Coursework Description Sheet

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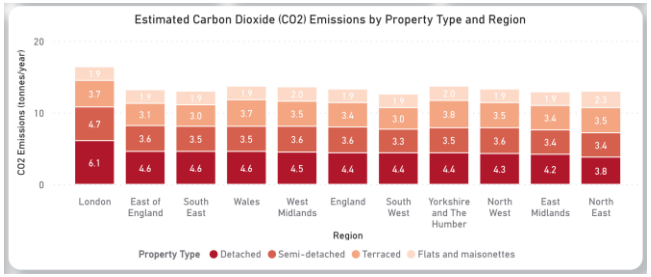
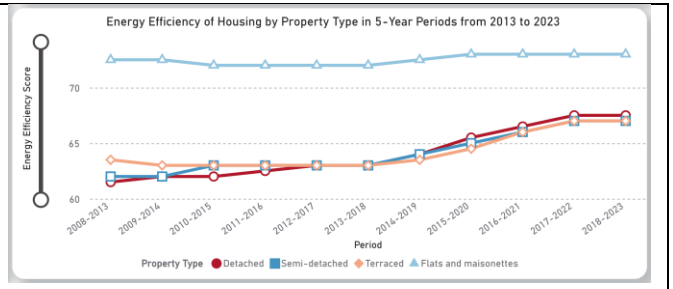
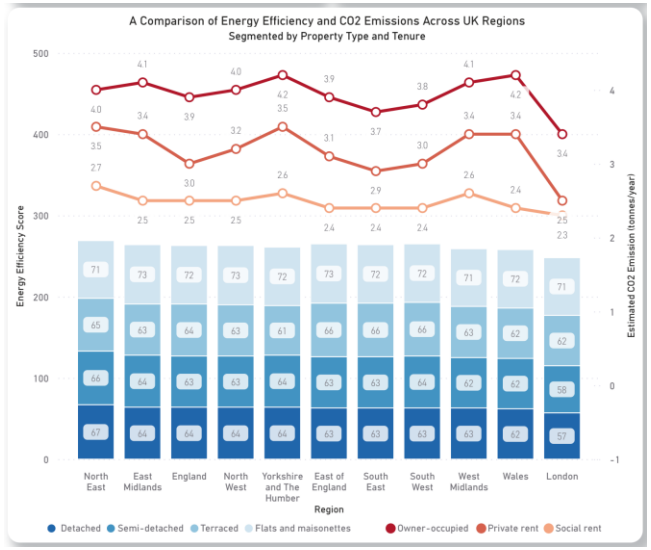
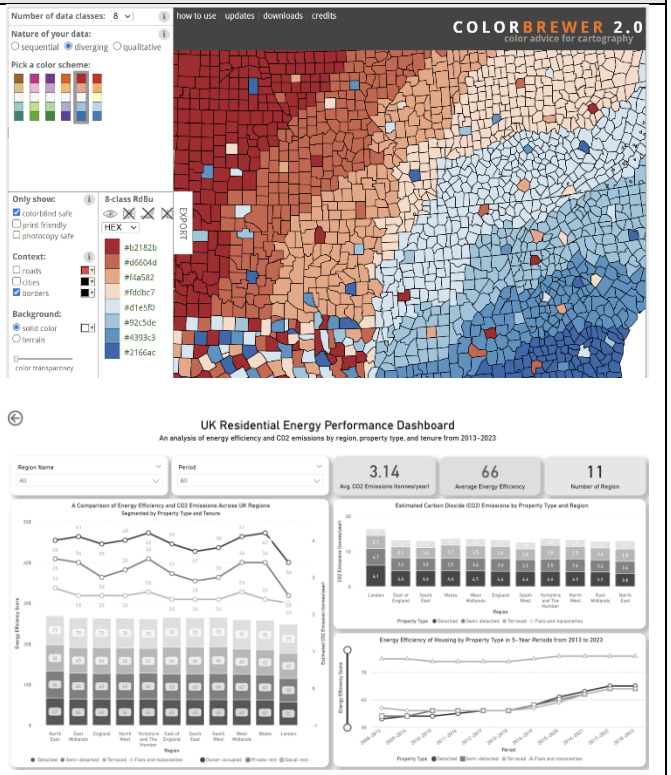
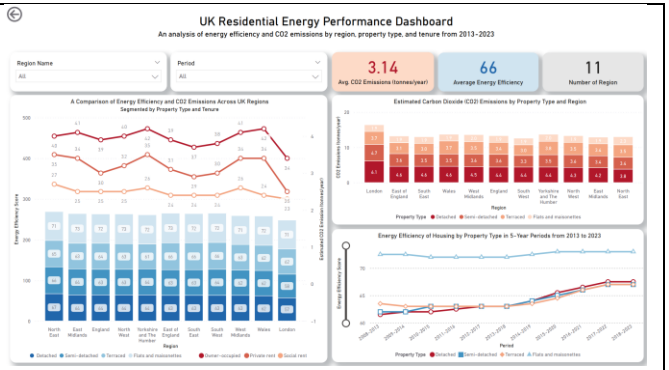
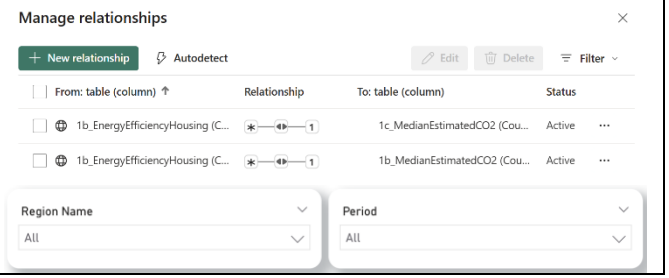
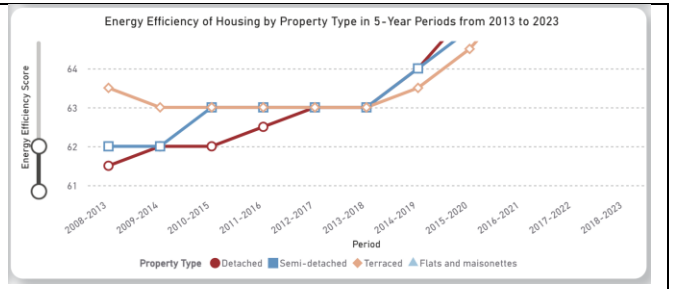
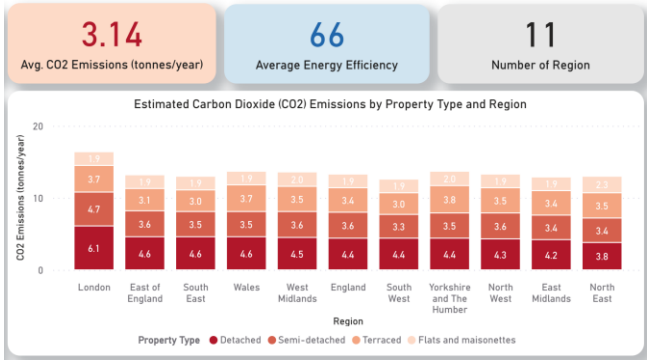
Question	Description	Figure
Fit to Task/User needs		
Location task - How does the visualization allow users to access the spread of carbon dioxide emissions across the UK based on the property type?	The graph shows estimated carbon dioxide (CO_2) emissions by property type and region in the UK, displayed as a stacked bar chart. This visualization provides an overview of total emissions for each region, stacked by property type. According to Munzner (2015), a stacked bar chart is suitable for visualizing this type of data because it is quantitative and has one categorical parameter. The advantage is that it allows for viewing of values and identifying trends at the same time. The data used is estimated CO_2 emissions by property type and region, up to the financial year ending March 2023, sourced from The Office for National Statistics (ONS), specifically shown in Table 1b. The x-axis in the graph displays the distribution of regions in the UK, allowing users to identify differences in estimated CO_2 emissions between regions. Furthermore, the y-axis represents the estimated CO_2 emissions in tonnes/year. Each bar in this chart is segmented based on four property types: detached, semi-detached, terraced, and flats and maisonettes. This is suitable for comparing the CO_2 emissions generated by each property type.	
Time task - How does the visualization allow user to understand the evolution of energy efficiency based on the property type, and location?	The visualization shows the development of energy efficiency every five years from 2008 - 2013 to 2018 - 2023, using a multi-line chart. The multi-line chart is used to display qualitative parameters, namely property type, so that changes in energy efficiency for each property type can be seen over time.	

	The horizontal axis shows five-year rolling periods in ascending order, left to right, making this display a time series chart. Furthermore, the vertical axis shows the energy efficiency score of housing, ranging from 1 to 91. However, this graph only displays scores from 60 to 74 due to the data distribution within that range. The "Property type" category creates four different lines, each visualized by several unique colors and marker shapes for easy identification and accessibility. Users can easily identify the evolution of energy efficiency based on property type by viewing this graph. Line charts are the standard and most effective method for this type of data (Munzner, 2015). This design also implements color and shape as visual channels to make it easier for users to compare and separate data based on property type.	
Multi-dimentional data task - How does the visualization allow user to identify correlation amongst at least three of the following parameters: property type, tenure, location, energy efficiency, and carbon dioxide emission?	The line and stacked column chart illustrate the comparison between energy efficiency and estimated CO_2 emissions across UK regions, which is segmented by property type and tenure. This type of diagram combines a line chart showing the energy efficiency score on the left y-axis, segmented by property type, with a multi-series line chart on the right y-axis showing estimated CO_2 emissions, consisting of 3 types of tenure (owner-occupied, private rent, and social rent). By using this diagram approach, it is hoped that users can easily identify correlations between parameters. Looking at the bar chart, users can easily see the energy efficiency scores of each property type in each UK region, as they are labeled with values. Meanwhile, by following the line chart above, they can easily compare the three different tenure types. They can also identify which tenure contributes the most or least to CO_2 emissions in each location. The strength of the visualization is its integrated design. By placing two different parameters in the same area for each region, the chart takes advantage of the principle of proximity, which encourages viewers to connect the information and look for relationships	

	(Ware, 2022). As a result, users can explore correlations, such as regions with lower efficiency scores have higher emissions from certain tenure types and it is a helpful tool for analytical reasoning.	
Visualisation Principles		
Use of colour - How does the use of colour in this dashboard enhance the readability and effectiveness of the data presentation?	The dashboard uses a specific eight-class color palette that is safe for colorblind users and grayscale printing, created with ColorBrewer 2.0 (Brewer and Harrower, n.d.). Choosing a diverging scheme is key to the dashboard's readability. The use of two distinct colors, red and blue, instantly shows the user that the data has two opposing directions. For example, values below the midpoint appear in shades of red, while values above it show shades of blue. The choice of red for CO_2 emissions plays on a common cultural understanding that red signals warning, danger, or negative outcomes. Meanwhile, blue represents energy efficiency. Blue often conveys coolness, stability, or positive/neutral information. Different shades, from darker to lighter, serve as a qualitative tool to differentiate between distinct categories, making it safe for grayscale printing. Instead of using completely different colors for each property type, which can create a rainbow effect, the design employs several shades of blue. Similarly, the three tenure types are represented by three distinct shades of red. The rainbow color map grabs attention, but it does not effectively show data in a scientific way **(Stoelzle and Stein, 2021)**. This color scheme creates a clean, organized, and professional look that helps users compare categories without being distracted by too much color variation. It was implemented systematically by creating a custom Power BI theme.	

Use of graphic design principles -How does the application of graphic design principles enhance the clarity and effectiveness of the data presentation in this dashboard?	Several graphic design principles used in this dashboard are proximity, continuity (Koffka, 2013), repetition, consistency, and white space. The design creates a visual structure that guides the user's attention, following the Z-pattern to reduce cognitive load. The law of proximity is used to group related elements. Each graph has a title at the top center and a legend always placed at the bottom center, making it easier for users to decode. Key Performance Indicators (KPIs) containing the average energy efficiency score and CO2 emissions are grouped in the top right corner as well, allowing users to get the summary quickly. Furthermore, the law of continuity contributes to the clean design and structured layout. The main title and subtitle are centrally aligned, creating a formal and balanced header. Filters and KPIs are also aligned in neat rows and the same width. Also, the three main charts are aligned horizontally. In addition, repetition and consistency are applied in the font style and size for similar elements. Consistent in colors, such as shades of blue for Energy Efficiency and shades of red for CO_2 emissions, is also applied throughout this dashboard. Lastly, the dashboard uses white space as gaps between each element. So the goal is to avoid disorganization and help users focus on one chart at a time. Another purpose is to improve the user's readability.	
Use of interaction - How does the use of interactive design elements improve the user's ability to explore and interpret data on this dashboard?	Two datasets were used to create the dashboard: Energy efficiency of housing and median estimated CO_2 emissions. Relationships were established for both datasets/tables. This step is crucial for displaying correct information and ensuring the graphs are connected. The column used to create the relationship is the "Country or Region Code" column. In this case, the "Country or Region Name" column is not used to avoid mistypes that could lead to relationship failure. All interactions on each chart should be functional, such as clicking on a specific bar or line and using filters.	

	The dashboard utilizes two filters: region name and period, equipped with drop-down menus and multi-selection. This feature allows users to select one or more regions and specific periods for a more focused or detailed view. These filters affect the entire graph depending on the filter applied. Additionally, a zoom slider has been added to the vertical axis for the energy efficiency by property type in the five-year period graph. This is because label values are not displayed on the graph to avoid overwhelming. To address this issue, users can use the zoom slider feature provided to zoom in vertically to see the energy efficiency score for a specific property type.	
Use of text and legend - How do the use of text and legends contribute to the clarity and user comprehension of the data presented in this dashboard?	The text used in this dashboard is customized with a uniform font family and consistent font size. The legend is always placed on the same side of each chart and is complemented by clear colors and symbols to avoid user misunderstandings when interpreting the data. All text in this dashboard uses the DIN font family with two sub-fonts: DIN (Regular) and DIN Light. Using only two fonts within the same family is expected to make reading easier for users and reduce distractions, allowing them to focus more on the chart content. The font size is also customized. Three font sizes are used: 8 for all text in the charts except the title, which uses a size of 10. The 28 font size is used for three charts to summarize important information on three key parameters (average CO_2 emissions, average energy efficiency, and total region). Center alignment is also applied to each chart. Furthermore, all three charts use a legend placed at the bottom center. This legend indicates the data categories displayed in the chart, such as property type and tenure. Both the text and legend work together to create a clear and accurate user experience. Furthermore, consistency in text and legend is expected to make it easier for users to understand and analyze data.	

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