

# VIS-Assessment 4

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## 1. Data, users, and tasks (25 points)

User Group **Activists from WWF**:

A1- **Investigate** the relative impact of climate change on natural habitats in different parts of the world, regarding, e.g., natural disasters, sea level, or forest cover

A2- **create** a ranking of countries (or parts of the world) in the data based on a specific metric (rising sea levels in the last x years, temperature changes, etc.)

A3- retrieve detailed information (disaster frequency, temperature change in the last x years, etc.) of a **selected** country/part of the world, with information about what possible disasters might affect this country/part of the world

### Dataset 14 — Climate-related Disasters Frequency

**Content:**

- Country-level counts of climate-related disasters (e.g., floods, storms, droughts, heatwaves)
- Annual records
- Rich temporal depth (often 1970–2020+)

**Interesting features:**

- Highly uneven distribution: some countries have frequent disasters (e.g., coastal or tropical regions), others very few.
- Multiple disaster types allow distinguishing ecological pressures.
- Strong year-to-year variability, valuable for identifying spikes or long-term increases.

**Missing values:**

- Some countries or early years may be missing due to incomplete reporting.
- Some disaster types may be underreported historically.

**Task relevance:**

- Supports **A1** by showing regional hazard intensity.
- Enables **A2** by allowing ranking by disaster frequency or trend.
- Enables **A3**, especially disaster-type inspection for selected countries.

### Dataset 23 — Annual Surface Temperature Change

**Content:**

- Annual temperature anomaly (relative to long-term baseline)
- Country-level data
- Often complete from 1960–2022+

**Interesting features:**

- Clear global warming signal visible as rising anomalies.
- Regional differences allow comparing hotspots (e.g., Arctic warming faster).
- Long consistent time series suitable for trend analysis.

**Missing values:**

- Some small regions or island states may have missing or aggregated values.

**Task relevance:**

- Supports **A1** by showing extent of temperature changes across regions.
- Enables **A2** rankings based on warming trends (e.g., top 10 fastest-warming countries).
- Provides **A3** detail-on-demand temperature curves for a selected country.

### Dataset 25 — Change in Mean Sea Levels

**Content:**

- Mean sea-level rise measurements in millimeters
- Global or regional aggregates (often fewer country-level data)
- Long-term time series (multiple decades)

**Interesting features:**

- Strong upward long-term trend consistent with global warming.
- Clear acceleration observable in many regions since 1990s.
- Useful for identifying areas where sea-level rise poses severe ecological risk.

**Missing values:**

- Many countries lack direct measurements; data often available only at regional/global scale.
- Some time steps may be missing due to measurement limitations.

**Task relevance:**

- Supports **A1** by enabling analysis of sea-level impacts on coastal ecosystems.

- Supports **A2** by allowing ranking of regions with highest sea-level rise (where available).
  - Supports **A3** by providing additional hazard information for coastal countries.
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**User Group Data Journalists:**

J1- **Demonstrate** how climate change indicators in Austria compare to other countries

J2- **show** a climate tax/expenditure discrepancy comparison between Austria and a selected country

J3- **show** the relation between Fossil Fuel subsidies and environmental taxes for different countries

Data journalists specialize in communicating complex environmental, political, and economic patterns in a way that the general public can understand. Their work requires identifying clear, evidence-based differences between Austria and other countries, revealing inconsistencies in policy, and highlighting trends relevant to climate reporting.

They need tools that allow:

- **Fast comparison** between Austria and other countries
- **Detection of discrepancies** between taxation and expenditures
- **Understanding of relationships** between subsidies and climate-policy signals
- **Access to both overview and detail views** for storytelling
- **Simple interactions** (no expert skills required)

The DJ dashboard (overview mode + selectable comparison mode, linked scatter, discrepancy trends, bar charts) directly supports these needs.

**Tasks for Data Journalists (J1–J3)**

(domain tasks only; abstraction will come later)

**J1 — Compare Austria to other countries using climate-relevant financial and environmental indicators**

In overview mode, the dashboard displays a comparison between Austria and world averages for:

- temperature anomaly
- CO<sub>2</sub> emissions
- disaster frequency

Selecting any country replaces the global average with that country.

This allows journalists to answer: "How does Austria compare overall?"

**J2 — Compare the discrepancy between environmental taxes and environmental protection expenditures**

Journalists often investigate whether countries reinvest their environmental tax revenue.

The discrepancy view shows:

(taxes – expenditures) over time.

In detail mode, Austria is compared directly to a selected country.

**J3 — Analyze the relationship between fossil-fuel subsidies and environmental taxes across countries**

The scatter plot uses:

- x-axis: fossil fuel subsidies
- y-axis: environmental taxes

An ideal view for detecting contradictions (e.g., high taxes but also high subsidies).

Austria is highlighted for quick identification.

**Dataset Description**

**Dataset 07 — Environmental Taxes**

**Content:** Annual environmental tax revenues per country.

**Interesting:**

- Large cross-country variation.
- Often stable long-term with policy-driven jumps.

**Missing values:**

- Some non-OECD countries have incomplete early records.

**Supports:**

- **J1:** Compare Austria's tax burden.
- **J2:** Forms the "tax" side of the discrepancy.
- **J3:** Y-axis in the subsidies–taxes scatter plot.

**Dataset 08 — Environmental Protection Expenditures**

**Content:** Country-level investments in environmental protection.

**Interesting:**

- Strong variation during economic cycles or climate investment programs.

**Missing values:**

- Some gaps in earlier years.

**Supports:**

- **J1:** Compare Austria to other countries.
- **J2:** Forms the "expenditure" side of the discrepancy.

**Dataset 09 — Fossil Fuel Subsidies**

**Content:** Monetary support to fossil-fuel consumption or production.

**Interesting:**

- Strong policy signal; high subsidies slow climate transition.

- Countries differ by orders of magnitude.
- Missing values:**
- Some nations underreport or have incomplete data.
- Supports:**
- J1: Contextualize Austria's policy alignment.
  - J3: X-axis of the subsidies–taxes relationship view.

#### Dataset 14 — Disaster Frequency

**Content:** Annual counts of climate-related disasters.

**Interesting:**

- High variability; reflects climate exposure.
- Missing values:**
- Underreporting in older years.
- Supports:**
- J1: One of the environmental indicators compared in the first panel.

#### Dataset 23 — Surface Temperature Change

**Content:** Annual temperature anomaly per country.

**Interesting:**

- Strong upward trend globally.
- Missing values:**
- Some countries have partial series.
- Supports:**
- J1: Climate-change indicator in the first panel.

#### Dataset 25 — Mean Sea-Level Change

(Used only where relevant; Austria has no coastline.)

**Content:** Sea-level rise in mm, global/regional.

**Interesting:**

- Shows rising global sea levels.
- Missing values:**
- No values for landlocked countries.
- Supports:**
- J1: Only for comparison countries where relevant; Austria is shown with "no data" instead of zero.

## 2. Task abstraction (15 points)

User Group Activists from WWF:

### A1 — Investigate the relative impact of climate change across regions

(domain task A1)

**WHY:**

Discover broad global patterns in climate impacts and identify regions experiencing elevated risk.

**WHAT:**

Country-level metrics:

- Disaster frequency over time (dataset 14)
- Temperature anomaly trends (dataset 23)
- Sea-level rise (dataset 25, when available)

**HOW:**

- Explore the global overview map showing disaster frequency over time
- Select a country to reveal detailed linked views
- Encode differences in severity through color intensity, line slopes, and Sankey flow magnitude
- Link all views so that selecting a region updates the line charts, ranking bars, and Sankey diagram

**Purpose:**

Provides an overview + detail-on-demand mechanism for understanding climate impacts globally.

### A2 — Rank countries according to a chosen climate-change metric

(domain task A2)

**WHY:**

Compare countries to identify which regions show the highest values or strongest trends in selected climate indicators.

**WHAT:**

User-selected metric from:

- Temperature increases over time
- Disaster frequency trend
- Sea-level rise trend (where available)

**HOW:**

- **Reconfigure** the ranking bar chart based on the chosen metric
- **Derive** trend values (e.g., slope of temperature increase, rate of disaster growth)
- **Filter** to highlight top 5 countries + selected country
- **Select** a metric via the bottom time-series panel (impact-over-time view)
- **Link** the ranking chart with the time-series visualizations and world map

**Purpose:**

Supports comparative analysis for prioritizing regions of interest.

**A3 — Retrieve detailed climate-impact information for a selected country**

(domain task A3)

**WHY:**

Describe and understand the composition, trends, and hazard-type distribution of climate impacts for a single country.

**WHAT:**

For the selected country:

- Disaster frequency by type (dataset 14)
- Temperature change time series (dataset 23)
- Sea-level rise time series (dataset 25, if applicable)
- Total disaster distribution (floods, storms, droughts, etc.)

**HOW:**

- **Select** a country on the world map
- **Abstract/Elaborate** by revealing more detailed views:
  - Line charts for temperature, sea level, disaster frequency
  - Sankey diagram for disaster-type distribution
- **Explore** temporal patterns using time-series views
- **Link** all updated views to maintain contextual understanding
- **Encode** disaster distribution using proportional flows in the Sankey diagram

**Purpose:**

Provides detail-on-demand for targeted ecological assessment.

User group **Data Journalists**:

**(J1) — Compare Austria's climate-change indicators to other countries**

**WHY:**

Present & Discover differences between Austria and other countries in climate-related financial and environmental indicators.

**WHAT:**

Country-level indicators: temperature change (23), CO<sub>2</sub> emissions or disaster exposure (14), environmental taxes (07), environmental protection expenditures (08), fossil fuel subsidies (09), and sea-level change where available (25).

**HOW:**

Select Austria; Select comparison country; Encode indicators in parallel visual formats (paired line charts or bar segments); Explore indicator differences; Hover for precise values; Link selections to update all views.

**(J2) — Compare discrepancy between environmental taxes and expenditures**

**WHY:**

Discover mismatches between how much Austria collects in environmental taxes and how much it invests in environmental protection, relative to other countries.

**WHAT:**

Time-series values for environmental taxes (07) and environmental protection expenditures (08) per country.

**HOW:**

Select country from dropdown; Reconfigure discrepancy line chart (tax – expenditure); Explore differences over time; Click year to request detailed values; Hover for exact amounts; Link to a bar chart showing the two indicators side by side.

**(J3) — Analyze relationship between fossil fuel subsidies and environmental taxes**

**WHY:**

Discover correlations or contradictions in national climate-policy signals (e.g., taxing polluters while subsidizing fossil fuels).

**WHAT:**

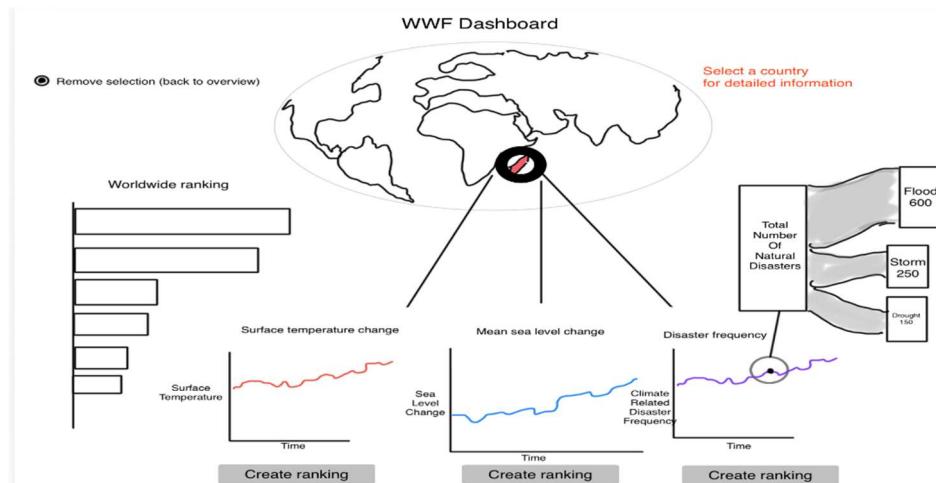
Cross-country pairs of indicators: fossil fuel subsidies (09) vs. environmental taxes (07).

**HOW:**

Encode values in a scatterplot; Highlight Austria; Select a country to activate detail mode; Explore distribution patterns; Hover to reveal exact amounts; Filter by selecting countries in other views; Link scatter selection to update comparison panels.

### 3. Functionality and usability of the dashboards (10 points each per dashboard = 40 points)

#### Dashboard 1: Activists from WWF



The WWF dashboard is designed to support Tasks **A1–A3**, enabling activists to investigate global climate-change impacts, compare countries, and retrieve detailed information about specific regions. The dashboard consists of **four linked views**, each providing a distinct analytical perspective:

1. **World Map Overview**,
2. **Impact-Over-Time View (Three Line Charts)**,
3. **Ranking View**,
4. **Disaster-Type Distribution (Sankey Diagram)**.

The dashboard opens in **overview mode**, showing global patterns. Selecting any country shifts the dashboard into **detail mode**, where all views update to focus on the chosen region. A “Remove Selection” button returns the dashboard to the global overview state.

#### Overview of Interactions and Linking

The dashboard uses a **bidirectional linking strategy**, where actions in one view update all others. Key interactions include:

- **Selecting a country on the map** updates the line charts, the Sankey diagram, and the ranking view.
- **Selecting a metric (temperature, sea-level, or disasters)** from the line charts updates the ranking bar chart to show “Top 5 + selected country.”
- **Clicking on any point along the disaster-frequency time series** updates the Sankey diagram to show the **disaster-type distribution for that year**.
- **Hovering over elements in any chart** displays tooltips (title + precise value).
- **Hovering over countries on the map** displays the country name.

This ensures that all four views are **coordinated**, supporting exploratory analysis (A1), comparative ranking (A2), and detail-on-demand (A3).

#### View 1 — World Map Overview

##### Description

The world map displays global disaster frequency using a choropleth or marker-based encoding. In overview mode, it animates or steps through time to illustrate how disaster frequency has evolved. In detail mode, selecting a country centers the dashboard on that region.

##### Supported Tasks:

- **A1** (discover regional climate impacts)
- **A3** (select a country for details)

##### Interactivity:

- **Hover**: Shows country name and latest disaster frequency.
- **Click/Select**: Filters all other views to the selected country.
- **“Remove selection” button**: Returns to overview mode.

##### Why a map for A1/A3?

Maps provide the most intuitive geographic overview, enabling users to visually detect hotspots. Spatial tasks (locating affected regions, comparing continents) rely on geographic encodings, which match the natural mental model of WWF analysts.

##### Usability Notes:

- Uses color saturation (high contrast, perceptually ordered) to show disaster frequency.
- No excessive labels to avoid clutter.
- One-glance identification of high-risk areas → excellent expressiveness for A1.

#### View 2 — Impact-Over-Time View (Three Linked Line Charts)

(temperature change, sea-level rise, disaster frequency)

##### Description

Three small-multiple line charts show the long-term evolution of each climate metric. In overview mode, the charts show global averages; in detail mode, they show values for the selected country.

##### Supported Tasks:

- **A1** (explore temporal climate impacts)
- **A2** (choose metric for ranking)
- **A3** (inspect detailed evolution for selected country)

##### Interactivity:

- **Select metric**: Clicking a line chart title sets the ranking chart to use that metric.

- **Click on a line-node (year):** Updates the Sankey diagram to show disaster types for that specific year.
- **Hover:** Displays a tooltip with exact year + value.

#### Why line charts for A1-A3?

Line charts are optimal for trend-related tasks, enabling comparison of slopes and long-term changes. This supports identifying rapid warming, increasing disasters, or acceleration in sea-level rise.

#### Usability Notes:

- Three separate charts avoid overplotting and giving false relation.
- Consistent x-axis (years) across all charts increases interpretability.
- Color-coded lines match the metric selection mechanism.

#### View 3 — Ranking of Countries by Selected Metric (Bar Chart)

##### Description

This vertical bar chart shows the **Top 5 countries + selected country** for the metric chosen via the line charts (temperature change, sea-level rise, disaster frequency). In overview mode, it displays the ranking for disaster frequency.

##### Supported Tasks:

- **A2** (ranking countries based on user-selected metric)

##### Interactivity:

- **Selecting a metric** in the line chart updates the ranking automatically.
- **Hover** displays the exact metric value.
- **Click on a country** highlights it on the map and updates the detail views.

#### Why bar charts for A2?

Bar charts are optimal for ranking tasks because:

- They provide a clear magnitude comparison.
- Ordering encodes ranking naturally.
- Length is one of the most accurate perceptual channel for quantitative values.

#### View 4 — Disaster-Type Distribution (Sankey Diagram)

##### Description

The Sankey diagram shows the composition of disasters (floods, storms, droughts, heatwaves, etc.) for the selected country. By default, it uses the most recent year; selecting a point on the disaster-frequency line chart updates the diagram to that specific year.

##### Supported Tasks:

- **A1** (understand relative impact of various climate hazards)
- **A3** (retrieve detailed information for a selected country)

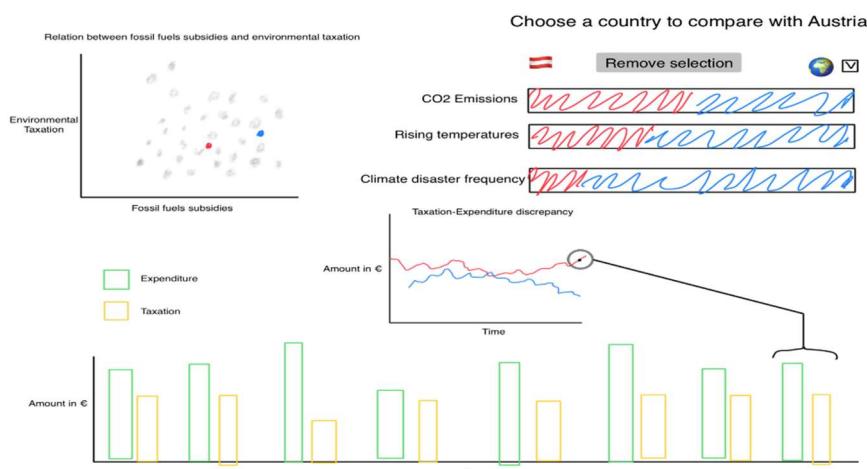
##### Interactivity:

- **Click on year** in the disaster line chart → updates the Sankey diagram.
- **Hover** over a flow → shows disaster type + count.
- **Automatically updates** when a new country is selected.

#### Why a Sankey diagram for A1/A3?

WWF activists need to understand **which hazards dominate** in a country. A Sankey diagram communicates proportions and flows much more effectively than pie charts or stacked bars, especially when multiple categories exist.

#### Dashboard for data journalists:



#### View 1 — Relation Between Subsidies and Taxes (Scatter Plot)

##### Description

This scatter plot shows each country as a dot, with:

- **x-axis:** fossil fuel subsidies (dataset 09)
  - **y-axis:** environmental taxes (dataset 07)
- Austria is highlighted in red; all others appear in grey. Selecting a country in any other view highlights it here; clicking a dot selects that country and switches the dashboard to detail mode.

##### Supported Tasks:

- **J3:** Discover relationship between subsidies and taxes.
- **J1:** Highlight Austria's position relative to peers.

#### Why a scatter plot?

Scatter plots are the most effective encoding for relational tasks (J3), allowing journalists to detect correlations, outliers, and contradictions (e.g., high taxes but also high subsidies). Position encodes magnitude precisely and avoids misinterpretation.

#### Interactivity & Linking:

- **Hover:** Shows country name and exact values.
- **Click:** Selects country → updates all views (climate indicators panel, discrepancy chart, bar chart).
- **Linked selections:** Selection in climate-indicator view highlights the dot here.

#### View 2 — Climate-Change Indicators Panel (Paired Line Charts)

##### Description

This panel compares Austria to world averages (overview mode) or to a selected country (detail mode) across three indicators:

- temperature anomaly (23)
- CO<sub>2</sub> emissions or disaster frequency (using 14 or 04)
- optional additional environmental variable

Each indicator is displayed as a small-multiple line chart: red for Austria, blue for the comparison country.

#### Supported Tasks:

- **J1:** Compare Austria to other countries across multiple climate indicators.
- **J3:** Selection here highlights the corresponding dot in the scatter plot.

#### Why line charts?

Line charts are optimal for temporal tasks (J1), showing long-term trajectories and enabling users to compare slopes, crossings, and divergences.

#### Interactivity & Linking:

- **Dropdown menu:** Select comparison country. Chosen over a map to enable rapid lookup of specific or small nations without zooming.  
**Hover:** Tooltip with exact year + value.
- **Linked:** Selecting a country here highlights it in the scatter plot and updates the discrepancy and bar charts.
- “**Remove selection**” button: Returns the dashboard to overview mode.

#### View 3 — Discrepancy View (Taxes – Expenditures Line Chart)

##### Description

This view shows how much a country's environmental tax revenue exceeds (or falls short of) its environmental protection expenditures over time.

In overview mode: Austria vs world average

In detail mode: Austria vs selected country

#### Supported Tasks:

- **J2:** Reveal discrepancies between taxes and expenditures.
- **J1:** Provide context for Austria's financial climate commitment.

#### Why a line chart?

The discrepancy is a derived time-series metric. Line charts effectively show whether the gap is widening or narrowing and allow direct slope comparison between Austria and another country.

#### Interactivity & Linking:

- **Click on any point** in the discrepancy chart → updates the detailed bar chart (View 4) for that specific year.
- **Hover:** Shows the precise discrepancy value.
- **Linked to View 4:** Year selection triggers a synchronized update.

#### View 4 — Taxation vs Expenditure Detail (Bar Chart)

##### Description

This bottom view shows the raw values of:

- environmental taxes (07)
  - environmental protection expenditures (08)  
for the country selected in any earlier interaction.
- Bars corresponding to the clicked year from the discrepancy chart are highlighted.

#### Supported Tasks:

- **J2:** Inspect detailed financial values for a selected year.
- **J1:** Compare raw tax/spending levels clearly.

#### Why a bar chart?

Bar charts provide the most accurate magnitude comparison between discrete categories (tax vs expenditure) and are ideal for J2, where precision matters.

#### Interactivity & Linking:

- **Hover:** Shows country, year, and exact value.
- **Linked:** Updates when a country is selected or a year is clicked in the discrepancy view.
- **Default:** Shows Austria's values without highlights in overview mode.

## 4. Reflection (15 points)

The WWF dashboard provides a balanced combination of overview, comparison, and detail views, enabling users to efficiently perform Tasks A1–A3. The world map and linked charts allow users to quickly identify climate-impact hotspots, compare trends, and retrieve detailed information about specific countries.

### **Efficiency for Users**

Users can complete core tasks rapidly because each visualization aligns with a specific analytical action. The world map supports immediate spatial understanding (A1), the line charts reveal temporal evolution without requiring additional navigation (A1, A3), the ranking bar chart enables fast comparison across countries (A2), and the Sankey diagram provides an intuitive breakdown of disaster types (A3). Interactions are minimal and direct—clicking or hovering is sufficient to access deeper information—leading to low cognitive load.

### **Balancing Visual Encodings with Data Attributes**

Each visual encoding was chosen based on the perceptual effectiveness of the corresponding data type. Geographic patterns are best expressed spatially (map), temporal changes via slopes and trajectories (line charts), quantitative comparison through length (bar chart), and categorical composition via flow width (Sankey). Separating the three metrics into small multiples avoids overplotting and preserves clarity. This ensures all attributes—spatial, temporal, categorical—are encoded using the most expressive channels available.

### **Overview vs. Detail View**

The overview views include the world map (global disaster patterns), the global-average line charts, and the initial ranking chart. Detail views include country-specific line charts, the Sankey diagram for disaster composition, and the ranking recalculated around the selected country. The “Remove Selection” button reinforces a clear separation between the two modes. This structure follows Shneiderman’s mantra: overview → zoom and filter → details on demand.

### **Interaction Tradeoffs and Limitations**

The dashboard restricts interactions to essential actions (select, hover, filter), avoiding complex UI mechanisms that would slow down analysis. This improves usability but limits advanced manipulation such as multi-country comparison or user-defined data transformations. Another limitation is the Sankey diagram’s dependence on disaster-type availability; countries with sparse records may show limited detail. Sea-level change is unavailable for non-coastal regions, which may lead to empty or suppressed line charts, though this avoids misleading zero values.

### **Linking Between Views**

All views are tightly linked: selecting a country updates the line charts, recomputes the ranking view, and refreshes the disaster-type distribution. Selecting a year on the disaster-frequency chart updates the Sankey diagram for that specific year. The map selection also synchronizes tooltips and highlights across charts. This coordinated linking enables smooth navigation between global context and specific details and ensures that every task (A1–A3) is supported with minimal effort.

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The Data Journalist Dashboard is optimized for rapid comparison, discrepancy detection, and relational analysis of Austria’s climate-related financial indicators. It allows users to easily identify how Austria differs from other countries and to understand underlying policy contradictions. The design emphasizes clarity, minimal interaction overhead, and strong linked-view coordination.

### **Efficiency of User Tasks**

Journalists can complete core tasks quickly because each view is purpose-built for its corresponding analytical need. The climate-indicators panel (overview mode) enables immediate comparison between Austria and world averages for temperature, CO<sub>2</sub> emissions, and disaster frequency (J1). The subsidies–taxes scatter plot allows fast identification of whether Austria aligns with peers (J3), while the discrepancy view highlights mismatches between taxes and environmental expenditures (J2). Selecting a country instantly updates all relevant views, allowing journalists to pivot between comparison targets with minimal friction.

### **Balancing Effective Visual Encodings and Data Complexity**

Each dataset is encoded using a visualization type that maximizes perceptual accuracy.

- **Scatter plot:** position encodes subsidies and taxes, ideal for correlation tasks (J3).
- **Line charts:** support temporal trend exploration (J1, J2).
- **Bar charts:** provide accurate magnitude comparison for taxation vs. expenditure details (J2). Grouping indicators into small multiples avoids overplotting and preserves clarity, even when comparing Austria to another country.

### **Overview vs. Detail Views**

The **overview views** include the climate-indicator panel (Austria vs world), the scatter plot (all countries), and the discrepancy view comparing Austria to global trends.

**Detail views** appear after selection: the indicator panel switches to Austria vs selected country, the discrepancy view updates to the chosen comparison, and the bottom bar chart reveals specific tax/expenditure values for a selected year. This aligns with the recommended workflow of *overview → zoom/filter → details on demand*.

### **Interaction Tradeoffs and Limitations**

Interactions were intentionally limited to simple operations—selecting a country, clicking a data point, and hovering for details—to maintain accessibility for nontechnical users. This simplicity improves usability but limits more advanced comparisons like selecting multiple countries simultaneously. Another limitation is that data availability varies across indicators (e.g., some countries have partial subsidy records), which may restrict the interpretability of the scatter plot. Austria’s landlocked status also limits relevance of sea-level data, though this is handled by suppressing values rather than misrepresenting them. We selected a drop-down over a map to prioritize **known-item lookup** (Task J1) and conserve screen space for complex financial charts.

### **Linking Between Views**

The dashboard uses consistent bidirectional linking:

- Selecting a country updates the indicator panel, the discrepancy view, and highlights the corresponding dot in the scatter plot.
  - Selecting a year in the discrepancy view updates the bar chart.
  - Interaction in the indicator panel or scatter plot keeps the user’s context intact across views.
- This coordinated linking ensures that Tasks J1–J3 can be performed smoothly and supports seamless movement between high-level comparison and detailed financial inspection.

## **5. Conclusion (5 points)**

This report presented two dashboard designs tailored to the distinct analytical needs of WWF activists and data journalists. Both dashboards apply essential visualization principles by using spatial encodings for geographic patterns, line charts for temporal trends, bar charts for magnitude comparisons, and coordinated multiple views to support the workflow of *overview → zoom/filter → details on demand*.

The WWF dashboard emphasizes exploration of global climate impacts, enabling users to investigate regional hazards, compare countries, and obtain detailed ecological information. The Data Journalist dashboard prioritizes clarity in financial and policy-related indicators, supporting efficient comparison between Austria and other countries, discrepancy detection, and relational analysis between subsidies and environmental taxes.

Interactions were intentionally kept simple—primarily selection, clicking, and hovering—to minimize cognitive load while preserving expressive analytical capability. The main tradeoffs concern the restriction to single-country comparisons and variations in data completeness across indicators.

# Appendix

User group: **Activists from WWF:**

1- Ideation

## General Goal:

Support WWF activists in:

- Investigating climate-impact severity across world regions (A1).
- Ranking countries by chosen climate-change metrics (A2).
- Retrieving detailed information for a single country (A3).

## Datasets used:

- Dataset 14: Climate-related Disaster Frequency
- Dataset 23: Annual Surface Temperature Change
- Dataset 25: Change in Mean Sea Levels

## Early ideas (sketch-level reasoning):

- World map with hazard intensity encoded in color → click country → details.
- Dropdown-based selection for users who prefer direct lookup instead of geographic navigation.
- Pie chart to summarize disaster-type distribution; maybe expandable into a detailed time-series view.
- Temporal comparison using small multiple line charts (temperature, disasters, sea-level).
- Ranking interaction: metric selection → bar chart updates.
- Alternative layout using one combined multi-line chart instead of three separate ones.
- Alternative detail view showing last 5 years of a chosen metric, each bar comparing country value to global mean.
- Sankey diagram for disaster-type distribution instead of pie chart (more expressive for flows).
- Pop-up vs inline detail views depending on screen clarity.
- Static map vs dynamic choropleth depending on performance and clarity.

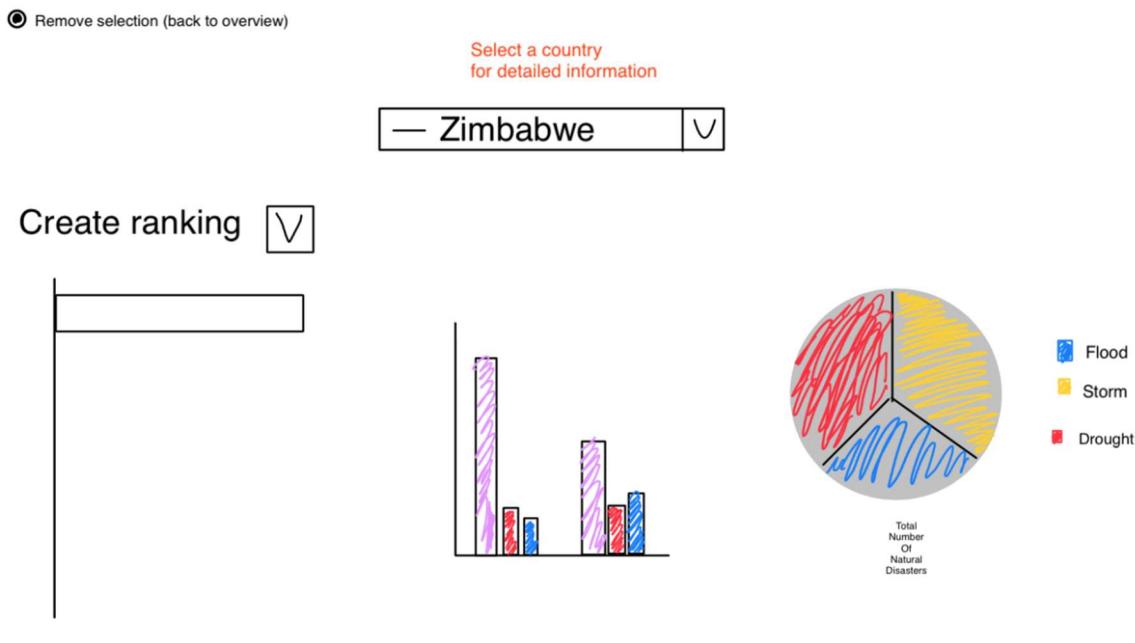
## Potential interaction mechanisms:

- Clicking pie sectors → open detail panel.
- Hover tooltips for temporal precision.
- Country selection either on map or dropdown.
- Ranking metric toggle using dropdown or by clicking chart titles.

**Core interaction model:**

Country selection happens through a central dropdown. The map is not the primary view.

Pie chart acts as a gateway to a secondary detail view (pop-up).

**Layout Description:****Views & Functions:****1. Country Selection Dropdown (Center)**

- Primary control element.
- User selects one country.
- All views refresh accordingly.

**2. Pie Chart — Disaster-Type Distribution**

- Shows share of flood, storm, drought, etc. based on Dataset 14.
- Clicking a pie slice opens a pop-up view containing a line chart showing the time series for that specific disaster type.
- Serves A1 and A3.

**3. Line Chart Pop-Up (Disaster-Type Over Time)**

- Displays annual counts for the selected disaster type.
- Supports A3 (detail retrieval).

**4. Ranking View (Selectable Metric)**

- Dropdown above chart allows choosing ranking metric:
  - Disaster total
  - Temperature change trend
  - Sea-level change
- Bar chart displays top countries accordingly.
- Supports A2.

**5. Multi-bar Temporal Comparison Chart**

- Three bars per year (for example) representing different climate indicators.
- Quick comparison for A1.

**Strengths:**

- Highly controlled interaction flow (dropdown first).
- Pie-chart popup provides clean progressive disclosure.

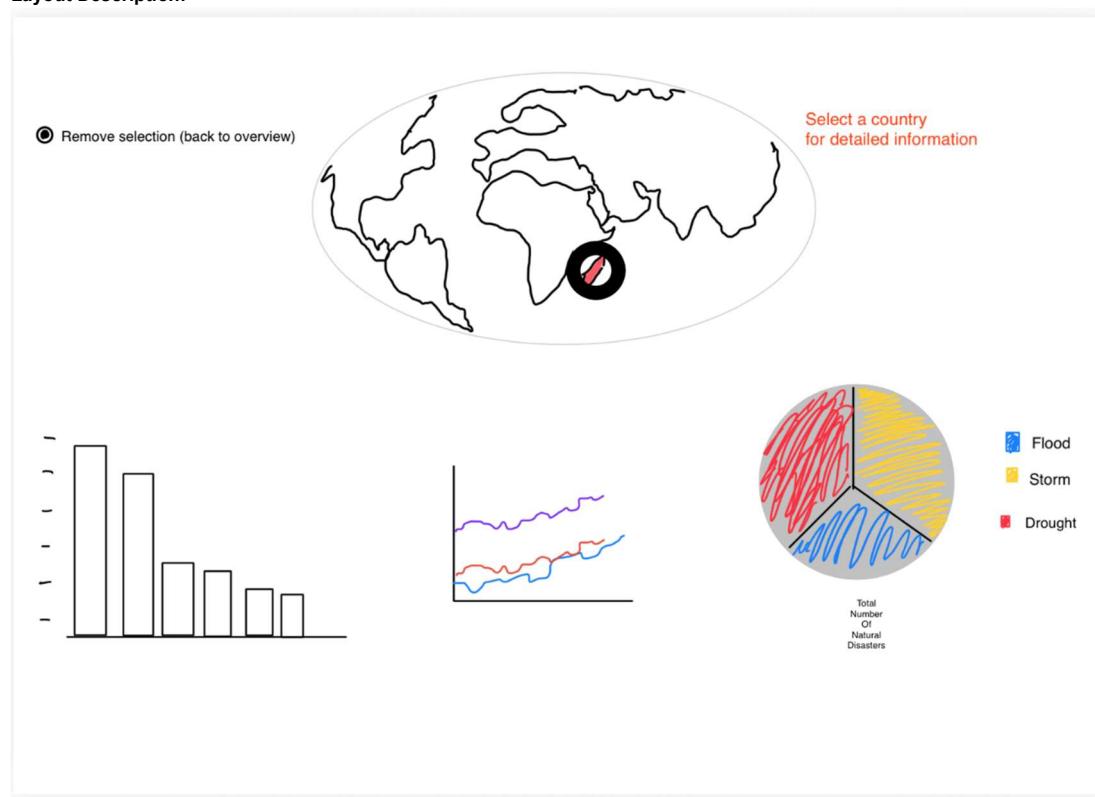
**Weaknesses:**

- Heavy reliance on dropdowns (which is penalized unless justified).
- Pop-ups are discouraged unless strictly necessary.

**Interaction model:**

User selects a country from a **static, non-animated world map**.

Temporal information is consolidated into a single multi-line chart to reduce space.

**Layout Description:****Views & Functions:****1. Static World Map (Top Center)**

- Used ONLY for selecting a country.
- No choropleth; only outlines → simplifies aesthetics.
- Supports A3 (country selection).

**2. Pie Chart with Popup**

- Same as in Idea 1: clicking slice → pop-up time-series for that disaster type.

**3. Combined Multi-Line Chart (Middle)**

- A single view merging:
  - Temperature anomaly (Dataset 23)
  - Disaster frequency (Dataset 14)
  - Sea-level rise (Dataset 25 where available)
- Each metric is a differently colored line.
- Supports A1.

**4. Detailed Last-Years Panel (Left)**

- Provides values for, e.g., the last 5 years of the selected metric.
- Bars compare:
  - Country value
  - Global value
- Supports A3.

**5. Ranking View (Left-Lower Corner)**

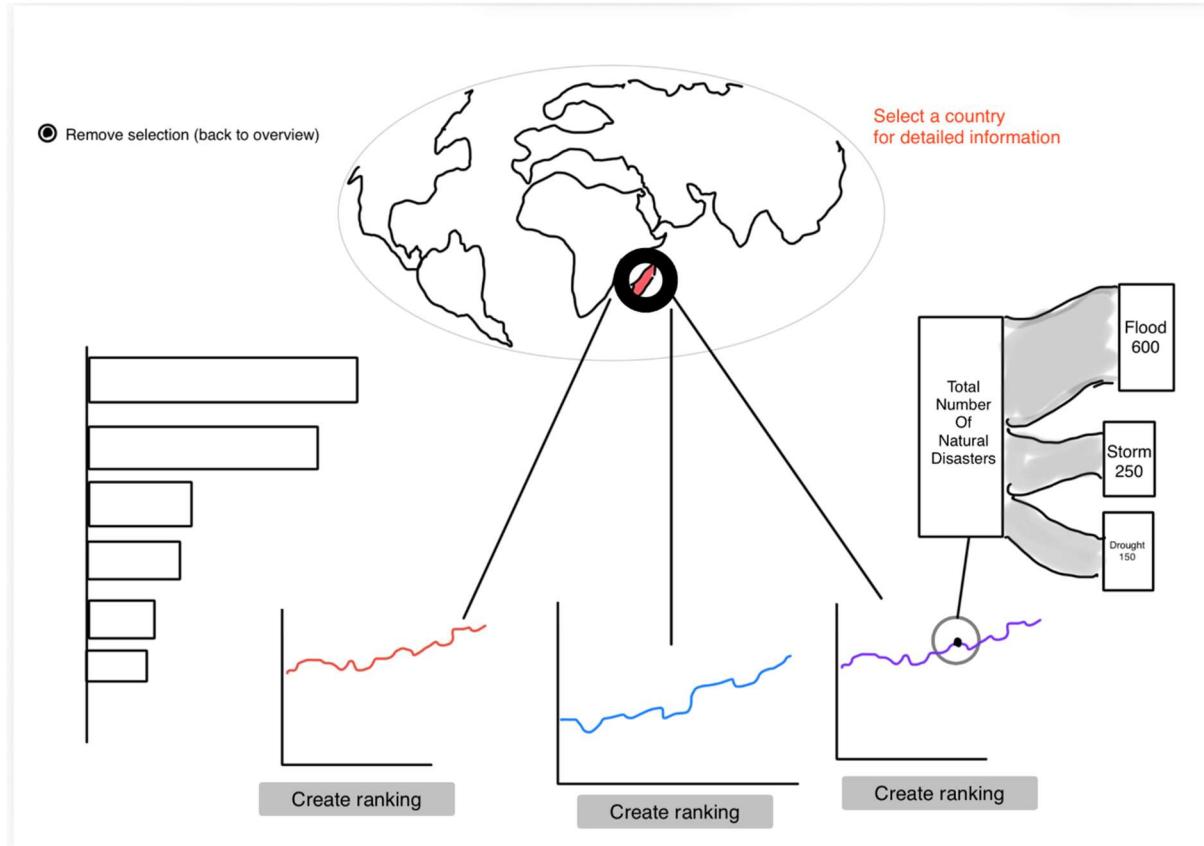
- Similar to Idea 1 but placed more prominently.
- Supports A2.

**Strengths:**

- Combined line chart simplifies view organization.
- Detailed last-years panel offers immediate recent-context insight.

**Weaknesses:**

- Combined line chart risks overplotting.
- Still uses a pie chart popup (penalized unless well justified).

**Layout Description:****Views & Functions:****1. Map Overview (Top)**

- Choropleth showing disaster frequency.
- Select a country → entire dashboard switches to detail mode.
- Supports A1, A3.

**2. Three Line Charts (Bottom Row)**

One for each dataset:

- Temperature anomaly (Dataset 23)
- Sea-level rise (Dataset 25)
- Disaster frequency (Dataset 14)

**Interactions:**

- Clicking a chart title sets ranking metric.
- Clicking a point in the disaster chart updates the Sankey distribution for that year.

Supports A1, A2, A3.

**3. Ranking View (Left)**

- Vertical bar chart showing Top 5 + selected country.
- Supports A2.

**4. Sankey Diagram (Right)**

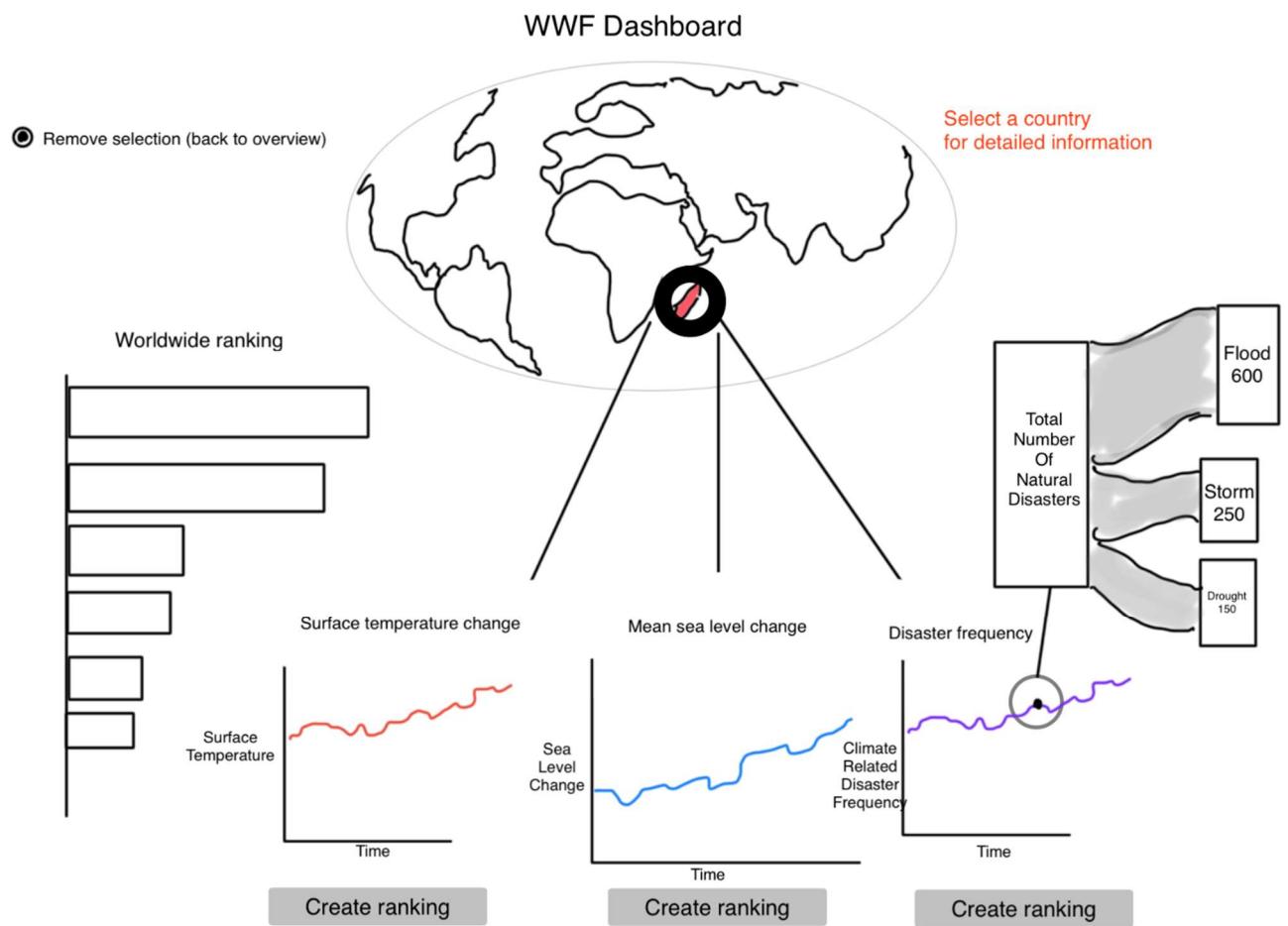
- Encodes disaster-type distribution for the selected country.
- Strength over pie: can show proportions and flows clearly.
- Updates when a new year is selected in the disaster line chart.
- Supports A3.

**Strengths:**

- Fully avoids pop-ups or dropdown dependency.
- Uses small multiples for temporal transparency.
- Uses Sankey instead of pie chart for better categorical comparison.

**Weaknesses:**

- Requires more screen space.
- Three line charts might overwhelm naive users (but activists are expert-level users).



User Group **Data Journalists**:

1- Ideation

**Goal of Data Journalists:**

- Compare Austria to other countries using climate and policy indicators.
- Inspect discrepancies between environmental taxes and expenditures.
- Identify contradictions between fossil fuel subsidies and environmental taxes.  
*(Matches the domain tasks J1–J3 in your A4 report.)*

**Datasets used:**

- **Dataset 04:** CO<sub>2</sub> emissions
- **Dataset 07:** Environmental taxes
- **Dataset 08:** Environmental protection expenditures
- **Dataset 09:** Fossil fuel subsidies
- **Dataset 14:** Climate-related disaster frequency
- **Dataset 23:** Surface temperature change
- **Dataset 25:** Mean sea-level change

**Early conceptual sketches / idea fragments:**

- A world map colored by a **climate indicator score** (composed of CO<sub>2</sub> emissions, temperature anomaly, disaster frequency, sea-level trend).
- Journos select a country on map → see Austria vs. that country.
- Paired line charts comparing Austria vs selected country for taxes/expenditures/temperature/CO<sub>2</sub>.
- Donut or bar breakdown for tax or expenditure categories upon clicking a time-series point.
- Scatterplot showing fossil fuel subsidies vs environmental taxes (Austria highlighted).
- Combined “bar relation view” comparing subsidy/taxation difference for many countries.
- Option: one large scatterplot (similar to final concept in A4) + smaller disaggregated indicator charts.
- Idea of using two-level detail:
  - Overview (map + scatterplot)
  - Detail (country-specific trends + breakdown distributions).

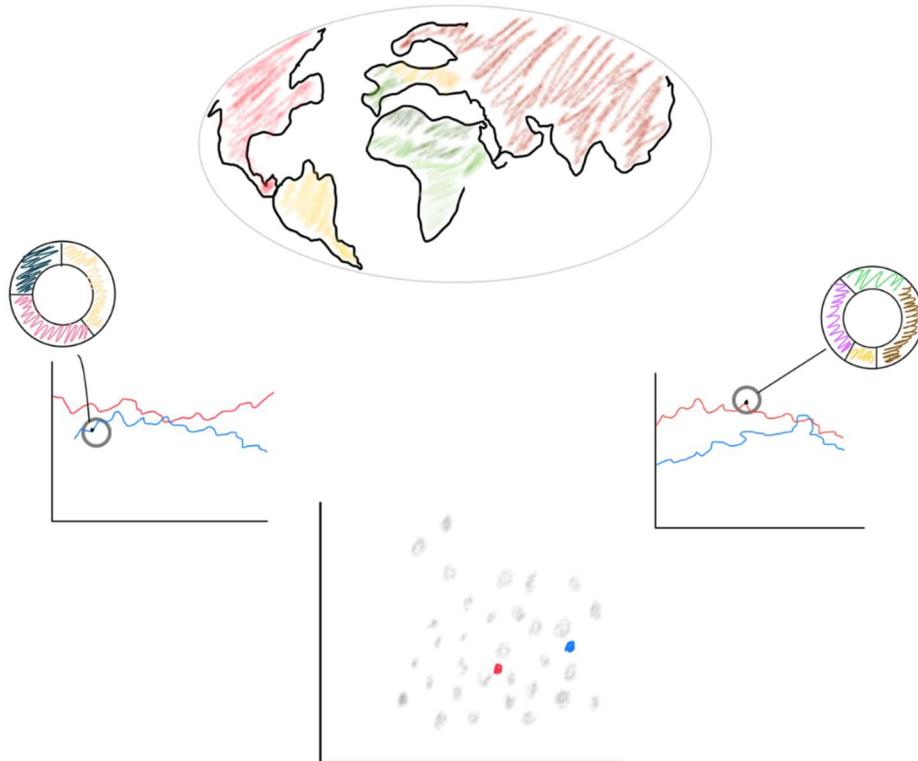
**Selection mechanisms:**

- Map-based selection (color-coded by climate score).
- Alternative: dropdown; but avoided unless necessary.
- Clicking a time-series point opens distribution view (tax or expenditure categories).

**Temporal considerations:**

- Map shows only **latest available year** to avoid clutter.
- Line charts show full historical evolution.

Choose a country to compare with Austria



#### Concept Summary:

A color-coded climate-score map allows quick identification of countries with notable climate or policy patterns. Line charts flank the map, comparing Austria with any selected country. Each line chart links to a donut-chart breakdown. A scatterplot at bottom matches the one in the main dashboard.

#### 1. Climate Score World Map (Top Left)

- Color scheme = climate score derived from: CO<sub>2</sub> (04), temperature (23), sea-level (25), disaster frequency (14).
- Shows latest year only.
- Selection → updates all views.
- Supports J1.

#### 2. Line Chart: Environmental Taxes (Left)

- Austria vs selected country.
- Clicking a point → shows donut chart with taxation distribution (energy, transport, resources, etc.).  
Uses dataset 07 and its subcategories.  
Supports J2.

#### 3. Line Chart: Environmental Expenditures (Right)

- Austria vs selected country.
- Clicking a point → opens expenditure-distribution donut (analogous to taxation).  
Uses dataset 08.  
Supports J2.

#### 4. Donut Chart (Left) — Tax Categories Breakdown

- Shows how the selected year's taxes are distributed.
- Temporary pop-up view.

#### 5. Donut Chart (Right) — Expenditure Categories Breakdown

- Same idea but for expenditures.

#### 6. Scatter Plot (Bottom)

- X-axis: fossil fuel subsidies (09).
- Y-axis: environmental taxes (07).
- Austria highlighted (consistent with final dashboard).  
Supports J3.

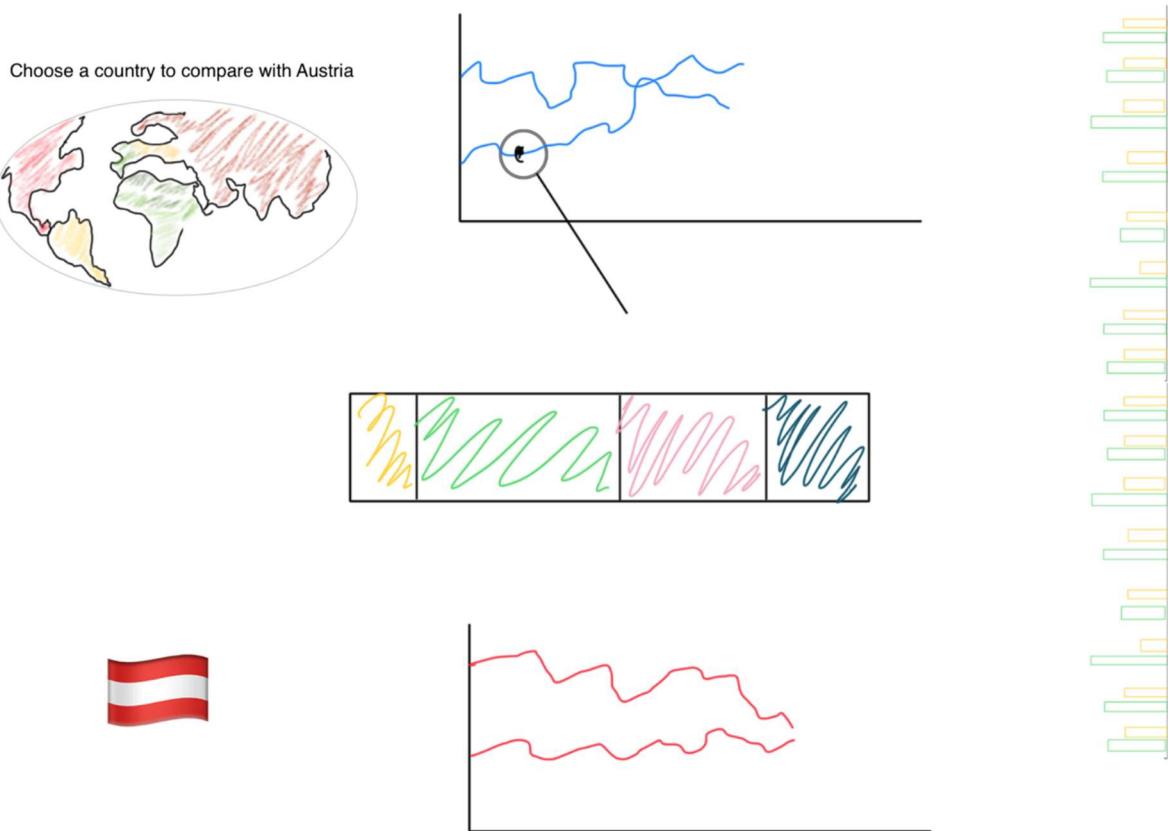
#### Strengths

- Strong separation between fiscal breakdown (donuts), temporal evolution (lines), and global context (map).
- Easy to understand for news audiences.

#### Weaknesses

- Pop-ups may be penalized unless justified.
- Map interpretation depends heavily on climate score transparency.

3- Design 2



**Concept Summary:**

This design keeps the climate-score map but emphasizes temporal comparison: two large line charts (top = selected country; bottom = Austria). A central panel presents distribution of categories based on selected time-series point. Right side shows a combined subsidy/taxation bar chart.

**1. Climate Score Map (Top Center)**

- Same scoring method as Idea 1.
- Displays most recent year.
- User selects comparison country.

Supports J1.

**2. Upper Line Chart (Selected Country)**

- Time series for expenditure (08) and taxation (07).
- Clicking a point triggers update of central distribution bar.

Supports J2.

**3. Lower Line Chart (Austria)**

- Same variables, Austria baseline.
- Visual parallelism allows easy comparison.

Supports J1, J2.

**4. Central Distribution Bar**

- Horizontal stacked bar showing **category distribution** for tax or expenditure of the clicked point (depending on which chart was clicked).
- Represents categories such as energy, transport, waste, etc.

Supports J2.

**5. Combined Subsidy–Tax Bar Chart (Right)**

- Shows two bars per country:
  - Fossil fuel subsidies (09)
  - Environmental taxes (07)
- Easy magnitude comparison.
- Strong complement to scatterplot in Idea 1.

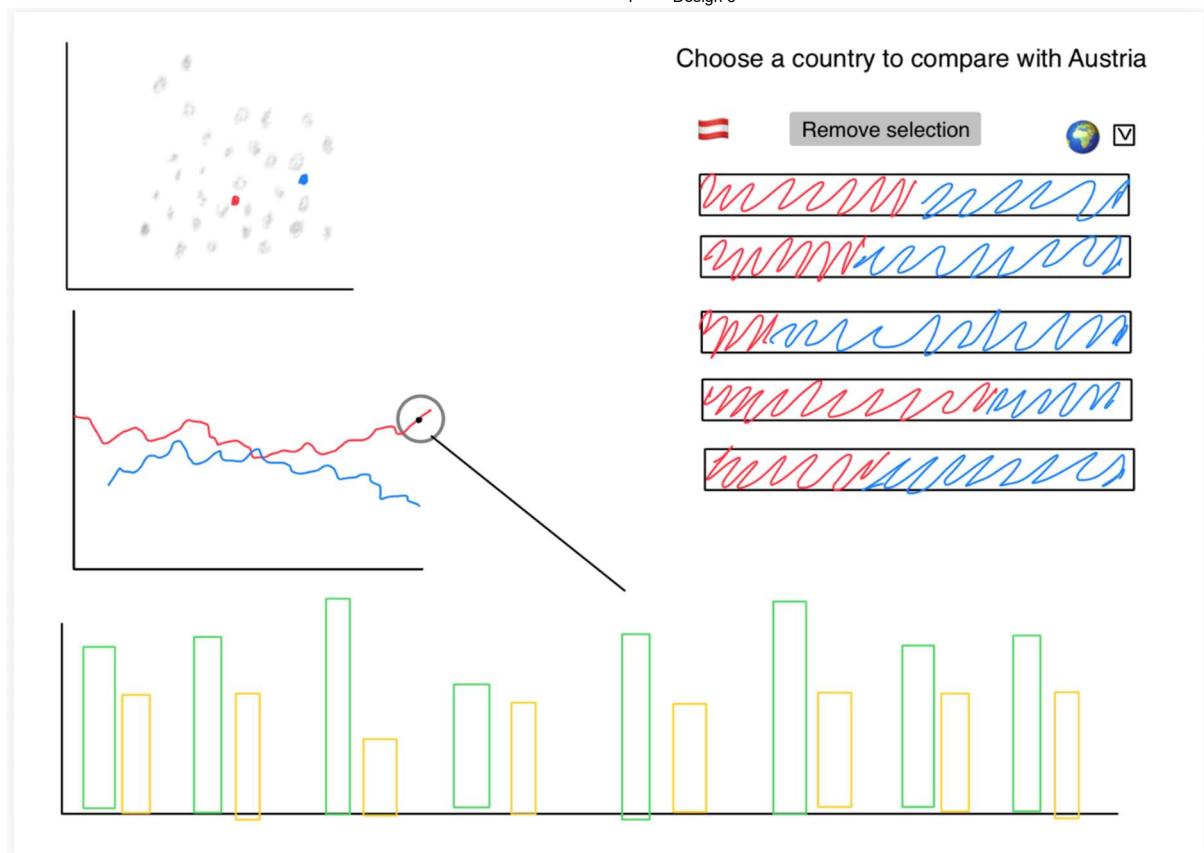
Supports J3.

**Strengths**

- Very clear Austria vs country comparison via two parallel line charts.
- Central distribution panel avoids pop-ups.
- Combined bar chart simplifies relational comparison.

**Weaknesses**

- More space-consuming.
- Lacks scatterplot relational insight unless added below.

**1. Scatter Plot (Top Left)**

- X-axis: fossil fuel subsidies (09).
- Y-axis: environmental taxes (07).
- Austria always highlighted in red.
- Selecting a country updates all other views.

Supports J3.

**2. Indicator Comparison Panel (Top Right)**

- Small multiple line charts comparing:
  - Temperature anomaly (23)
  - Disaster frequency or CO<sub>2</sub> emissions (14 or 04)
  - Optional: sea-level where available (25)
- Red = Austria, blue = selected country (or world average in overview mode).

Supports J1.

**3. Discrepancy Line Chart (Center)**

- Shows (tax – expenditure) over time for Austria vs selected country.
- Selecting a year updates the detailed bar chart.

Uses datasets 07 &amp; 08.

Supports J2.

**4. Taxation vs Expenditure Detail Bar Chart (Bottom)**

- Two bars for selected year: environmental taxes (07) and expenditures (08).
- Updates whenever a time-series point is clicked in the discrepancy chart.

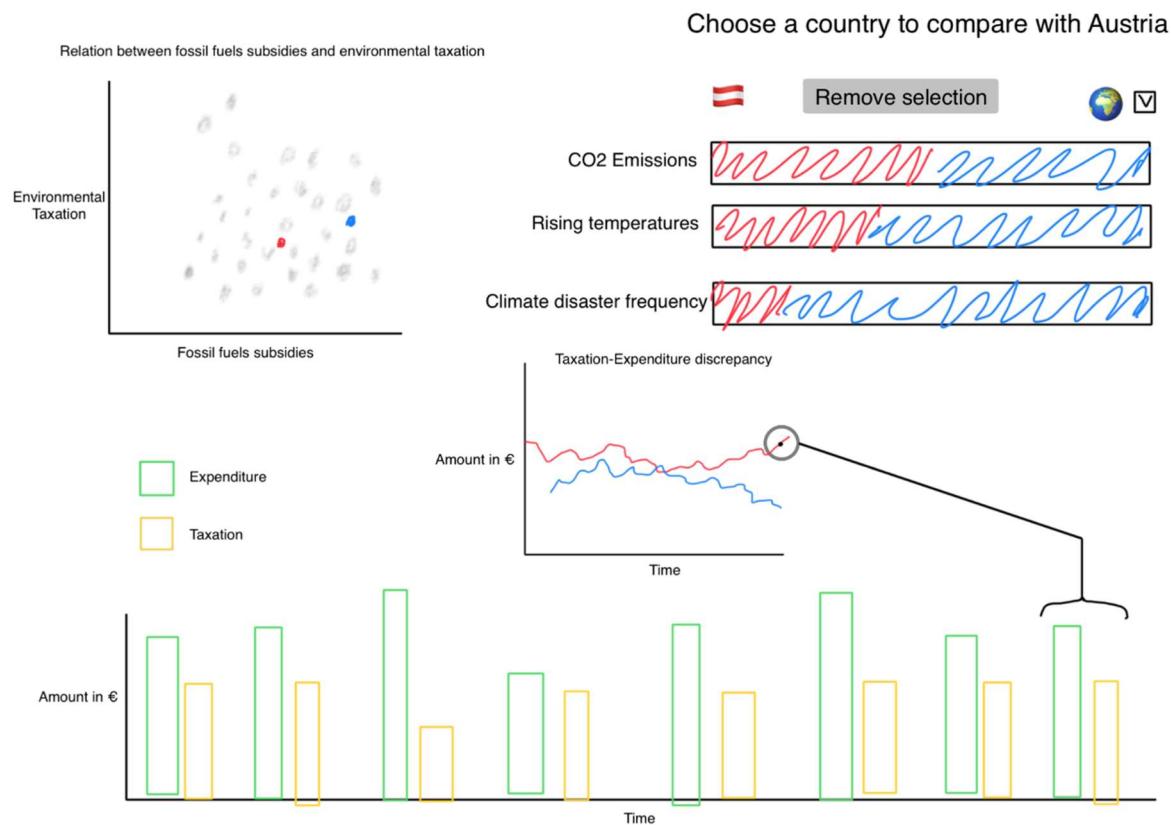
Supports J2.

**Strengths**

- Minimal interaction complexity—ideal for journalists.
- Strong coordination between all views.
- No pop-ups; avoids sliders and dropdowns except country selector.
- Aligns directly with your A4 text and grading guidelines.

**Weaknesses**

- Lacks global map for spatial overview.
- Emphasizes relational/financial analysis rather than broader climate context.



## AI Usage

AI was used in this assignment for exploring Ideas, researching topics, reformatting text and searching chart names