Thesis Defense – 27.09.2023

Space as a Metaphor

Design Guidelines and Evaluation of Map Imitation

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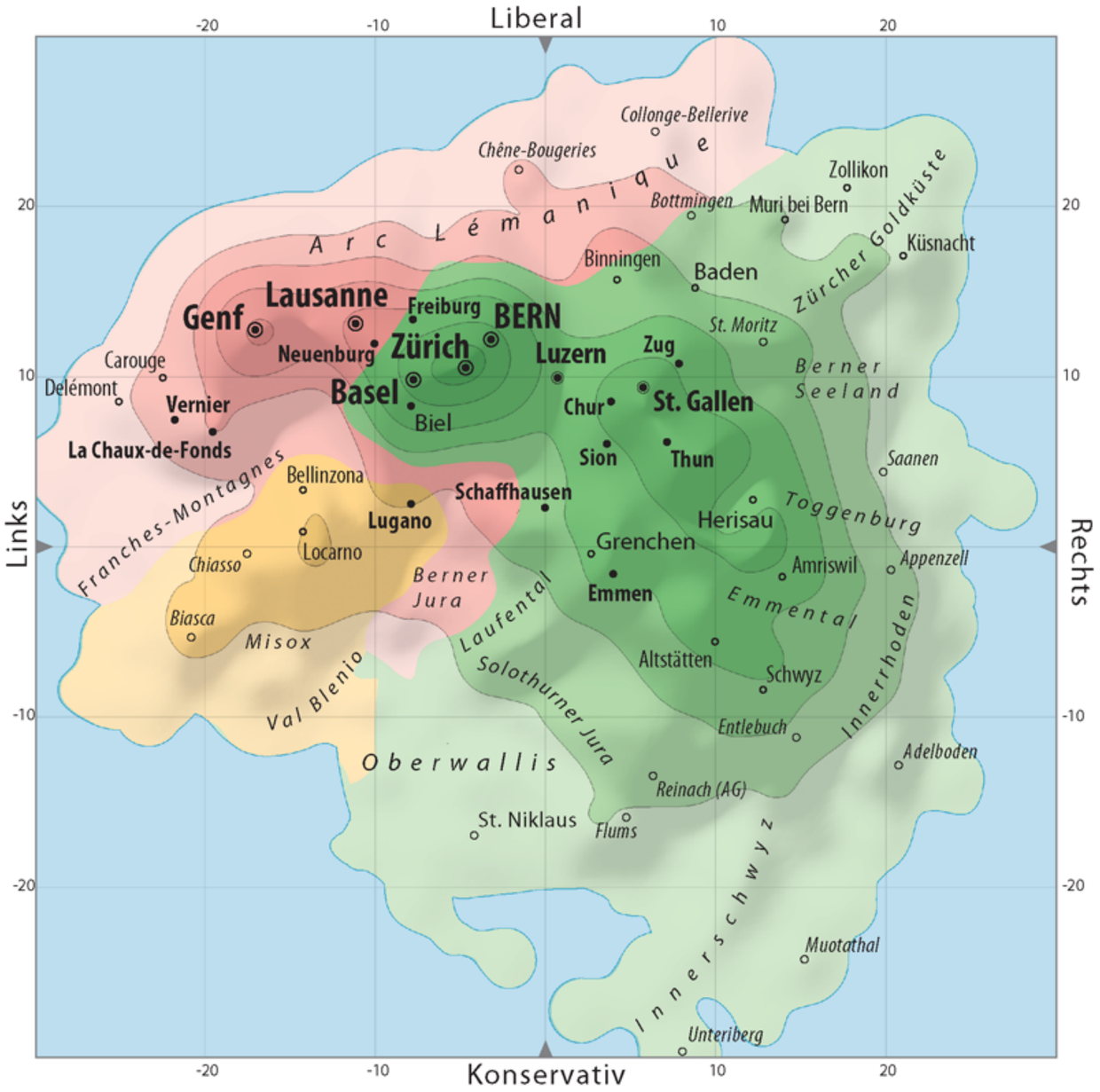
External supervisor: Jethro Lennox (HarperCollins Publishers)
Reviewer: Dr. Yuri Engelhardt (UT)

Motivations



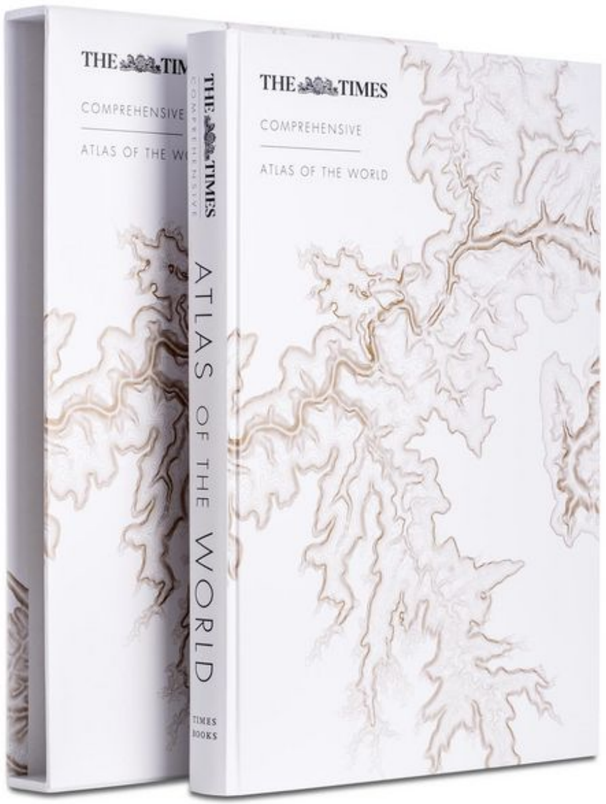
Map of the Swiss political landscape (Hermann & Leuthold, 2003, p. 59)

1. How to make one?

2. What do people think of it?

HarperCollins

3.



4. Climate Crisis

Photo by Matt Palmer on Unsplash

Research Structure

Research Questions

1. What criteria dictate the creation of a commercial data visualization?

2. How can a map imitation be designed?

3. How does the map-likeness of a visualization influence user performance?

Thesis Structure

Introduction (Motivation & Research Questions)

Define ‘Map Imitation’ + Framework

Design

Test

Map Imitation

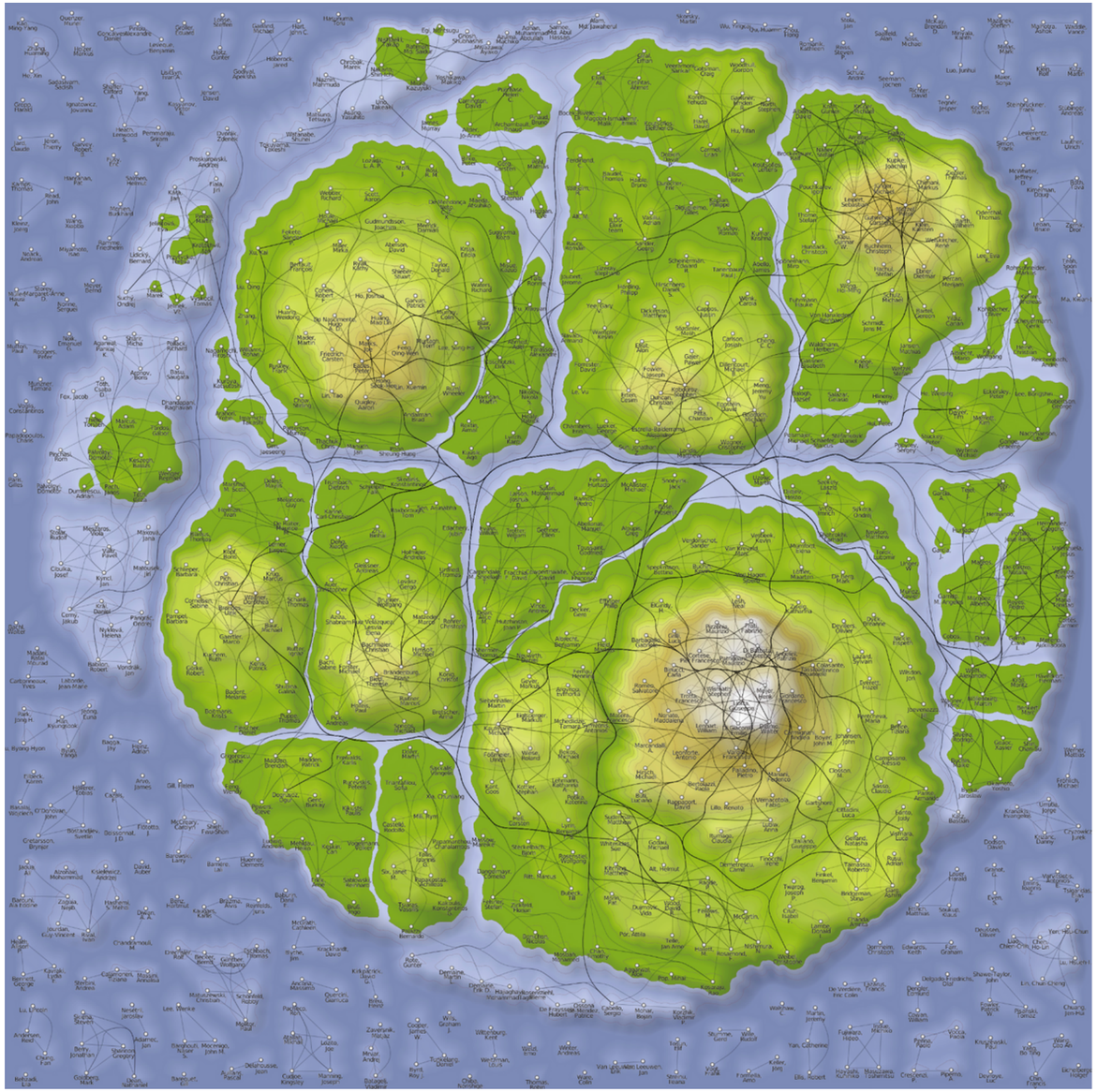
17th & 18th

The Beginnings

Carte de Tendre (Chauveau & Scudéry, 1654)

1990s

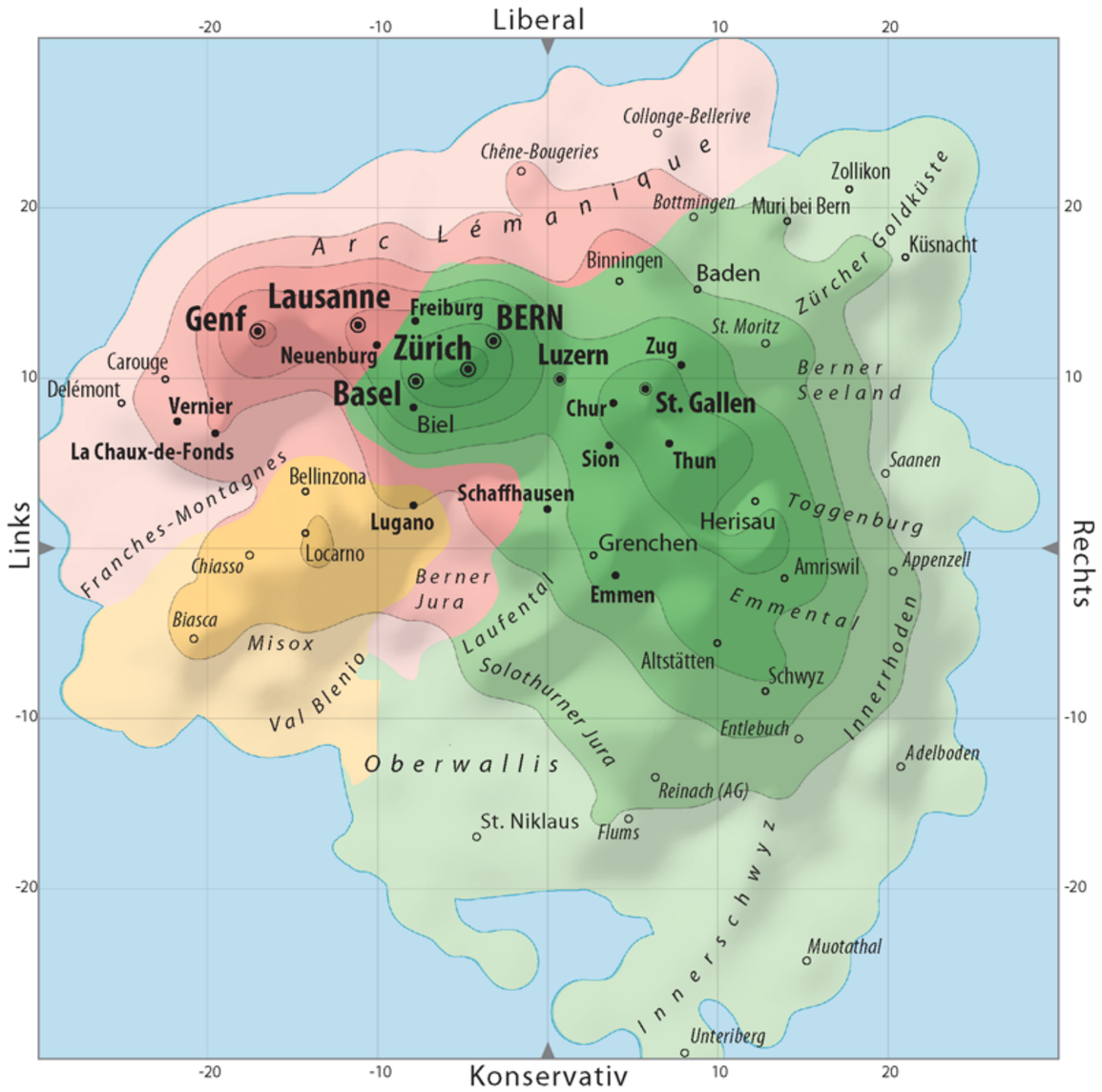
Web: New Challenges



Graph drawing collaboration graph (Gronemann & Jünger, 2013)

21th

Broadening the Realm of Map Imitation



Map of the Swiss political landscape (Hermann & Leuthold, 2003, p. 59)

New Definition

“

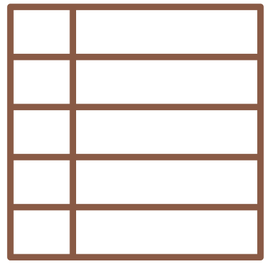
A *map imitation* is a **map-like visualization of non-geospatial data**, or geospatial data, created by plotting individual data items onto **non-geospatial coordinates**, and designed to **resemble a map** using cartographic elements.

Research Questions 1&2

Design Workflow

Preparation

Preliminary Considerations



Data Selection

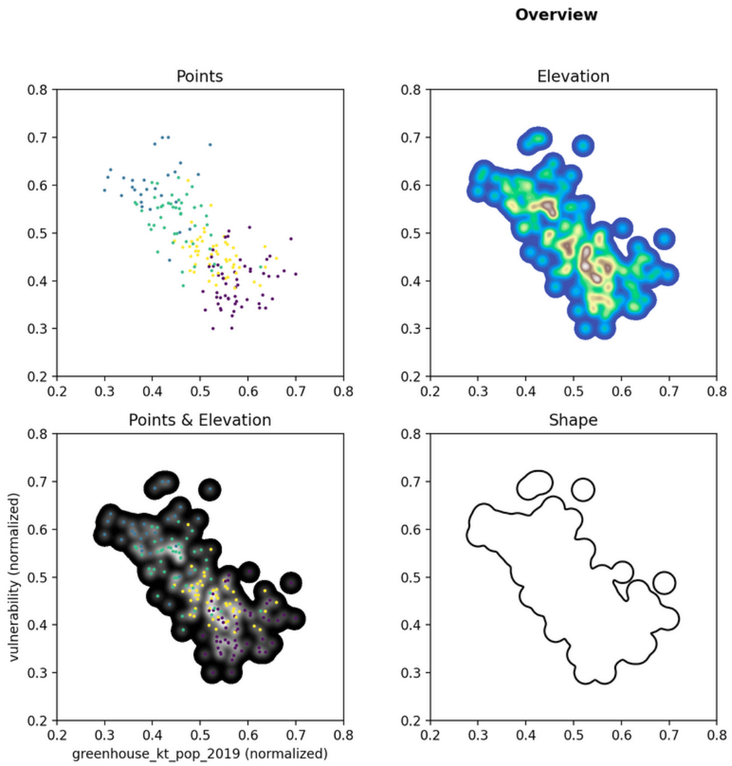
Processing

Position in the Plane

Relief

Ocean

Areas



Sigma : **0.008**

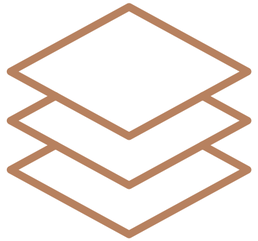
Logarithmic scales :
Horizontal (x): True
Vertical (y): False
Relief (z): True

Horizontal (x) : greenhouse_kt_pop_2019
Min value: 0.000384005
Max value: 0.040880084

Vertical (y) : vulnerability
Min value: 0.255123588
Max value: 0.674057818

Relief (z) : pop_2019
Min value: 47712
Max value: 1407745000

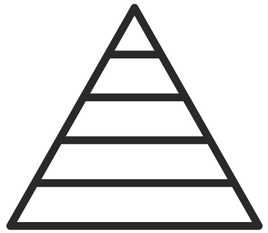
Design



Layering

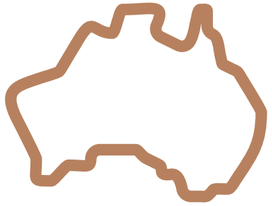
Central Elements

Surrounding Elements



Visual Hierarchy

Company Constraints



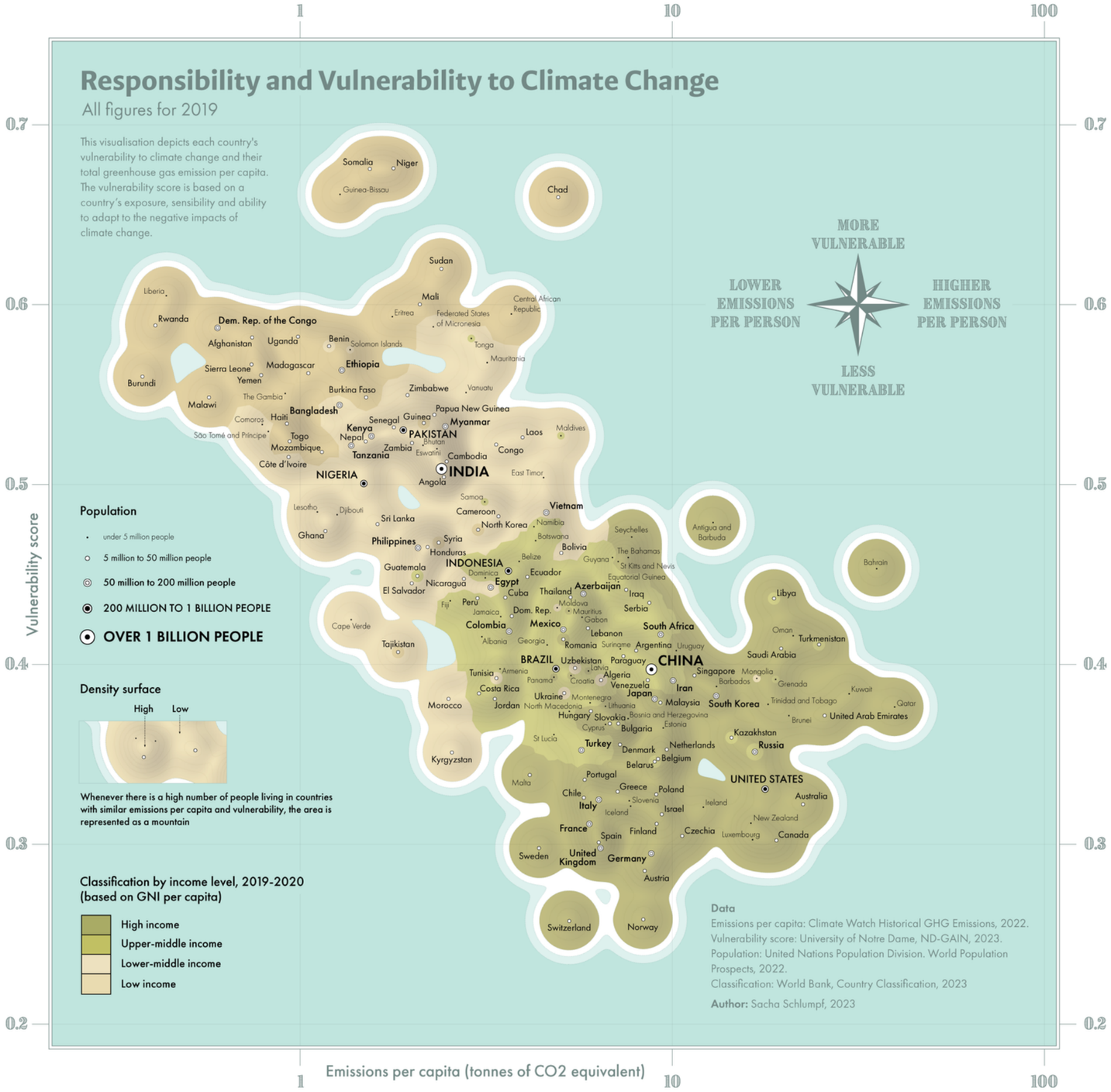
Countries

Graphic Design

Responsibility and Vulnerability to Climate Change

All figures for 2019

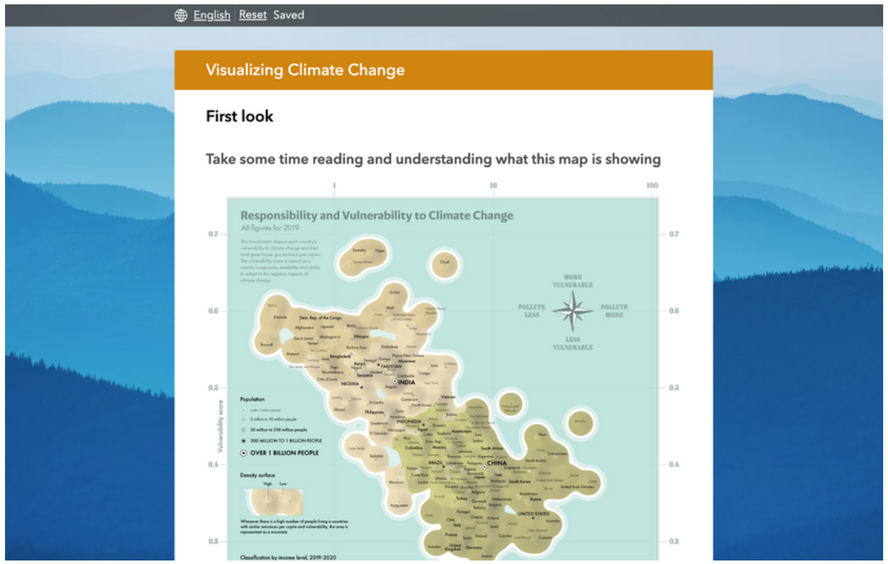
This visualisation depicts each country's vulnerability to climate change and their total greenhouse gas emission per capita. The vulnerability score is based on a country's exposure, sensibility and ability to adapt to the negative impacts of climate change.



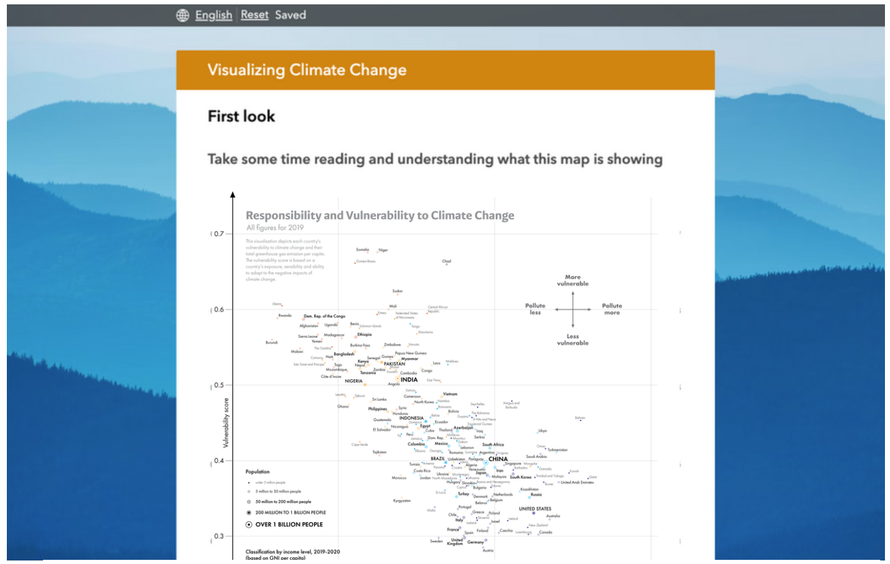
Research Question 3

Surveys

https://url.ch



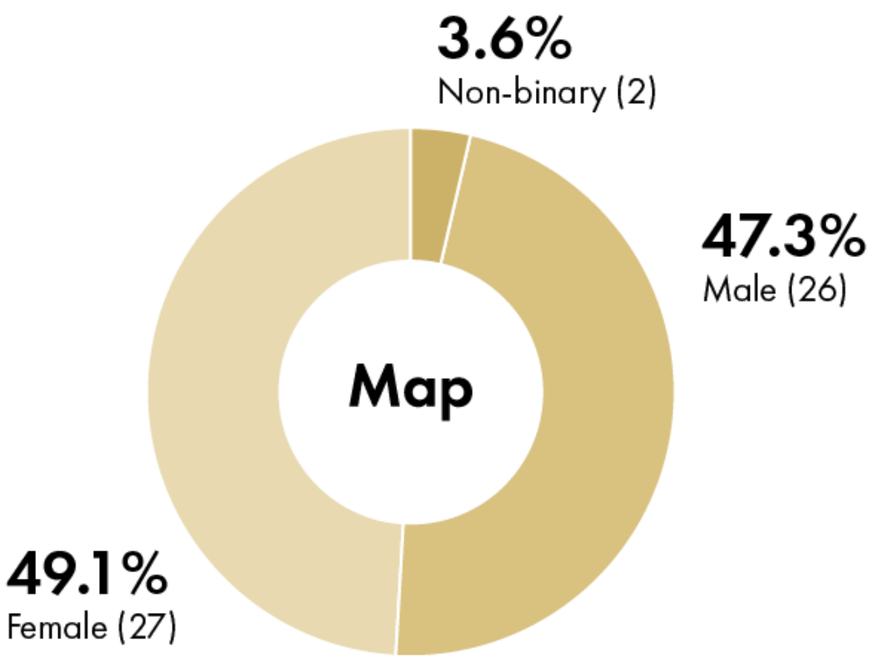
55 participants

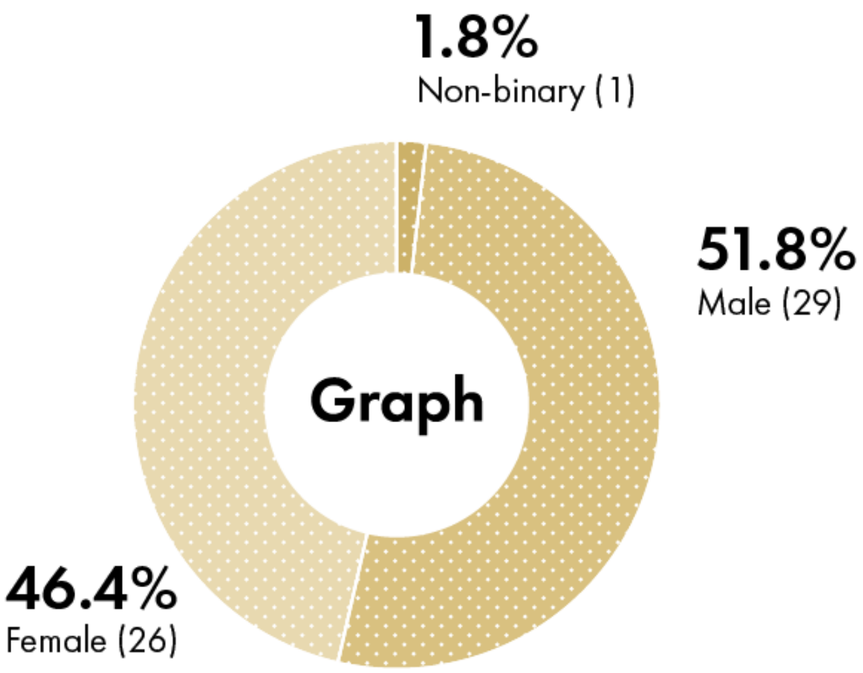


56 participants

Genders

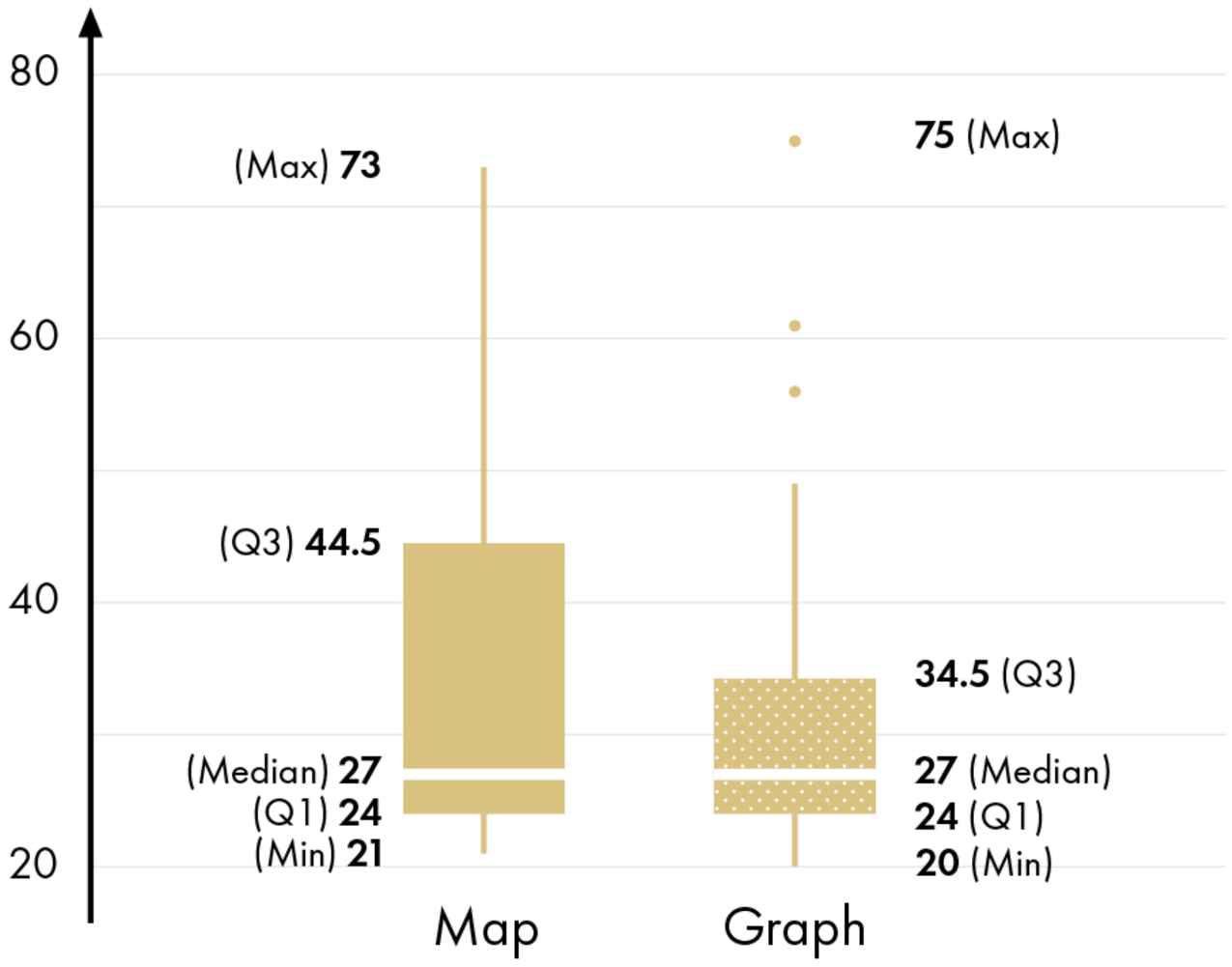
Distribution





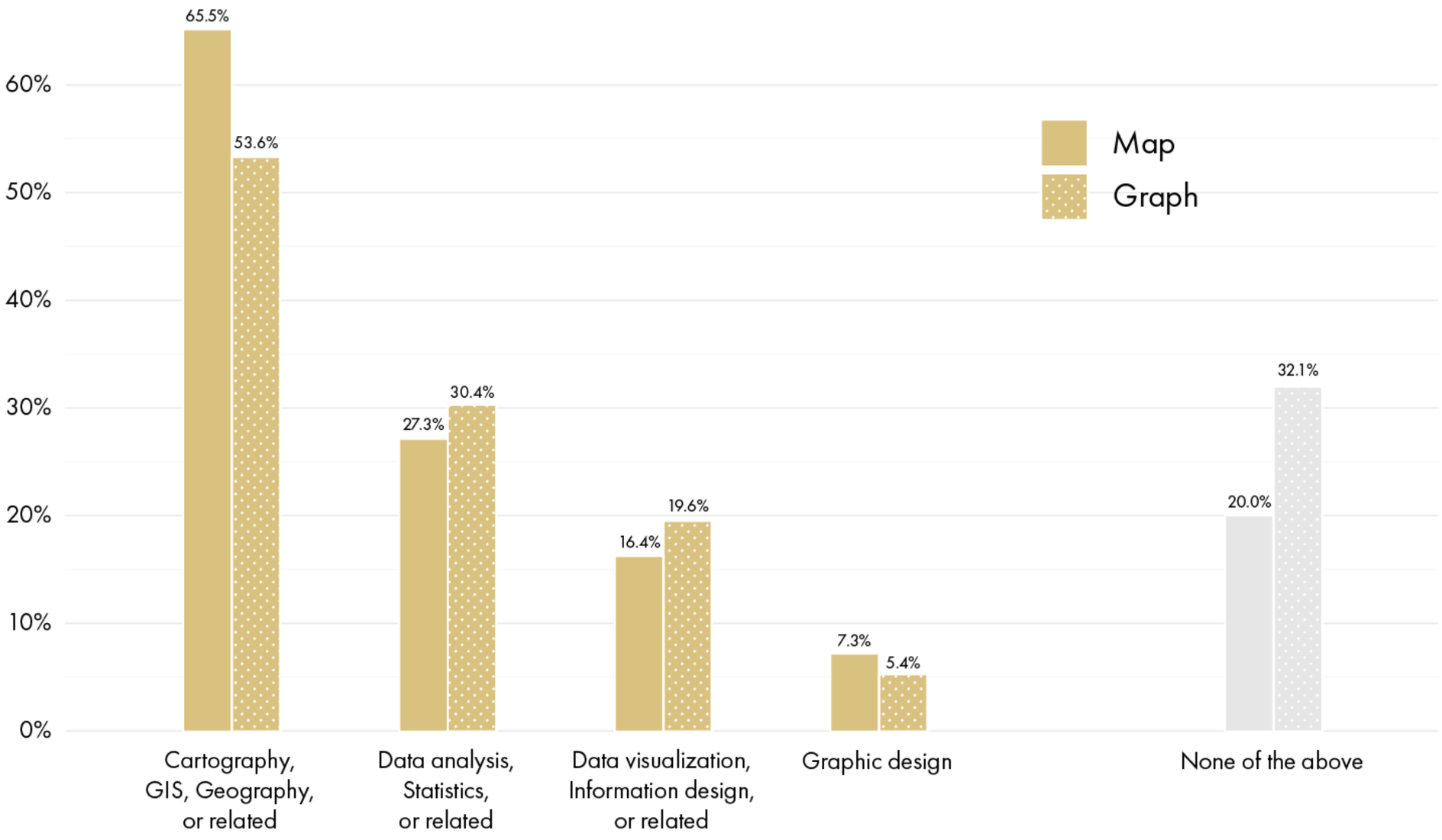
Age

Range and quartiles



Background

Selected fields



Two-Proportion Z-test

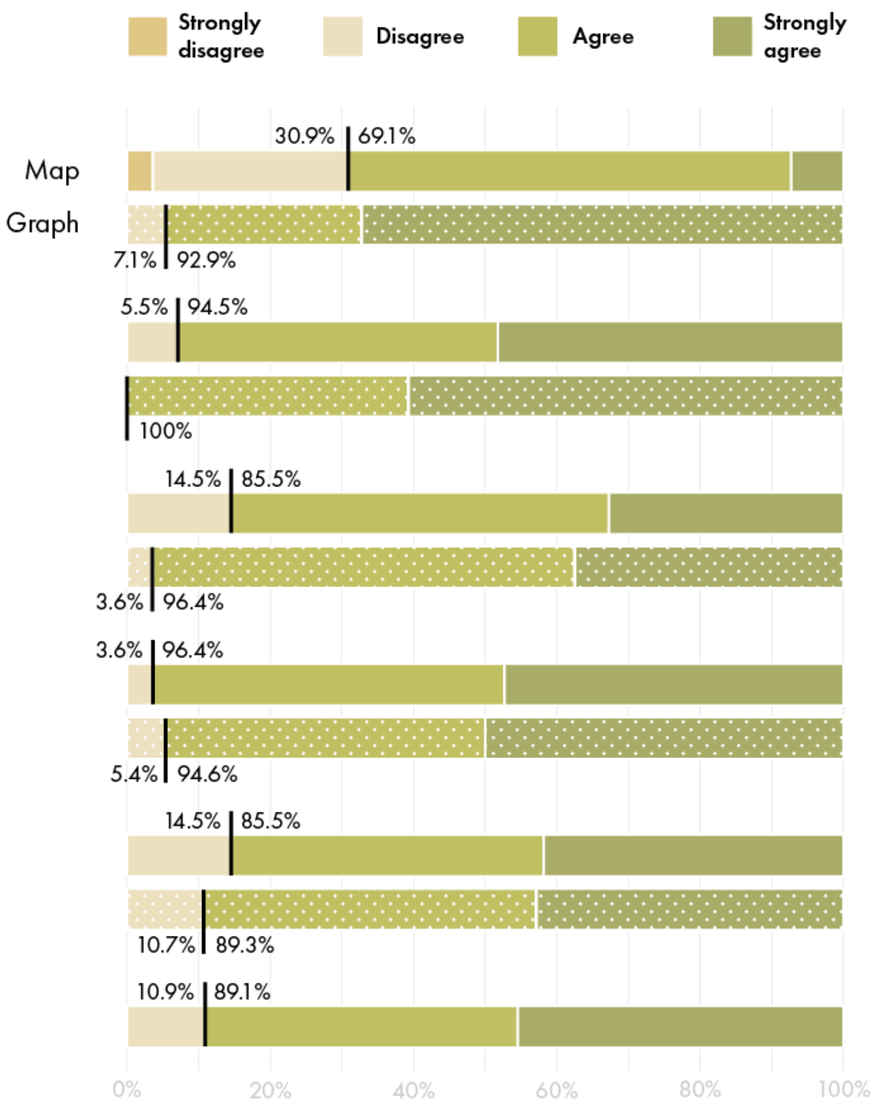
H0: The proportions in the two surveys are equal **($\mu 1 = \mu 2$)**.

H1: The proportion in the Map Survey is higher / lower than in the Graph Survey **($\mu 1 > \mu 2$ or $\mu 1 < \mu 2$)**.

Red = significant difference ($\alpha = 0.05$)

Part A

Distribution of answers



QA.1 "I find the visualization easy to understand."

QA.2 "I find the way the information is represented on this visualization interesting"

QA.3 "The visualization helped me to understand the represented topic better."

QA.4 "If I had a book with this visualization printed large, I'd want to spend some time looking in detail at everything this graph shows."

QA.5 "I like the design of the visualization (colours, fonts, etc.)"

QA.6 "I like that the countries are arranged differently than in a conventional map."

Question A.7

"Is there anything you don't understand on this visualization? If yes, what?"

Map

30.9% (17)

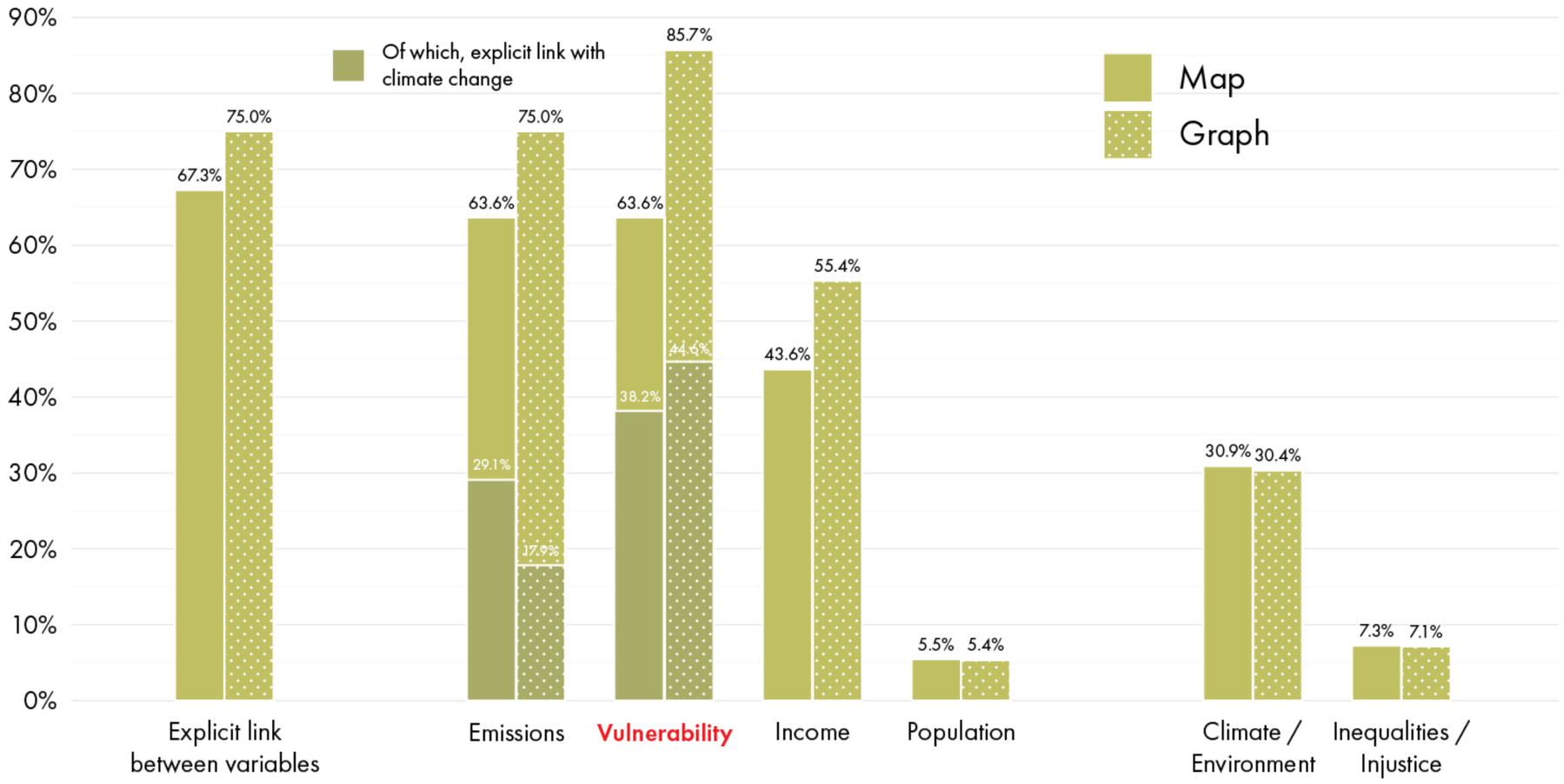
Graph

5.4% (3)

Question B.1

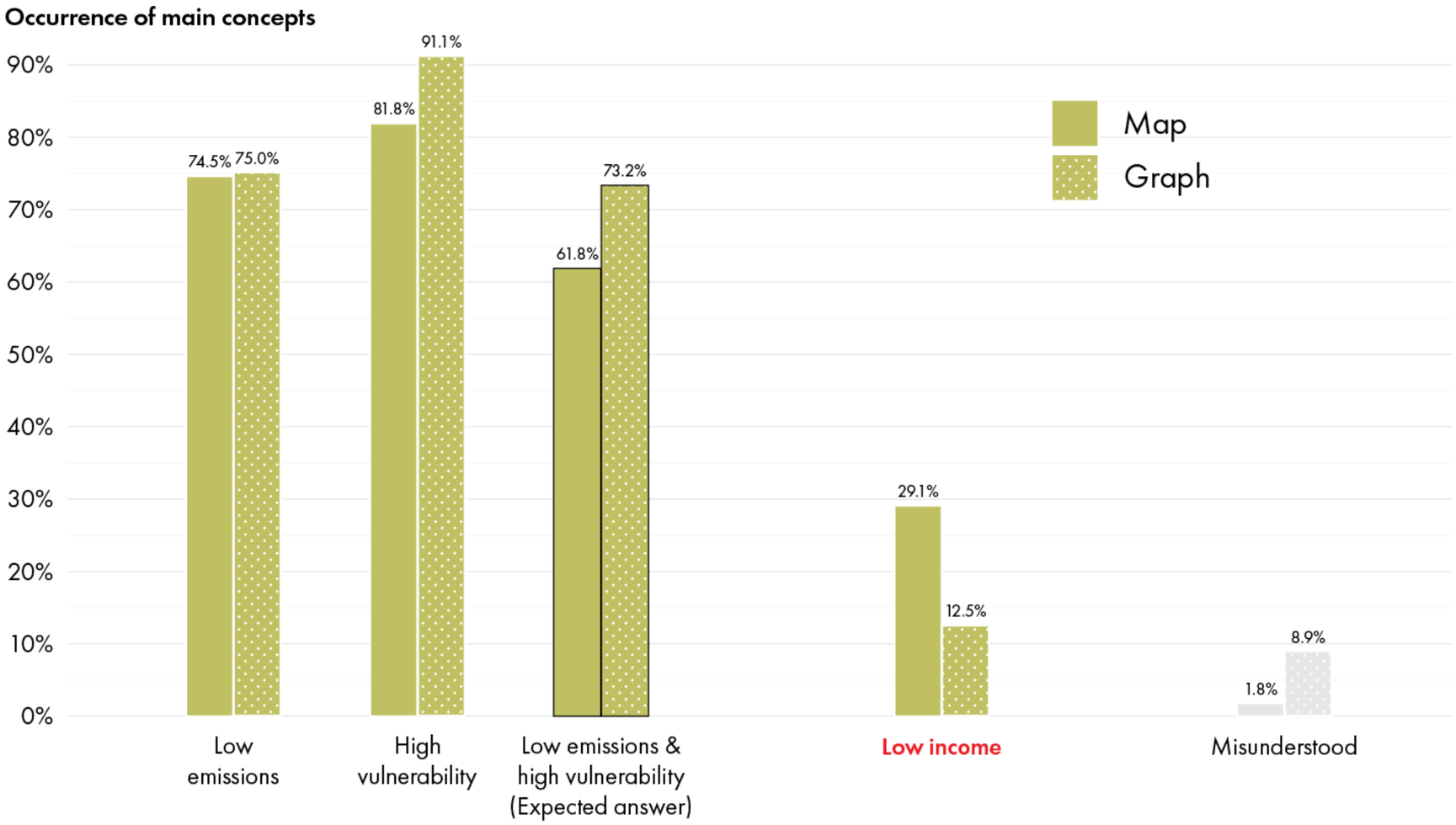
"In one sentence, what message do you take away from this visualization?"

Occurrence of main concepts



Question B.2

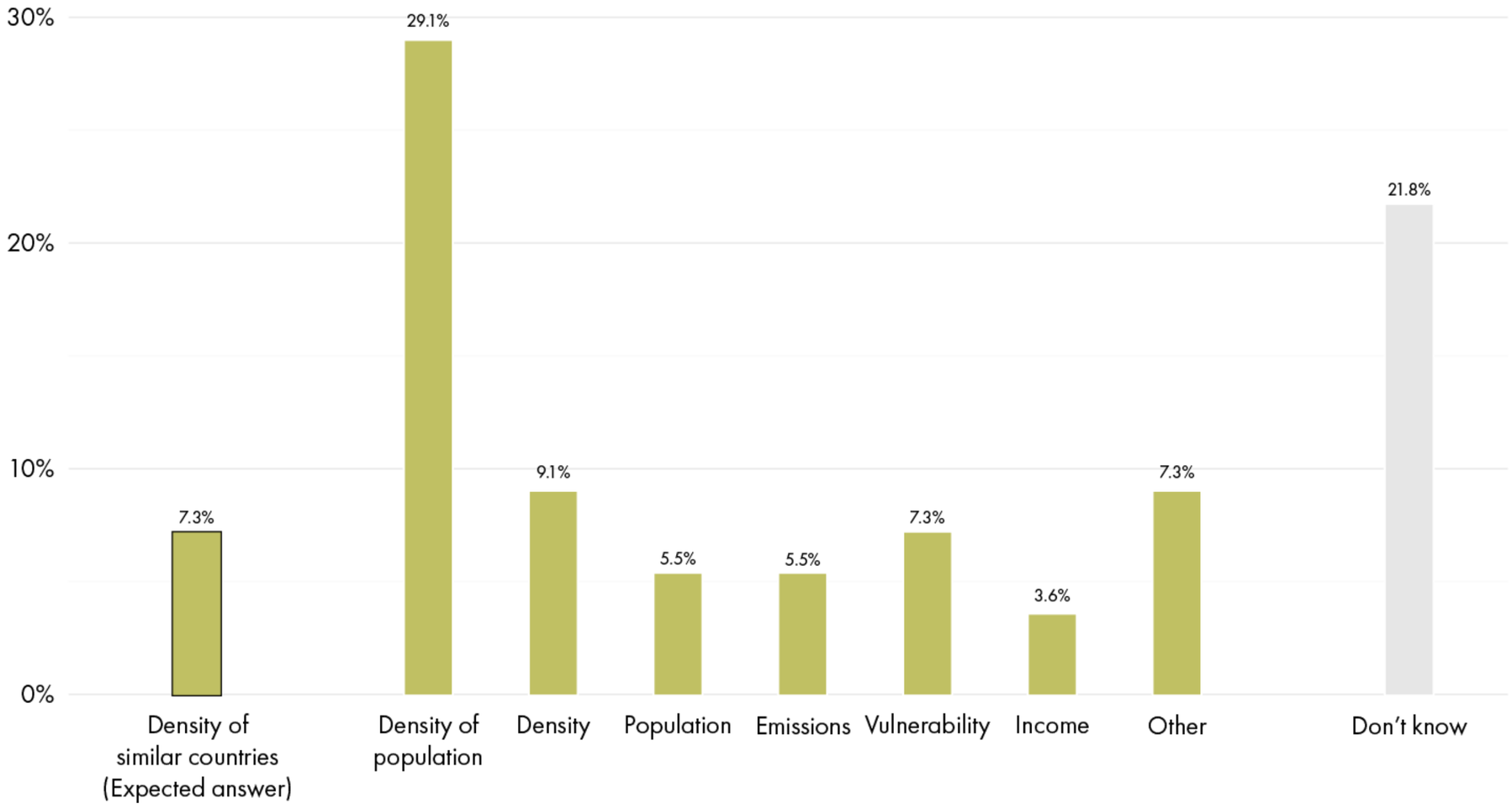
"If a country is on the top-left of the visualization, what does that mean?"



Question B.5

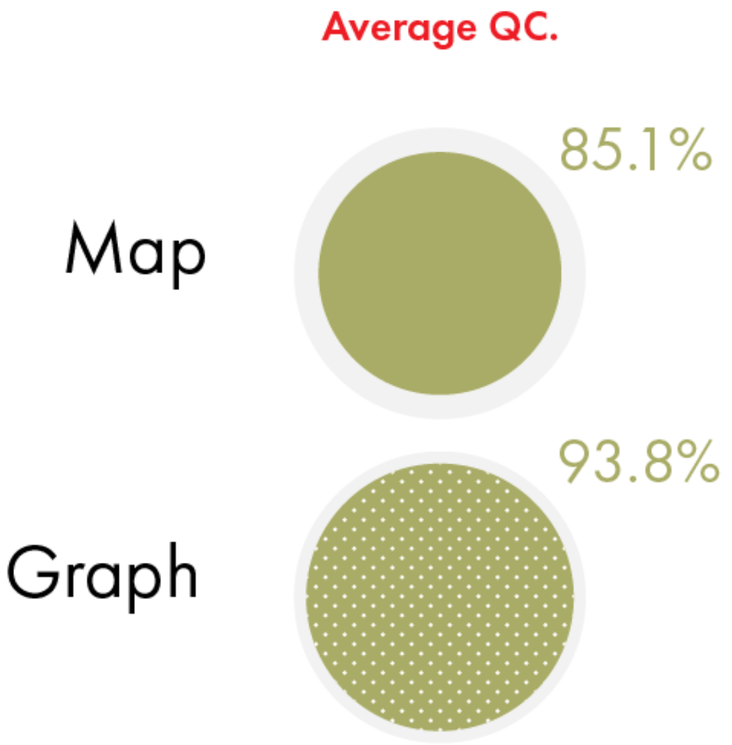
"What does the relief represent?"

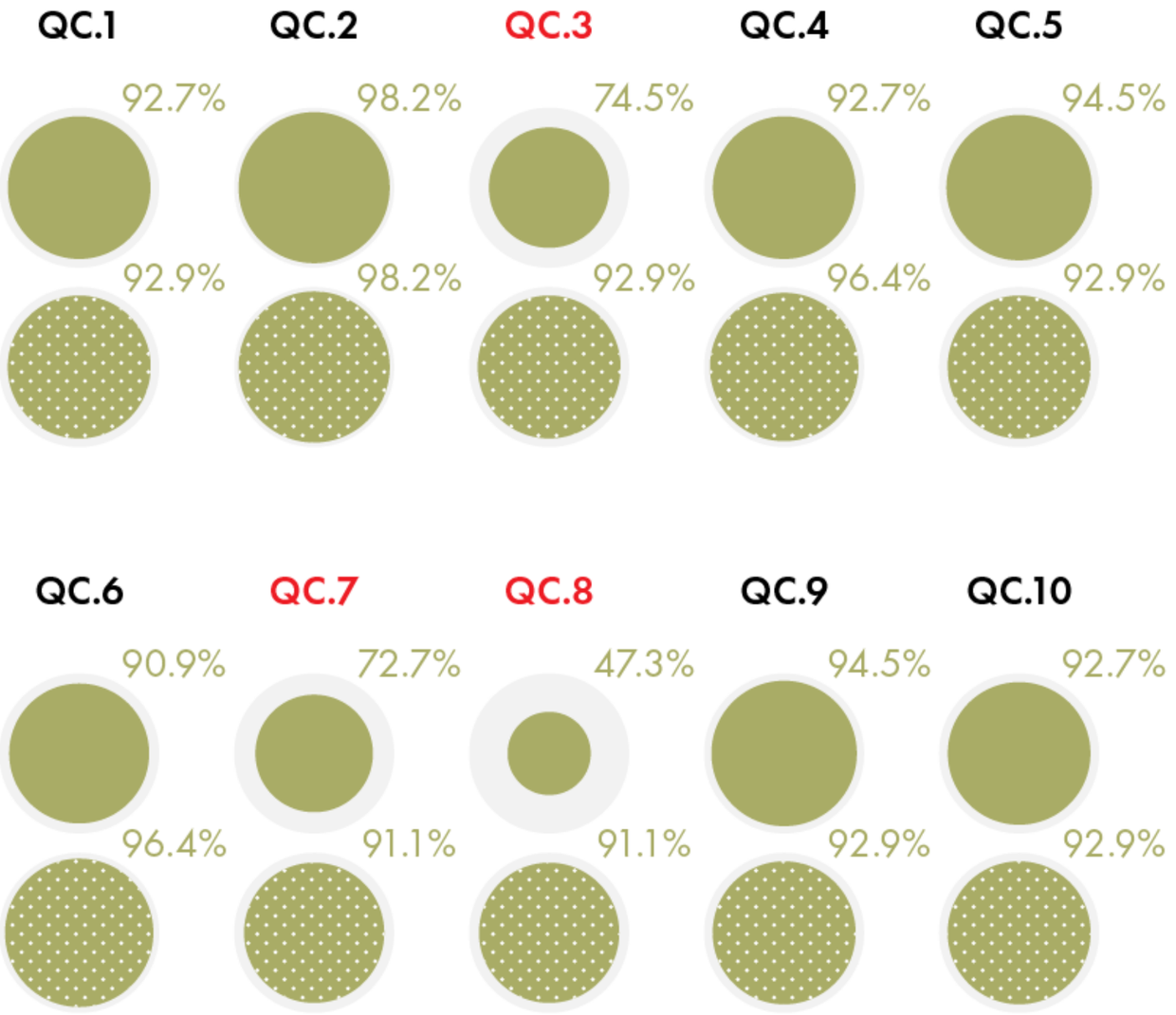
Occurrence of main concepts



Part C

Proportion of correct answers





Main Findings

1. The map imitation is more difficult to understand and leads to more errors than the graph

2. The message retained depends on the visualization type

3. The relief is superfluous and confusing

Limitations

Screen

Knowing the author (me)

Sample bias

Methodology

Conclusion

RQ.1

What criteria dictate the creation of a commercial data visualization?

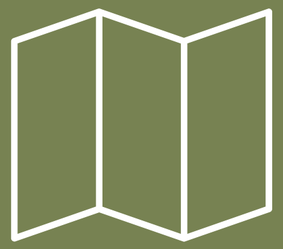
RQ.2

How can a map imitation be designed?

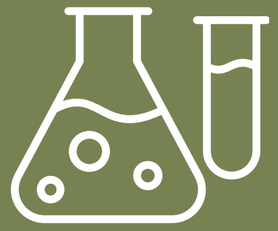
RQ.3

How does the map-likeness of a visualization influence user performance?

Future Research



Other map imitations



Other types of user studies

Thank You!

Maps References

Hermann, M., & Leuthold, H. (2003). Atlas der politischen Landschaften: Ein weltanschauliches Porträt der Schweiz. vdf Hochschulverlag AG.

Chauveau, F., & Scudéry, M. de. (1654). Carte de Tendre [Map]

Gronemann, M., & Jünger, M. (2013). Drawing Clustered Graphs as Topographic Maps. In W. Didimo & M. Patrignani (Eds.), Graph Drawing (Vol. 7704, pp. 426–438). Springer Berlin Heidelberg.

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