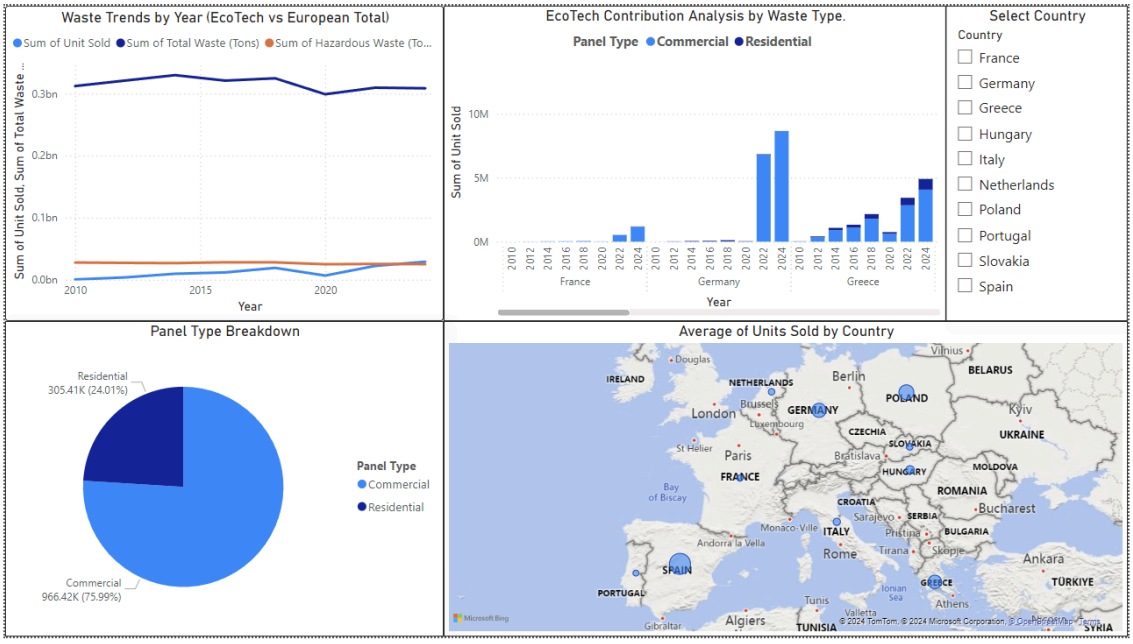
In general, this dashboard establishes a solid understanding of visualizing significant information for EcoTech. Although the current design is meaningful in presenting information, some further improvements can be made to interaction, inclusiveness, as well as other representations. There is evidence of a need to highlight the problem of littering and disposal, especially with regard to commercial panels, while continuing to improve the recycling strategies for less often used materials. With reference to these challenges, and with the help of a dashboard, EcoTech has the potential to demonstrate to Europe how solar panels can be implemented sustainably.

Dashboard Images:









References

ChatGPT (2024). https://chatgpt.com/share/673d099f-f754-8000-8c87-2307d7409203 (Accessed: November 19, 2024).