UN GEOSPATIAL NETWORK

UNITED NATIONS COMMITTEE OF EXPERTS ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

Side Event of the UN Geospatial Network at the Eleventh Session of UN-GGIM

Mapping For A Sustainable World

MAPPING
FOR A
SUSTAINABLE WORLD

United Nations

ICA
ACI


SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

13 CLIMATE ACTION — TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

THE GLOBAL MEAN TEMPERATURE IN 2018 IS APPROXIMATELY **1°C ABOVE** THE PRE-INDUSTRIAL BASELINE

186 PARTIES HAVE RATIFIED THE PARIS AGREEMENT

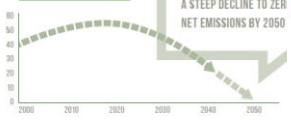
CLIMATE-RELATED AND GEOPHYSICAL DISASTERS **CLAIMED AN ESTIMATED 1.3 MILLION LIVES** BETWEEN 1998 AND 2017

DESPITE AN INCREASE IN GLOBAL CLIMATE FINANCE FLOWS OF 17% (2015–2016), COMPARED WITH 2013–2014,

INVESTMENT IN

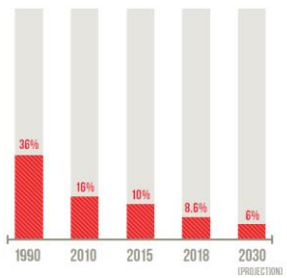
ATMOSPHERIC CO_2 CONCENTRATION IS **146% OF PRE-INDUSTRIAL LEVELS (2017)**

TO LIMIT GLOBAL WARMING TO 1.5°C, **GLOBAL CARBON EMISSIONS NEED TO FALL TO 55% OF 2010 LEVELS BY 2030 AND CONTINUE A STEEP DECLINE TO ZERO NET EMISSIONS BY 2050**



1 NO POVERTY — END POVERTY IN ALL ITS FORMS EVERYWHERE

THE WORLD IS NOT ON TRACK TO END POVERTY BY **2030**



55% OF THE WORLD'S POPULATION HAVE NO ACCESS TO **SOCIAL PROTECTION**

736 MILLION PEOPLE LIVED IN EXTREME POVERTY IN 2015, **413 MILLION** IN SUB-SAHARAN AFRICA

MORE THAN 90% OF DEATHS DUE TO DISASTERS OCCUR IN LOW- AND MIDDLE-INCOME COUNTRIES

14 LIFE BELOW WATER — CONSERVE AND SUSTAINABLY USE THE OCEANS, SEA AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

OCEAN ACIDITY HAS INCREASED BY **26%** SINCE PRE-INDUSTRIAL TIMES

IT IS EXPECTED TO RAPIDLY INCREASE **BY 100–150% BY 2100**

THE INCREASE IN OCEAN ACIDITY IS A NEGATIVE PHENOMENON. IT IMPACTS THE ABILITY OF THE OCEAN TO ABSORB CO_2 AND ENDANGERS MARINE LIFE.

THE PROPORTION OF FISH STOCKS WITHIN BIOLOGICALLY SUSTAINABLE LEVELS DECLINED FROM **90%** (1974) TO **67%** (2015)

87 COUNTRIES SIGNED THE AGREEMENT ON PORT STATE MEASURES, THE **FIRST BINDING** INTERNATIONAL AGREEMENT ON ILLEGAL, UNREPORTED AND UNREGULATED FISHING

104 OUT OF 220 COASTAL REGIONS IMPROVED THEIR **COASTAL WATER QUALITY** (2012–2018)

17% OF WATERS UNDER NATIONAL JURISDICTION ARE COVERED BY PROTECTED AREAS

MORE THAN DOUBLE THE 2010 COVERAGE LEVEL

5 GENDER EQUALITY — ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

18% OF EVER-PARTNERED WOMEN AND GIRLS AGED **15 TO 49 YEARS HAVE EXPERIENCED** PHYSICAL AND/OR SEXUAL **PARTNER VIOLENCE**

IN SOUTHERN ASIA, A GIRL'S RISK OF MARRYING IN CHILDHOOD HAS DECREASED BY **40%** SINCE 2000

STILL, **30%** OF WOMEN AGED 20 TO 24 YEARS WERE MARRIED BEFORE AGE 18 (2018)

24% OF NATIONAL PARLIAMENTARIANS ARE WOMEN AN INCREASE FROM 19% (2010)

WOMEN REPRESENT **39%** OF THE WORKFORCE BUT ONLY **27%** OF MANAGERIAL POSITIONS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE — BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

INDUSTRIALIZATION IN LDCs **IS TOO SLOW** TO MEET THE 2030 AGENDA TARGET

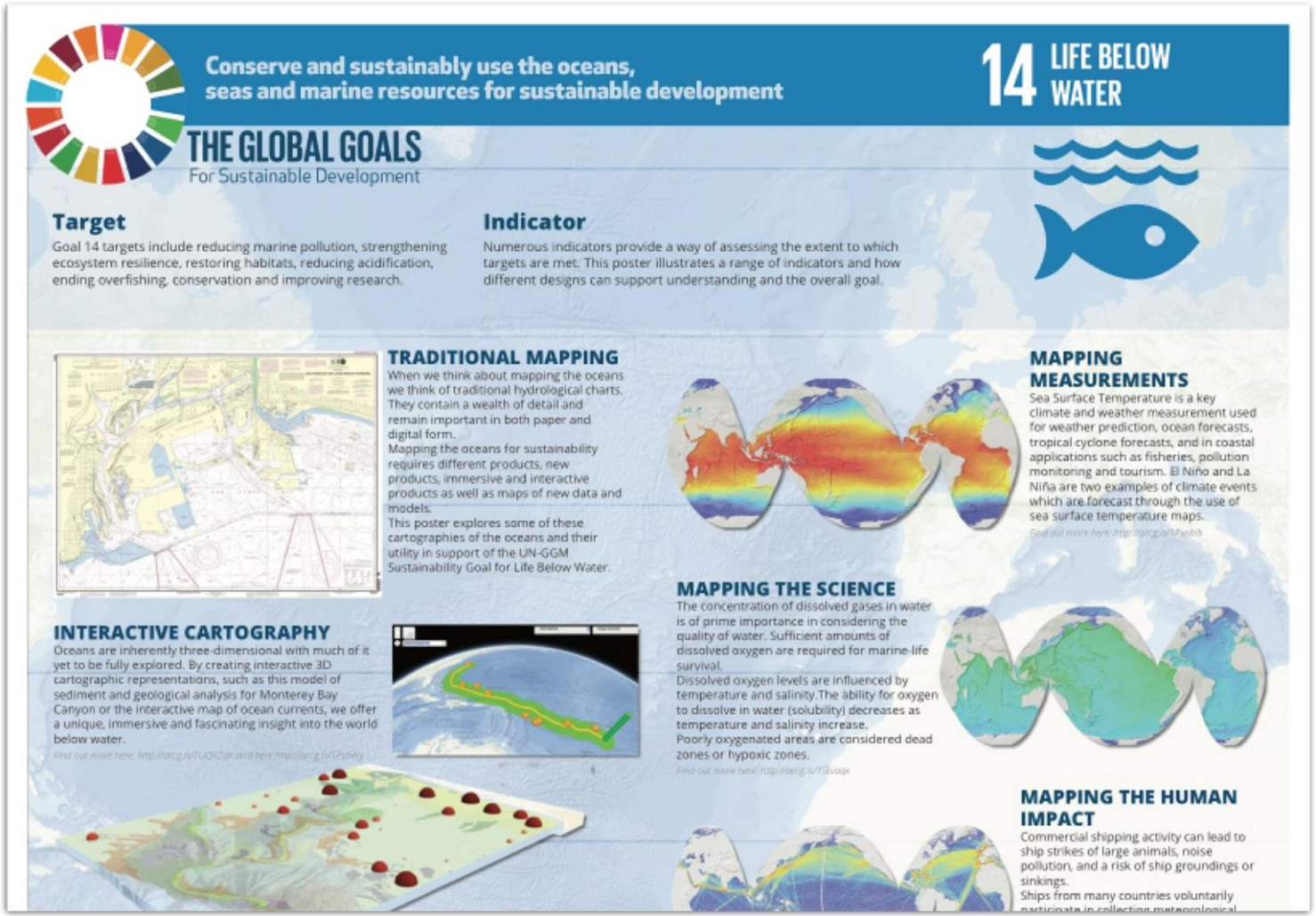
MEDIUM-HIGH AND HIGH-TECH SECTORS ACCOUNT FOR 45% OF THE GLOBAL MANUFACTURING VALUE ADDED (2016), BUT THE SHARE IS ONLY 15% IN SUB-SAHARAN AFRICA

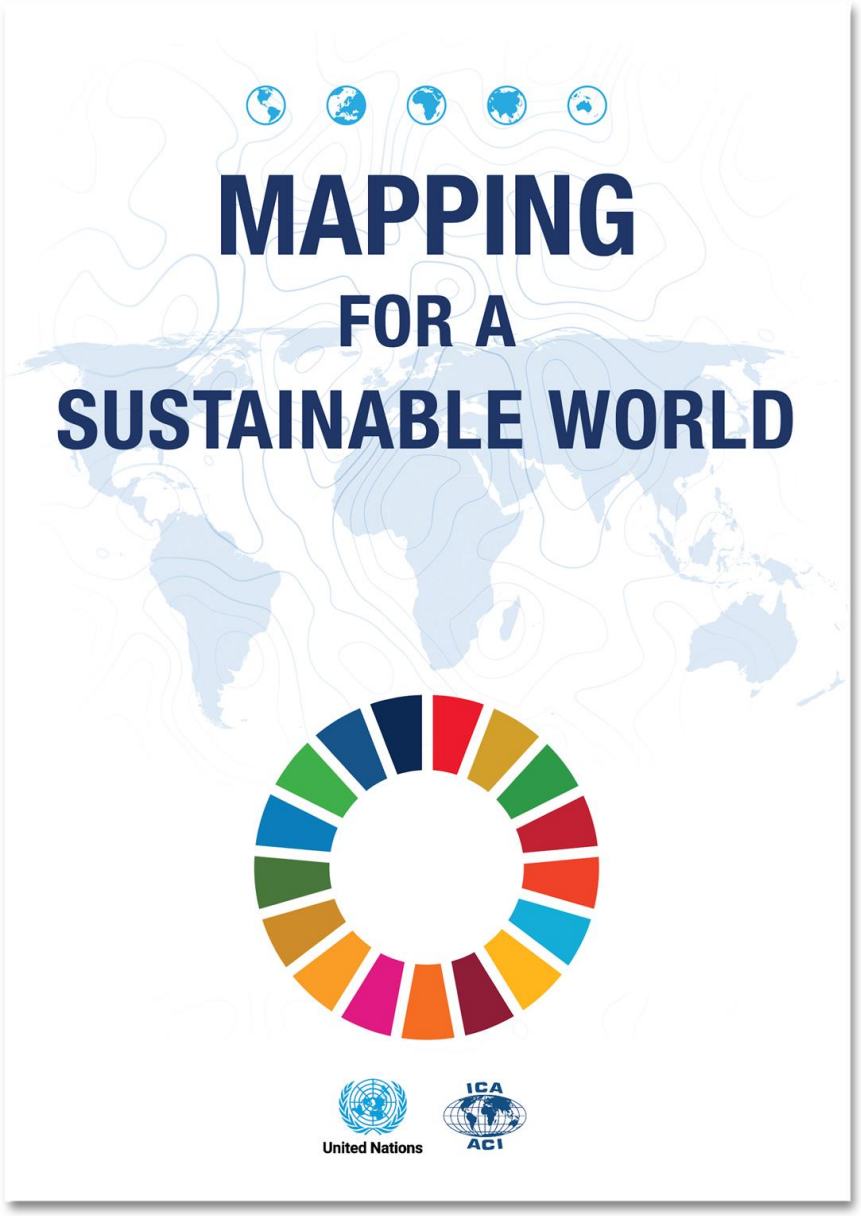
GLOBAL INVESTMENT IN RESEARCH AND DEVELOPMENT IS **$2 TRILLION** (2016), UP FROM **$739 BILLION** (2000)

90% OF PEOPLE LIVE WITHIN RANGE OF A 3G OR HIGHER QUALITY MOBILE NETWORK (2018), **BUT NOT ALL CAN** AFFORD TO USE IT

UN-GGIM

UN-GGIM › Bureau





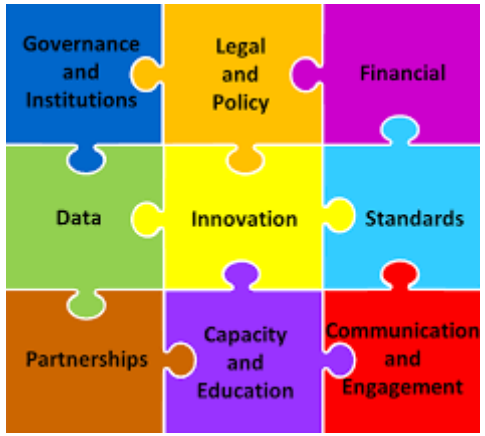
4 QUALITY EDUCATION

Open and free publication to

Ensure inclusive and equitable quality education
And promote lifelong opportunities for all

Kraak MJ, RE Roth, B Ricker, A Kagawa, and G Le Sourd. 2020.
Mapping for a Sustainable World
New York: United Nations

Available in UN Digital Library and UNiLibrary
https://digitallibrary.un.org/record/3898826
https://www.un-ilibrary.org/content/books/9789216040468/read



Integrated Geospatial Information Framework

Global Statistical and Geospatial Framework

SDG Geospatial Roadmap

Onlaps with UN-GGIM topics and working streams:

Partnerships
Data quality and availability
Innovation and geospatial science
Capacity building and Education
Statistical and Geospatial integration
Common geographies
Enumeration areas
Sustainable Development Goals
Use of SDG indicators
Showcase of integration for national context

Structure &

The book comprises four sections. Section 1 introduces the SDGs and their relation to geospatial data, describing SDG indicators and data transformations for mapping. Section 2 describes foundational design decisions in the cartographic workflow including projections, scale, generalization, symbolization, typography, and visual hierarchy among others. Section 3 introduces common map types (e.g., choropleth maps, proportional symbol maps, dasymetric maps, bivariate maps, cartograms) and diagrams (e.g., bar charts, scatterplots, timelines) for representing the SDG indicators. Finally, Section 4 discusses considerations for map use environments such as audiences, user interfaces and interaction operators, mobile and web media, storytelling versus exploration, and open access.

Table of Contents

SDGs & Geospatial Data

Map design considerations

Maps & diagrams

Map Use Environments

3.7 Bivariate Maps

A ***bivariate map*** (bi=two, variate=variables) depicts two data attributes in a single thematic map. Bivariate maps can be powerful for visual interpretation of spatial patterns, particularly for comparing the spatial distribution of two potentially related SDG indicators as well as for identifying outlier locations that do not conform to an expected relationship between SDG indicators. However, bivariate maps can be confusing and even misleading because they exhibit increased information complexity and are found less frequently in popular media.

In practice, it is useful to consider three kinds of bivariate maps based on combinations of the visual variables: separable (e.g., thematic map combinations, shaded cartograms, shaded proprtional symbols), integral (e.g., bivariate choropleth maps), and configural (e.g., split symbol maps). Bivariate map legends should be plotted with X- and Y-axes to show all possible symbol combinations (Figure 3.7-1) and, thus, inform how each symbol combination should be read in the resulting map.

A ***separable*** bivariate map preserves reading of both original X and Y indicators in the map, with a separable map functionally serving like two different maps on a single page (Figure 3.7-2). Use separable maps for independent indicators with different attribute units, such as comparing an absolute frequency to a relative percentage or an unnormalized indicator to a normalized variant.

An ***integral*** bivariate map restricts reading of the original X and Y indicators but promotes reading of the + relationship between indicators, making it easier to infer correlations and identify places that do not conform to the expected relationship (Figure 3.7-3). Use integral maps for dependent indicators in the same attribute units for visual correlation. Avoid integral maps when there is no known correlation as they can be misleading and infer a causal relationship.

A ***configural*** bivariate map maintains reading of the original X and Y attributes while including a visual hint about the + relationship that can be used for visual correlation (Figure 3.7-4). Use configural maps for independent indicators in the same attribute units. These are useful for comparing temporal changes, such as before versus after, or subsets within an indicator, such as rural versus urban.

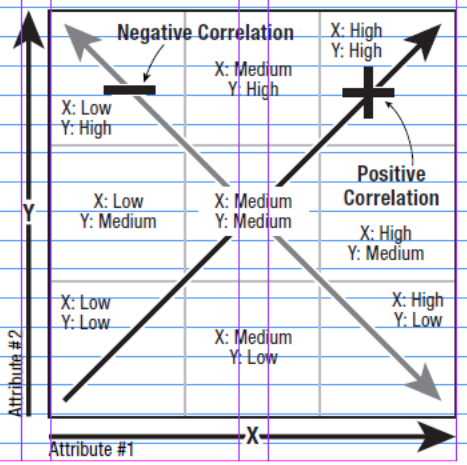


Figure 3.7-1: Reading bivariate maps. Bivariate map legends should be arranged in two dimensions to show example symbol combinations. Different bivariate map types then vary by how the X- and Y-axes and positive (+) correlation are preserved.

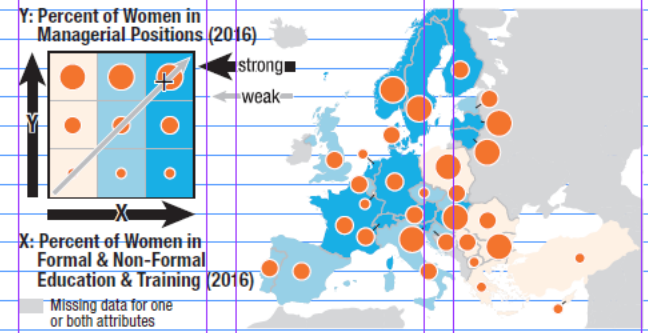


Figure 3.7-2: Separable bivariate map. Indicator 4.3.1 (2016) on the per cent of women in formal and non-formal education and training is mapped as a choropleth and Indicator 5.5.2 (2016) on the per cent of women in managerial positions is mapped with proportional symbols. Separable maps preserve X and Y but do not have an emergent positive (+) dimension.

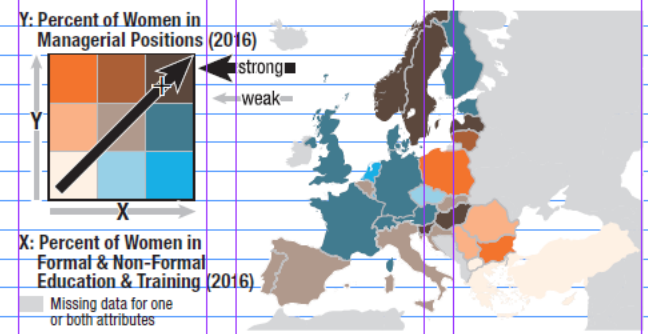


Figure 3.7-3: Integral bivariate map. Indicator 4.3.1 (2016) and 5.5.2 (2016) are remapped using a bivariate choropleth, which has an emergent positive (+) dimension. Because both indicators have the same attribute unit (percentages), the bivariate choropleth map is a better solution than the thematic map combination in Figure 3.7-2.

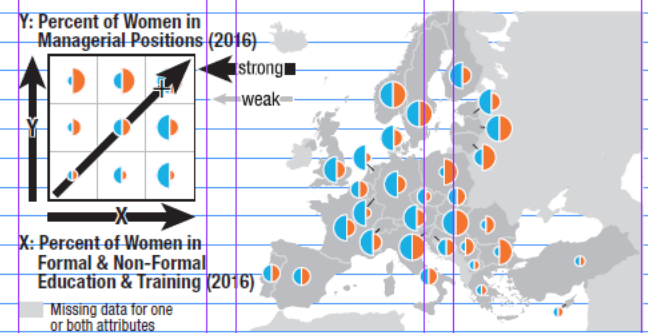


Figure 3.7-4: Configural bivariate map. Indicator 4.3.1 (2016) and 5.5.2 (2016) are remapped as a split proportional symbol map. Configural solutions preserve X and Y but also have an emergent + dimension. The split proportional symbol map is more appropriate than the Figure 3.7-3 bivariate choropleth if independence between attributes is assumed.

Integral and configural bivariate maps usually are classified into just 2x2 or 3x3 classes to reduce complexity (e.g., 3x3 results in nine unique bivariate symbols). Separable bivariate maps can include 4x4, 5x5, or even 7x7 classes much like univariate maps since it is possible to attend to the X and Y attributes separately (see Section 1.9).

STROKES & CORNERS

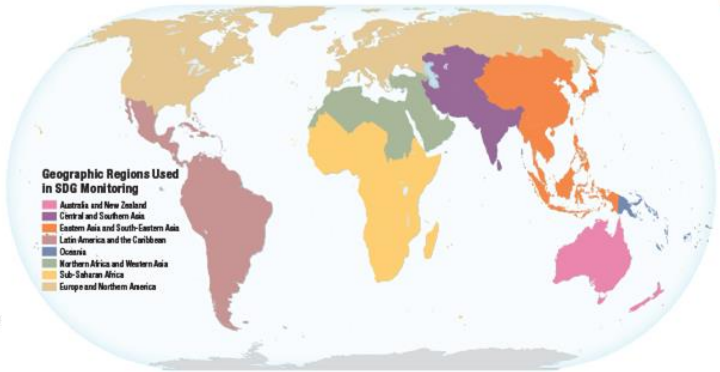
country boundary (30K, 0.4 stroke width)
figure arrowheads (100K, arrow 2, scale 80%, rounded cap)
figure rounded rectangles (3pt corner radius)
figure rounded rectangels outline (30K, 0.4 stroke width)

EXPORTS

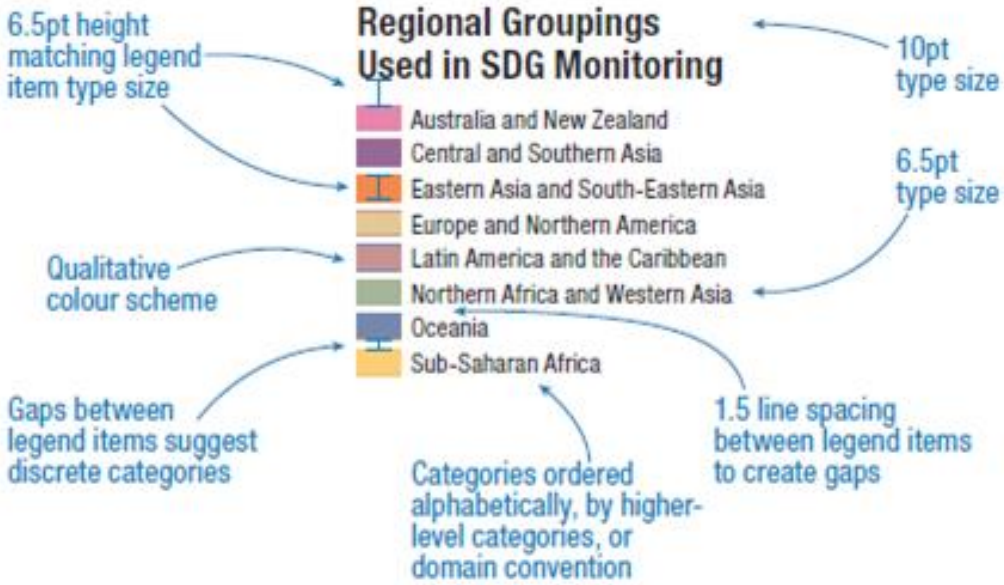
Place .AI files rather than image exports into layout
Export a copy of maps/figures as .PDF on "high quality print" setting

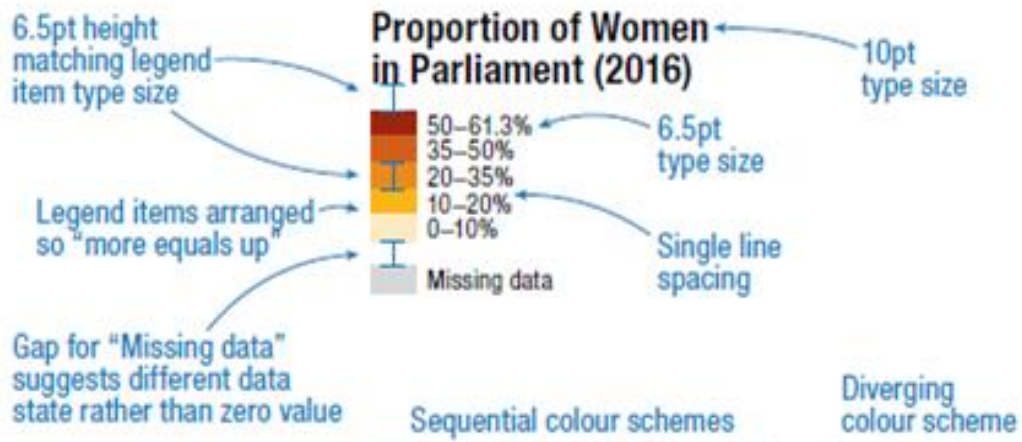
Land:
White polygon, exported to photoshop
Outer Glow:
Color 50/10/15/0
Multiply
Opacity 51
Noise 0
Spread 16
Size 9
Color Overlay:
Color 50/10/15/0
Multiply 71

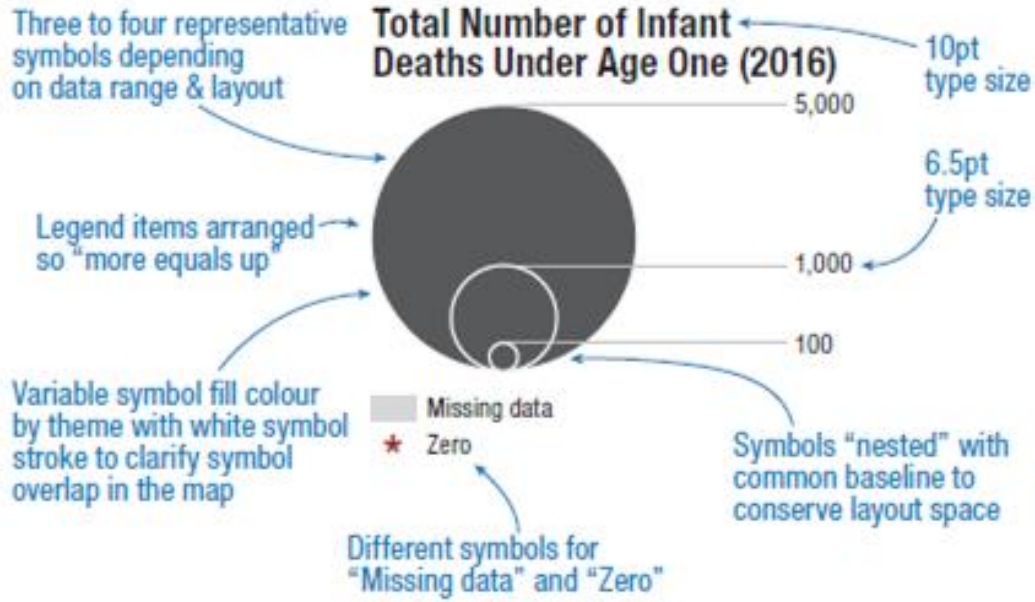
Water:
White polygon, exported to photoshop
Inner Glow:
Color 18/0/3/0
Multiply
Opacity 46
Size 250
Color Overlay:
Color 30/0/6/0
Multiply 11

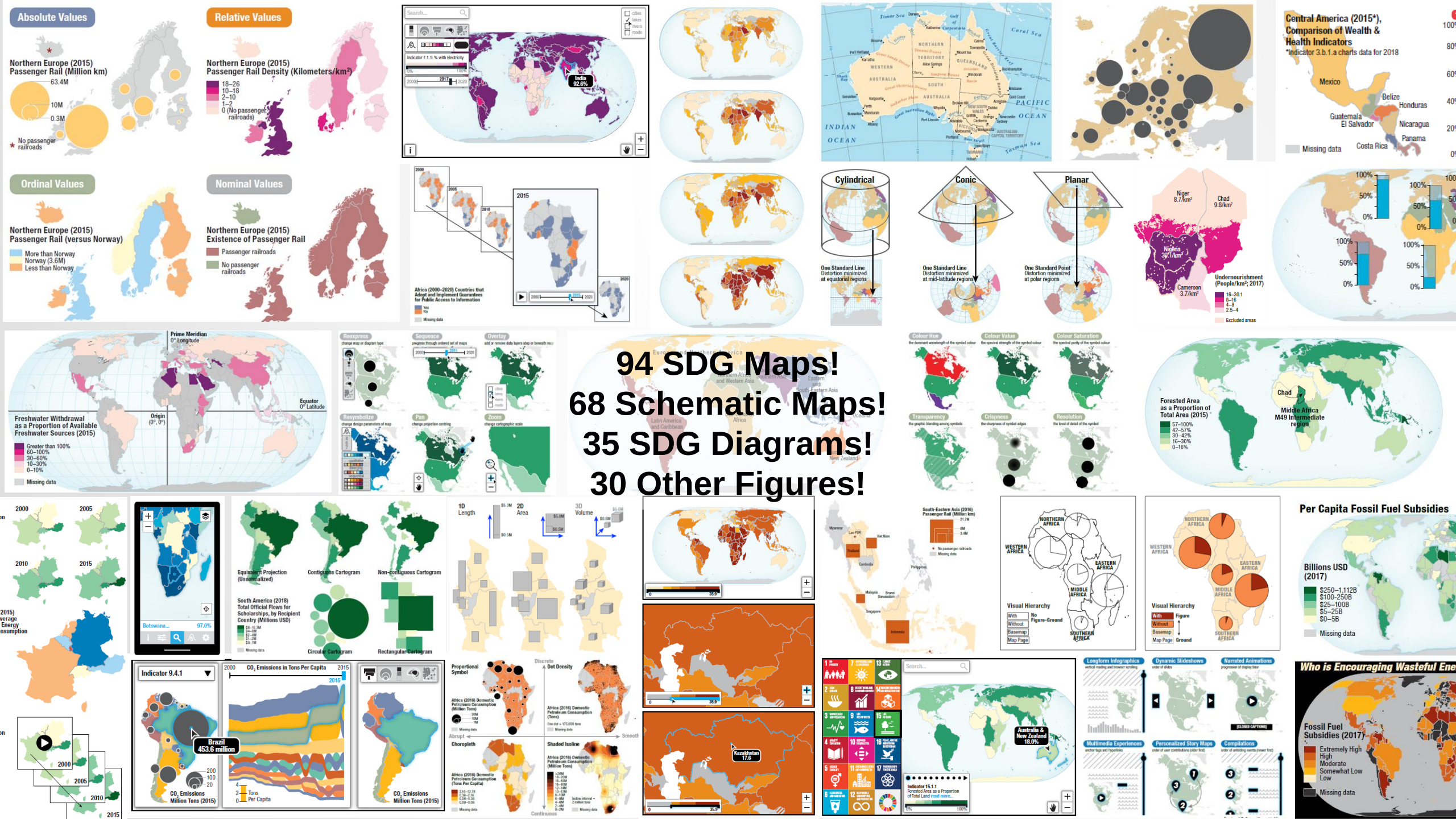


REGION
Country





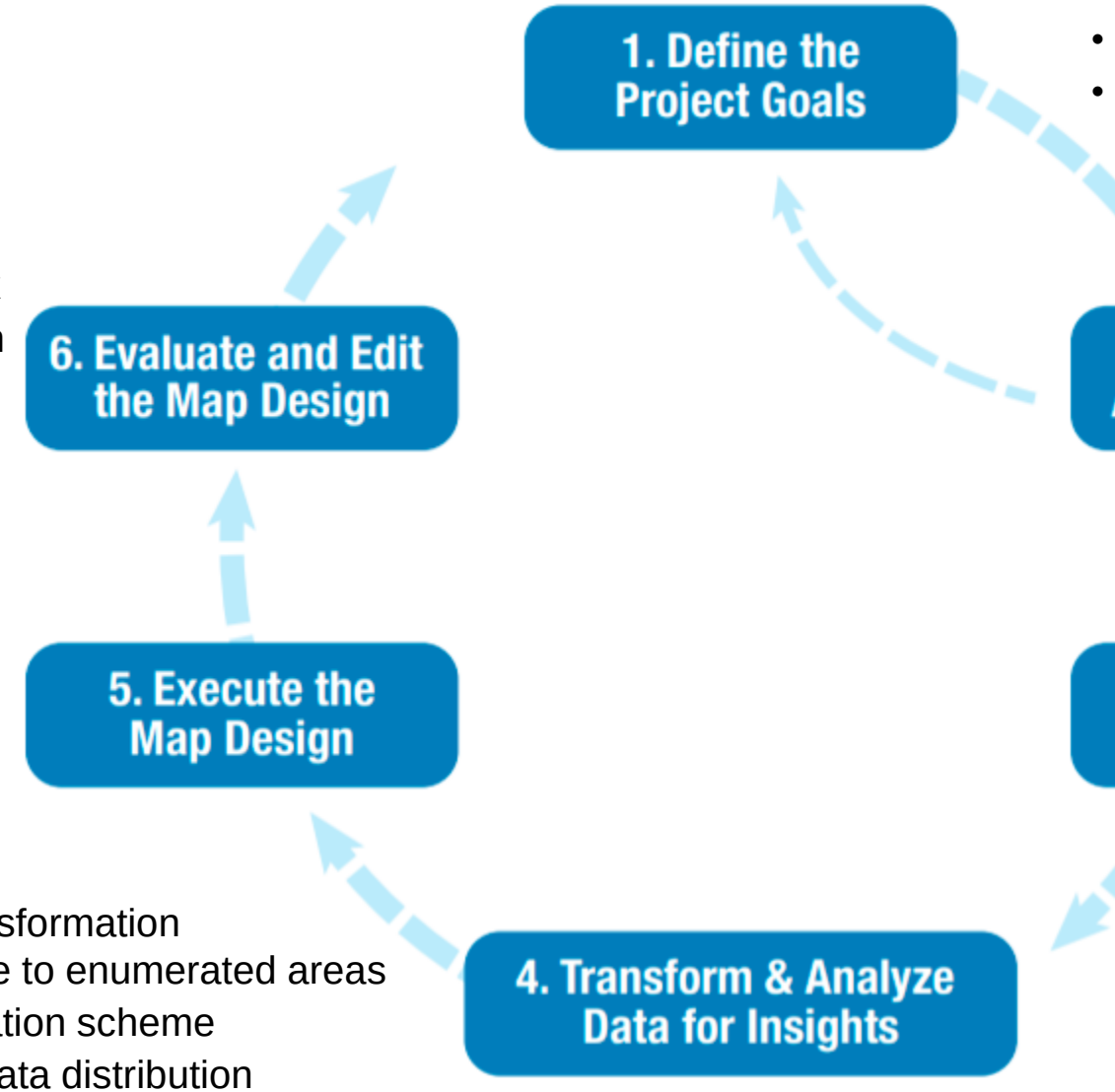



Absolute Values
Northern Europe (2015)
Passenger Rail (Million km)
63.4M
10M
0.3M
No passenger railroads
Relative Values
Northern Europe (2015)
Passenger Rail Density (Kilometers/km²)
18–26
10–18
2–10
1–2
0 (No passenger railroads)
Ordinal Values
Northern Europe (2015)
Passenger Rail (versus Norway)
More than Norway
Norway (3.6M)
Less than Norway
Nominal Values
Northern Europe (2015)
Existence of Passenger Rail
Passenger railroads
No passenger railroads
India
92.6%
Cylindrical
One Standard Line
Distortion minimized
at equatorial regions
Conic
One Standard Line
Distortion minimized
at mid-latitude regions
Planar
One Standard Point
Distortion minimized
at polar regions
Central America (2015*),
Comparison of Wealth &
Health Indicators
*Indicator 3.b.1.a charts data for 2018
Mexico
Belize
Honduras
Guatemala
El Salvador
Nicaragua
Costa Rica
Panama
Missing data
Niger
8.7/km²
Chad
9.8/km²
Nigeria
30.1/km²
Cameroon
3.7/km²
Undernourishment
(People/km²; 2017)
16–30.1
8–16
4–8
2.5–4
Excluded areas
Prime Meridian
0° Longitude
Equator
0° Latitude
Origin
(0°, 0°)
Freshwater Withdrawal
as a Proportion of Available
Freshwater Sources (2015)
Greater than 100%
60–100%
30–60%
10–30%
0–10%
Missing data
Reexpress
Sequence
Overlay
Resymbolize
Pan
Zoom
Colour Hue
Colour Value
Colour Saturation
Transparency
Crispness
Resolution
Forested Area
as a Proportion of
Total Area (2015)
57–100%
42–57%
30–42%
16–30%
0–16%
Chad
Middle Africa
M49 Intermediate
region
94 SDG Maps!
68 Schematic Maps!
35 SDG Diagrams!
30 Other Figures!
Botswana...
97.0%
Equivalent Projection
(Unnormalized)
Contiguous Cartogram
Non-contiguous Cartogram
South America (2018)
Total Official Flows for
Scholarships, by Recipient
Country (Millions USD)
Circular Cartogram
Rectangular Cartogram
1D
Length
2D
Area
3D
Volume
South-Eastern Asia (2016)
Passenger Rail (Million km)
Visual Hierarchy
With
Without
Basemap
Map Page
No Figure-Ground
Figure
Ground
Per Capita Fossil Fuel Subsidies
Billions USD
(2017)
$250–1,112B
$100–250B
$25–100B
$5–25B
$0–5B
Missing data
Indicator 9.4.1
Brazil
453.6 million
CO₂ Emissions
Million Tons (2015)
CO₂ Emissions in Tons Per Capita
Tons
Per Capita
Proportional
Symbol
Dot Density
Choropleth
Shaded Isoline
Discrete
Continuous
Abrupt
Smooth
Kazakhstan
17.6
Australia &
New Zealand
18.0%
Indicator 15.1.1
Forested Area as a Proportion
of Total Land
Longform Infographics
Dynamic Slideshows
Narrated Animations
Multimedia Experiences
Personalized Story Maps
Compilations
Who is Encouraging Wasteful Ene
Fossil Fuel
Subsidies (2017)
Extremely High
High
Moderate
Somewhat Low
Low
Missing data

Compelling stories about our world…

…using maps and geospatial information

1 Mapping for the Goals
Cartographic planning and design
What is the narrative?



- Subject/Goal
- Audience
- Environment
- Data selection
- Decision on representation

- Review available datasets
- Collect official SDG indicator data

- Choose software
- Clean and Reformat
- Choose Enumeration areas
- Align attributes
- Assess completeness
- Manage missing data
- Join temporal data

- Data transformation
- Normalize to enumerated areas
- Classification scheme
- Review data distribution
- Check anomalies or patterns

- Projection
- Symbolization
- Scale & extent
- Thematic map type
- Visual variable
- Symbol/shape
- Annotation/Typography

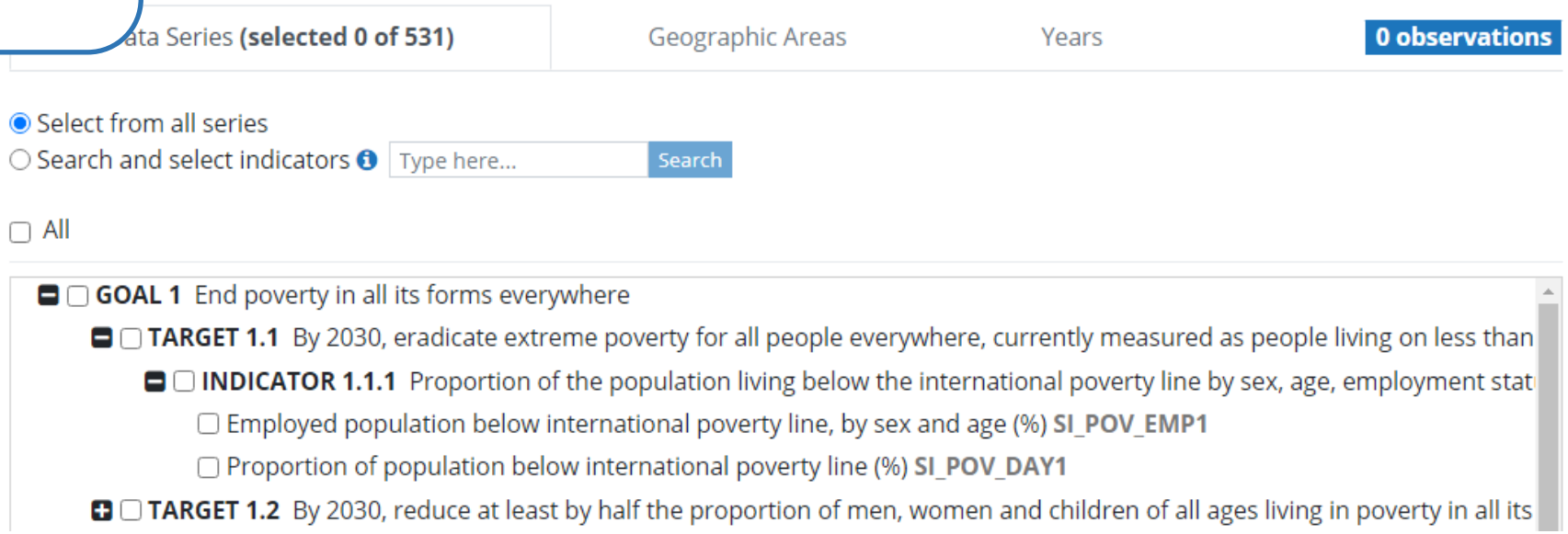
- Complete a self-edit
- Consultation/feedback
- Revise and finalization

2

Statistical - SDG indicators
Geospatial - UN Geodata

SDG indicators
United Nations Global SDG Database

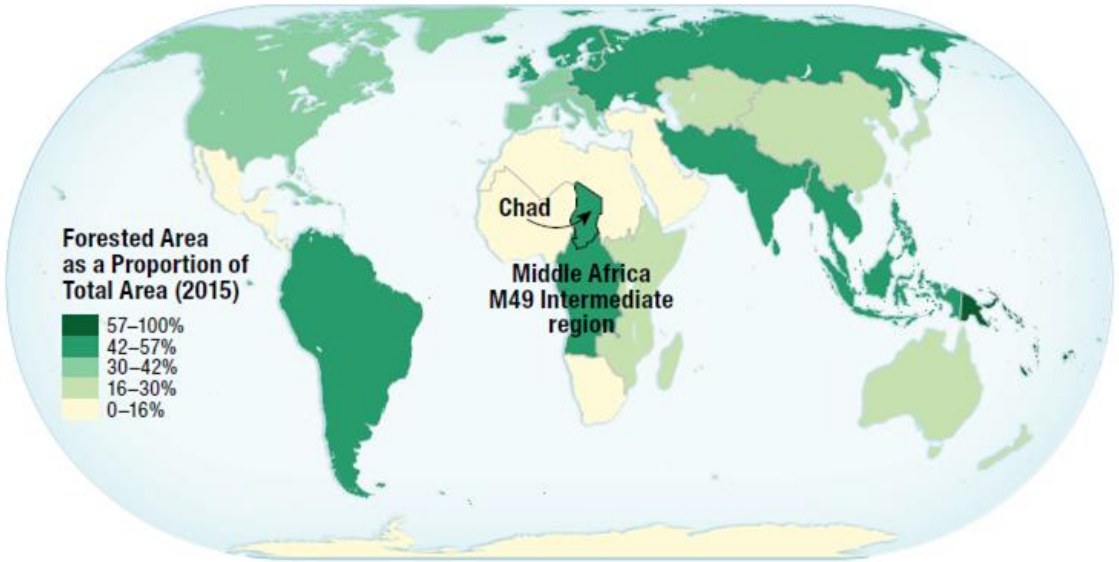
https://unstats.un.org/sdgs/indicators/database/



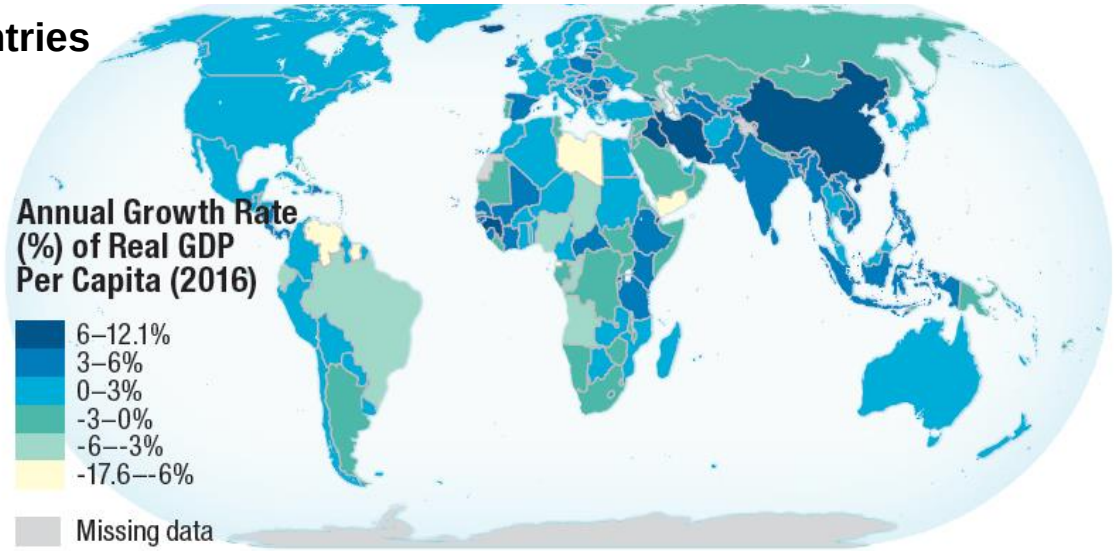
SDG indicator data

Goal	Target	Indicator	SeriesCode	SeriesDescription	GeoAre	GeoAreaName	Nature	Reporting Type	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	2	Africa	G	G	PERCENT			47			43			41		39	38
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	8	Albania	G	G	PERCENT			2			1			0			
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	12	Algeria	G	G	PERCENT												1
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	19	Americas	G	G	PERCENT			8			7			5		4	4
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	24	Angola	G	G	PERCENT	32								30			
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	32	Argentina	G	G	PERCENT	6	9	14	7	5	4	3	3	3	3	2	1
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	51	Armenia	G	G	PERCENT		19	15	11	8	5	3	3	1	2	2	2
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	142	Asia	G	G	PERCENT			30			23			19		15	12
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	36	Australia	G	G	PERCENT		1		1	1				0		0	
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	53	Australia and New	G	G	PERCENT			1			1			0		0	0
1	1.1	1.1.1	SI_POV_DAY1	Proportion of population	40	Austria	G	G	PERCENT	0			0	0	0	0	0	1	1	1	0

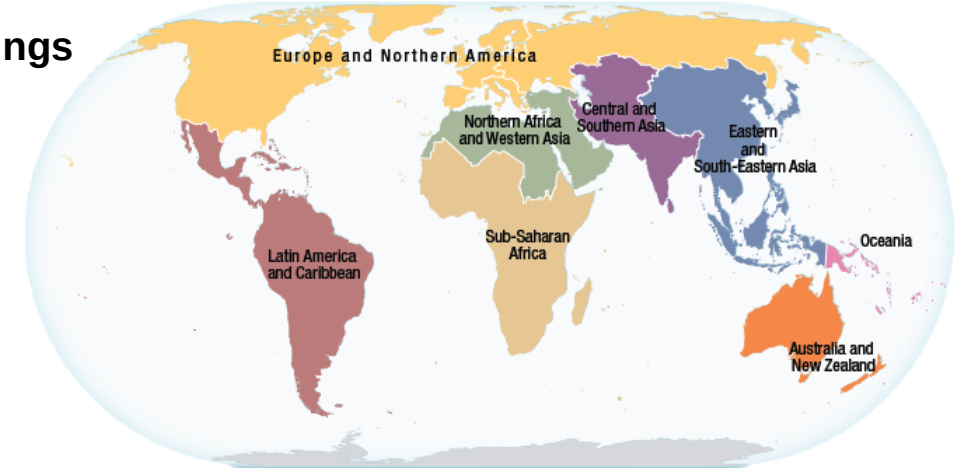
3 Enumeration areas



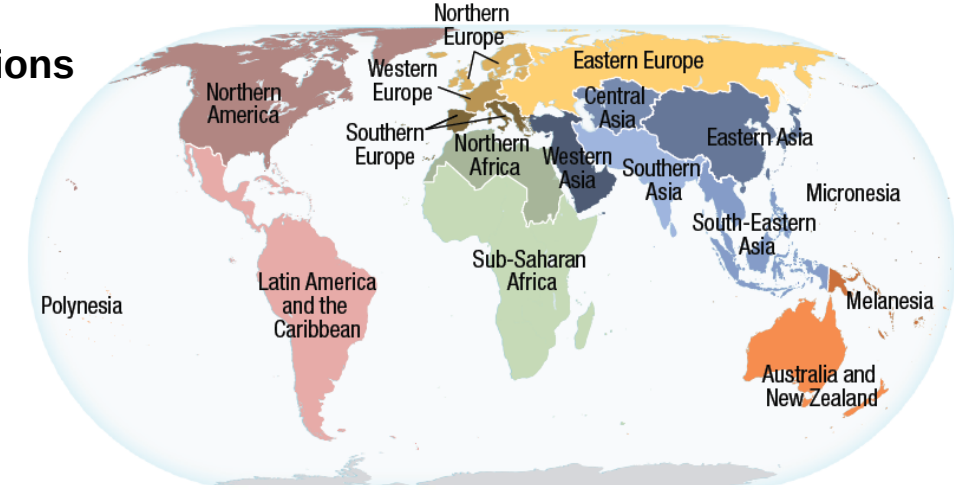
Countries



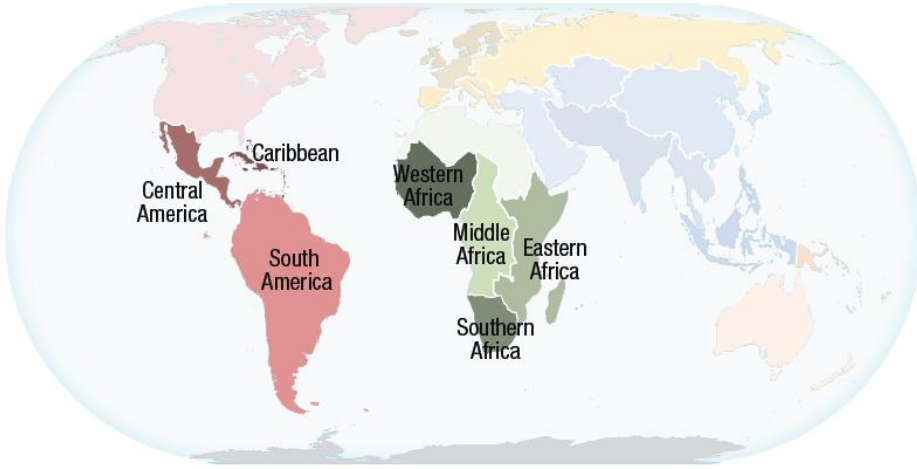
SDG groupings



Sub-regions



Intermediary regions



4

Transform & Analyze

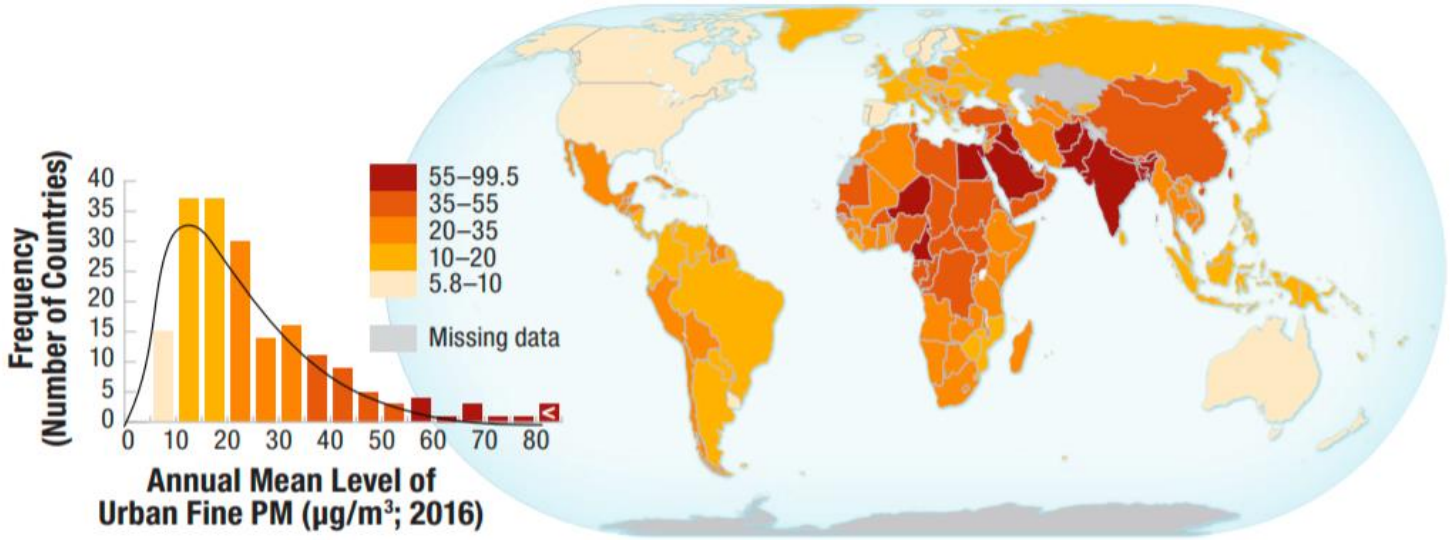


Figure 1.9-1: Data distributions and classification. **Left:** The histogram depicts the left-skewed attribute distribution for Indicator 11.6.2 (2016) on the annual mean levels of urban fine particulate matter. **Right:** The resulting arithmetic scheme increases distances between class breaks in a regular progression, here expanding each class width by 5 µg/m3 to provide more detail for features in the clustered side of the distribution rather than emphasizing outliers.

Statistical distribution analysis and classification

Geographic transformation

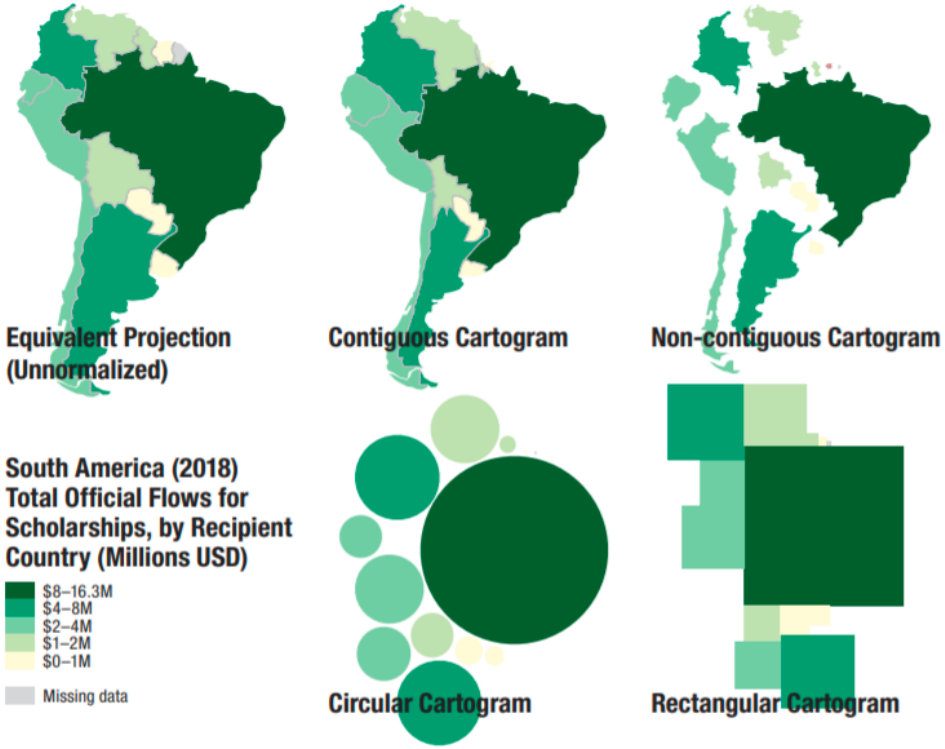


Figure 3-8.2: Types of cartograms. Indicator 4.b.1 (2018) on the total official flows for scholarships, by recipient country (Millions USD) is mapped for South American countries as a choropleth atop four different population-based cartograms. **Top-centre:** Contiguous. **Top-right:** Non-contiguous. **Bottom-left:** Circular. **Bottom-right:** Rectangular.

5

Execute map design

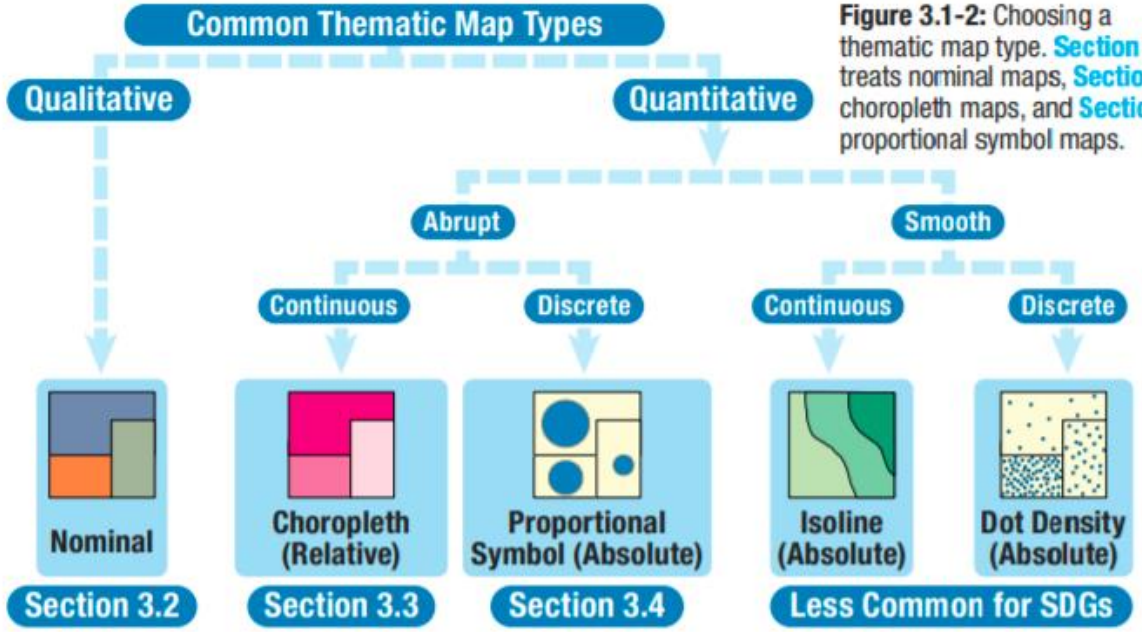


Figure 3.1-2: Choosing a thematic map type. Section 3.2 treats nominal maps, Section 3.3 choropleth maps, and Section 3.4 proportional symbol maps.

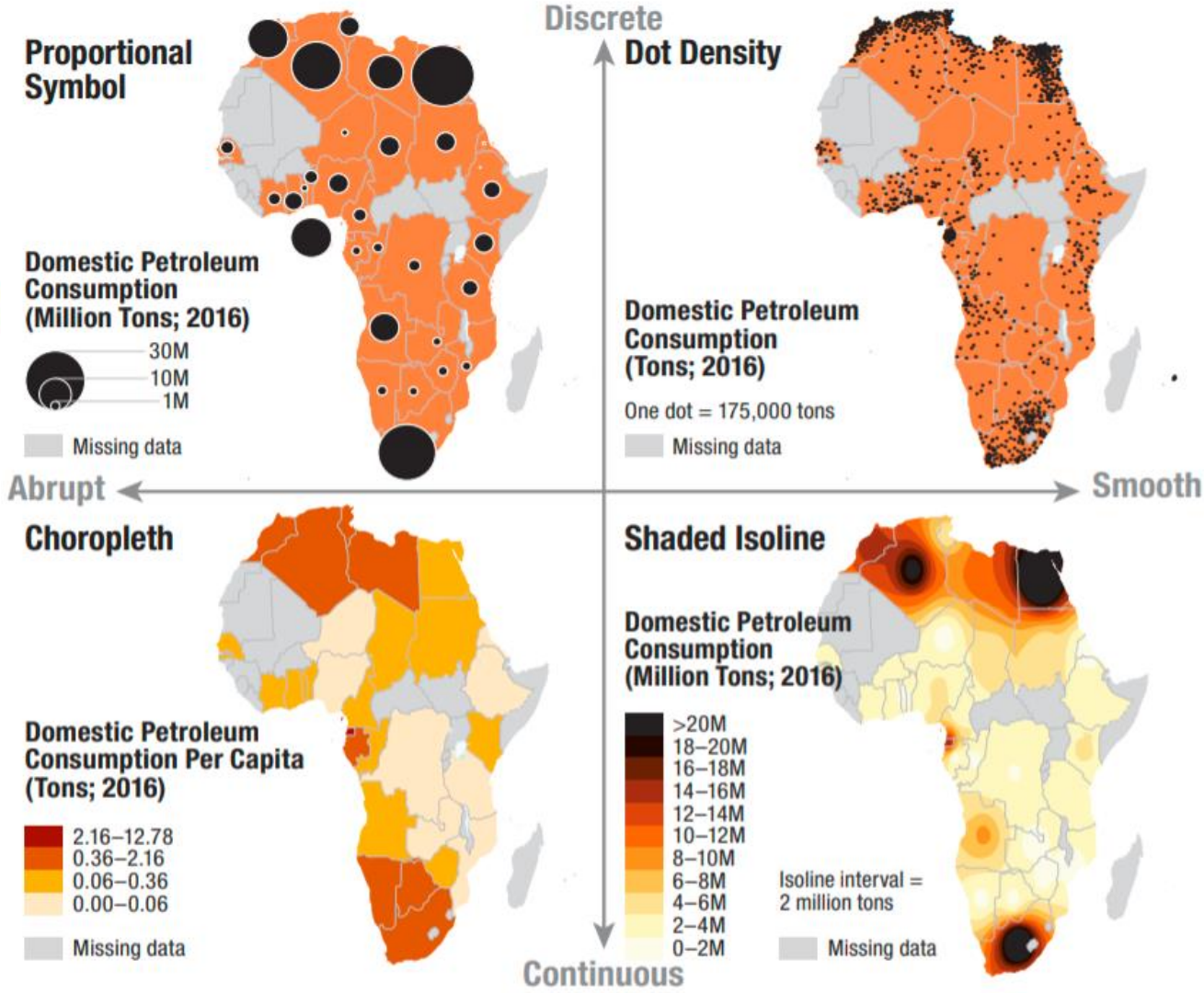
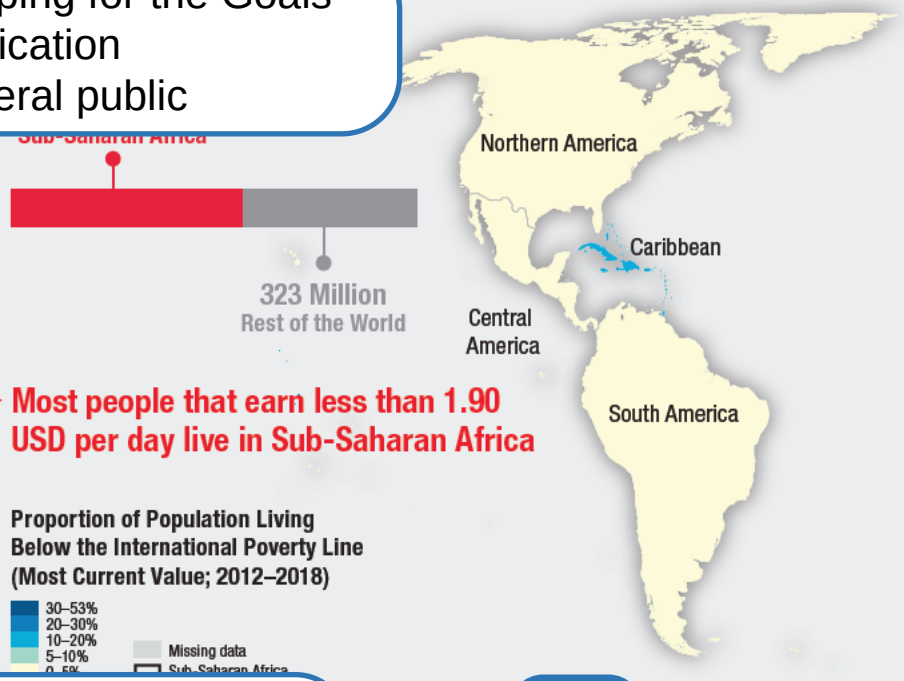


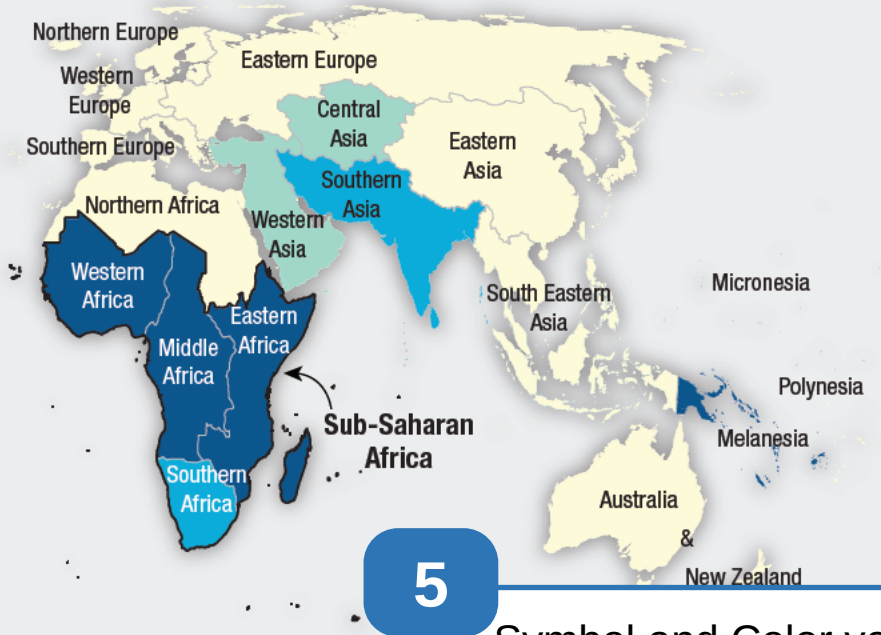
Figure 3.1-1: Thematic map types. The four maps depict Indicator 12.2.2 (2016) on domestic petroleum consumption. **Top-left:** Proportional Symbol. **Top-right:** Dot density. **Bottom-left:** Choropleth. **Bottom-right:** Shaded isoline.

GOAL 1: END POVERTY IN ALL ITS FORMS EVERYWHERE

1 Mapping for the Goals
Publication
General public

2 Statistical - SDG indicators as:
Proportion of pop. living below poverty line (most current values)
Geospatial - UN Geodata





3 Enumeration Areas as:
Sub- & intermediary regions

The UN Secretary-General meets people living in a camp for internally displaced persons (IDPs) in the town of Bangassou, Central African Republic. (Source: UN Photo/Eskinder Debebe, 2017)

4 Choropleth
Classification scheme
Review data distribution

The map depicts Indicator 1.1.1 (most curren… on the proportion of population living below th… day) as a choropleth… evel, global set of reg… ings for obtaining greater homogeneity in… SDG groupings are derived from the M49 …ombination of regions and sub-regions.

Indicator 1.1.1 is a ratio level, relative value (a proportion) and, thus, is normalized for choropleth mapping to… ts from the modifiable areal unit problem. The chor… classification for the left-skewed attribu… tial colour scheme for an apparent increase i…

The boundaries and names shown and the designations u… …tance by the United Nations.

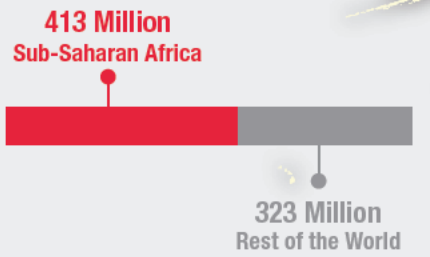
5 Symbol and Color value
Scale and extent
Annotation and graphics

6 Review

GOAL 1: END POVERTY IN ALL ITS FORMS EVERYWHERE

SDG Target 1.1
Eradicate extreme poverty for all people everywhere

► **736 million people lived in extreme poverty in 2015**

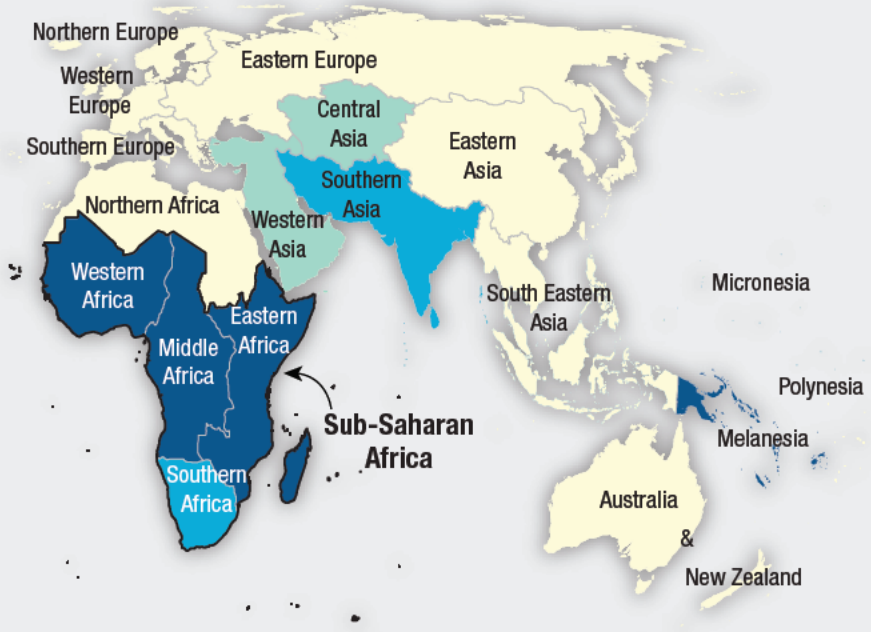


► **Most people that earn less than 1.90 USD per day live in Sub-Saharan Africa**

Proportion of Population Living Below the International Poverty Line (Most Current Value; 2012–2018)

30–53%
20–30%
10–20%
5–10%
0–5%
Missing data
Sub-Saharan Africa

◄ The UN Secretary-General meets people living in a camp for internally displaced persons (IDPs) in the town of Bangassou, Central African Republic. (Source: UN Photo/Eskinder Debebe, 2017)



▲ The map depicts Indicator 1.1.1 (most current value for 2012–2018) on the proportion of population living below the international poverty line (set at 1.90 USD per day) as a choropleth by SDG groupings. The M49 standard is a multi-level, global set of region, sub-region, and intermediate region groupings for obtaining greater homogeneity in sizes of demography. The SDG groupings are derived from the M49 methodology and use a combination of regions and sub-regions.

Indicator 1.1.1 is a ratio level, relative value (a proportion) and, thus, is normalized for choropleth mapping to mitigate effects from the modifiable areal unit problem. The choropleth map uses an arithmetic classification for the left-skewed attribute distribution and a sequential colour scheme for an apparent increase from low to high.

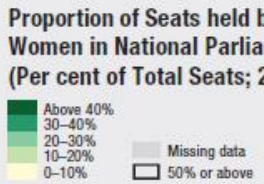
GOAL 5: ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

SDG Target 5.5

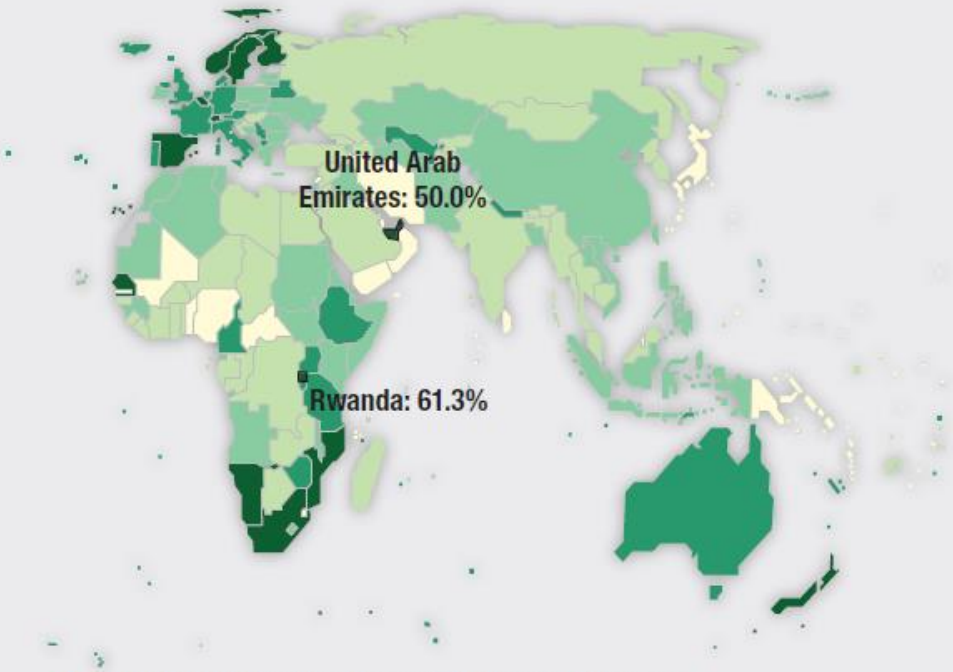
Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making

► **Only 24% of parliamentary leaders were women in 2020**

► **Only four national parliaments have 50% or greater representation by women**



◄ Wide view of the opening meeting of the sixty-fourth session of the Commission on the Status of Women (CSW). Member States adopted a political declaration in which they pledged to step up action to fully implement the landmark Beijing Declaration and Platform for Action on gender equality, agreed to 25 years ago. (Source: UN Photo/Loey Felipe, 2020)



▲ The map depicts Indicator 5.5.1 (2020) on the proportion of seats held by women in national parliaments as a choropleth map. Countries for the choropleth map are highly generalized to show only the overall thematic patterns, simplifying the message. This style also increases the visual weight of smaller nations. UN Women promotes this basemap for its publication on "Women in Politics."

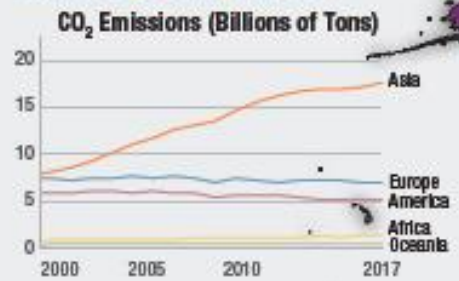
Although simplified, the map remains projected in the Eckert IV equivalent projection used throughout the book, allowing for comparison of areas in the choropleth. The choropleth map uses an equal interval classification for the uniform attribute distribution and a sequential colour scheme that crosses yellow to green colour hues but primarily relies on the ordered visual variable colour value.

5 GENDER EQUALITY

GOAL 9: BUILD RESILIENT INFRASTRUCTURE, PROMOTE SUSTAINABLE INDUSTRIALIZATION, & FOSTER INNOVATION

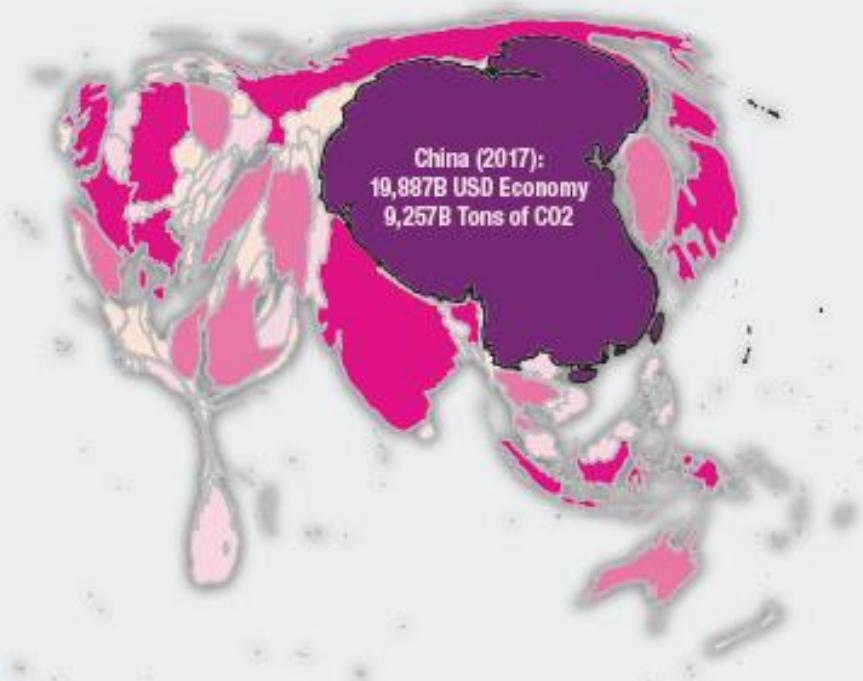
SDG Target 9.4
Upgrade infrastructure and retrofit industries to make them sustainable

► 32 billion tons of CO_2 were emitted globally in 2017



► The two largest national economies by GDP also emit the most CO_2 worldwide

A Mongolian family uses solar panels to generate power for their ger, a traditional Mongolian tent, in Tarialan, Province of Uvs in Mongolia. The solar panels are sponsored by the United Nations Development Fund to empower herder groups to use clean energy. (Source: UN Photo/Ekinder Debebe, 2009)



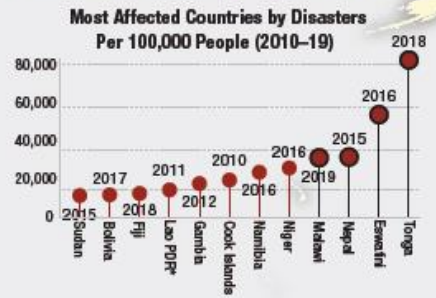
▲ The map depicts Indicator 9.4.1 (2017) on CO_2 emissions in metric tons per chained dollars as a contiguous cartogram. Rather than mapping the normalized indicator as a choropleth map, the relative rate is reverted to the original absolute attributes and then mapped using two different visual variables: countries are scaled by total CO_2 emissions from fuel combustion (size) and then then shaded by gross domestic product (GDP) purchasing power parity (colour value).

The resulting bivariate cartogram visually normalizes GDP by CO_2 emissions, showing dramatic differencas among regions. As temperatures rise an estimated 1.5°C by 2100, the cartogram reveals that the Global North has a disproportionate responsibility in reducing CO_2 emmissions through sustainable infrastructure and industries.

GOAL 13: TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE

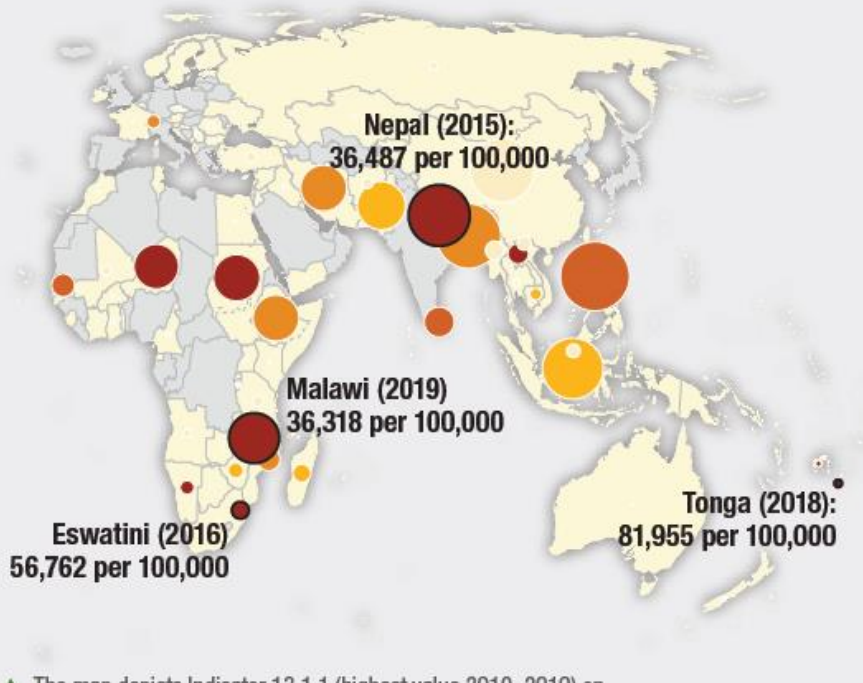
SDG Target 13.1
Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters

► **Climate change affected more than 39 million people in 2018**



► **Only 85 countries have plans to meet the Sendai framework to reduce disaster risk**

◄ Secretary-General of the World Meteorological Organization (WMO) briefs reporters on its State of the Climate 2019 Report. A world map of global temperature differences between 1981–2010 and 2019 is shown in the background. (Source: UN Photo/Manuel Elias, 2020)

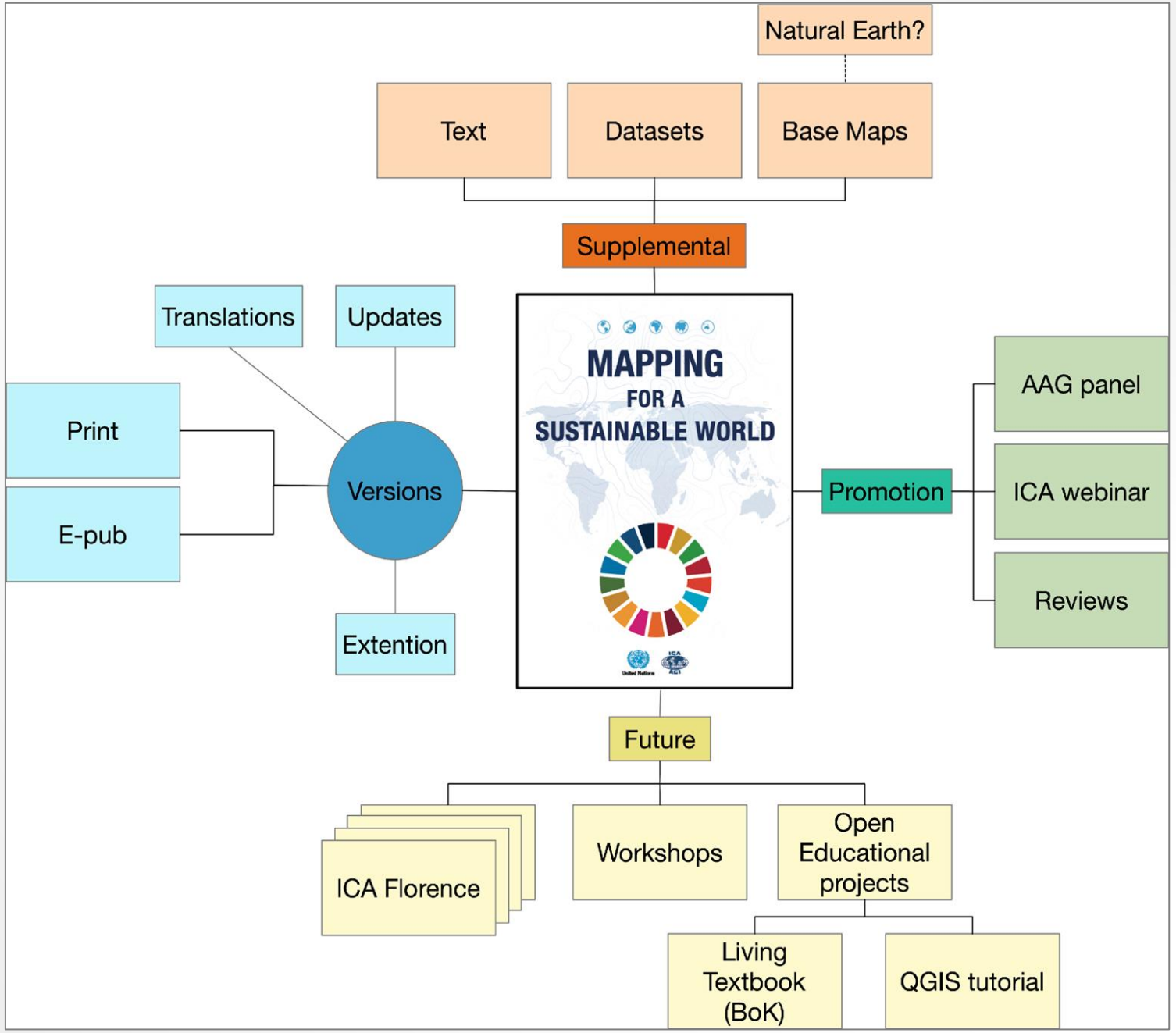


▲ The map depicts Indicator 13.1.1 (highest value 2010–2019) on directly affected persons attributed to disasters using shaded proportional symbols by country. Affected persons is depicted in two ways: the absolute total as proportional symbols (size) and the relative rate per 100,000 people through shading (colour value).

Climate change affects everyone, but developing countries and marginalized populations often shoulder a disproportionate burden from climate-related hazards such as severe weather, fires and flooding, and food and water scarcity. Representing Indicator 13.1.1 in two ways tells the story of both the overall magnitude of the problem through the proportional symbols and the impact on specific populations through the colour shading.

13 CLIMATE ACTION

WHAT IS NEXT?


Natural Earth?
Text
Datasets
Base Maps
Supplemental
Translations
Updates
Print
E-pub
Versions
Extention
MAPPING
FOR A
SUSTAINABLE WORLD
Promotion
AAG panel
ICA webinar
Reviews
Future
ICA Florence
Workshops
Open
Educational
projects
Living
Textbook
(BoK)
QGIS tutorial

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E-handbook of SDG indicators: https://unstats.un.org/wiki/display/SDGeHandbook/Home

IAEG-SDGs: https://unstats.un.org/sdgs/iaeg-sdgs/

WG on Geospatial Information: http://ggim.un.org/UNGGIM-wg6/

UN-GGIM: https://ggim.un.org/

UN Geospatial website: https://www.un.org/geospatial/

Partnership information between ICA and UNGIS: https://www.un.org/geospatial/programmes

UN GEOSPATIAL NETWORK

UNITED NATIONS COMMITTEE OF EXPERTS ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

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