

The role of Cartography as enabler of geospatial knowledge

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President, International Cartographic Association

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The ICA and the UN-GGIM

- The ICA is a founding international professional society of the Geospatial Society thematic network of the UN-GGIM
- Served as the leader of the Geospatial Societies for several terms

The Strength of the ICA

- **People**
 - 28 Commissions and 1 Working Group focused on specific cartographic and geospatial topics
- **Conferences**
 - International Cartographic Conferences (ICCs)
 - 2021 Florence, Italy (Europe)
 - 2023 Cape Town, South Africa (Africa)
 - 2025 Vancouver, Canada (Americas)
 - 2027 Warsaw, Poland (Europe)
 - Regional Cartographic Conferences (RCCs)
 - 2022 EuroCarto, Vienna
 - 2022 AutoCarto, Redlands
 - 2024 EuroCarto, Vienna
 - 2024 AsiaCarto, HongKong
- **Publications**
 - International Journal of Cartography (peer reviewed)
 - ICA News
 - eCARTO News
 - ICA website – www.icaci.org
 - ICC Proceedings

ICA National Members

- National Mapping and Geospatial Agency
 - National Geographical Institute
 - Department of Surveys and Mapping
 - Geographical Military Institute
- National Cartographic Association
- National Committee for Cartography

ICA Members



ICA Collaborations

- One of the founding organizations of the UN-GGIM Geospatial Societies Network
- Member of the International Science Council ISC and the OGC
- MOUs with many organizations (currently: 11)



Four UN Initiatives of Interest to ICA

- Sustainable Development Goals (SDGs)
- Integrated Geospatial Information Framework (IGIF)
- Global Statistical Geospatial Framework (GSGF)
- UN Centres of Excellence (China, Germany, and Saudi Arabia)

A GOAL for ICA: “Actionable” Cartography and GIScience

- There are more problems to solve than there are workable solutions to help them go away.
- Many challenges can be solved with existing data and simple solutions.
 - Keep it simple; keep it simple; keep it simple...

ICA Commissions

- Atlases
- Cartography and Sustainable Development * *new: aligned to SDGs*
- Cartography in Early Warning and Crisis Management
- Cognitive Issues in Geographic Information Visualization
- Digital Transformation of National Mapping Agencies * *new: aligned to IGIF*
- Education and Training *opportunities for collaboration with GGKIC*
- GeoAI * *new: potential alignment with the proposed Centre in Riyadh*
- Geospatial Analysis and Modeling
- Geospatial Data Analytics * *new: potential alignment with Geospatial Societies*

ICA Commissions

- Integrated Geospatial Information for Cartography * *new: aligned to IGIF*
- Location Based Services
- Map Design
- Map Projections
- Maps and the Internet
- Marine Cartography
- Topographic Mapping
- Toponymy
- Ubiquitous Mapping

ICA Commission Alignment to Current Needs: The Integrated Geospatial Information Framework IGIF

1. Cartography in Early Warning And Crisis Management

1. Digital Transformation of NMAs

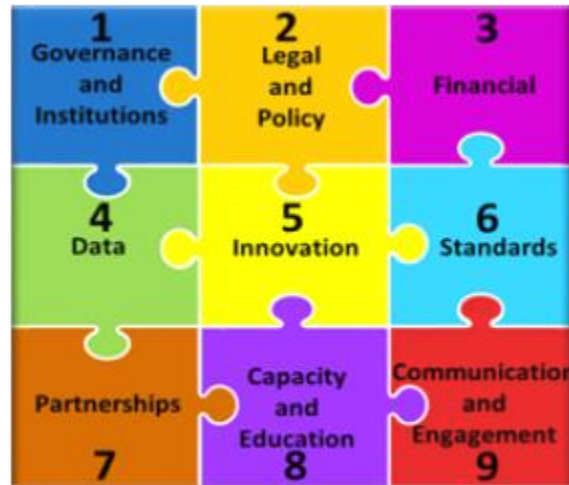
4. Topographic Mapping

4. Atlases

4. Geospatial Data Analytics

4. Marine Cartography

7. Sustainable Development



8. Education and Training

8. Cartography and Children

5. Cognitive Issues in Geo Visualization

5. Geospatial Analysis and Modeling

5. Location Based Services

5. GeoAI

5. Ubiquitous Mapping

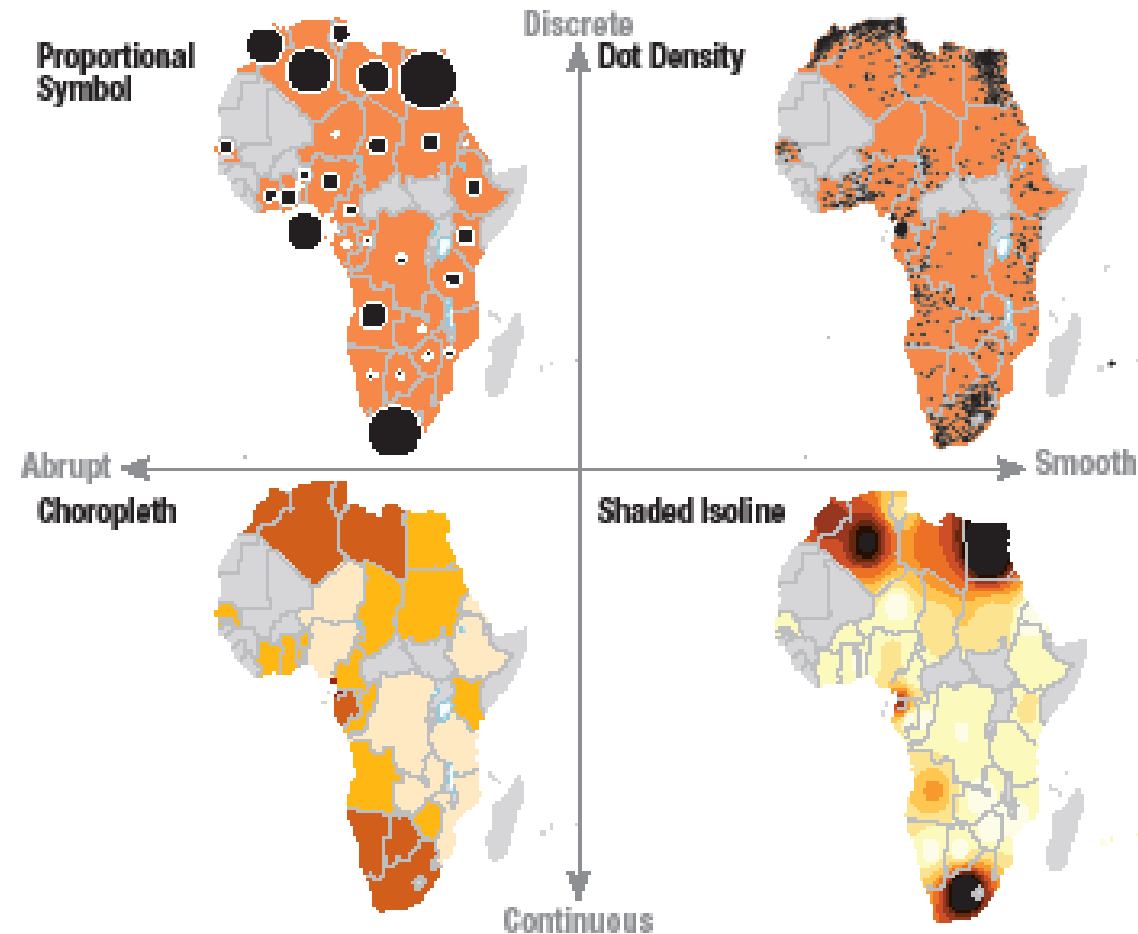
6. SDI and Standards

All. Integrated Geospatial Information
for Cartography (IGIF)

Information is Oftentimes Complicated

- This is what cartographers are good at...
 - Selecting information that is most important
 - Eliminating or reducing unnecessary noise
 - Generalizing to aid in understanding
 - Simplifying to help focus attention
 - Displacing to include necessary content
 - Designing maps and cartographic visualizations to effectively communicate the message
 - ...by using geodata integrated with other data types...

Different thematic map types using the same geodata



ICA and the SDGs

- **Full-Sized ICA Posters on the 17 SDGs**
 - <https://icaci.org/maps-and-sustainable-development-goals/>

ICA and SDG Goal 1

No poverty



Ending Poverty in all its forms everywhere

THE GLOBAL GOALS
For Sustainable Development

Target
By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day

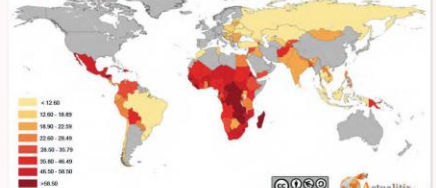
Indicator
Percentage of population below \$1.25 (PPP) per day

1 NO POVERTY



Names identify topographic elements which localize the map theme

Percentage of Population below the Poverty Line, by Country



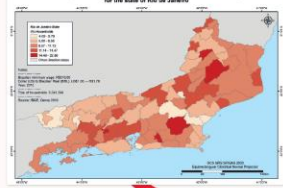
Fonte: Banco Mundial - 2015
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Percentage of households with income less than 1/4 of minimum wage in Brazil



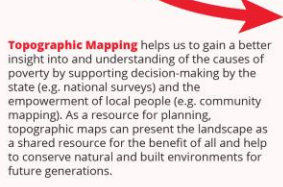
The maps in this poster illustrate geographical patterns of poverty around the world and focus on the city of Rio de Janeiro, Brazil. Left a sequence of choropleth maps showing percentage of households with an income less than 1/4 of the minimum wage in Brazil (R\$10), at regional and local levels.

Percentage of households with income less than 1/4 of minimum wage for the state of Rio de Janeiro



Right topographic and toponymic information, that is, more details about the landscape and the place names of the areas covered in the thematic maps at the same scales. Comparing the maps allows observations to be made about the patterns of poverty and its relationship with space and place. We can identify general trends, such as the low levels of income in regions within the Amazon basin and identify specific regions within the city of Rio de Janeiro which experience greater levels of poverty.

Percentage of households with income less than 1/4 of minimum wage for neighborhoods in municipality of Rio de Janeiro



Below the combination of the thematic data with topographic data to allow efficient understanding of the relationship between poverty and place. However, poverty is an organic phenomenon and choropleth maps such as these are limited in how they present these data; they impose artificial boundaries that rarely coincide with fluid concepts and realities.

Rio de Janeiro State - Brazil Municipality



Topographic Mapping helps us to gain a better insight into and understanding of the causes of poverty by supporting decision-making by the state (e.g. national surveys) and the empowerment of local people (e.g. community mapping). As a resource for planning, topographic maps can present the landscape as a shared resource for the benefit of all and help to conserve natural and built environments for future generations.

Percentage of households with income less than 1/4 of minimum wage for neighborhoods in municipality of Rio de Janeiro



Toponymy allows us to analyze the relations between and among people, history, geography and culture, space and time. Toponymy, place names or geographical names are one of the most commonly and widely used way of geoinformation, consisting of official and local names of administrative, cultural and geographic features, including streets and roads.

The ICA Commission on Topographic Mapping provides a forum for those whose primary focus is the design, production and use of topographic mapping and related geospatial data products.

The ICA Commission on Toponymy disseminates scientific knowledge on the processing and use of toponyms within geography and cartography and supports the publication of gazetteers, toponymic data files and toponymic reference systems.

Data and Information Source:
Actualitix.com
Banco Mundial, 2015
IBGE, Censo 2010
National Geographic
Open Street Map, created by people like you and free to use.

Boundaries on maps may vary slightly, but they are often different from those in the field. This poster series is a compilation of maps created by cartographers from different countries. The ICA has the right to use and reproduce these maps as long as the source is acknowledged and the ICA acknowledges that these maps do not represent an official position of the ICA.

ICACI
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Vice-chair: Anja Hopfstock, e-mail: anja.hopfstock@icaci.de

Commission on Toponymy
Chair: Paula Almeida, e-mail: paula.almeida@icaci.de
Vice-chair: Peter Jordan, e-mail: peter.jordan@icaci.de

WE MAPS
INTERNATIONAL MAP YEAR 2015-2016

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ICA and SDG Goal 2

End hunger



End hunger, achieve food security and improve nutrition and promote sustainable agriculture

THE GLOBAL GOALS
For Sustainable Development

2 ZERO HUNGER



Target

End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants to safe, nutritious and sufficient food all year round.
Ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production.

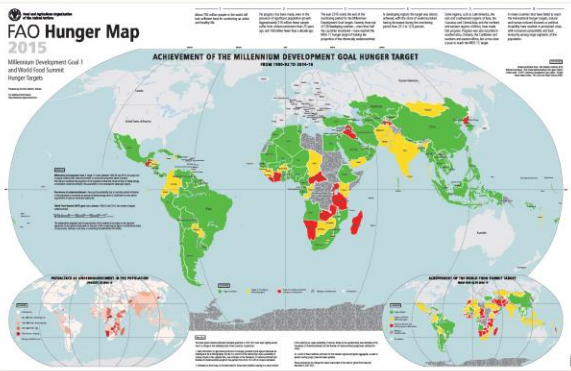
Indicator

Prevalence of Undernourishment (PoU)
Prevalence of population with moderate or severe food insecurity.
Emissions of greenhouse gasses in agriculture (per hectare of land and per unit of output).

Maps communicate spatial patterns and spatio-temporal analysis results effectively

FAO Hunger Map 2015

ACHIEVEMENT OF THE MILLENNIUM DEVELOPMENT GOAL HUNGER TARGET



Mapping the reality of food insecurity in the World

The prevalence of undernourishment (PoU) is analyzed for each country and visualized in the world map. Changes of PoU have been monitored and visually presented in the map. It is shown that the progress of reduction in number of undernourished has been made in all world regions, but at different rates.

Between the monitoring period of 1990-2015, more than 50% of the developing countries have at least halved the proportion of the chronically undernourished. But the map also shows that many countries still have not reached the international hunger target, with increased vulnerability and food insecurity among large segments of the population.

Sustainable agriculture

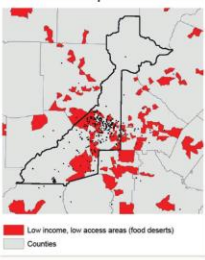
GIS and mapping have been used as enabling technology for sustainable agriculture and food production. The GIS and GPS-enabled mobile device technologies allow planners, agronomists and farmers to research and devise for resilient agricultural practices and better productivity. For example, emissions of greenhouse gasses per hectare of land and per unit of output can be accurately estimated based on precise geolocation, observation, and measurement.



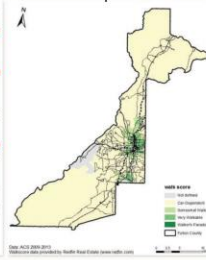
Prevalence of population with moderate or severe food insecurity at fine urban and regional scales

The prevalence of food insecurity also needs to be studied at the local level. This is often done with special consideration of the income level and people's spatial accessibility to healthy food. The mapping of the analysis results helps to identify areas where improvements are urgently needed. The maps below show such areas in Atlanta, USA.

Map title



Map title



Contributors: Mapping Unit, Angela Yao, Jerry Johnson in Geography Department at the University of Georgia

The ICA Commission on Geospatial Analysis and Modeling focuses on spatial analysis, modeling and data mining, often with links to the geovisualization and visual analytical approaches. The commission encourages concerted efforts on cutting-edge or emerging research directions related to geospatial data and problems.

Commission on Geospatial Analysis and Modeling
Chair: Xiaohu Angela Yao e-mail: xyao@uga.edu
View-chair: Ben Allsop e-mail: ben.allsop@ga.gov

Note: Some of the maps come from publications from official sources.

Data and Information Source Info:
FAO, ESRI, researchers at the University of Georgia, USA

Boundaries on maps may vary slightly. Authorities are often different on their dates and position. This poster series is compiled from many sources to compare them. The data may be used in a different way and for different purposes. The data are not intended to be used for any other purpose than for the purpose of the poster series. The data are not intended to be used for any other purpose than for the purpose of the poster series.



ICA
Commission on Geospatial Analysis and Modeling



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ICA and SDG Goal 4

Quality education



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

THE GLOBAL GOALS
For Sustainable Development

4 **QUALITY EDUCATION**

Target

By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and Goal-4 effective learning outcomes. And eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

Indicator

Completion rate primary and secondary / teachers in primary education, school life expectancy, out-of children of primary school age and out-of-school adolescents of lower secondary school age.

Maps help children understand our world

Every person - child, young or adult - should be able to benefit from educational opportunities designed to meet his/her basic learning needs.

These needs comprise both essential learning tools (such as literacy, oral expression, numeracy, and problem solving) and basic learning contents (knowledge, skills, values, and attitudes), indispensable to human beings to survive, allowing them to fully develop their capacities, living and working with dignity, improving life quality, making well-founded decisions, and continuing to learn.

Higher education institutes offering cartography courses

Cartography can play an important role in the goals proposed by the United Nations. Learning how to guide one's self into the geographic space, read maps and know how to use them as a spatial representation with a specific language is essential for the formation of autonomous citizens.

Children who draw maps nowadays will be more conscious adults about the geographic space!



The main goal of the ICA Commission on Cartography and Children is promote the use and enjoyment of maps by children and young people.

The Commission on Maps and Graphics for Blind and Partially Sighted People exchanges and disseminates information on the design and production technologies for maps and graphics for blind and visually impaired people.

The Commission on Education and Training acts as a forum to maintain an overview of cartographic education worldwide.

As cartography is a visual language, it is essential to have different representations of the same data and content. This poster serves as a visual aid for people with different types of disabilities. The ICA aims to be inclusive and accessible to all people. The ICA encourages the use of different colors and representations.

Commission on Cartography and Children
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Commission on Education and Training
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ICA and SDG Goal 9

Industry, Innovation, and Infrastructure



Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

THE GLOBAL GOALS
For Sustainable Development

9 **INDUSTRY, INNOVATION AND INFRASTRUCTURE**

Mobile communication technology enables "anywhere, anytime, for anyone and anything" map services

Target
Significantly increase access to information and communications technology and strive to provide universal and affordable access to the internet in least developed countries by 2020.

Indicator
Fixed broadband quality measured by mean download speed. Subscription fixed broadband internet (per 100 people).

Visualization of broadband & subscriptions

3D Extrusion - representing the fixed broadband quality measure by the mean download speed. This variable is visualized via a 3D extrusion in the map. The higher the extrusion, the faster is broadband connection speed.

Color - The numbers of subscription for fixed broadband internet (per 100 people) is visualized by color in the map. Darker color represents a higher number of subscriptions.

The map shows relations of subscriptions and download speed in different countries. In France for example there seems to be a high number of subscriptions for fixed broadband internet. The download speed seems slightly lower than in some neighboring countries.

Mobile broadband

With mobile broadband users can access maps on their mobile device. As many devices have build-in Global Navigation Satellite System (GNSS) receivers, it is possible to display the current position of the user. A mobile broadband connection enables the user to utilize Location-Based Services (LBS), for example for navigation or local information, entertainment, or social networking.

Mobile broadband enables public to access (spatial) information anywhere and anytime. This trend together with the development of information and communications technology (ICT) foster many innovative applications, such as smart cities, intelligent transportation services and urban planning. These innovative applications play a key role in developing a sustainable future.

New devices

All countries have increasing access to the internet, mobile & fixed. Emerging mobile devices (e.g., smart watches and digital glasses) are increasingly considered for visualizing maps. It is expected to have an increasing diversity of technical systems (including data formats) and an increasing diversity of devices.

Concerning the cartographic presentation of content we may see different "specialized platform specific systems" vs "more universal or web-based systems", as the different media can handle content and interactivity in various ways. For example the map has to scale according to the size of the display in a smart watch.

The main goal of the ICA Commission on Location Based Services (LBS) is to advance the research on LBS in all its interdisciplinary fields, with the aim to enable "anywhere, anytime, for anyone and anything" 4A services.

Data and Information Source:
ITU, global ICT statistics, 2014, Subscription to fixed broadband internet (per 100 people)
<https://www.itu.int/ITU-D/Statistics/Pages/stat/default.aspx>
Kauwe, State of the Internet, 2014.
<https://www.alanai.com/careers/working/state-of-the-internet-report>
Authors: Jukka M. Krupp, Heideberg Huang, Andrew Keller, Julian Brockhoff

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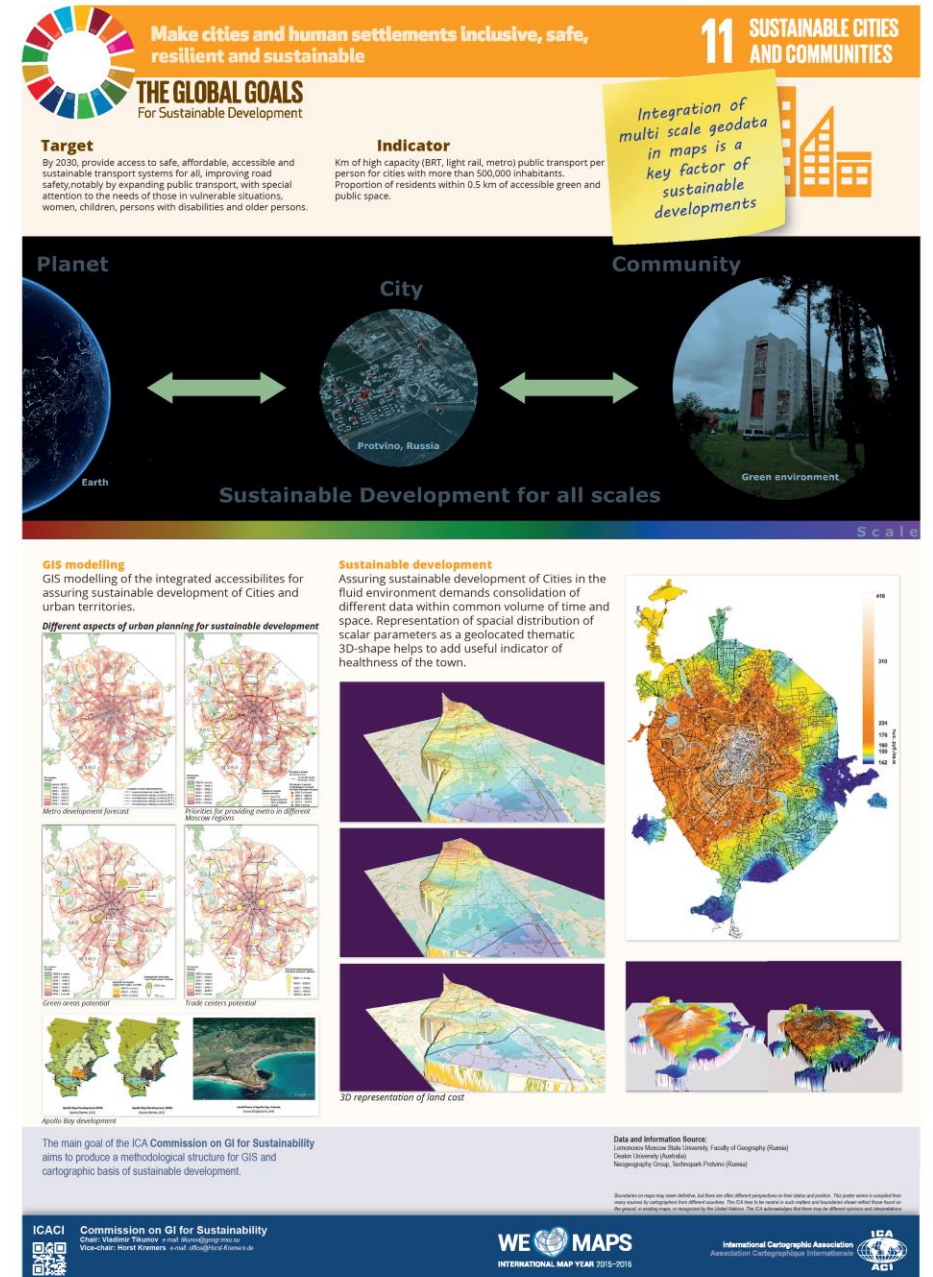
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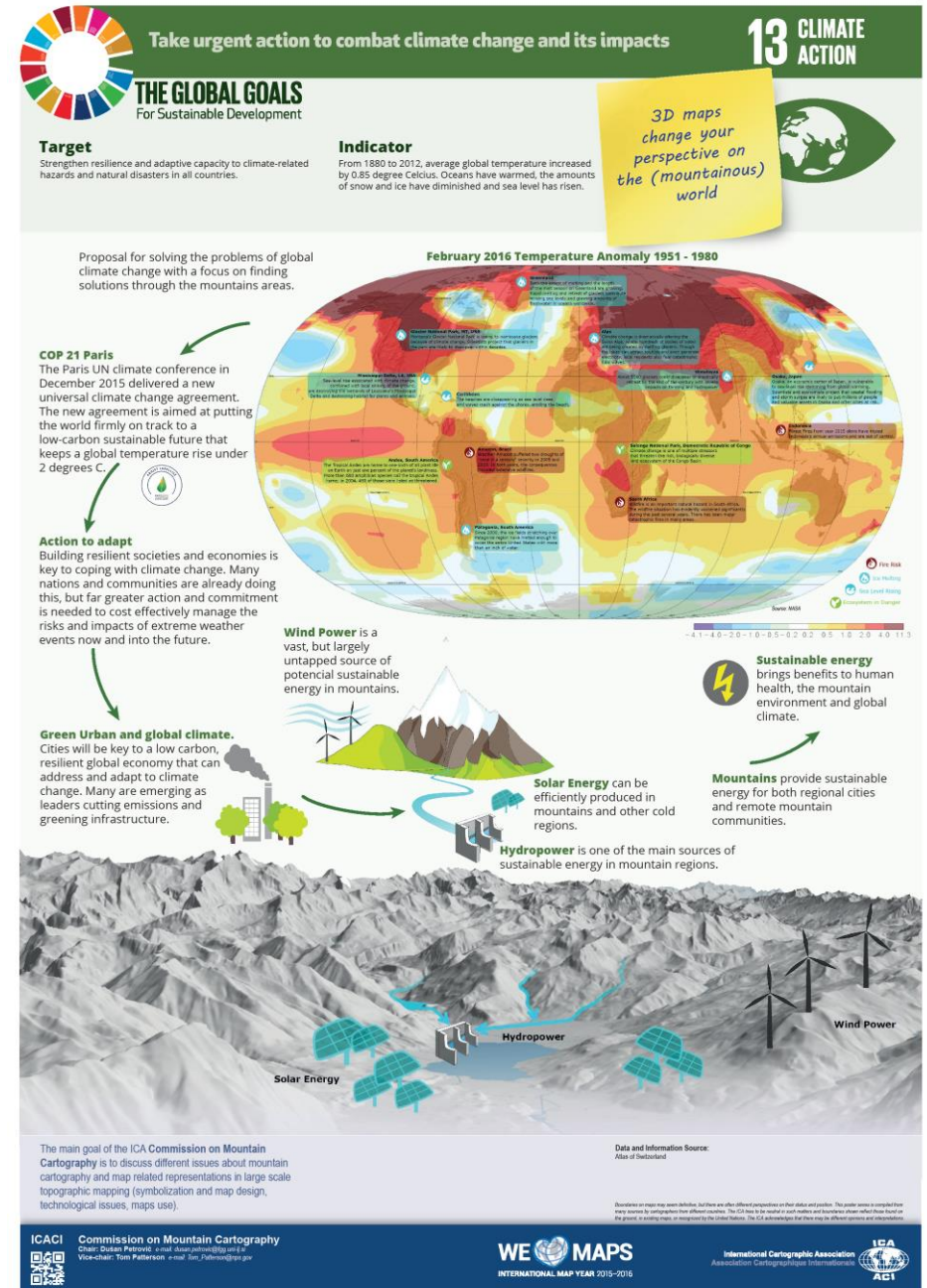
ICA and SDG Goal 11

Sustainable Cities and Communities



ICA and SDG Goal 13

Climate Change



Atlas of Sustainability





Let's make the world a better place with maps