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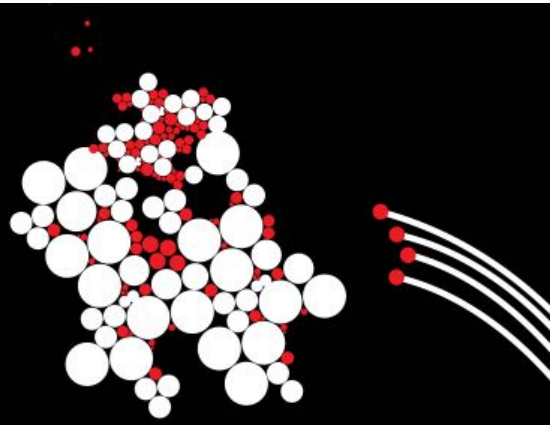
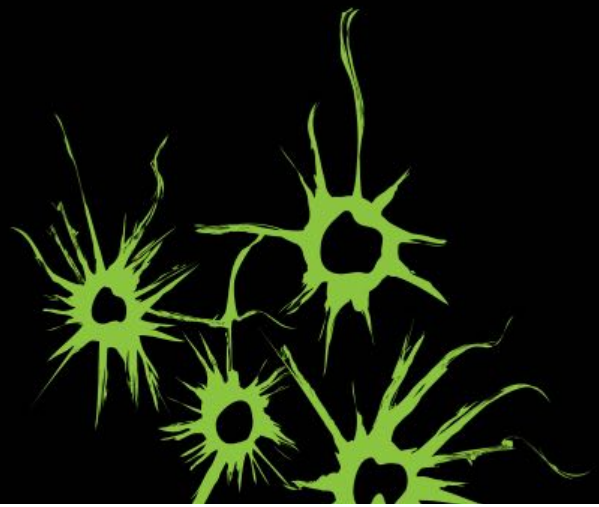


Using effective visualization in maps and diagrams to better understand the SDGs

Menno-Jan Kraak



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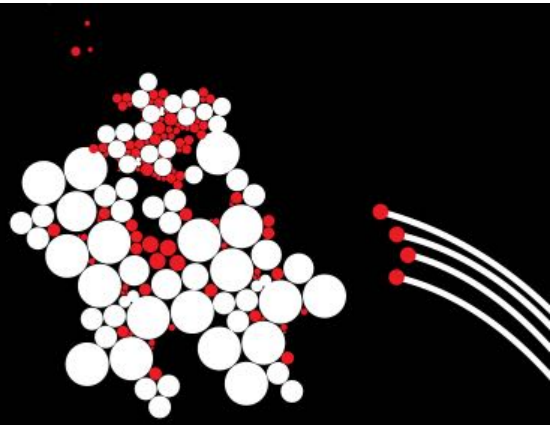
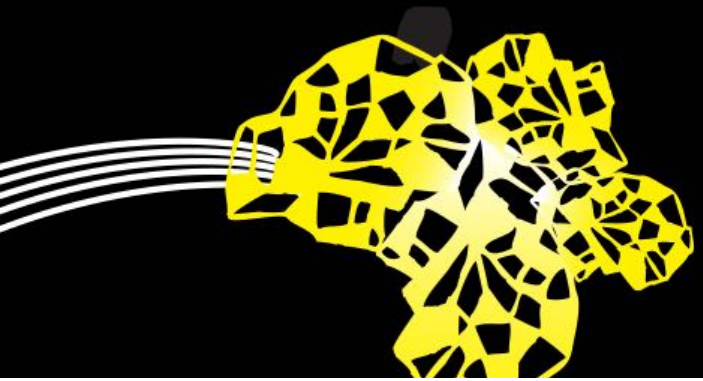
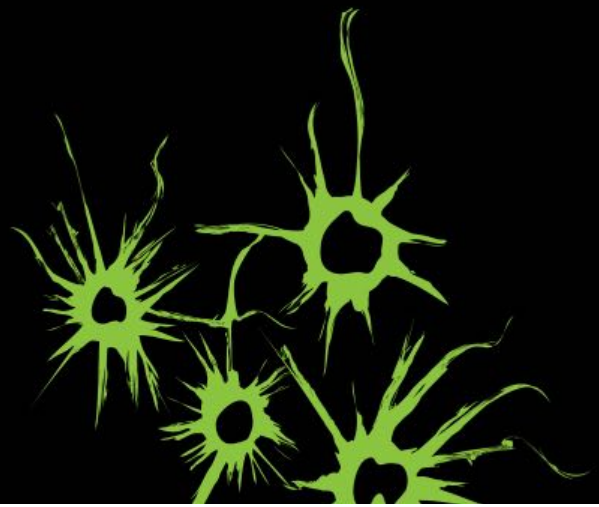


My maps,
The good, the bad and the ugly

Menno-Jan Kraak





Workshop

Using effective visualization in maps and diagrams to better understand the SDGs

- Introduction

  Exercise: Who is who?
- SDG Indicator characteristics

  Exercise: design your own map: Gender Inequality Index
- Cartographic workflow

  Exercise: define your own world view
- Design choices
- Conclusions

Exercise: Who is Who?

Draw the contour of your country

Ask your neighbor if she / he can tell were you're from

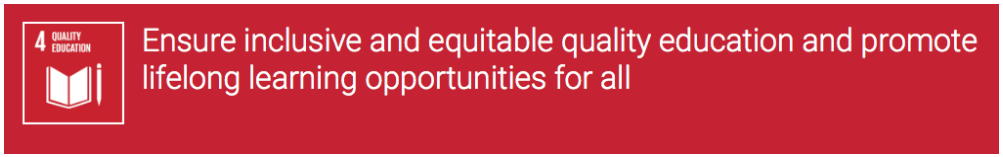
SDG

Indicator characteristics

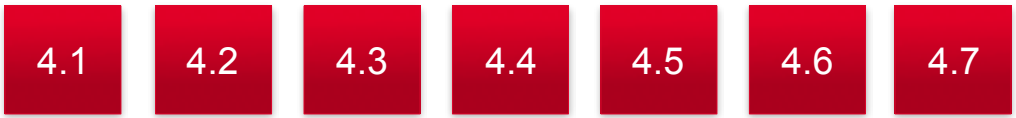
Sustainable Development Goals

Example: Goal 4 Education

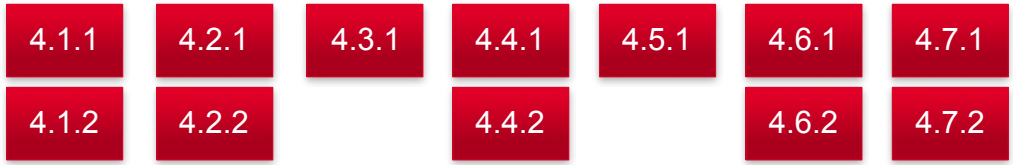
- Goals



- Targets



- Indicators



http://www.un.org/sustainabledevelopment/education/

Goal 4: Education - Sample Targets

- **4.1** By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes
- **4.2** By 2030, ensure ……..
- …..

https://sustainabledevelopment.un.org/content/documents/6754Technical%20report%20of%20the%20UNSC%20Bureau%20(final).pdf

Goal 4: Education - Sample Indicators

- ***4.1*** *By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes*

- **Indicator 4.1.1** Percentage of children who achieve minimum proficiency standards in reading and mathematics at end of: (i) primary (ii) lower secondary
- **Indicator 4.1.2** Completion rate (primary, lower secondary, upper secondary)

Goal 4: Education - Analyzing the data

% minimum proficiency

Completion **rate** levels of education

% of 15yrs proficiency of environmental science and geoscience

Early Childhood Development **Index**

Participation **rate** in organized learning

Participation **rate** among 25-65 years

Enrollment **ratios** by level and type

% of computer and information literate

% of proficient

% of 13yrs promoting governance

Youth/adult literacy **rate**

Parity **indices** (female/male, urban/rural, .

Indicators and data types

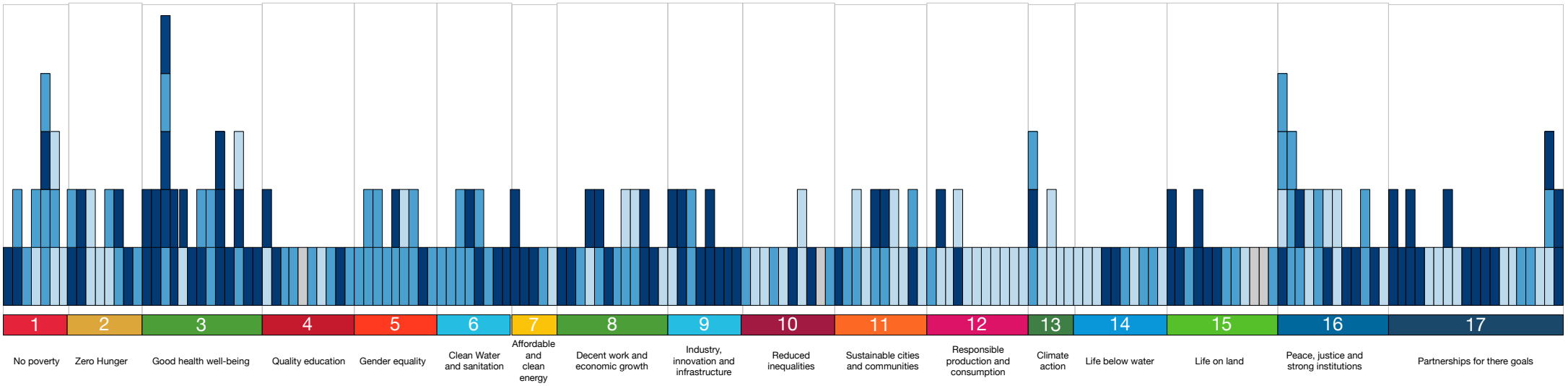
scale type	absolute / relative	variables	data type (name)		description (X and Y are variables)
ratio	absolute (one value)	one variable	absolute value		count X
	relative (calculated using two or more values)	one variable	proportion	proportion of total population	% of total population
				other proportion	% of X, other than population
		two variables	rate	rate per population unit	count X per capita / population
				change rate (per time unit)	% change or count X per time
				other rate	X per Y, other than population or time
		many variables	index (calculated)		formula
ordinal		one variable	ordinal value		level or rank
nominal		one variable	nominal value		in SDG indicator all: yes/no

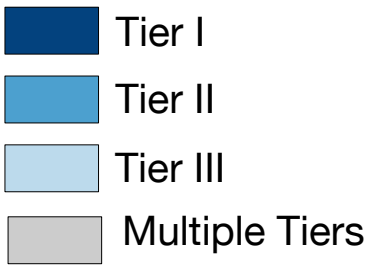
SDG indicator tiers

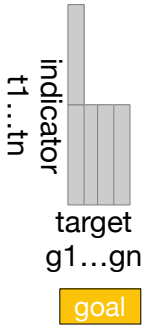
Incomplete indicators

- **Tier I:** internationally established methodology and standards
  - Data regularly produced for at least 50 percent of countries and of the population in every region
- **Tier II:** data not regularly produced by countries
- **Tier III:** methodology or standards are being (or will be) established

Indicators and their TIER level







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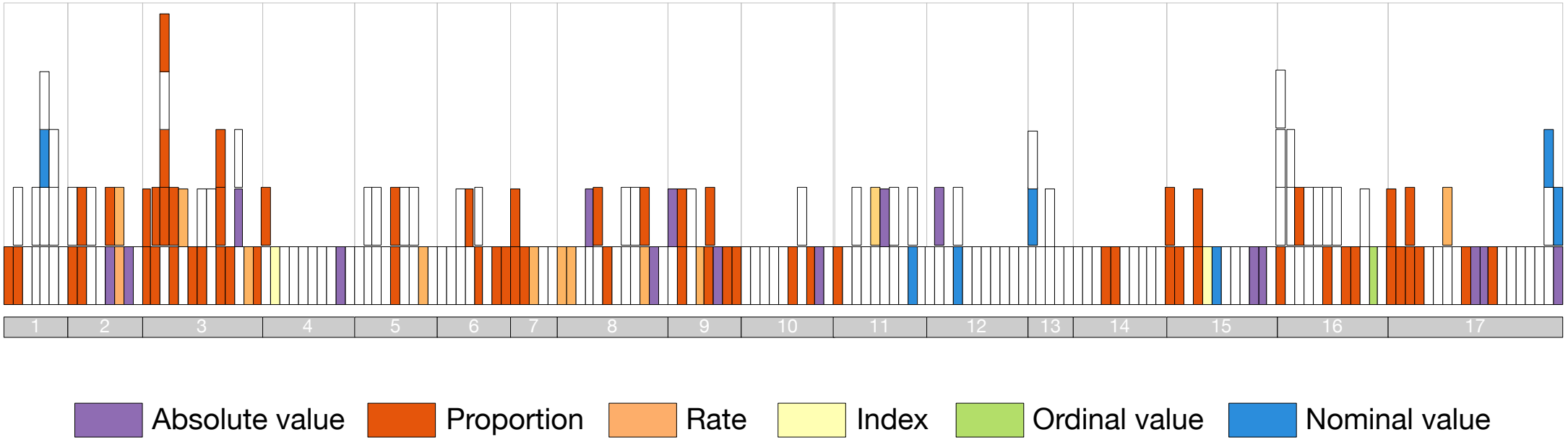
Nature of the indicators



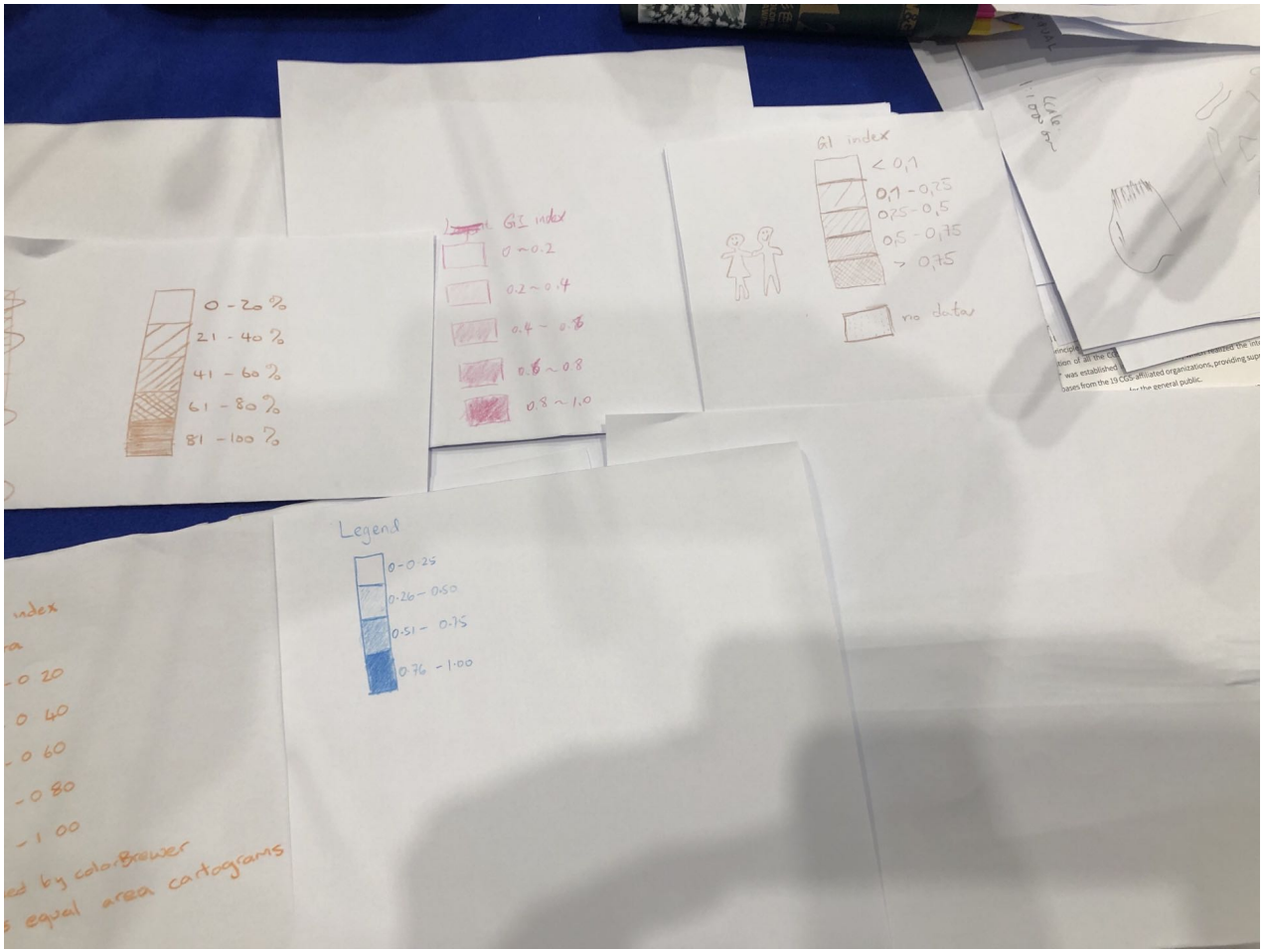
Exercise: design your own map

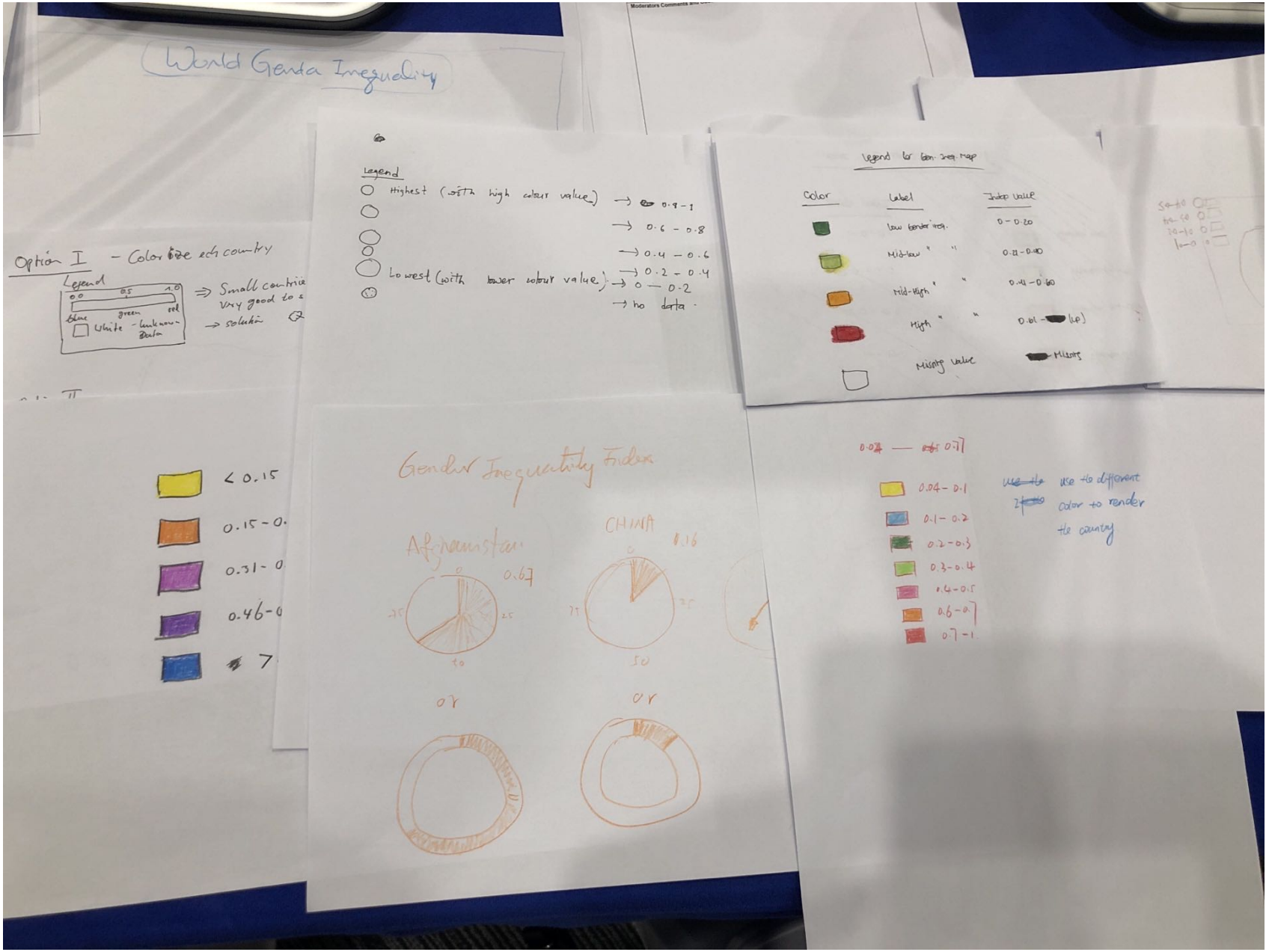
Gender inequality index

Name	GI index	Name	GI index	Name	GI index	Name	GI index	Name	GI index	Name	GI index
Afghanistan	0,67	Cote d'Ivoire	0,67	Guinea	-	Kuwait	0,33	Norway	0,05	Serbia	0,18
Angola	-	Cameroon	0,57	Gambia	0,64	Laos	0,47	Nepal	0,50	Suriname	0,45
Albania	0,27	Dem. Rep. Congo	0,66	Guinea-Bissau	-	Lebanon	0,38	New Zealand	0,16	Slovakia	0,18
United Arab Emirates	0,23	Congo	0,59	Eq. Guinea	-	Liberia	0,65	Oman	0,28	Slovenia	0,05
Argentina	0,36	Colombia	0,39	Greece	0,12	Libya	0,17	Pakistan	0,55	Sweden	0,05
Armenia	0,29	Costa Rica	0,31	Greenland	-	Sri Lanka	0,39	Panama	0,46	Swaziland	0,57
Australia	0,12	Cuba	0,30	Guatemala	0,49	Lesotho	0,55	Peru	0,39	Syria	0,55
Austria	0,08	N. Cyprus	-	Guyana	0,51	Lithuania	0,12	Philippines	0,44	Chad	0,69
Azerbaijan	0,33	Cyprus	0,12	Honduras	0,46	Luxembourg	0,07	Papua New Guinea	0,59	Togo	0,56
Burundi	0,47	Czechia	0,13	Croatia	0,14	Latvia	0,19	Poland	0,14	Thailand	0,37
Belgium	0,07	Germany	0,07	Haiti	0,59	Morocco	0,49	Puerto Rico	-	Tajikistan	0,32
Benin	0,61	Djibouti	-	Hungary	0,25	Moldova	0,23	North Korea	-	Turkmenistan	-
Burkina Faso	0,62	Denmark	0,04	Indonesia	0,47	Madagascar	-	Portugal	0,09	Timor-Leste	-
Bangladesh	0,52	Dominican Rep.	0,47	India	0,53	Mexico	0,35	Paraguay	0,46	Trinidad and Tobago	0,32
Bulgaria	0,22	Algeria	0,43	Ireland	0,13	Macedonia	0,16	Palestine	-	Tunisia	0,29
Bahamas	0,36	Ecuador	0,39	Iran	0,51	Mali	0,69	Qatar	0,54	Turkey	0,33
Bosnia and Herz.	0,16	Egypt	0,57	Iraq	0,53	Myanmar	0,37	Romania	0,34	Taiwan	-
Belarus	0,14	Eritrea	-	Iceland	0,05	Montenegro	0,16	Russia	0,27	Tanzania	0,54
Belize	0,38	Spain	0,08	Israel	0,10	Mongolia	0,28	Rwanda	0,38	Uganda	0,52
Bolivia	0,45	Estonia	0,13	Italy	0,08	Mozambique	0,57	W. Sahara	-	Ukraine	0,28
Brazil	0,41	Ethiopia	0,50	Jamaica	0,42	Mauritania	0,63	Saudi Arabia	0,26	Uruguay	0,28
Brunei	-	Finland	0,06	Jordan	0,48	Malawi	0,61	Sudan	0,57	United States of America	0,20
Bhutan	0,48	Fiji	0,36	Japan	0,12	Malaysia	0,29	S. Sudan	-	Uzbekistan	0,29
Botswana	0,44	Falkland Is.	-	Kazakhstan	0,20	Namibia	0,47	Senegal	0,52	Venezuela	0,46
Central African Rep.	0,65	France	0,10	Kenya	0,56	New Caledonia	-	Solomon Is.	-	Vietnam	0,34
Canada	0,10	Gabon	0,54	Kyrgyzstan	0,39	Niger	0,70	Sierra Leone	0,65	Vanuatu	-
Switzerland	0,04	United Kingdom	0,13	Cambodia	0,48	Nigeria	-	El Salvador	0,38	Yemen	0,77
Chile	0,32	Georgia	0,36	South Korea	0,07	Nicaragua	0,46	Somaliland	-	South Africa	0,39
China	0,16	Ghana	0,55	Kosovo	-	Netherlands	0,04	Somalia	-	Zambia	0,53
										Zimbabwe	0,54

Design & draw
the map legend

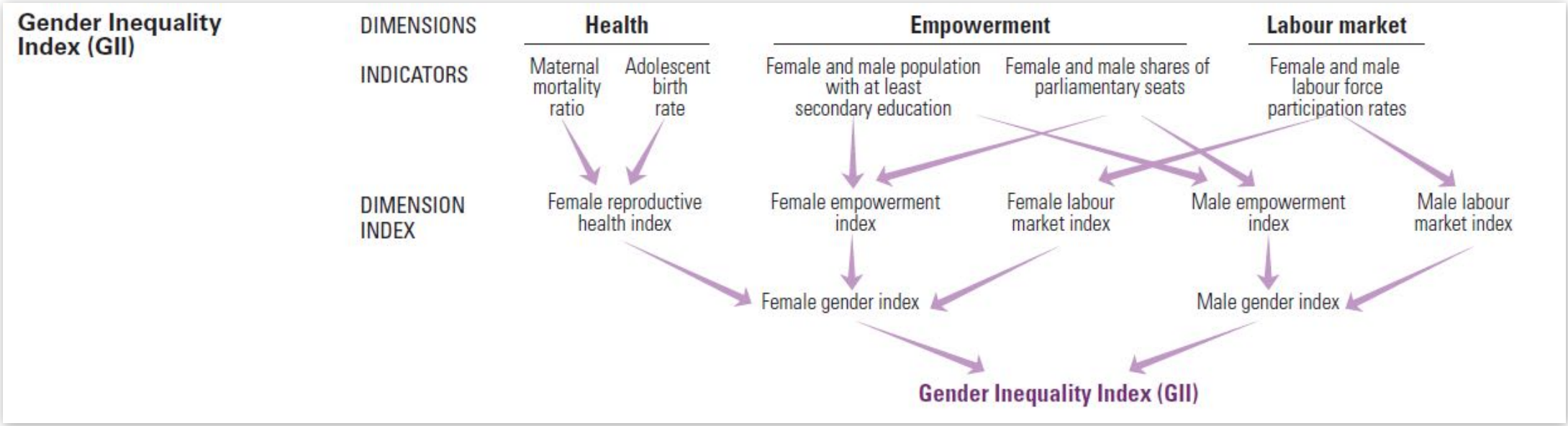
Your work


0 - 20 %
21 - 40 %
41 - 60 %
61 - 80 %
81 - 100 %
GI index
0 ~ 0.2
0.2 ~ 0.4
0.4 ~ 0.6
0.6 ~ 0.8
0.8 ~ 1.0
GI index
< 0,1
0,1 - 0,25
0,25 - 0,5
0,5 - 0,75
> 0,75
no data
Legend
0 - 0.25
0.26 - 0.50
0.51 - 0.75
0.76 - 1.00
index
0 20
0 40
0 60
0 80
1 00
by color Brewer
equal area cartograms


World Gender Inequality
Option I - Color the each country
Legend
blue green red
White - unknown data
Small countries
Very good to s
→ solution
Legend
Highest (with high colour value) → 0.8 - 1
→ 0.6 - 0.8
→ 0.4 - 0.6
Lowest (with lower colour value) → 0.2 - 0.4
→ 0 - 0.2
→ no data
legend for Gen. Ineq. map
Color
Label
Index value
low Gender ineq.
0 - 0.20
Mid-low " "
0.21 - 0.40
Mid-high " "
0.41 - 0.60
High " "
0.61 - (to)
Missing value
Missing
< 0.15
0.15 - 0.
0.31 - 0
0.46 - 0
Gender Inequality Index
Afganistan
0.67
to
or
CHINA
0.16
50
or
0.04 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
0.6 - 0.7
0.7 - 1
use to different color to render the country

Cartographic Workflow

Gender inequality index



http://hdr.undp.org/en/composite/GII

Gender inequality index

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United Arab Emirates	0,23	Congo	0,59	Eq. Guinea	-	Liberia	0,65	Oman	0,28	Slovenia	0,05
Argentina	0,36	Colombia	0,39	Greece	0,12	Libya	0,17	Pakistan	0,55	Sweden	0,05
Armenia	0,29	Costa Rica	0,31	Greenland	-	Sri Lanka	0,39	Panama	0,46	Swaziland	0,57
Australia	0,12	Cuba	0,30	Guatemala	0,49	Lesotho	0,55	Peru	0,39	Syria	0,55
Austria	0,08	N. Cyprus	-	Guyana	0,51	Lithuania	0,12	Philippines	0,44	Chad	0,69
Azerbaijan	0,33	Cyprus	0,12	Honduras	0,46	Luxembourg	0,07	Papua New Guinea	0,59	Togo	0,56
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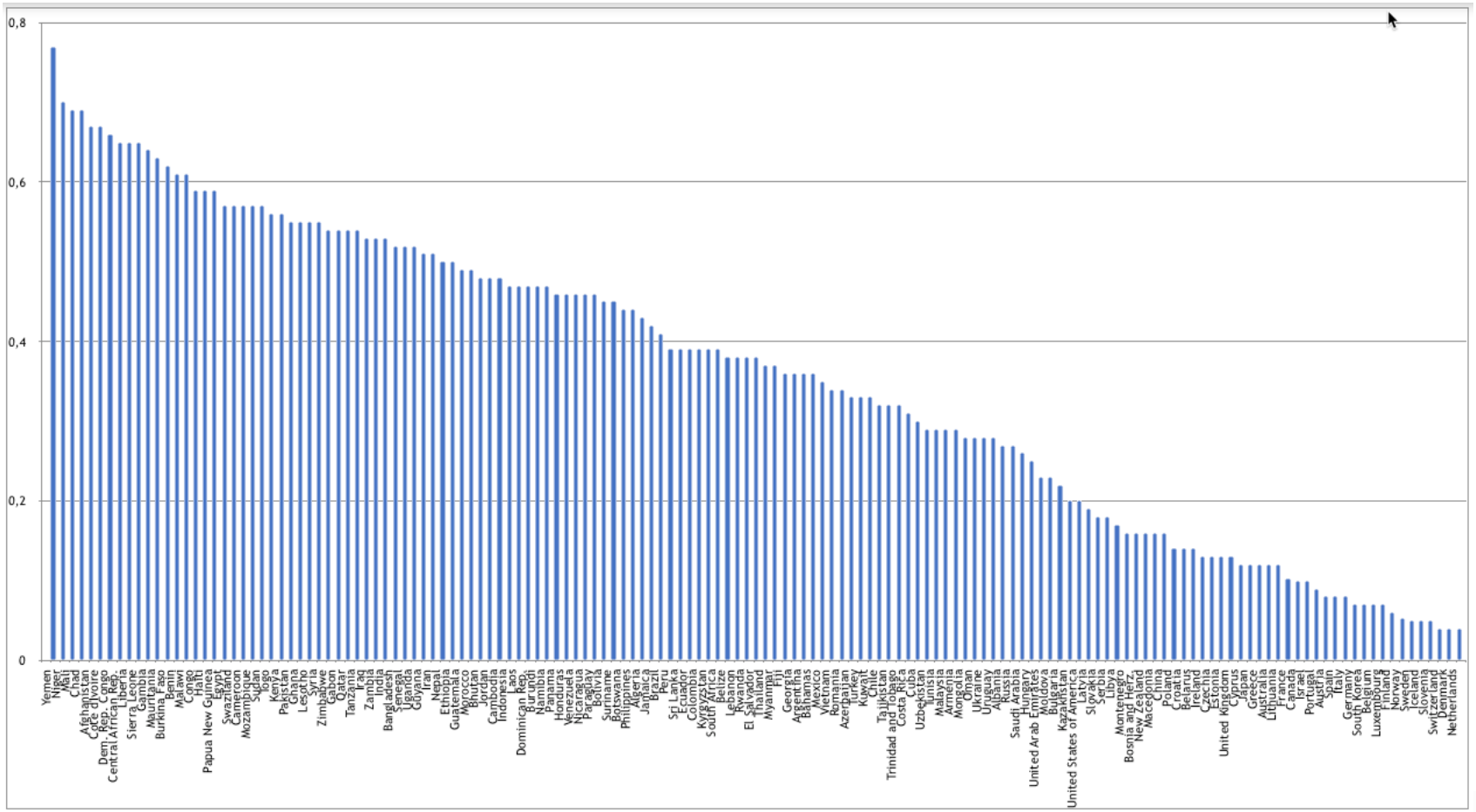
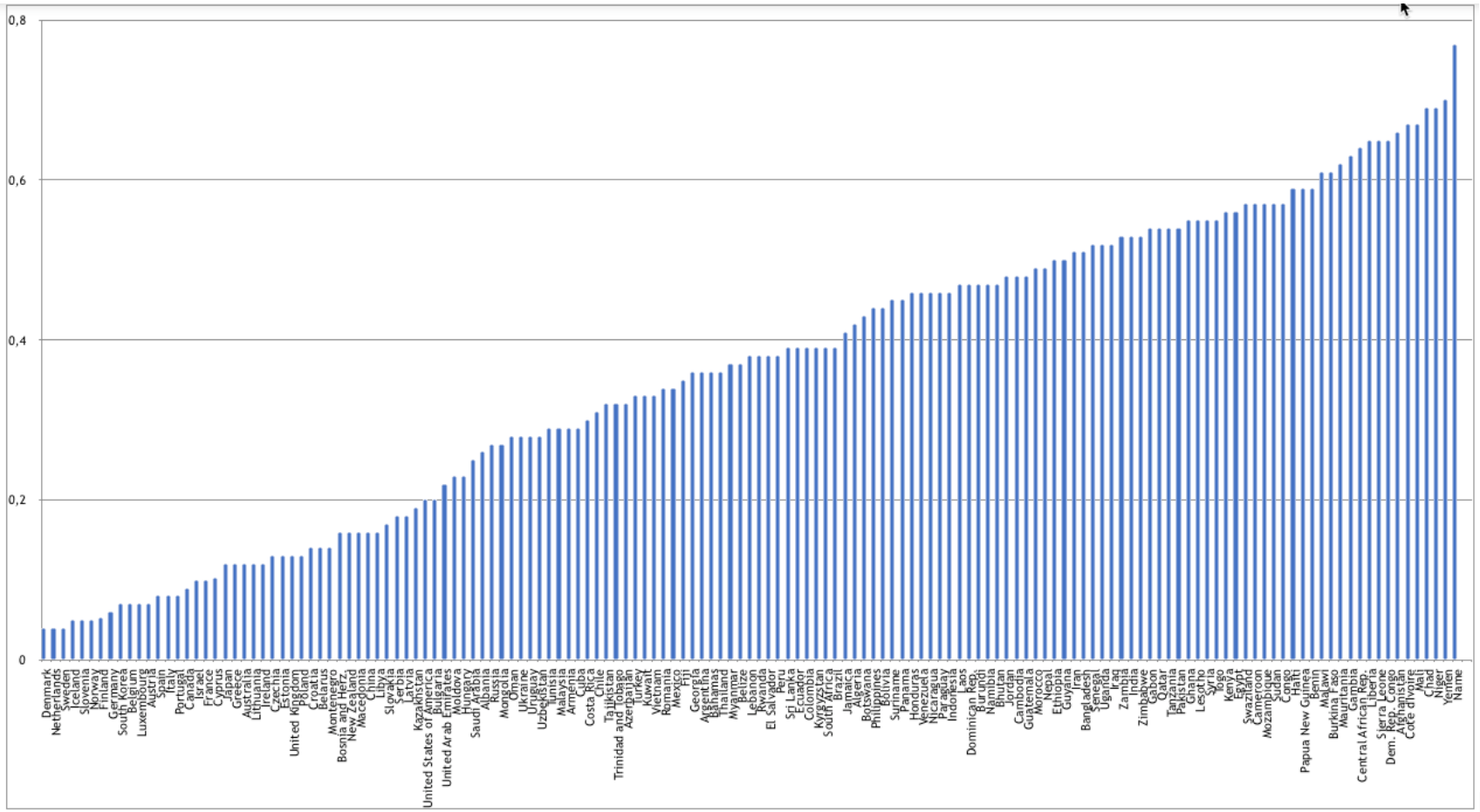
Belgium	0,07	Germany	0,07	Haiti	0,59	Morocco	0,49	Puerto Rico	-	Tajikistan	0,32
Benin	0,61	Djibouti	-	Hungary	0,25	Moldova	0,23	North Korea	-	Turkmenistan	-
Burkina Faso	0,62	Denmark	0,04	Indonesia	0,47	Madagascar	-	Portugal	0,09	Timor-Leste	-
Bangladesh	0,52	Dominican Rep.	0,47	India	0,53	Mexico	0,35	Paraguay	0,46	Trinidad and Tobago	0,32
Bulgaria	0,22	Algeria	0,43	Ireland	0,13	Macedonia	0,16	Palestine	-	Tunisia	0,29
Bahamas	0,36	Ecuador	0,39	Iran	0,51	Mali	0,69	Qatar	0,54	Turkey	0,33
Bosnia and Herz.	0,16	Egypt	0,57	Iraq	0,53	Myanmar	0,37	Romania	0,34	Taiwan	-
Belarus	0,14	Eritrea	-	Iceland	0,05	Montenegro	0,16	Russia	0,27	Tanzania	0,54
Belize	0,38	Spain	0,08	Israel	0,10	Mongolia	0,28	Rwanda	0,38	Uganda	0,52
Bolivia	0,45	Estonia	0,13	Italy	0,08	Mozambique	0,57	W. Sahara	-	Ukraine	0,28
Brazil	0,41	Ethiopia	0,50	Jamaica	0,42	Mauritania	0,63	Saudi Arabia	0,26	Uruguay	0,28
Brunei	-	Finland	0,06	Jordan	0,48	Malawi	0,61	Sudan	0,57	United States of America	0,20
Bhutan	0,48	Fiji	0,36	Japan	0,12	Malaysia	0,29	S. Sudan	-	Uzbekistan	0,29
Botswana	0,44	Falkland Is.	-	Kazakhstan	0,20	Namibia	0,47	Senegal	0,52	Venezuela	0,46
Central African Rep.	0,65	France	0,10	Kenya	0,56	New Caledonia	-	Solomon Is.	-	Vietnam	0,34
Canada	0,10	Gabon	0,54	Kyrgyzstan	0,39	Niger	0,70	Sierra Leone	0,65	Vanuatu	-
Switzerland	0,04	United Kingdom	0,13	Cambodia	0,48	Nigeria	-	El Salvador	0,38	Yemen	0,77
Chile	0,32	Georgia	0,36	South Korea	0,07	Nicaragua	0,46	Somaliland	-	South Africa	0,39
China	0,16	Ghana	0,55	Kosovo	-	Netherlands	0,04	Somalia	-	Zambia	0,53
										Zimbabwe	0,54

Perception


0,8
0,6
0,4
0,2
0
Yemen
Niger
Mali
Chad
Afghanistan
Cote d'Ivoire
Dem. Rep. Congo
Central African Rep.
Liberia
Sierra Leone
Gambia
Mauritania
Burkina Faso
Benin
Malawi
Congo
Guinea
Papua New Guinea
Egypt
Swaziland
Cameroon
Mozambique
Sudan
Togo
Kenya
Pakistan
Ghana
Lesotho
Syria
Zimbabwe
Gabon
Qatar
Tanzania
Iraq
Zambia
India
Bangladesh
Senegal
Uganda
Guyana
Iran
Nepal
Ethiopia
Guatemala
Morocco
Bhutan
Jordan
Cambodia
Indonesia
Laos
Dominican Rep.
Burundi
Namibia
Panama
Honduras
Venezuela
Nicaragua
Paraguay
Bolivia
Suriname
Botswana
Philippines
Algeria
Jamaica
Brazil
Peru
Sri Lanka
Ecuador
Colombia
Kyrgyzstan
South Africa
Belize
Lebanon
Rwanda
El Salvador
Thailand
Myanmar
Fiji
Georgia
Armenia
Bahamas
Mexico
Vietnam
Romania
Azerbaijan
Turkey
Kuwait
Chile
Tajikistan
Trinidad and Tobago
Costa Rica
Cuba
Uzbekistan
Tunisia
Malaysia
Armenia
Mongolia
Oman
Ukraine
Uruguay
Albania
Russia
Saudi Arabia
Hungary
United Arab Emirates
Moldova
Bulgaria
Kazakhstan
United States of America
Latvia
Slovakia
Serbia
Libya
Montenegro
Bosnia and Herz.
New Zealand
Macedonia
China
Poland
Croatia
Belarus
Ireland
Czechia
Estonia
United Kingdom
Cyprus
Japan
Greece
Australia
Lithuania
France
Canada
Israel
Portugal
Austria
Spain
Italy
Germany
South Korea
Belgium
Luxembourg
Finland
Norway
Sweden
Iceland
Slovenia
Switzerland
Denmark
Netherlands

Perception



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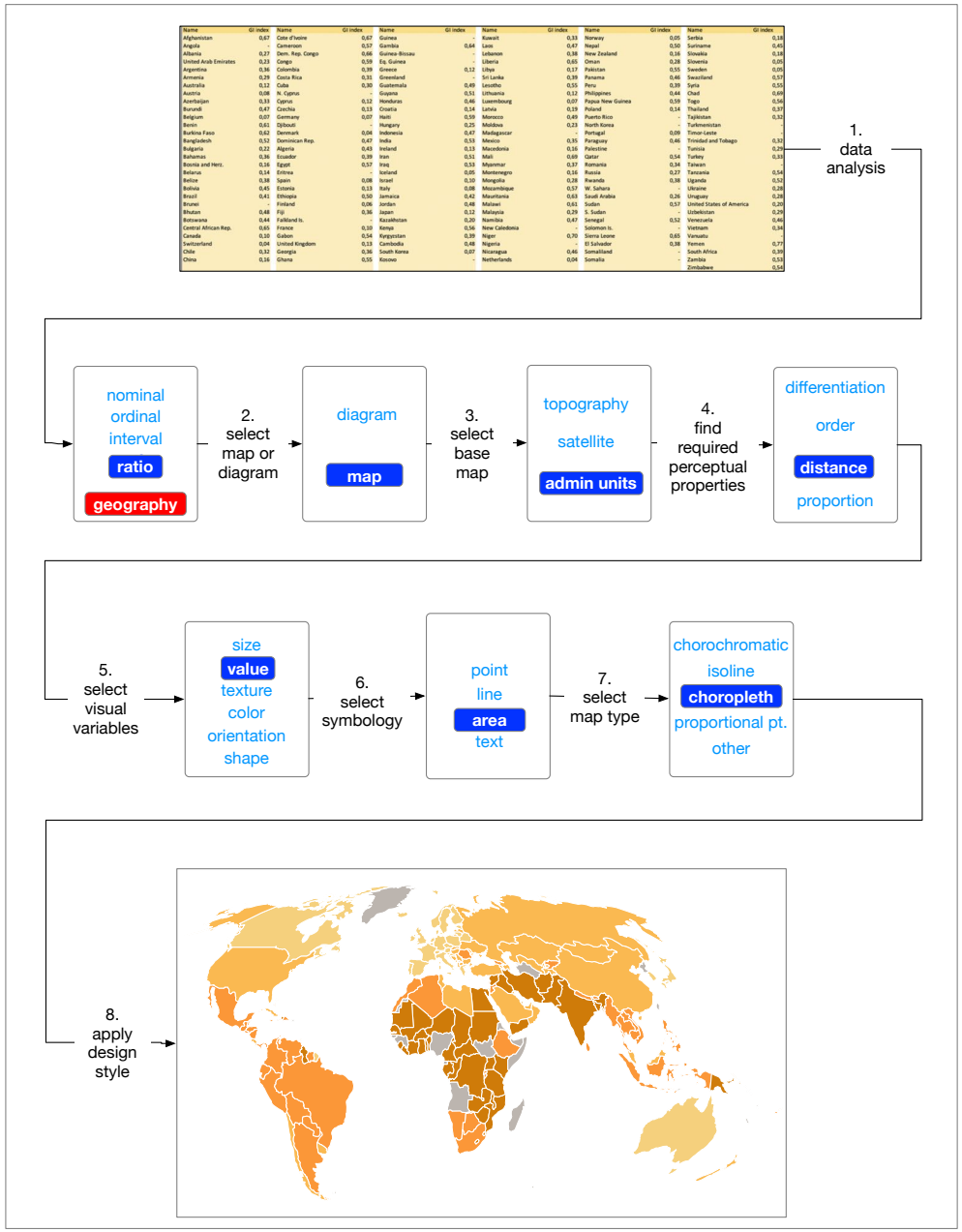
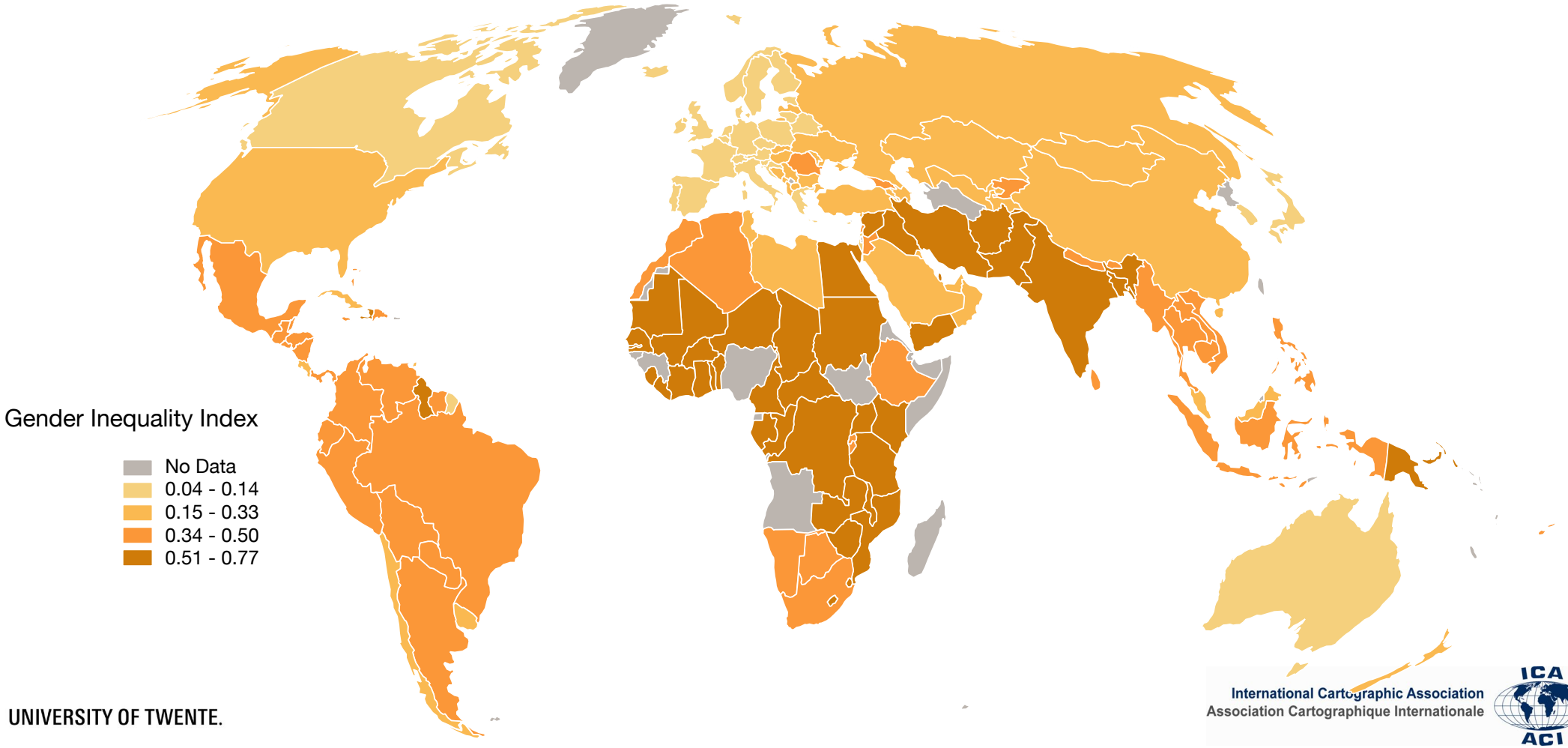

1. data analysis
nominal
ordinal
interval
ratio
geography
2. select map or diagram
diagram
map
3. select base map
topography
satellite
admin units
4. find required perceptual properties
differentiation
order
distance
proportion
5. select visual variables
size
value
texture
color
orientation
shape
6. select symbology
point
line
area
text
7. select map type
chorochromatic
isoline
choropleth
proportional pt.
other
8. apply design style

Gender inequality index



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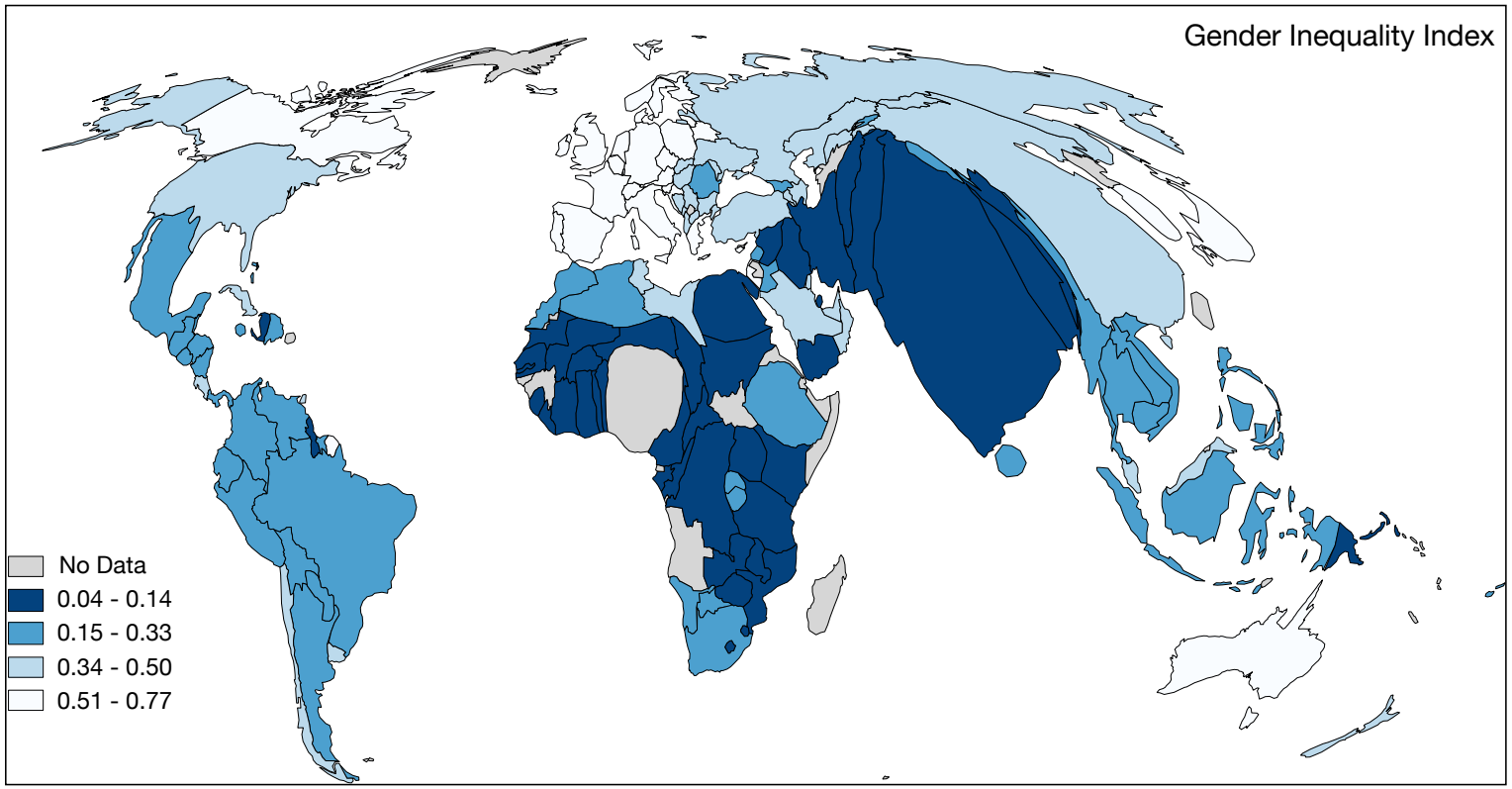
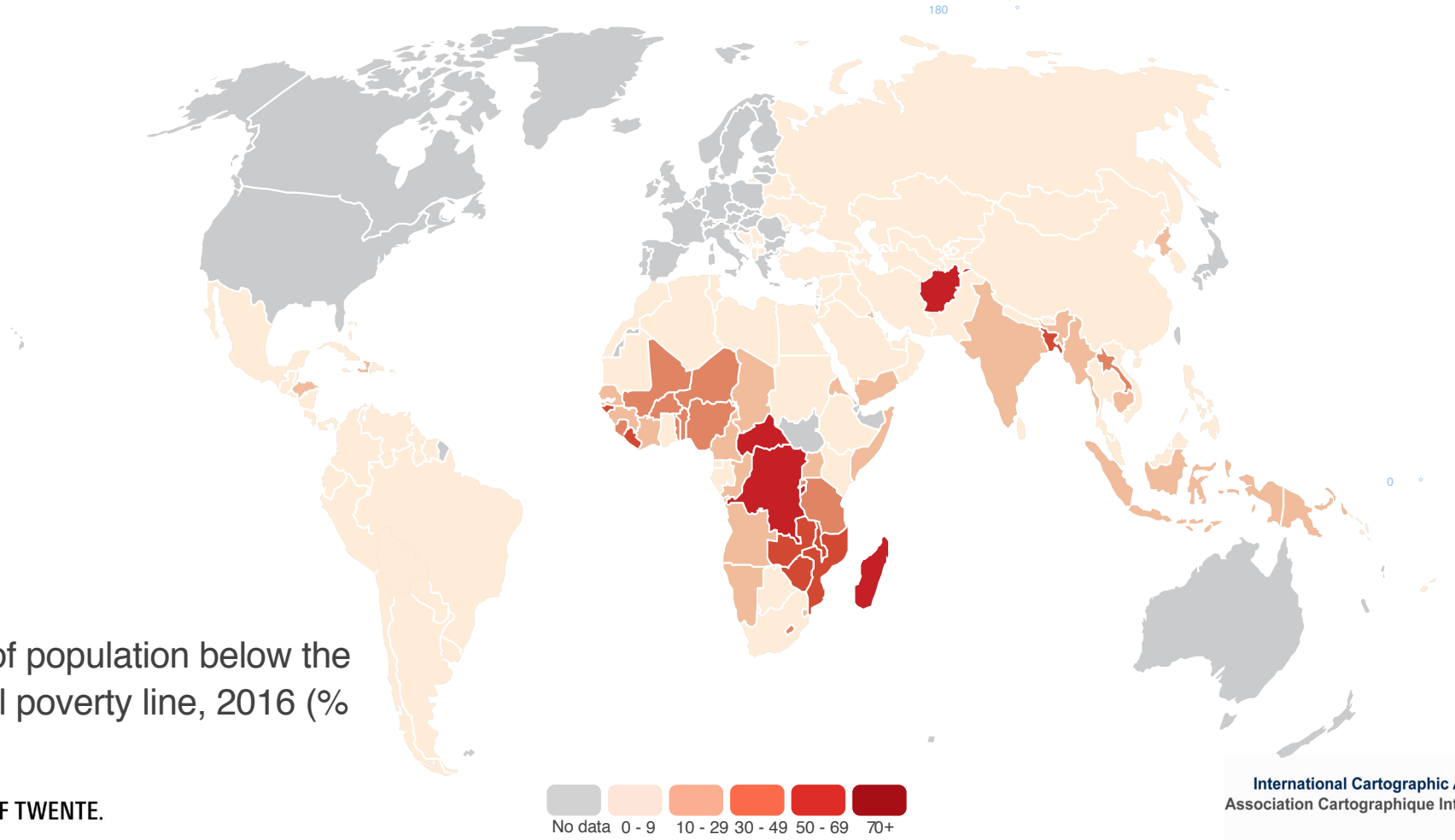
Base Maps

Map projections



Not visible: Small Island Developing States (SIDS)?



Proportion of population below the international poverty line, 2016 (%

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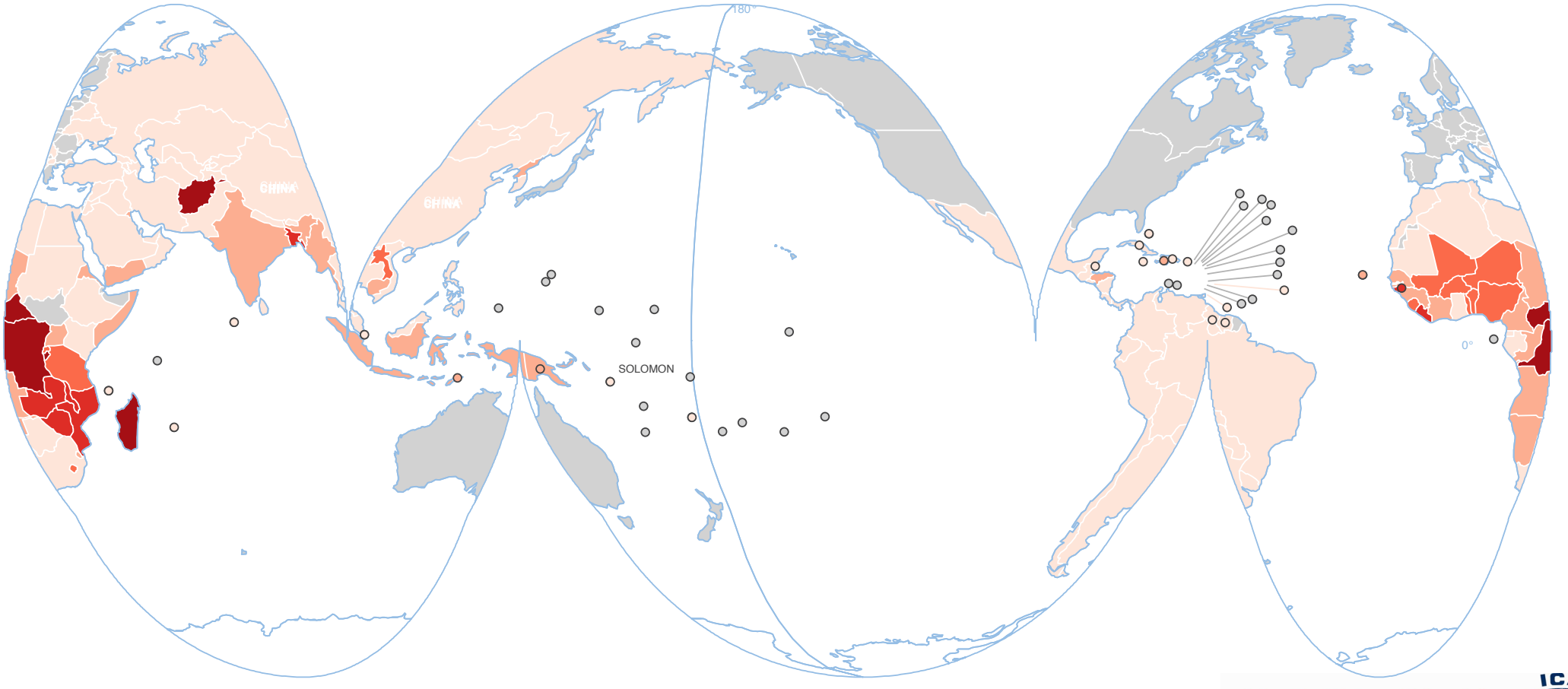
Visible SIDS

Jessica Gosling-Goldsmith



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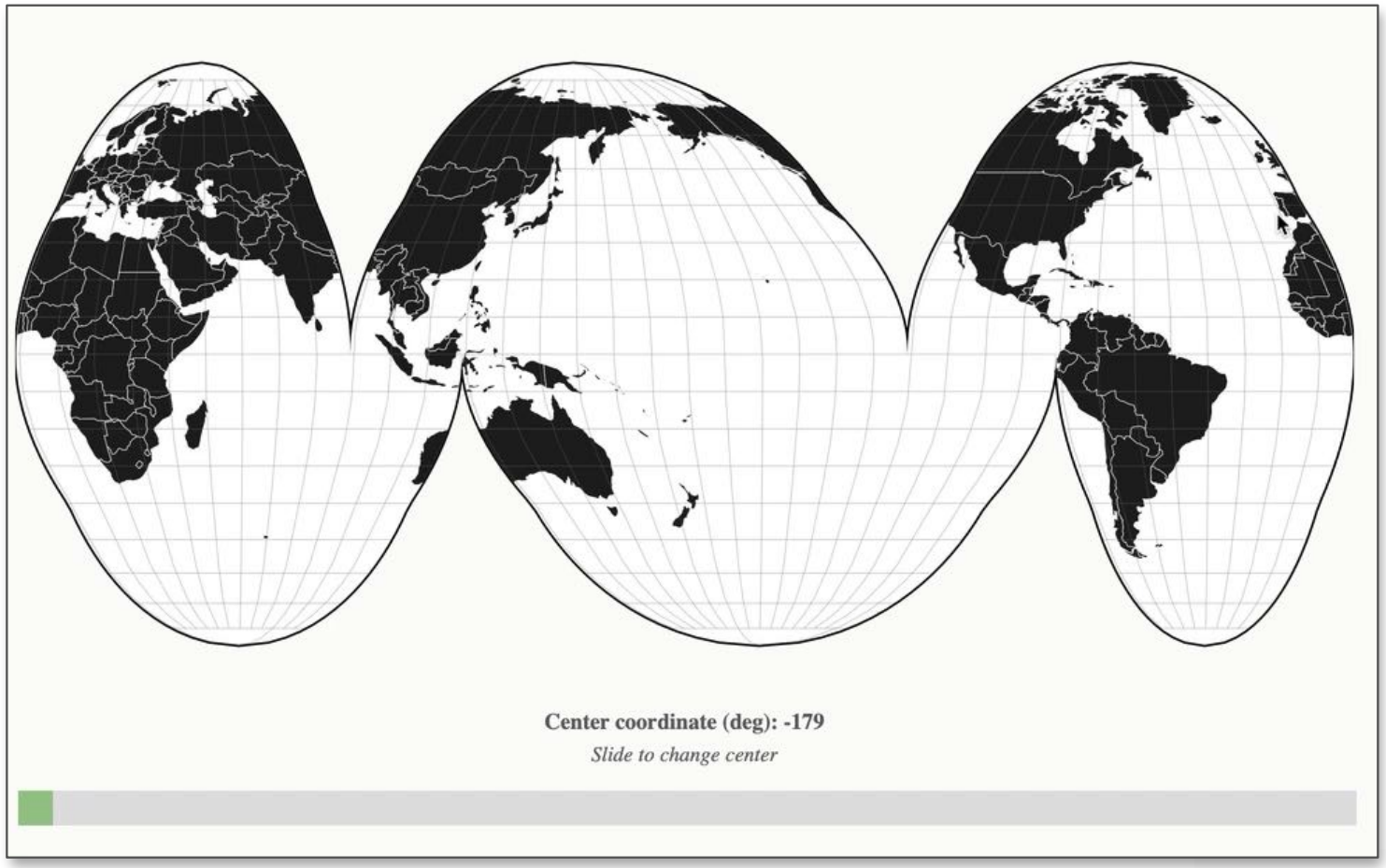
Moving central meridian



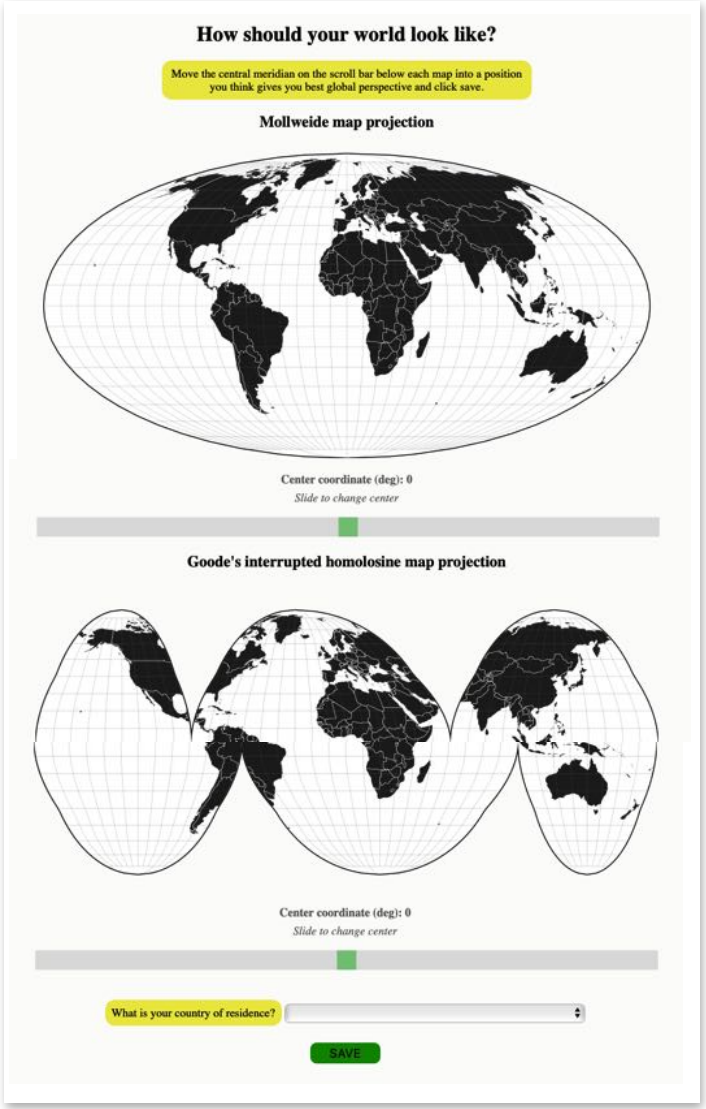
Exercise: define your own world view

Go to: https://worldview.calisto.pt

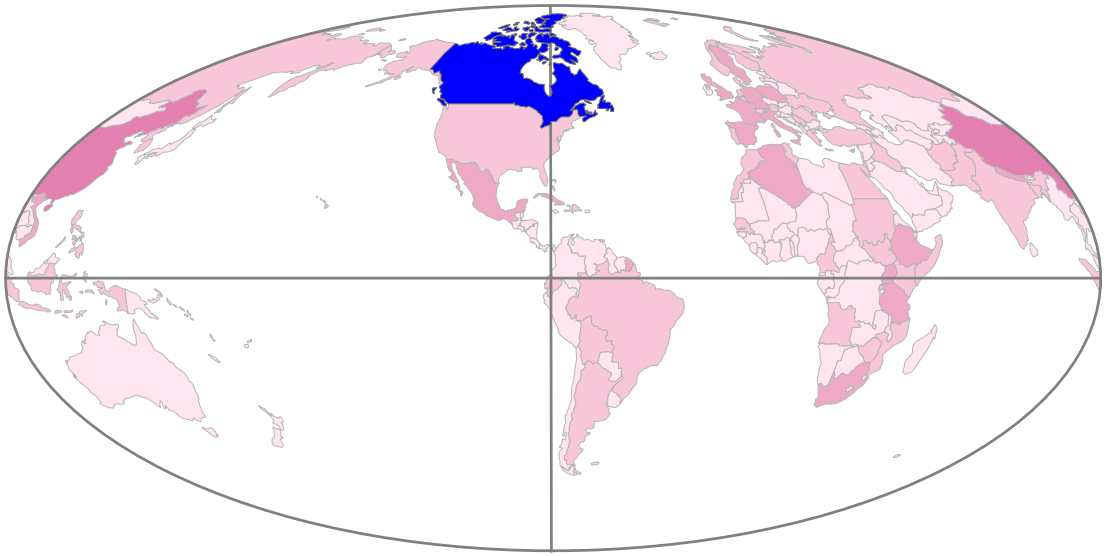
Move the central meridian on the scroll bar below each map into a position you think gives your best global perspective, and click save

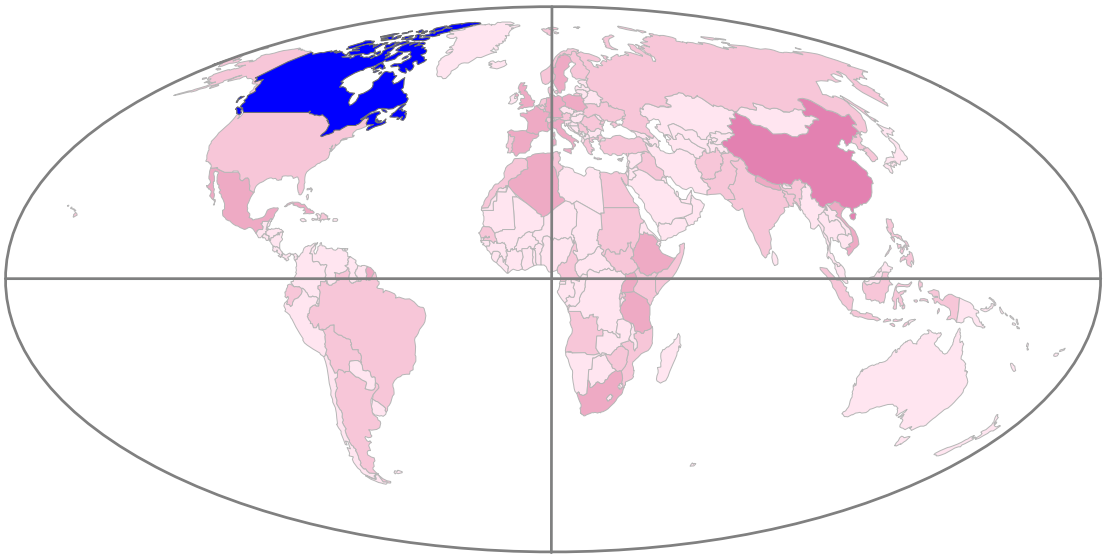
Select your country

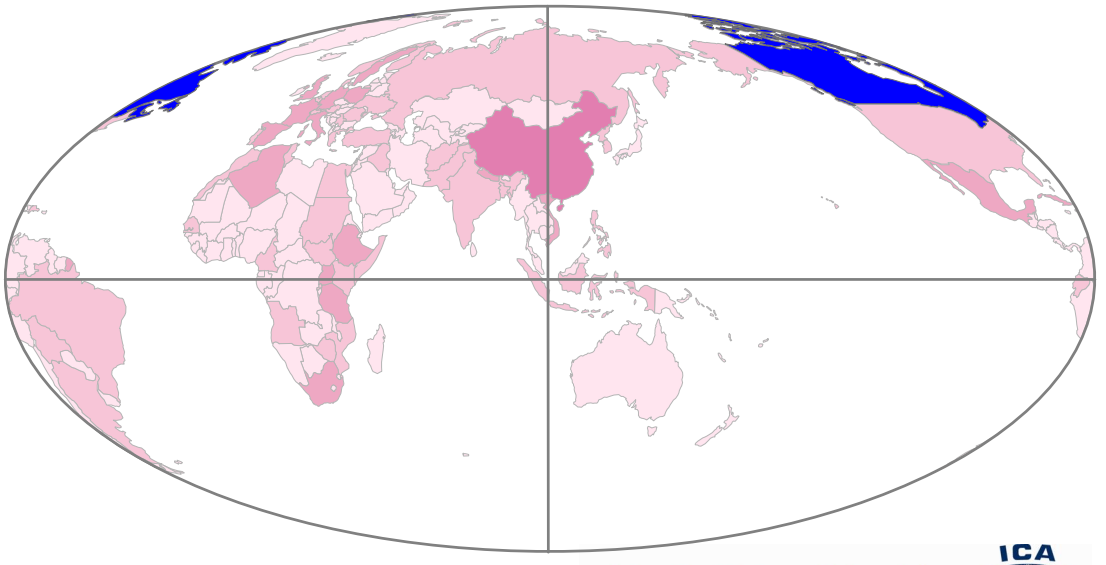
https://worldview.calisto.pt



Local perspective







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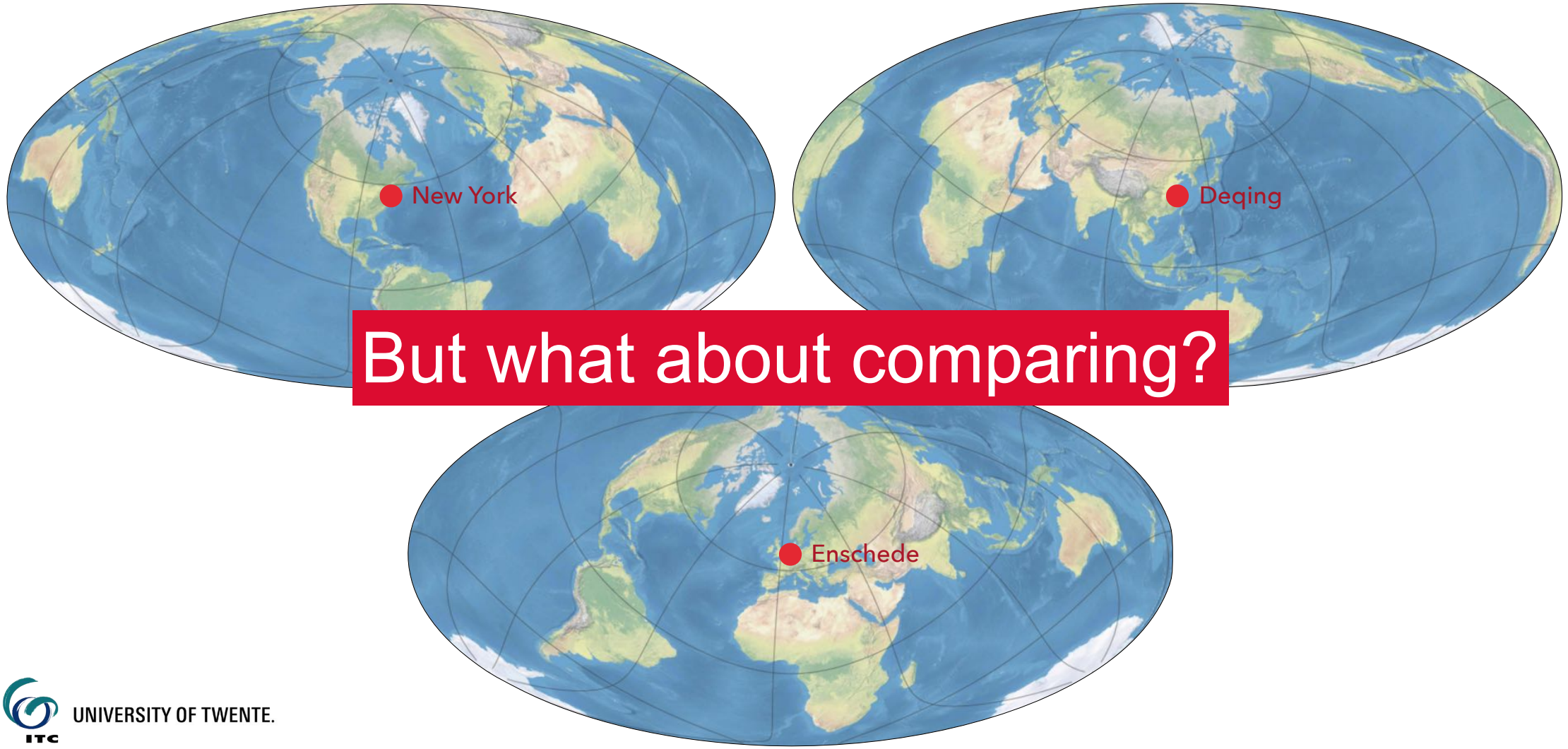
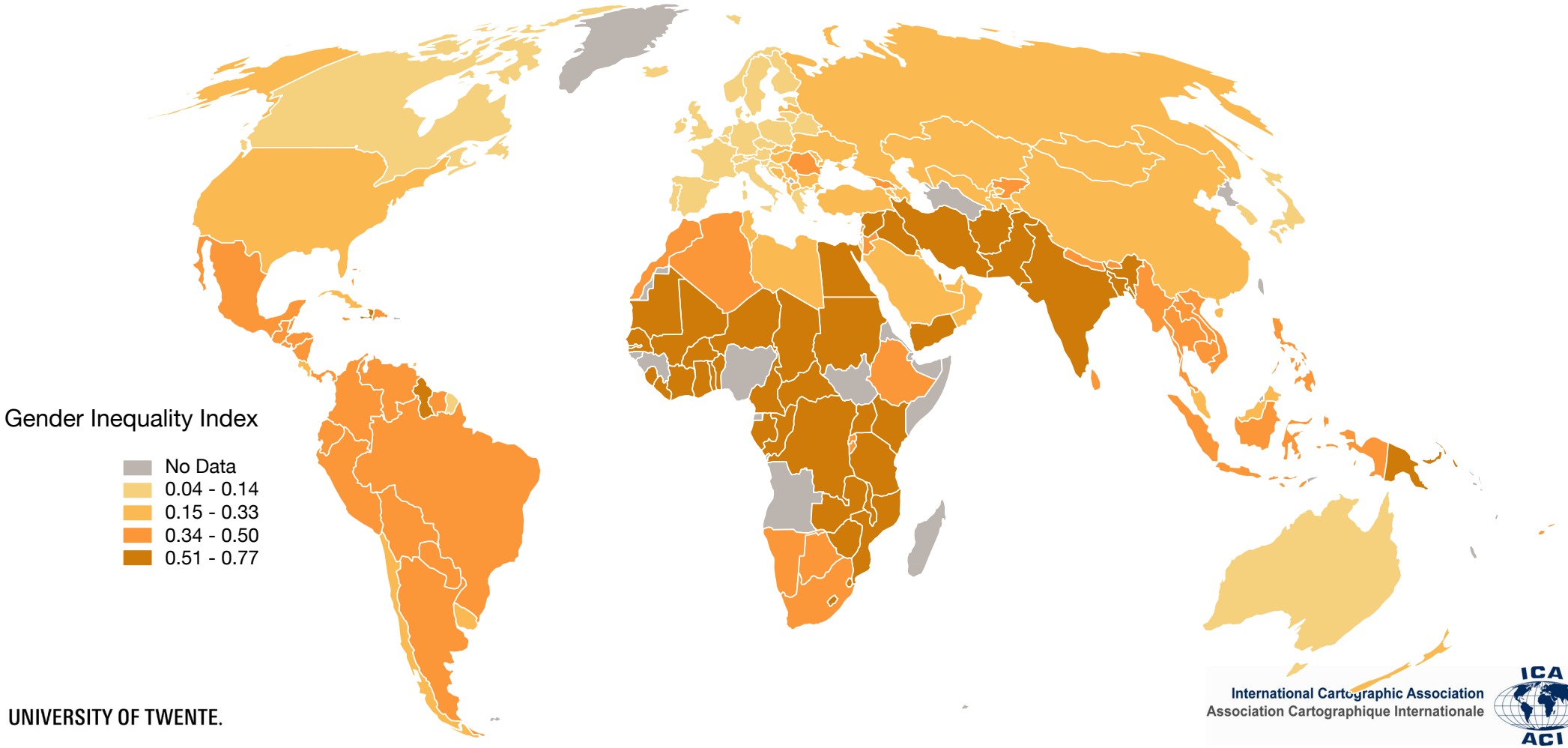
‘Local’ point for global perspective



But what about comparing?

Design choices

Gender inequality index



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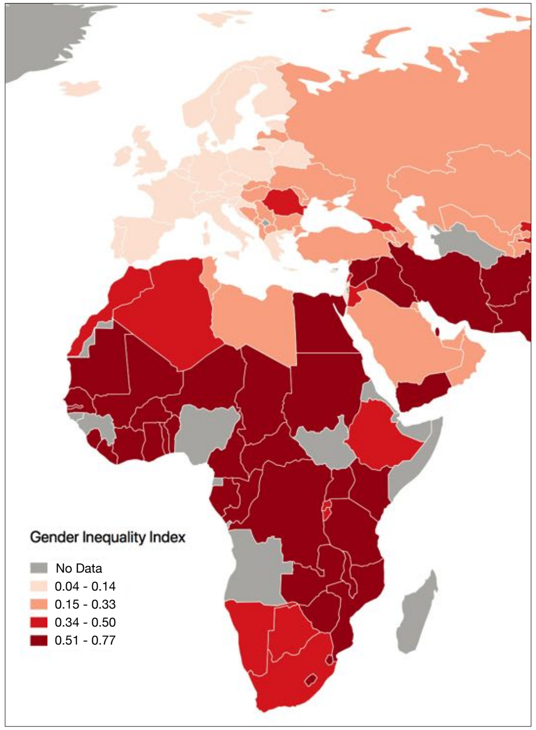
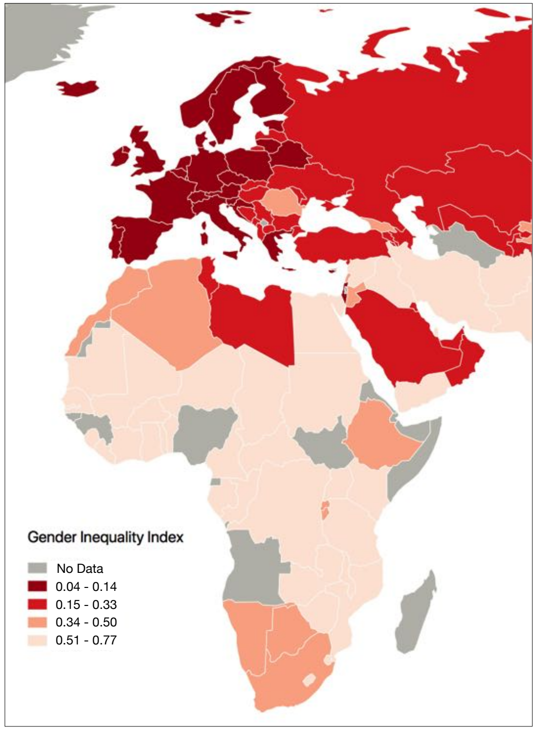
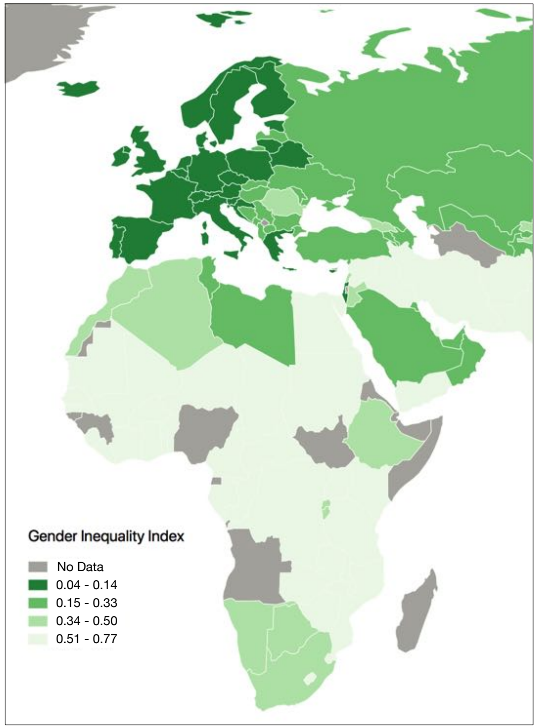
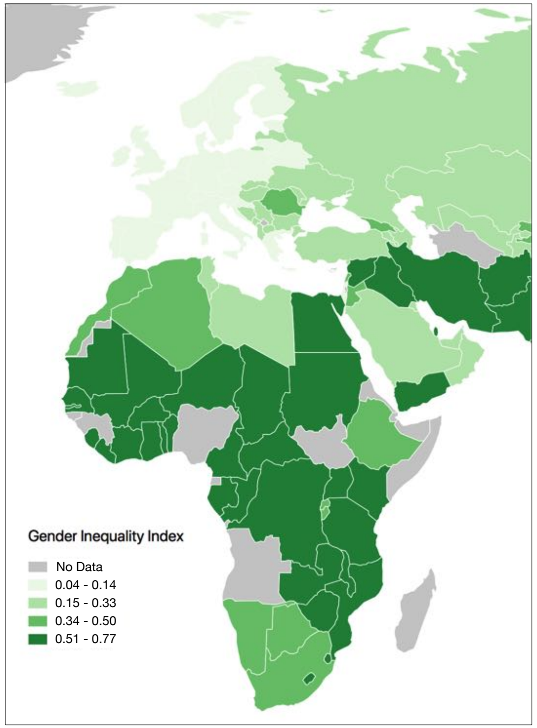
Choice of color - what do you want to tell?

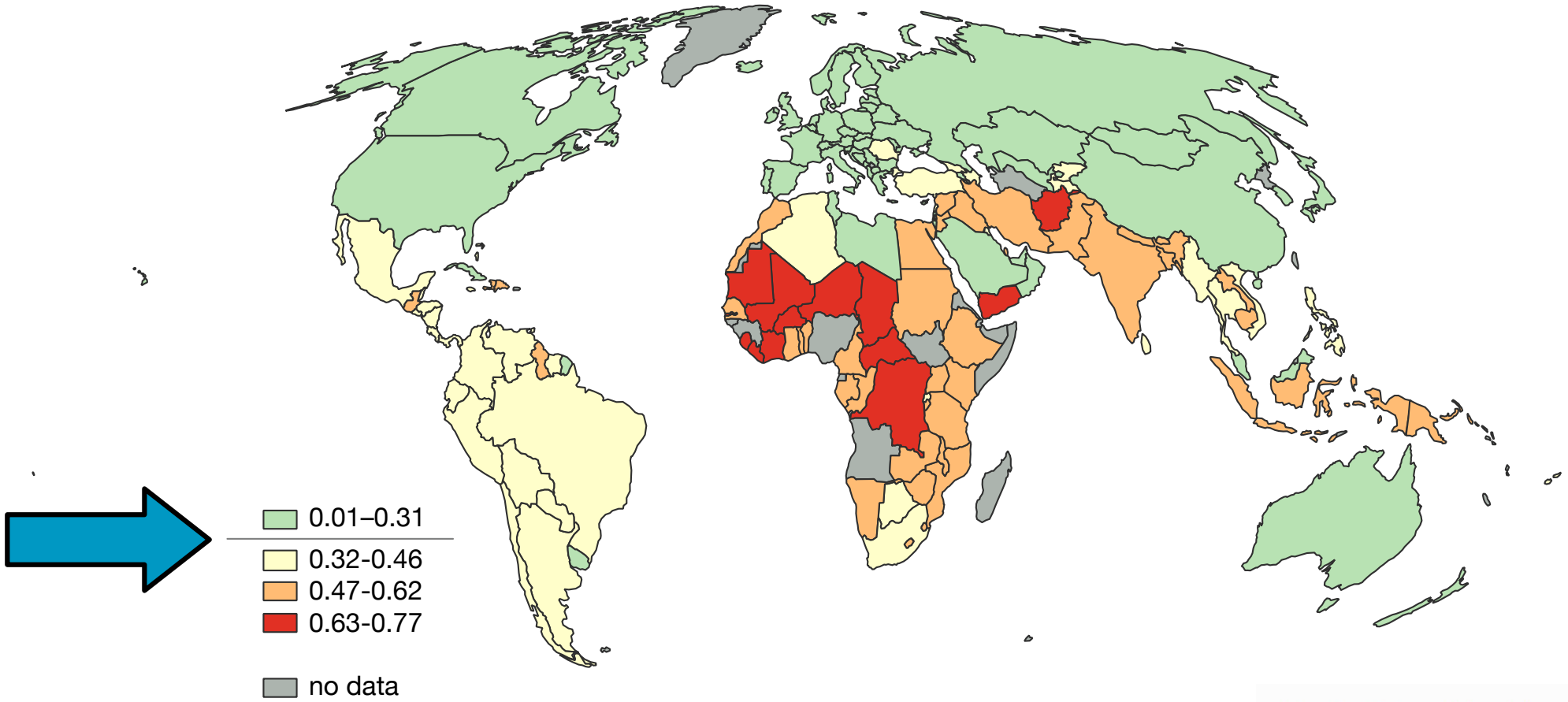








Choice of color - bivariate solution



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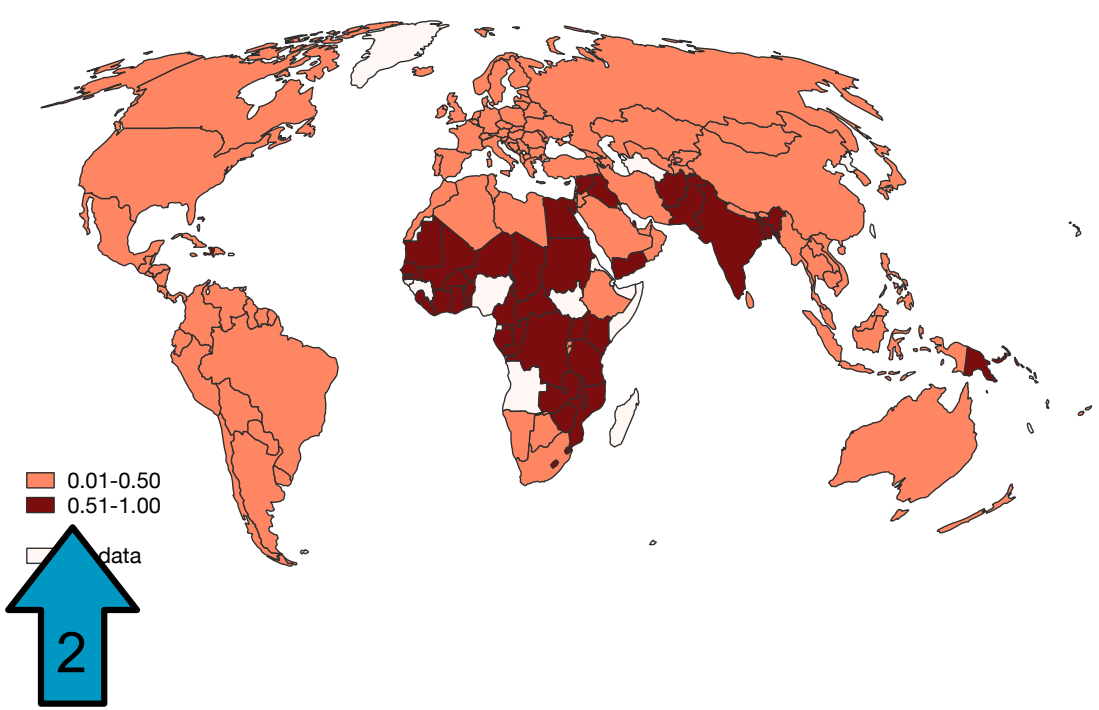
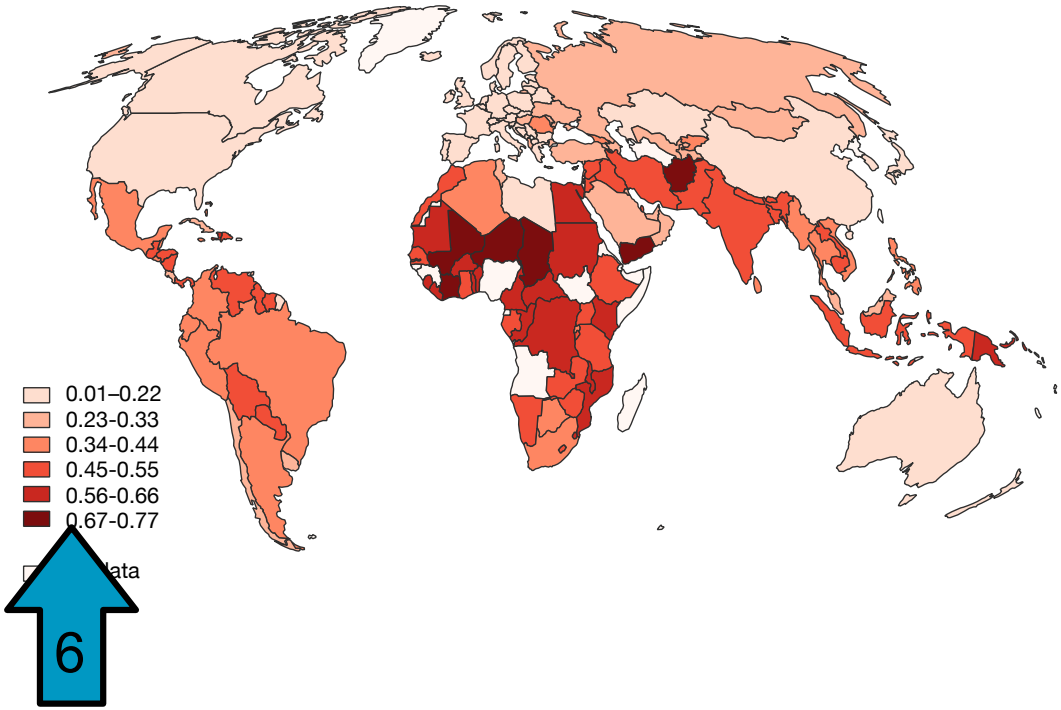
Different patterns because of number of classes





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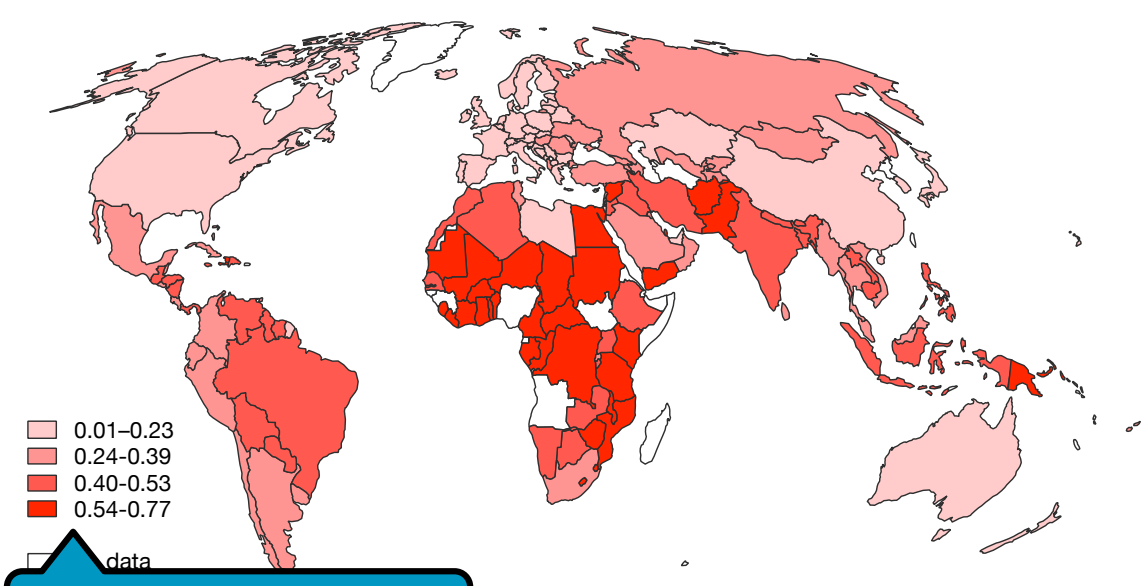
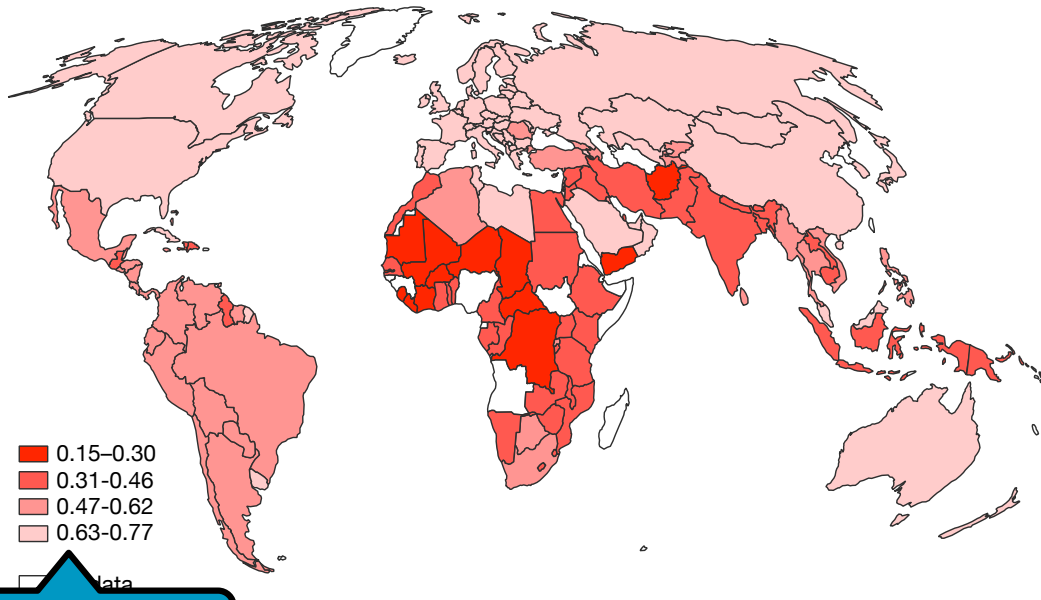
Different patterns because of classification



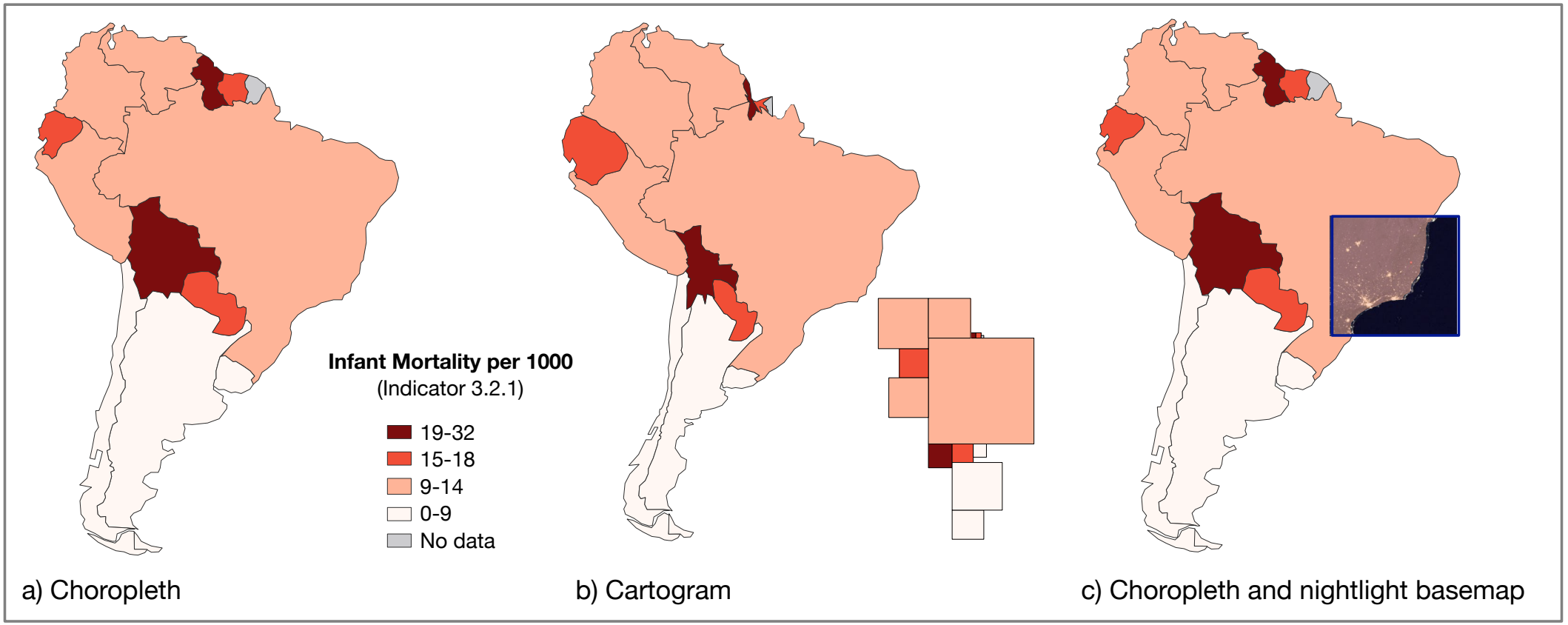
Same amount of observations per class



Equal class size

Population related topics

Alternative representations



Conclusions

Mapping problems

- Base map
  - Projection (web services work with Mercator projection….)
  - Content (often satellite imagery / open street map are used….)
- Administrative units
  - Size
  - Distribution within unit (people, other)
- Design flaws
  - Choice projection / adm. units
  - Data handling
  - Application of visual variables
- There is a limited use of the available graphic representations

ICA's objective

Offer guidelines and best practices for mapping the UN SDGs to…

- Best support the SDGs through Cartography with help of the cartographic community

- Transfer knowledge and expertise via the book ***Mapping a sustainable world*** and various training related activities

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Let’s make the world a better place with maps