

Cartographic Body of Knowledge in the Era of AI

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Definition

A **body of knowledge (BOK or BoK)** is the complete set of concepts, terms and activities that make up a professional domain, as defined by the relevant learned society or professional association



CartoBoK – a long term project

Several people in ICA have been engaged in the concept over many years.....

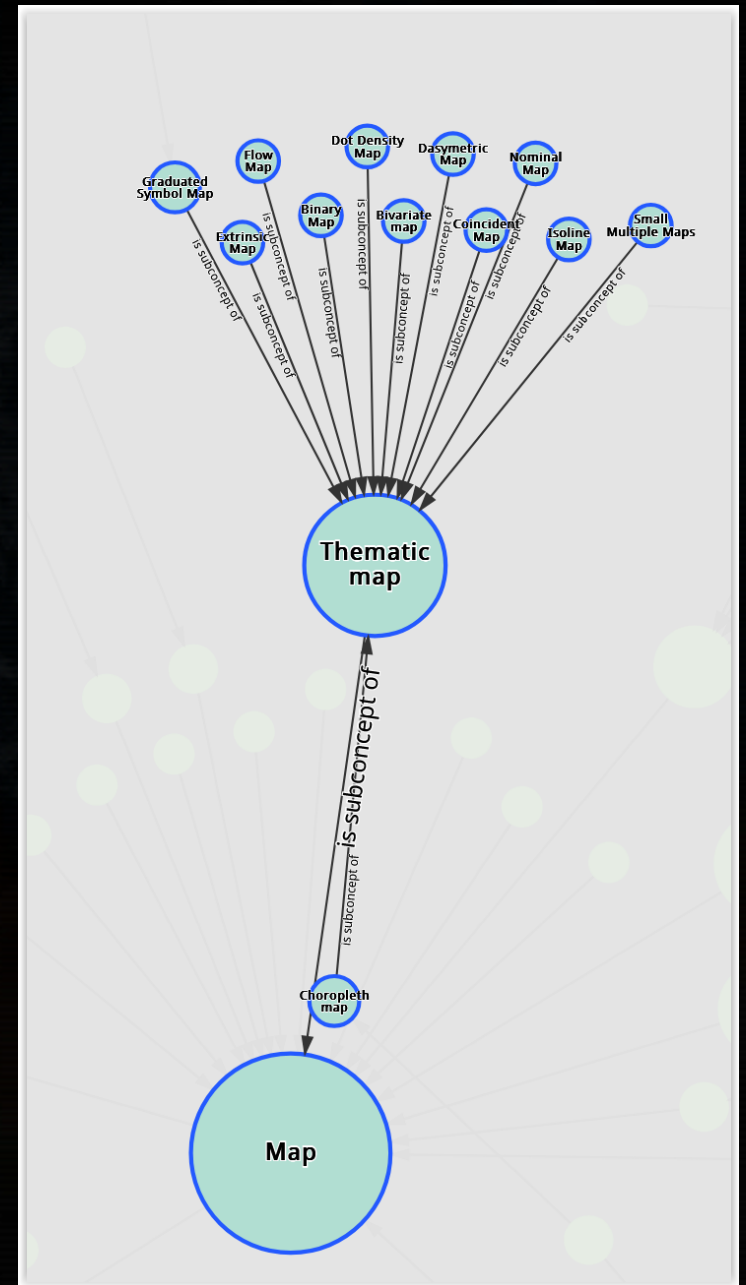


CartoBoK – the knowledge in ICA

- Collection of concepts, terms and activities from ICA commissions and working groups
- The engagement in the commissions for CartoBoK is varying
- A few commissions have been very active
- Person-dependent



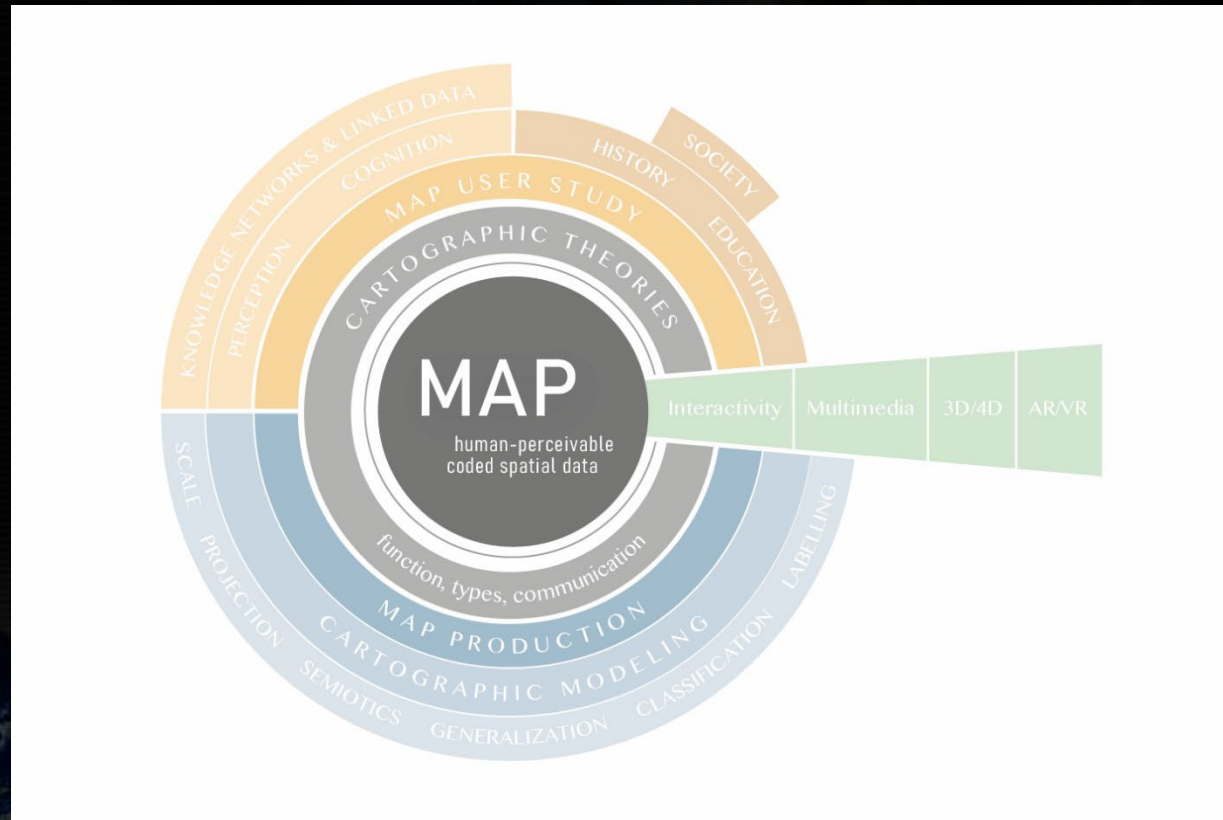
Concept – sub-concept



LivingTextbook



Circle concept



Campaigns for extending the content in CartoBoK

- Collecting keywords from the Commissions (previous period)
 - Successful – most Commission contributed
- Web based form for the collection of definitions, closer explanation, examples etc. of three of the keywords for each Commission (previous period)
 - less successful. Contribution from 4-5 Commission. Excellent from two of them
- New web-based collection, asking for only definition of concepts of central concepts related to the Commission. Personal email to Commission Chairs.
 - Some contributions – but not overwhelming
- Extending the content by the use of AI (ChatGPT) and the keywords from the Commissions





Collected cartographic «keywords» related to the different ICA Commissions



Example from the Mountain Cartography Commission

[Home](#)

[Terms of Reference](#)

[Definitions](#)

[Keywords](#) ☰

[Textbooks](#)

[Other resources](#) ☰

Commission on Mountain Cartography

- [Mountain Maps](#)
- [Relief](#)
- [Terrain Models](#)
- [Elevation Models](#)
- [Relief Morphology](#)
- [Contour lines](#)
- [Relief Shading](#)
- [Rock and Cliff Depicting](#)
- [Elevation Tints](#)
- [Tourism](#)
- [Mountaineering and Climbing](#)
- [3D Terrain Visualization](#)
- [Panoramic Maps](#)
- [Data Capturing in Mountain Environment](#)
- [Cave Mapping](#)
- [Seafloor Mapping](#)
- [Glacier and Scree Mapping](#)
- [Snow Covered Terrain Mapping](#)
- [Wayfinding in Mountain Environment](#)
- [Changes in Mountain Environment](#)
- [History of Mountain Maps](#)

AI generated description of Concepts

Cartographic generalization

Cartographic generalization is the process of simplifying or modifying the representation of geographic features on a map to improve readability and usability at different scales while preserving essential spatial patterns and relationships.

Basic

Introduction

Key Characteristics of Cartographic Generalization:

- **Reduces complexity** of geographic features while maintaining their overall shape and function.
- **Improves readability** by emphasizing important features and eliminating unnecessary details.
- **Adapts data to different map scales** (small-scale maps require more generalization than large-scale maps).
- **Ensures effective communication** of spatial information.

Explanation

Common Techniques of Cartographic Generalization:

1. Selection:

- **Choosing which features to display** based on the map's purpose and scale.
- Example: A **world map** may show only major cities, omitting smaller towns.

2. Simplification:

- **Reducing the complexity of shapes** while maintaining their general form.
- Example: **Straightening winding rivers** to improve clarity at smaller scales.

3. Aggregation:

- **Combining multiple smaller features** into a single, generalized representation.
- Example: **Merging small lakes** into a larger water body on a small-scale map.

4. Amalgamation:

- **Grouping adjacent similar features** into a single, larger entity.
- Example: Representing **clusters of small islands** as one generalized island shape.

5. Displacement:

- **Shifting features slightly** to prevent overlap while maintaining relative positions.
- Example: Moving **city labels** slightly apart to avoid overlapping.

6. Exaggeration:

- **Enlarging small but significant features** to make them more visible.
- Example: **Increasing the width of roads or rivers** so they remain distinguishable at small scales.

7. Refinement:

- **Removing minor or less important details** while keeping essential features intact.
- Example: Eliminating **small bends in coastlines** that do not add meaningful detail.

8. Symbolization:

- **Using different visual styles** (colors, patterns, or line styles) to enhance feature distinction.
- Example: **Bold lines for major highways** and **thin lines for local roads**.

Exaggerate

In cartographic generalization, exaggerate refers to the technique of intentionally enlarging or emphasizing certain geographic features to improve their visibility and clarity on a map, especially at smaller scales. This ensures that critical details remain distinguishable and effectively communicate spatial information.

Basic

Introduction

Key Characteristics of Exaggeration in Cartography:

- **Used when a feature is too small to be visible at a given scale.**
- **Enhances readability and visual impact** without distorting the overall geography.
- **Maintains the importance of key elements** while simplifying less significant details.

Examples

Common Examples of Exaggeration in Cartography:

1. Rivers and Roads:

- Thin rivers or roads are **thickened** to remain visible on small-scale maps.

2. Urban Areas and Landmarks:

- Small but important cities may be **represented with larger symbols** or bold text.

3. Coastlines and Islands:

- Small islands may be **enlarged** or **given a more prominent shape** for recognition.

4. Mountain Peaks and Elevation:

- Elevation symbols for mountains may be **amplified** to highlight terrain.

5. Boundaries and Political Borders:

- Borders may be **exaggerated with bold lines** to ensure clear differentiation.

Outgoing relations

- Exaggerate is subconcept of [Cartographic generalization](#)

AI generated description of Concepts

Thematic map

A thematic map is a type of map that focuses on a specific theme or subject, rather than just geographic locations. It visually represents spatial variations of particular data, such as population density, climate patterns, economic activities, or land use, across a defined area. Unlike reference maps (which show general geographical features like roads, rivers, and cities), thematic maps emphasize a particular dataset and use colors, symbols, and patterns to communicate information effectively.

Basic

Introduction

Key Features of Thematic Maps

- ✓ **Focus on a Single Theme** – Represents one specific dataset (e.g., temperature, income, election results).
- ✓ **Uses Symbolism** – Employs colors, patterns, shading, or size variations to illustrate data differences.
- ✓ **Geographic Context** – Includes base maps but emphasizes the thematic content over physical geography.
- ✓ **Data Interpretation** – Helps in analyzing trends, distributions, and patterns.

Explanation

Types of Thematic Maps

- Choropleth Map** – Uses different colors or shading to show statistical values (e.g., population density by region).
- Dot Density Map** – Uses dots to represent occurrences of a phenomenon (e.g., crime incidents in a city).
- Isoline Map (Contour Map)** – Uses lines to connect points of equal value (e.g., temperature, elevation).
- Cartogram** – Distorts geographic areas based on the variable being mapped (e.g., countries resized by GDP).
- Proportional Symbol Map** – Uses symbols of different sizes to represent data values (e.g., earthquake magnitudes).
- Heat Map** – Uses color gradients to represent intensity (e.g., COVID-19 cases per region).
- Flow Map** – Shows movement patterns using arrows (e.g., migration, trade routes).

Examples

1. Population & Demographics Maps

- ★ **World Population Density Map** – Shows how densely populated different regions are using a **choropleth map** (shaded colors).
- ★ **Urban Growth Map** – Visualizes how cities have expanded over time.
- ★ **Migration Flow Map** – Uses **arrows and lines** to show migration trends between countries.

Example: A **U.S. Population Density Map** using color gradients to highlight areas with higher concentrations of people.

2. Climate & Weather Maps

- 🌡️ **Temperature & Climate Maps** – Uses **isoline (contour) maps** to show temperature variations worldwide.
- 🌀 **Hurricane & Storm Tracking Maps** – Displays storm paths using **flow maps** and real-time weather tracking.
- 🌬️ **Wind Speed & Air Quality Maps** – Uses symbols and shading to show pollution levels or wind currents.

Example: A **Global Climate Change Map** showing temperature rise over decades.

3. Economic & Industrial Maps

- 💰 **GDP Distribution Map** – Represents economic strength by country or region, often using a **cartogram** (distorting area sizes).
- 🏭 **Industrial Output Maps** – Highlights major production areas for industries like **oil, manufacturing, or technology**.
- 🛒 **Consumer Spending Maps** – Shows variations in spending habits across different states or cities.

Example: A **World GDP Map** resizing countries based on their economic size.

4. Environmental & Conservation Maps

- 🌳 **Deforestation Maps** – Shows forest loss over time using satellite imagery combined with thematic overlays.
- 🔥 **Wildfire Risk Maps** – Uses heat mapping to indicate areas prone to fires.
- 🌊 **Climate Change & Sea Level Rise Maps** – Depicts potential flooding zones due to rising sea levels.

Example: An **Amazon Rainforest Deforestation Map** highlighting deforested areas over years.

5. Political & Election Maps

- 🗳️ **U.S. Election Results Maps** – Uses a **choropleth or cartogram** to show which political party won each state or county.
- 🌐 **Global Democracy Index Maps** – Represents political freedom levels in different countries.
- ⚔️ **Conflict & War Zone Maps** – Shows regions experiencing war or political instability.

Example: A **U.S. Presidential Election Map** displaying states won by each candidate.

6. Transportation & Infrastructure Maps

- 🚇 **Public Transit Maps** – Uses **schematic or flow maps** to show metro and bus routes in cities.
- 🚗 **Traffic Congestion Maps** – Uses real-time geospatial data to highlight heavily trafficked roads.
- ✈️ **Airline Route Maps** – Shows **global flight paths** using curved lines to connect major airports.

Example: A **New York City Subway Map** showing all metro lines and connections.

7. Health & Disease Maps

- 🦠 **COVID-19 Spread Maps** – Uses **heat maps** to show infection rates by country or region.
- 💉 **Vaccination Distribution Maps** – Displays global or national vaccine coverage.
- 🦟 **Malaria Risk Maps** – Shows areas with high mosquito-borne disease rates.

Example: A **Global COVID-19 Cases Map** with red hotspots indicating high infection areas.

8. Natural Disaster & Risk Maps

- 🌋 **Earthquake Hazard Maps** – Uses **dot density maps** to show locations and magnitudes of past earthquakes.
- 🌊 **Tsunami Risk Maps** – Identifies coastal areas vulnerable to tsunamis.
- 🌵 **Drought Severity Maps** – Uses color gradients to highlight regions experiencing extreme drought conditions.

Example: A **U.S. Earthquake Risk Map** with symbols showing past earthquake epicenters.

9. Cultural & Linguistic Maps

- 🗣️ **Language Distribution Maps** – Shows the primary languages spoken in different countries.
- 🕌 **Religious Affiliation Maps** – Displays major religions by region or country.
- 🏛️ **World Heritage Site Maps** – Marks locations of UNESCO heritage sites.

Example: A **Global Language Map** highlighting dominant languages in each region.

10. Agricultural & Land Use Maps

- 🌾 **Global Crops & Farming Maps** – Shows where different crops like wheat, rice, or coffee are grown.
- 🌱 **Soil Quality & Fertility Maps** – Helps farmers understand soil conditions for better crop yield.
- 🌵 **Desertification Risk Maps** – Highlights regions at risk of turning into deserts due to climate change.

Example: A **Global Wheat Production Map** showing the top wheat-growing countries.

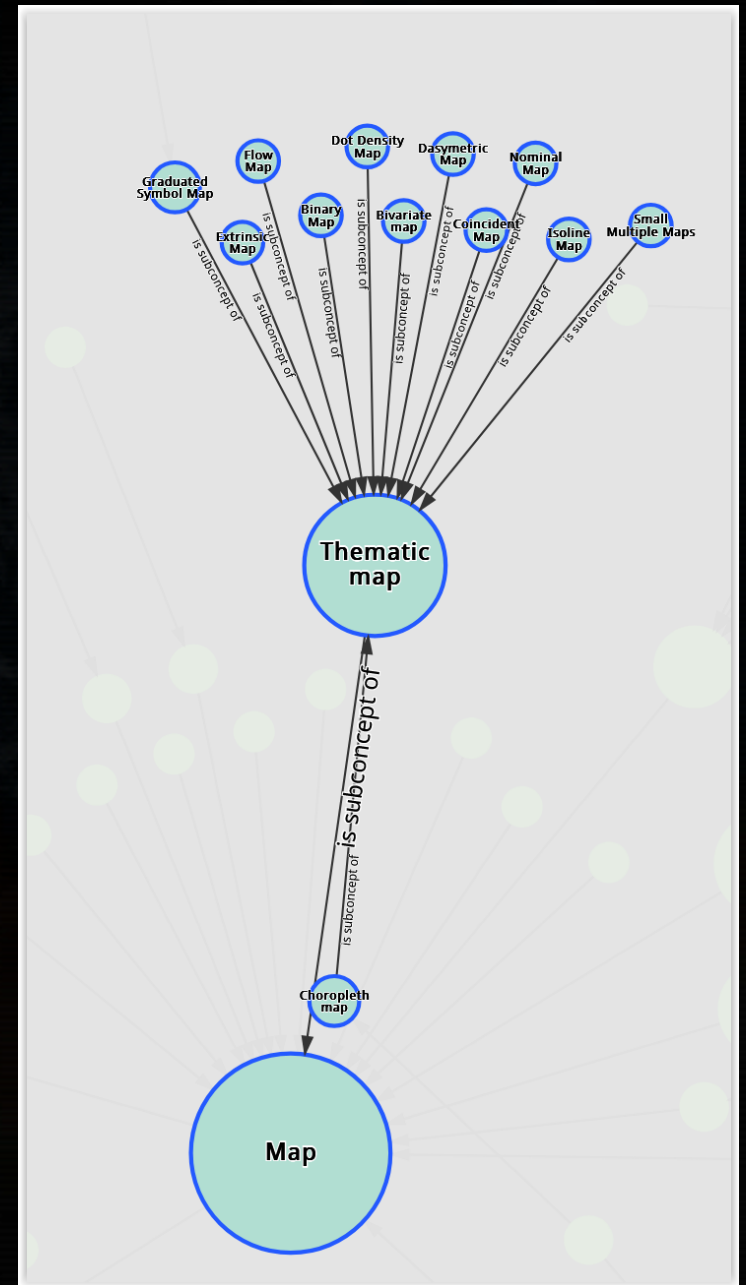
Outgoing relations

- Thematic map *is subconcept of* Map

Incoming relations

- Small Multiple Maps *is subconcept of* Thematic map
- Choropleth map *is subconcept of* Thematic map
- Dasymeric Map *is subconcept of* Thematic map

Concept – sub-concept



LivingTextbook



AI generated description of Concepts

Interactive maps

An interactive map is a digital map that allows users to engage with geographic data through actions like zooming, clicking, filtering, and exploring different layers. Unlike static maps, interactive maps provide a more dynamic user experience by responding to inputs and displaying relevant information in real time.

Intermediate

Introduction

Key Features of Interactive Maps

1. **Zoom & Pan** – Users can zoom in/out and move around the map for better visualization.
2. **Clickable Elements** – Users can click on locations or objects to view additional details (e.g., city names, statistics, images).
3. **Search & Filters** – Maps allow users to search for specific locations or filter data based on categories.
4. **Layer Control** – Users can toggle different map layers (e.g., satellite view, traffic, heatmaps).
5. **Real-Time Updates** – Some interactive maps display live data, such as weather conditions or traffic updates.

Importance of Interactive Maps

- Improve **user engagement** by making navigation and exploration intuitive.
- Support **data-driven decision-making** by visualizing geographic trends.
- Enhance **accessibility** by allowing non-experts to explore spatial data easily.

Examples

Examples of Interactive Maps

- **Google Maps & Apple Maps** – Allow users to search locations, get directions, and view real-time traffic.
- **GIS Web Maps (ArcGIS Online, QGIS Web)** – Enable spatial data analysis with multiple layers.
- **COVID-19 Dashboard by Johns Hopkins University** – Allowed users to track cases globally.
- **Election Results Maps** – Show real-time voting outcomes by region.
- **Flight Tracking Maps (Flightradar24)** – Display live aircraft movements.

AI generated content

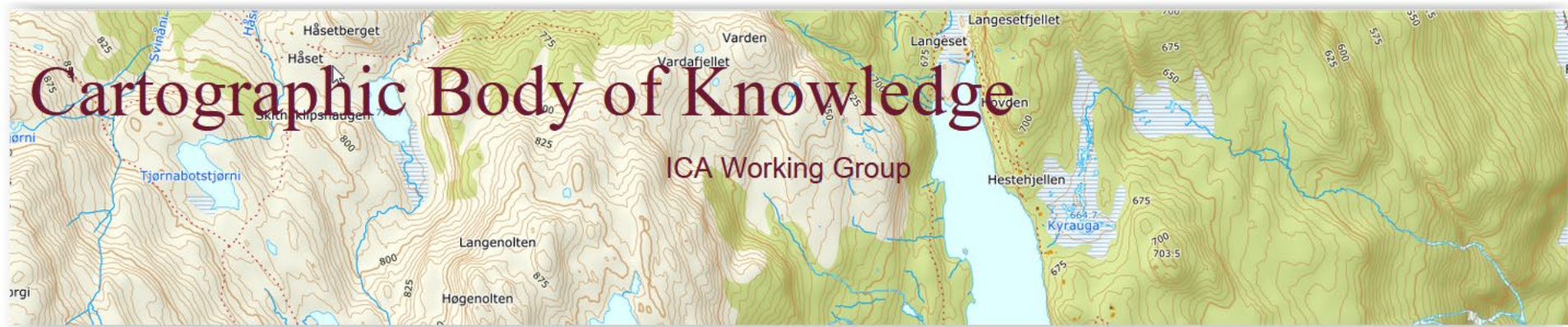
- Is the description correct?
- Is the content objective?
- Is the description sufficient?
- Is it possible to structure together with other information?
- Is using ChatGPT cheating?



Future tasks

- Evaluate the level of knowledge
- Evaluate the connections in the LivingTextBoK
- Evaluate the use of AI when describing concepts
- Discuss boundaries for CartoBoK
- Collect more concepts
- Establish an hierachical visualization

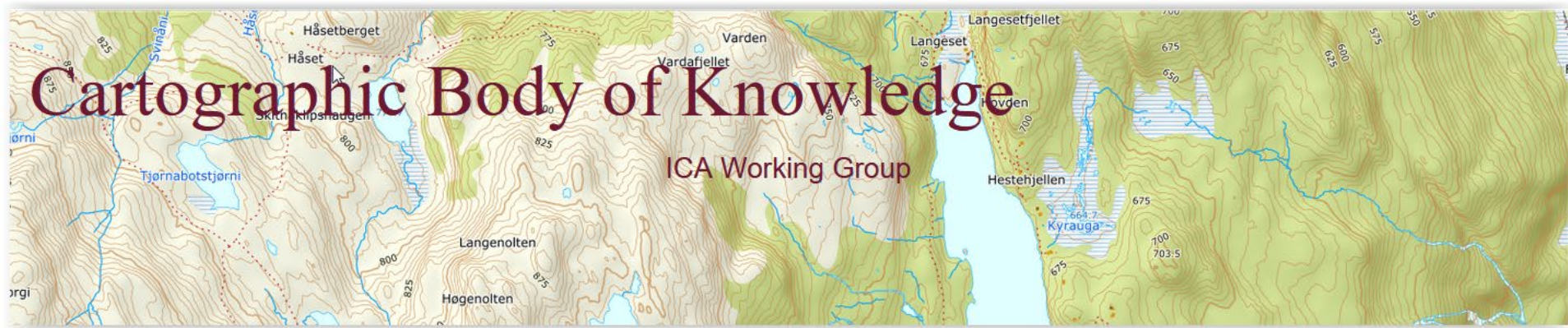




More information can be found at

<https://bok.cartography.no>





Thank you for your attention!

