Cartography is the art, science and technology of making and using maps.

Why maps?

Dorp
Maps are abstractions or models of reality, in which geographic space is represented by map space.

The spatial layout of maps enable users to see:
- patterns
- relationships
- trends

Why maps?
- Make invisible things visible

Maps, constraints and variables:
- goal / purpose of map
- user characteristics
- use environment
- data characteristics
  - contents
  - scale
  - projection
  - accuracy
  - interface
  - map design

Context:
- personal landscape preferences
  - http://www.daarmoetikzijn.nl/
- weather: wind speed
  - http://www.knmi.nl/actueel/
**Context: maps to present**

- start: facts to be presented are fixed
- process: choice of appropriate visualization technique
- result: high quality visualization presenting facts, the single best map
- emphasize: on map design

**Context: maps to explore**

- start: data without hypothesis about the data
- process: interactive, undirected search for structures and trends
- result: visualization that provides hypothesis, different alternative views
- emphasize: enabling ‘discoveries’

**Presentation**

- For presentation, communication of the map contents can be optimized by applying cartographic design rules for the translation of data into graphics
- Guided by: ‘How do I say what to whom, and is it effective?’

**Exploration**

- Map as interface to the data
- Map in context
Exploration

Understanding maps

Understanding which map to use

Understanding which map to use

40 minutes by underground

3 minutes walking
Understanding what to map?

- day
- night

Understand need for design

Understanding what has been mapped?

Understanding your limitations
Understanding your possibilities


Understanding your data

Data analysis and design

Method: data analysis and design
### Correct design?

<table>
<thead>
<tr>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Correct Map" /></td>
<td><img src="image2.png" alt="Incorrect Map" /></td>
</tr>
</tbody>
</table>

### Important map types

- **Choropleth**
- **Qualitative map**
- **Proportional point symbol map** (diagram map)

### Design: visual hierarchy

- Population of the province of Saaremaa in comparison with other Estonian provinces
- Population of the province of Tartu in comparison with other Estonian provinces

<table>
<thead>
<tr>
<th>Province</th>
<th>Population</th>
<th>Distance</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harjumaa</td>
<td>550000</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Hiiumaa</td>
<td>150000</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Ida-Virumaa</td>
<td>50000</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Järvamaa</td>
<td>10000</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Jõgevamaa</td>
<td>8482</td>
<td>0</td>
<td>0.016</td>
</tr>
<tr>
<td>Läänemaa</td>
<td>550000</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Lääne-Virumaa</td>
<td>150000</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Pärnumaa</td>
<td>50000</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Põlvamaa</td>
<td>10000</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Raplamaa</td>
<td>8482</td>
<td>0</td>
<td>0.016</td>
</tr>
<tr>
<td>Saaremaa</td>
<td>10000</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Tartumaa</td>
<td>550000</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Valgamaa</td>
<td>150000</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Viljandimaa</td>
<td>50000</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Võrumaa</td>
<td>10000</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

### Estonia's population density in 2012

- ![Population Density Map](image3.png)

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50 km</td>
<td></td>
</tr>
<tr>
<td>50 km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- All information symbol Tartu
- Map title / legend
- Other provincial symbols
- Provincial names
- Base map
Thematic map types

Common mistakes

Convert

Maps at work
Backgrounds

On-line tools

Scale - zoom levels

Compare location
Impression of non-area related phenomena may be wrong because it is influenced by the size of the areas (e.g., dominant language spoken: related to people, not to area).

Use a cartogram.

Qualitative maps - caution

Choices to be made: absolute or relative quantities

Scale & placename patterns

Geographical units
'Errors' due to (misuse of) mapping method: design error?

unemployment

- More than 8%
- Less than 8%

unemployment

- More than 8%
- Less than 8%