

UNIVERSITY OF TWENTE.

**MODERN WEB CARTOGRAPHY AT
ITC-UNIVERSITY OF TWENTE**

(ENSCHEDA, THE NETHERLANDS)

Gateway to international knowledge exchange focusing on
capacity building and institutional development



FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION



FACULTY ITC

UNIVERSITY OF TWENTE

In 2010 ITC became a faculty of the University of Twente (UT)

- Distinctive character and mission is preserved
- More firmly embedded in Dutch academic education system
- It will lead to innovative research and education in different areas



UNIVERSITY OF TWENTE.



UNIVERSITY OF TWENTE

- An entrepreneurial campus university established in 1961
- More than 10,000 students
- 3,300 staff members

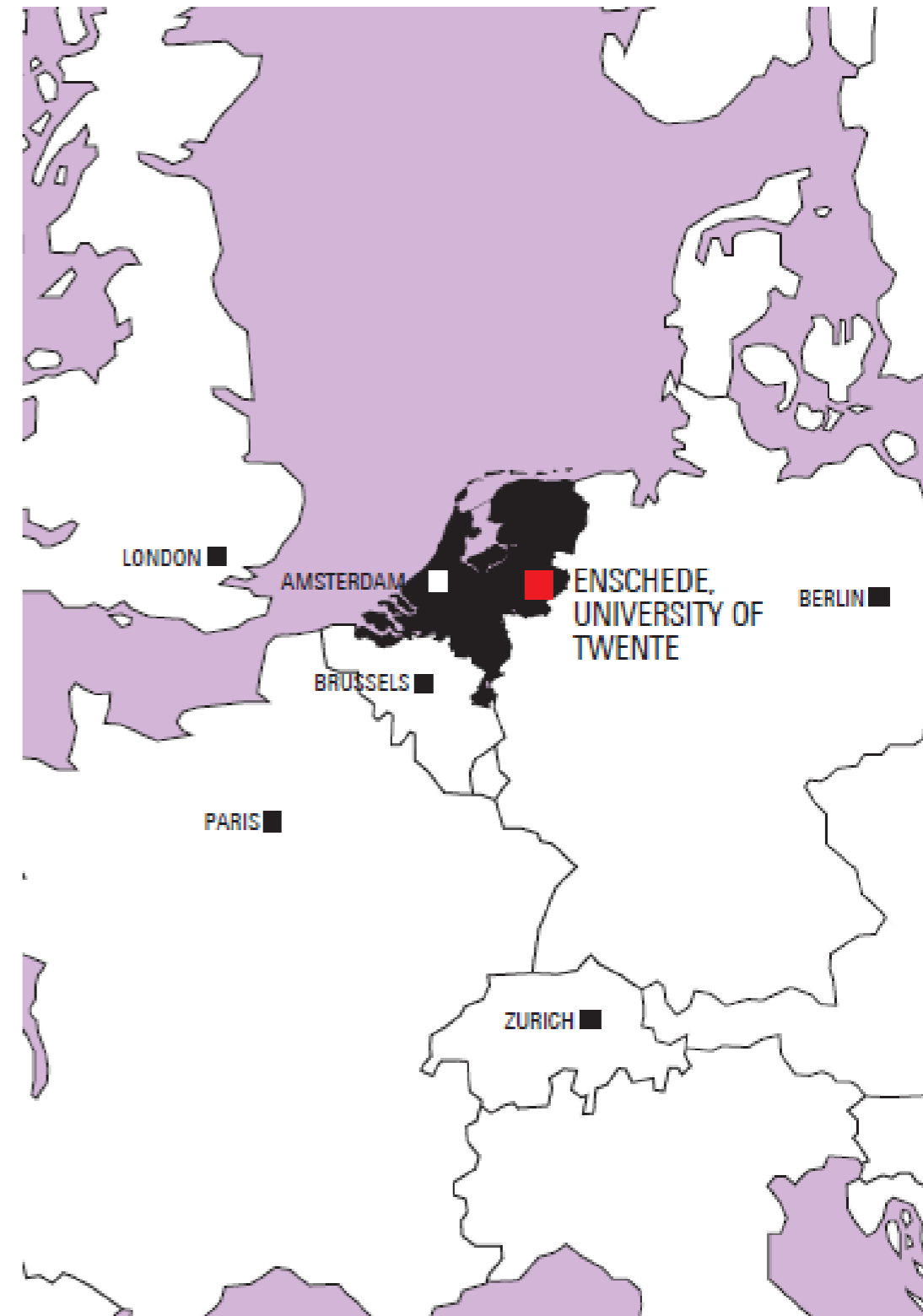


LOCATION

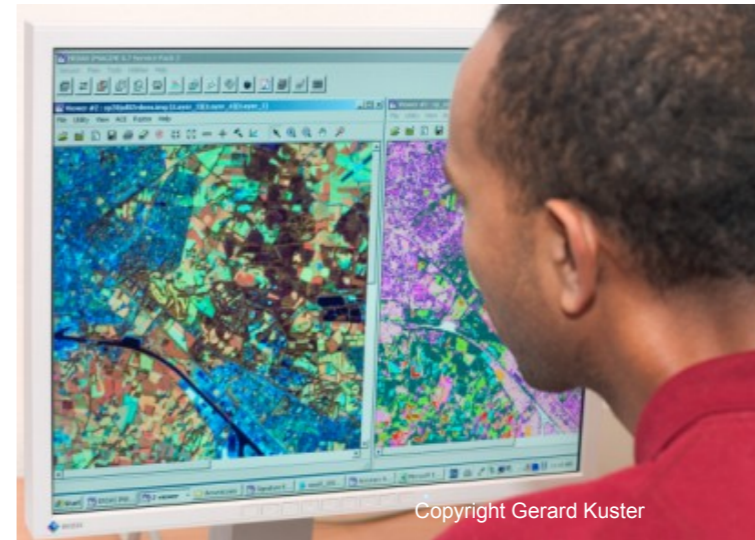
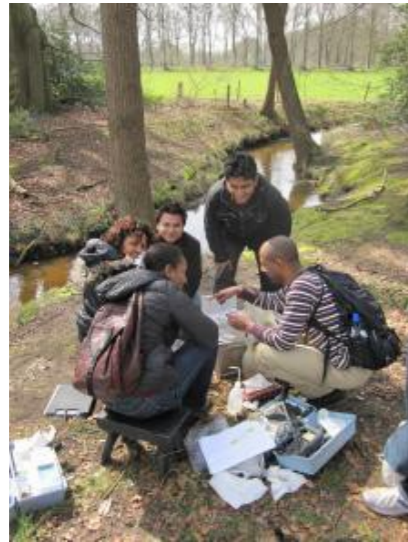
THE NETHERLANDS

Enschede

- A distinctive modern and lively university town
- At the Eastern border of the Netherlands
- Surrounded by remarkable spots of natural beauty and tranquility



FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION



Copyright Gerard Kuster



Copyright Gerard Kuster



ITC ESTABLISHED IN 1950

BY MINISTER WILLEM SCHERMERHORN

1950

International **T**rainning **C**entre for Aerial Survey, ITC

1968

International Institute for Aerial Survey and Earth Sciences, ITC

1985

International Institute for Aerospace Survey and Earth Sciences, ITC

2002

International Institute for Geo-Information Science and Earth Observation, ITC

2010

Faculty of Geo-Information Science and Earth Observation, ITC
University of Twente



UNIVERSITY OF TWENTE.



WHAT'S ITC ALL ABOUT?

GEO-INFORMATION MANAGEMENT, WORLDWIDE AND INNOVATIVE

- One of the world's foremost education and research establishments in geo-information science and earth observation
- A wide range of disciplines and activities in this field
- Contribute to capacity building in developing countries and emerging economies
- Solving real world problems
- Multicultural environment with staff and students from over 175 countries



KEY FIGURES 2013

- 939 newly registered students
- 348 degrees/diplomas/certificates awarded
- 161 registrants for the graduate programme (31 December)
- 44 external projects
- More than 20,000 alumni from 175 countries





SIX SCIENTIFIC DEPARTMENTS

OPERATING AS CENTRES OF EXCELLENCE

- Covering the different fields of disciplinary interest that encompass ITC's core mission:
 - Earth Observation Science
 - Earth Systems Analysis
 - Geo-information Processing
 - Natural Resources
 - Urban and Regional Planning and Geo-information Management
 - Water Resources




GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

Combination of tools and methods for the

- collection
- storage and
- processing

of geo-spatial data and for the dissemination and use of these data and of services based on these data

- 
-
- Focus on tools and methods and on application of these in:
 - food security
 - water management
 - urban planning
 - land administration
 - disaster management
 - strengthening civil society
 - earth sciences
 - environmental management and biodiversity

ITC'S CORE ACTIVITIES



- Education



- Research

- Capacity development



EDUCATION

A MULTICULTURAL ENVIRONMENT





TARGET GROUP

- Young and mid-career professionals and scientists
- From developing and emerging countries
- Increasingly professionals from industrialized countries





COURSES

IN THE DEGREE AND DIPLOMA PROGRAMMES

Geo-information science and earth observation for

- Applied Earth Sciences
 - Geoinformatics
 - Land Administration
 - Natural Resources Management
 - Urban Planning and Management
 - Water Resources and Environmental Management
-
- Environmental Modelling and Management
 - Geographical Information Management and Applications



RESEARCH

SPACE FOR GLOBAL DEVELOPMENT



CAPACITY DEVELOPMENT

IN THE FRAMEWORK OF INTERNATIONAL DEVELOPMENT COOPERATION



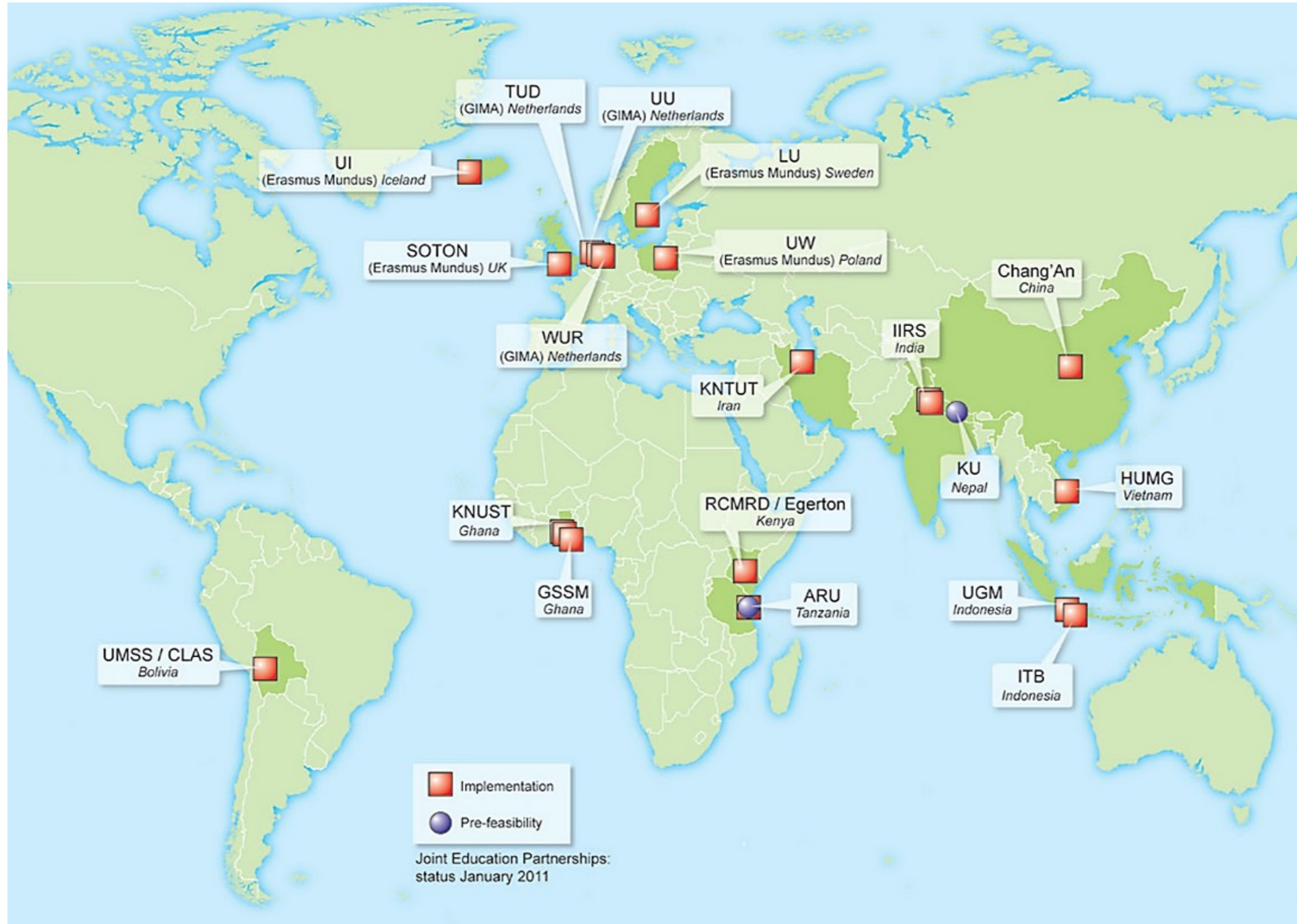


PROJECT SERVICES

TAILORED TO THE NEEDS OF OUR CLIENTS

- Institutional development
- Advisory services
- Contract training
- Contract research and development

EDUCATION PARTNERSHIPS



An interactive Carto Dashboard for Distributed Statistical Data in an SDI

- what is it?
- where did it come from?
 - how does it work?
- how does it **ACTUALLY** work?

**An interactive
Carto Dashboard for
Distributed Statistical Data
in an SDI**



An interactive Carto Dashboard for Distributed Statistical Data in an SDI

a system that can consume a combination of statistical data from the SDI, and cartographically integrate them, so that visual comparison of data from different providers or different data from a single provider is optimized.

*The Carto Dashboard can be considered as a
“smart data viewer”*

A new role for the cartographer

providing
(cartographic knowledge for)
tools that implement cartographic intent:

*“code that thinks like a
cartographer”*

Cartography from Code...?

or

*“how I learned to stop
worrying and love coding in
cartography”*

Barend Köbben

ITC – Universiteit Twente

b.j.kobben@utwente.nl – @barendkobben

A change in my world

My tools once were these:



A change in my world

...but now look like this:

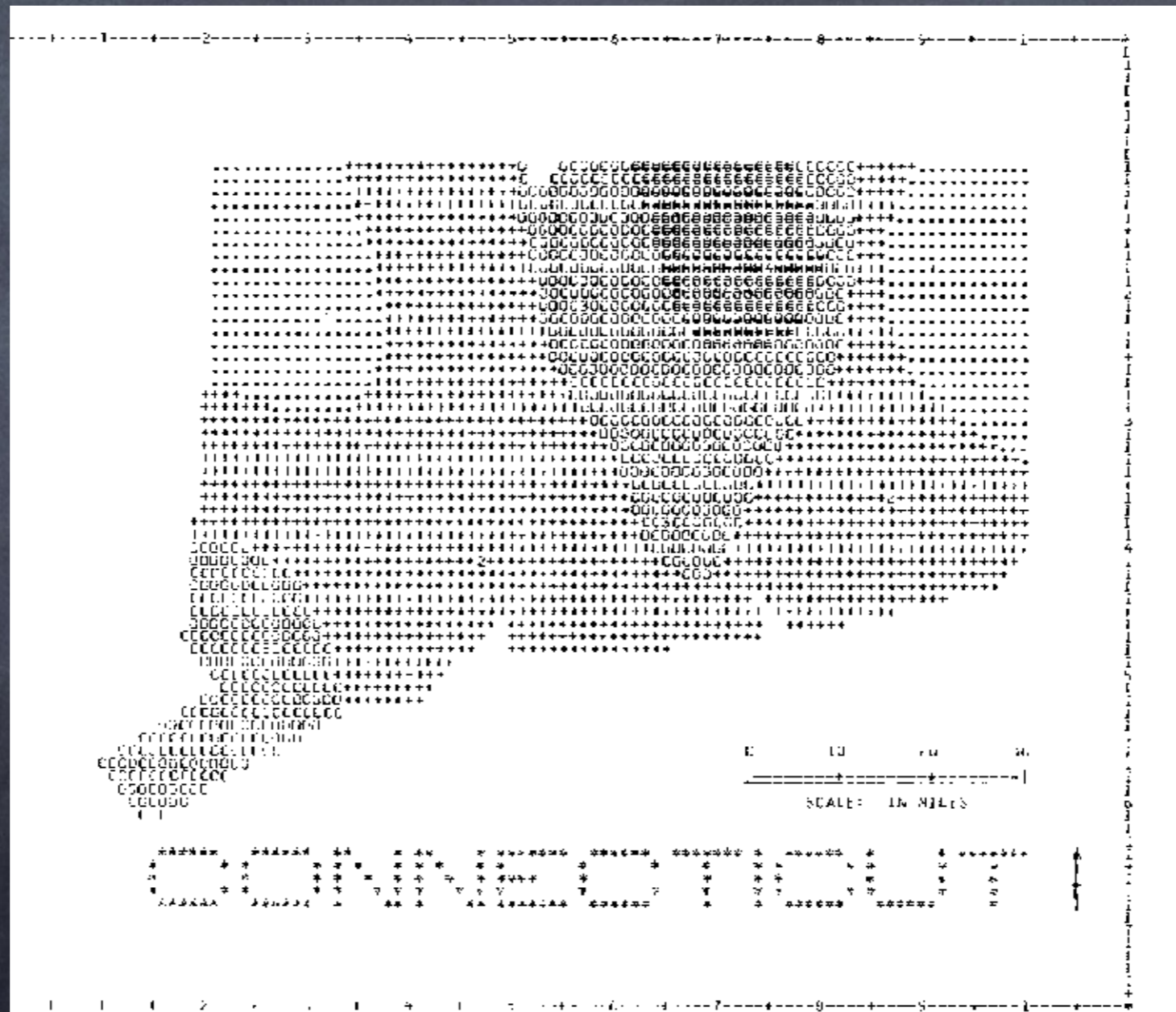
The image shows a web browser window displaying a D3.js visualization of a timeline. The browser address bar shows the URL `localhost/D3tests/tracksViewer/napoleon.html`. The code editor shows the following JavaScript code:

```
54 d3.selectAll("#Timeline").append("chart");
55
56 // define variables
57 var margin = {top: 0, right: 0, bottom: 0, left: 0};
58 width = 510;
59 height = 330;
60
61
62 var centered;
63
64 // define projection parameters
65 var projection = d3.geo.mercator()
66   .center([28.88034, 54.260112])
67   .rotate([0,0])
68   .scale(39000);
69
70 // create svg canvas to draw map on
71 var svg = d3.select("#Map").append("svg")
72   .attr("width", width)
73   .attr("height", height)
74   .attr("border", 3)
75   .attr("class", "canvas");
76
77 // create path object
78 var path = d3.geo.path().projection(projection);
79
80 // create group object g
81 var g = svg.append("g");
82
83 // create div object to use for dynamic tooltip
84 var div = d3.select("body")
85   .append("div")
86   .attr("class", "tooltip")
87   .style("opacity", 0);
```

The visualization consists of three horizontal timelines. The top timeline shows a red bar with vertical lines extending downwards to a blue bar. The middle timeline shows a blue bar with vertical lines extending upwards to a red bar. The bottom timeline shows a blue bar with vertical lines extending downwards to a red bar. The timelines are labeled with months: October, November, and December. The top timeline has numerical labels: 1717.5, 20, 22.5, 24, 25, 30. The middle timeline has numerical labels: 16, 18, 20, 22, 24, 26, 28, 30. The bottom timeline has numerical labels: 16, 18, 20, 22, 24, 26, 28, 30.

A change in my world

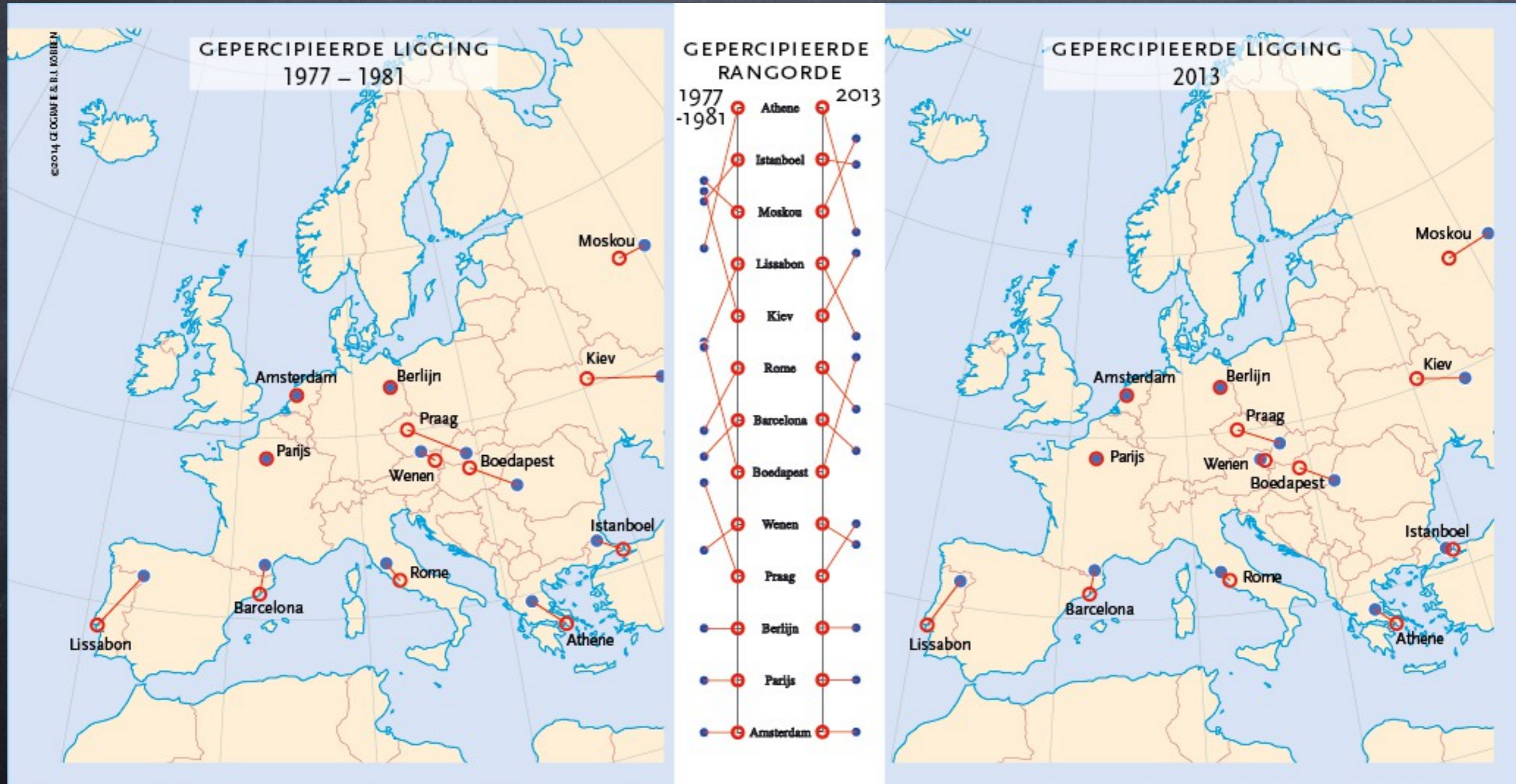
Computers gave me this at first:



SYMAP line printer output (1965, by Howard Fisher)

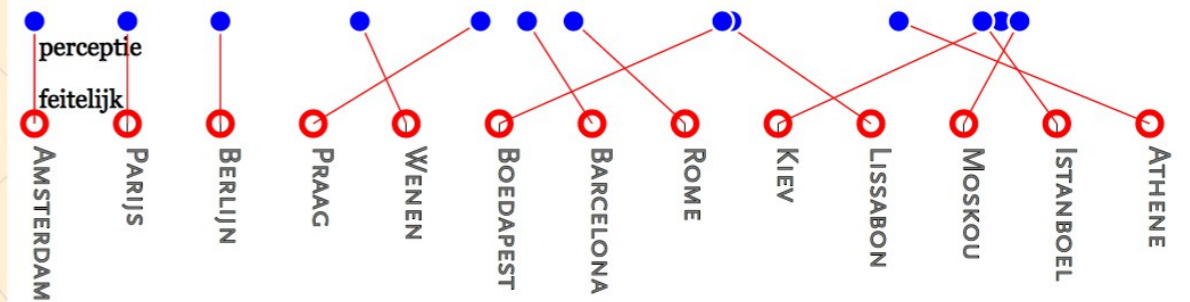
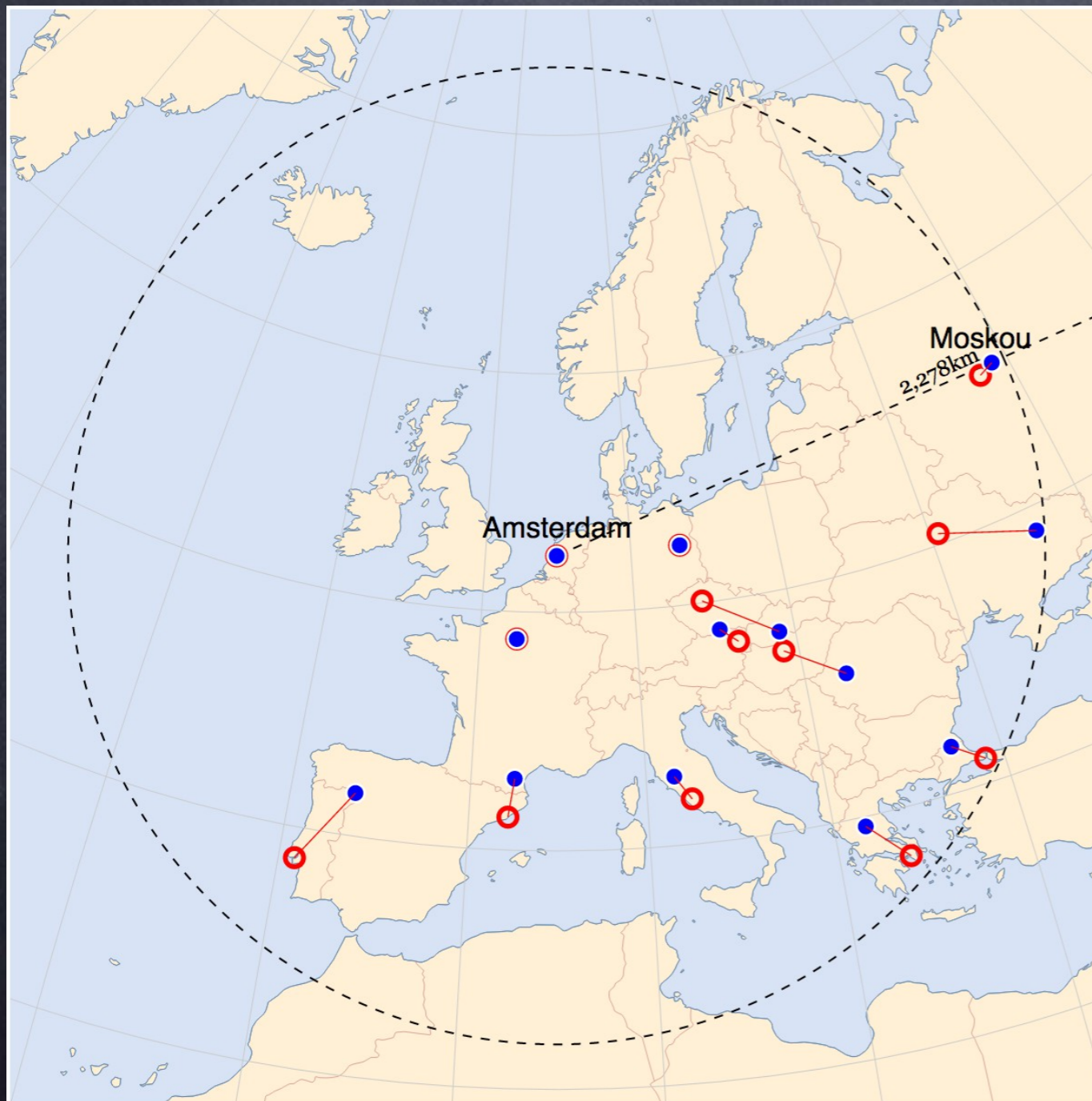
A change in my world

...but have been improving since:



A change in my world

...and now allow me to do really nice interactivity:



FACTUAL PERCEPTION 1977-1981 PERCEPTION 2013

Perceived distances 1977-1981 and 2013

Students situate Eastern-European cities too far and Southern-European to close.

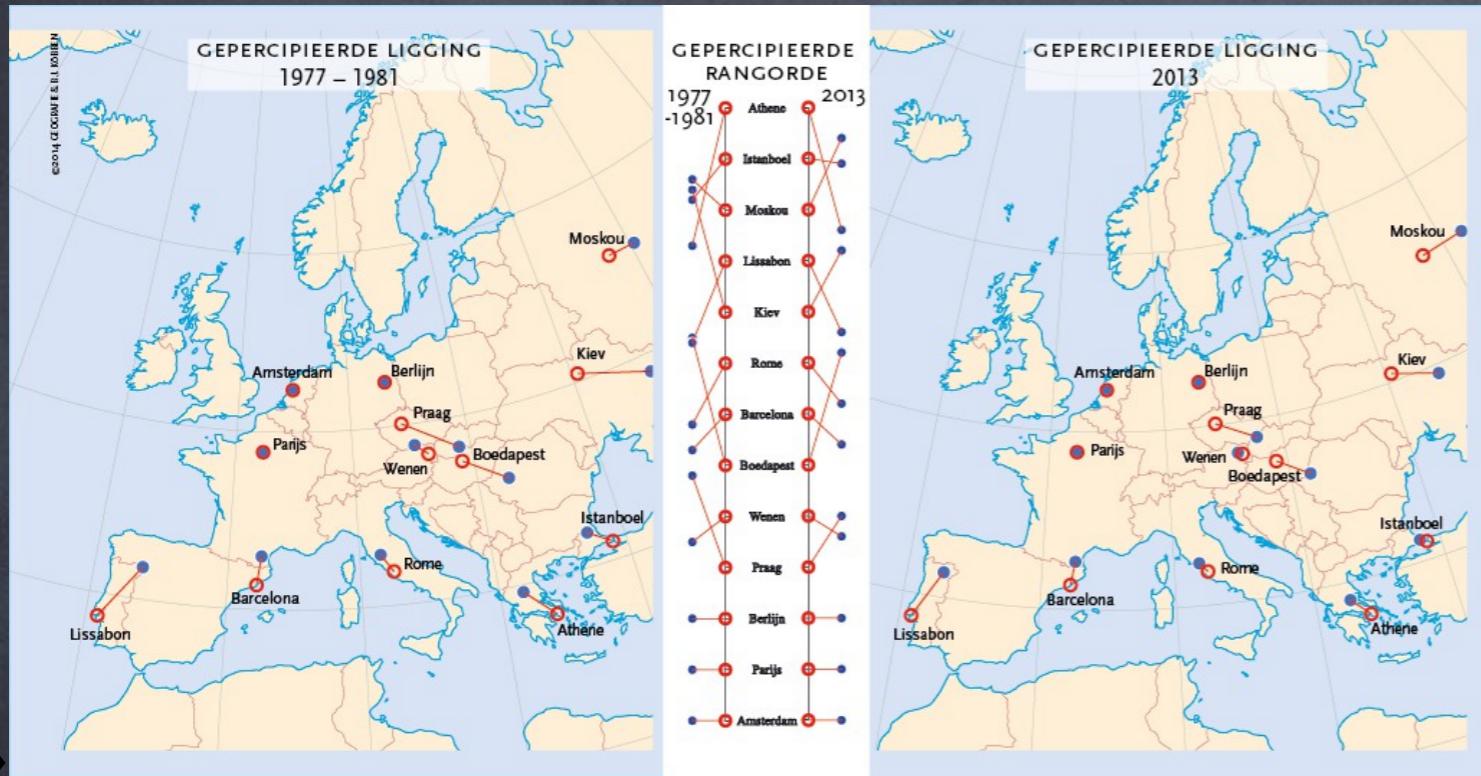
Click the buttons to see the differences between factual locations (and order) and how they were perceived by Geography students...

Works in modern browsers supporting HTML5 (not IE Explorer 8 and lower)

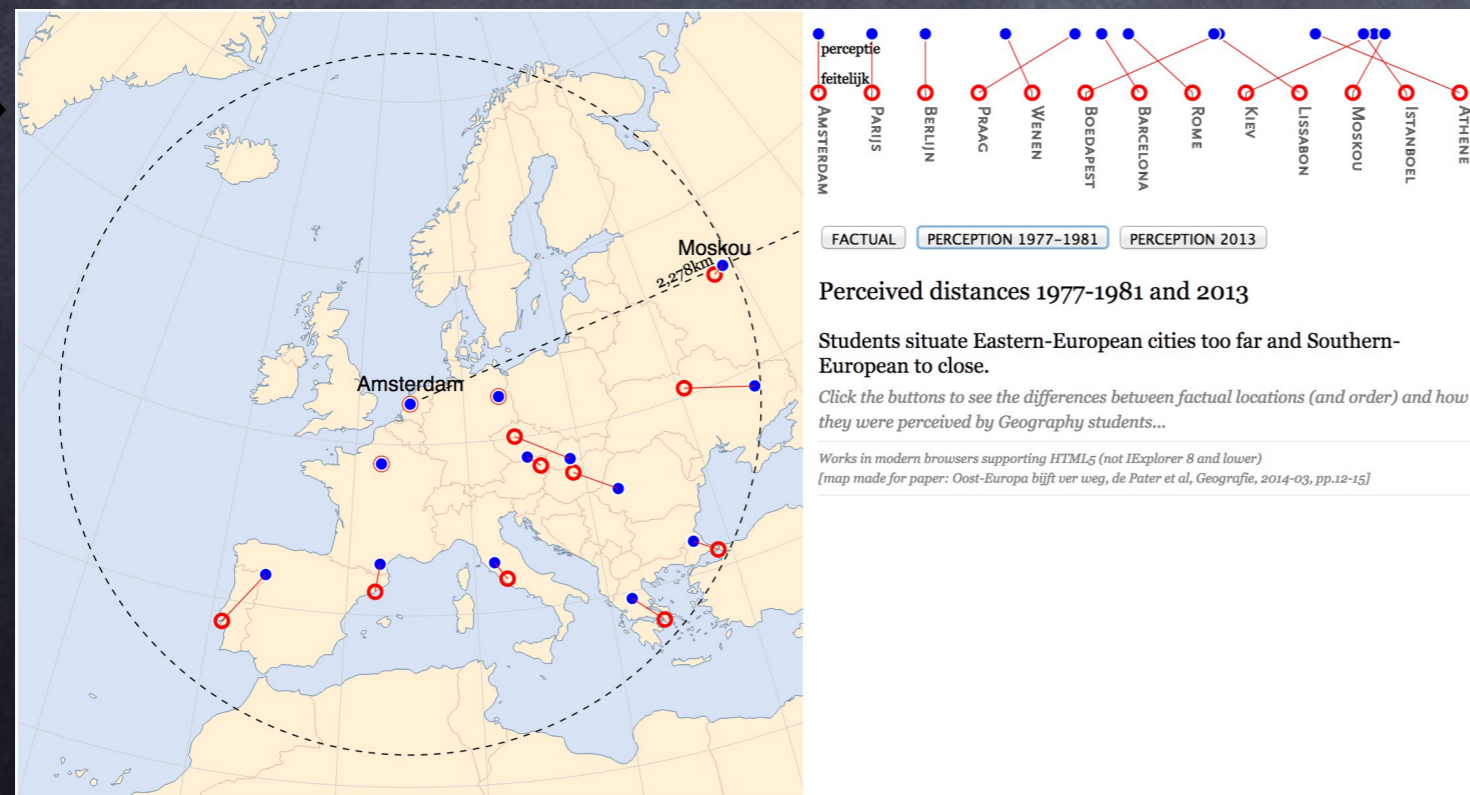
[map made for paper: Oost-Europa blijft ver weg, de Pater et al, Geografie, 2014-03, pp.12-15]

A change in my world

Both were constructed using software



this one was
digitally drawn



this one was
coded (programmed)

A new role for the cartographer

providing

tools that implement cartographic intent

A new role for the cartographer

providing
(cartographic knowledge for)
tools that implement cartographic intent

The new role of the cartographer

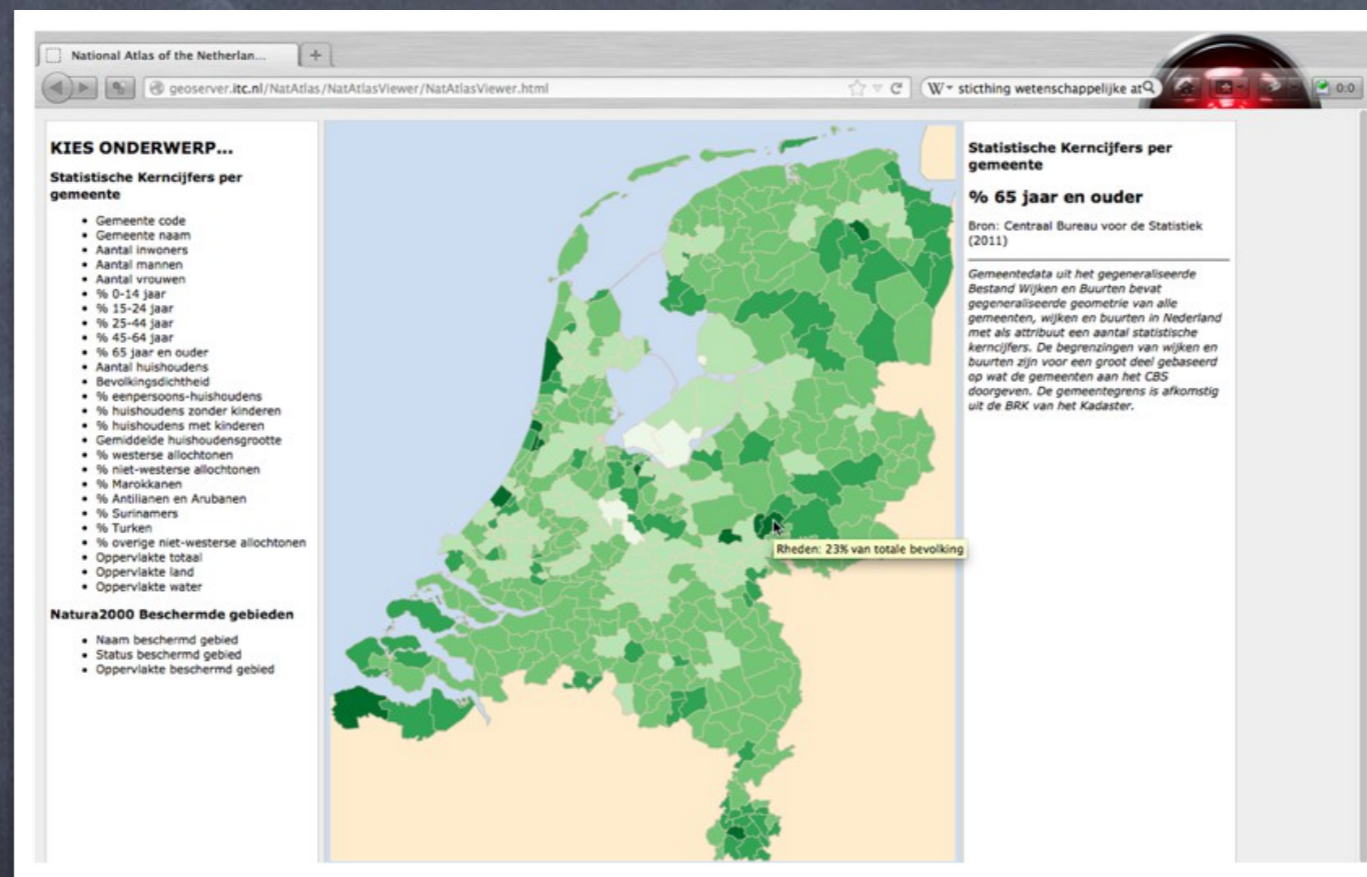
providing
(cartographic knowledge for)
tools that implement cartographic intent:

“code that thinks like an atlas”

Statistics Dashboard

Building further on the
NATIONAL ATLAS IN SDI
prototype

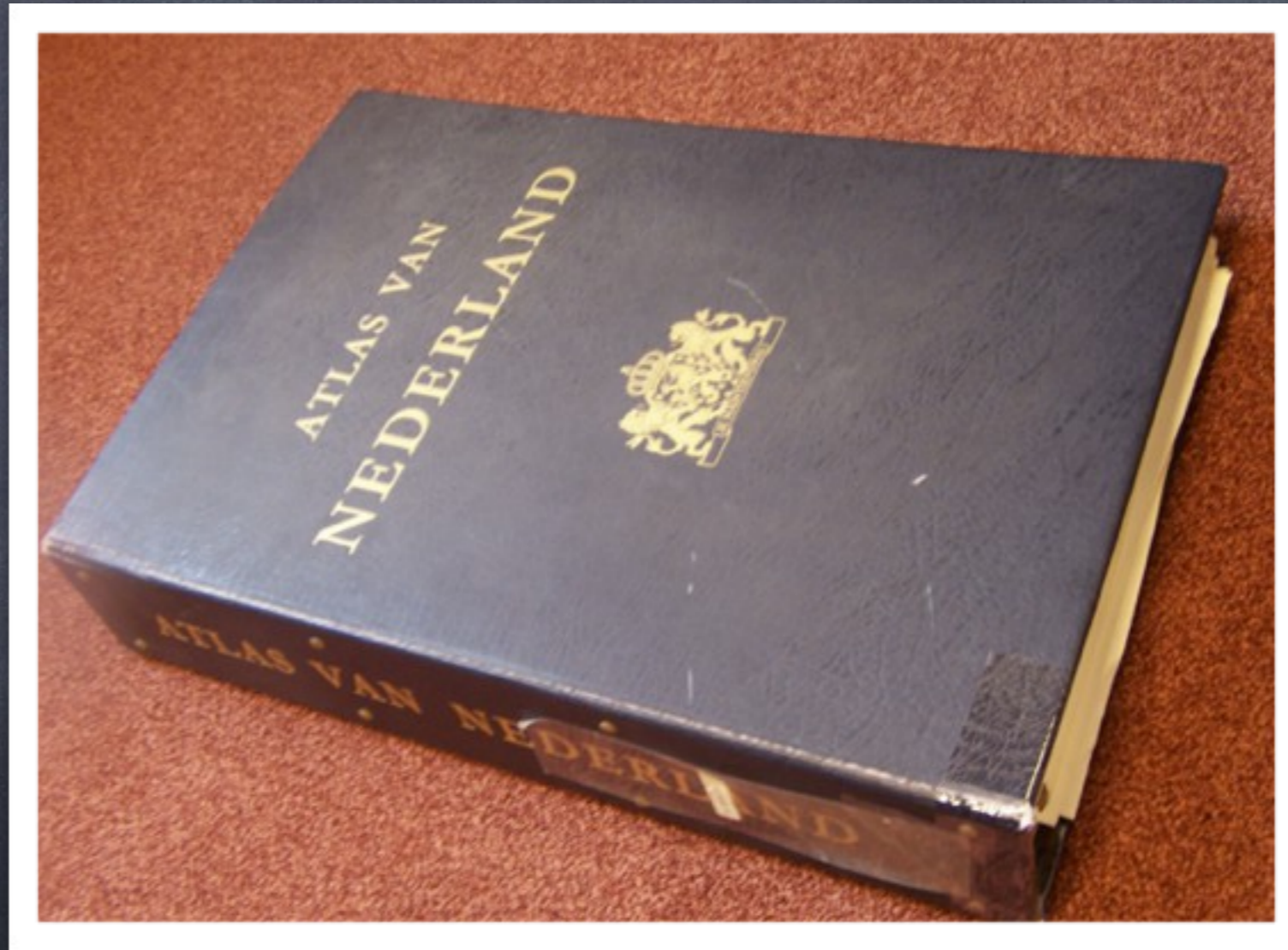
The Dutch National Atlas within SDI



details in Dresden paper:
Cartographic Journal, 50 : 3, pp. 225—231

Brief history of the Dutch National Atlas

Brief history of the Dutch National Atlas



1st edition (1963–1978)

Brief history of the Dutch National Atlas



2nd edition (1989–1995)

Brief history of the Dutch National Atlas

after 1998 government involvement and
funding ended

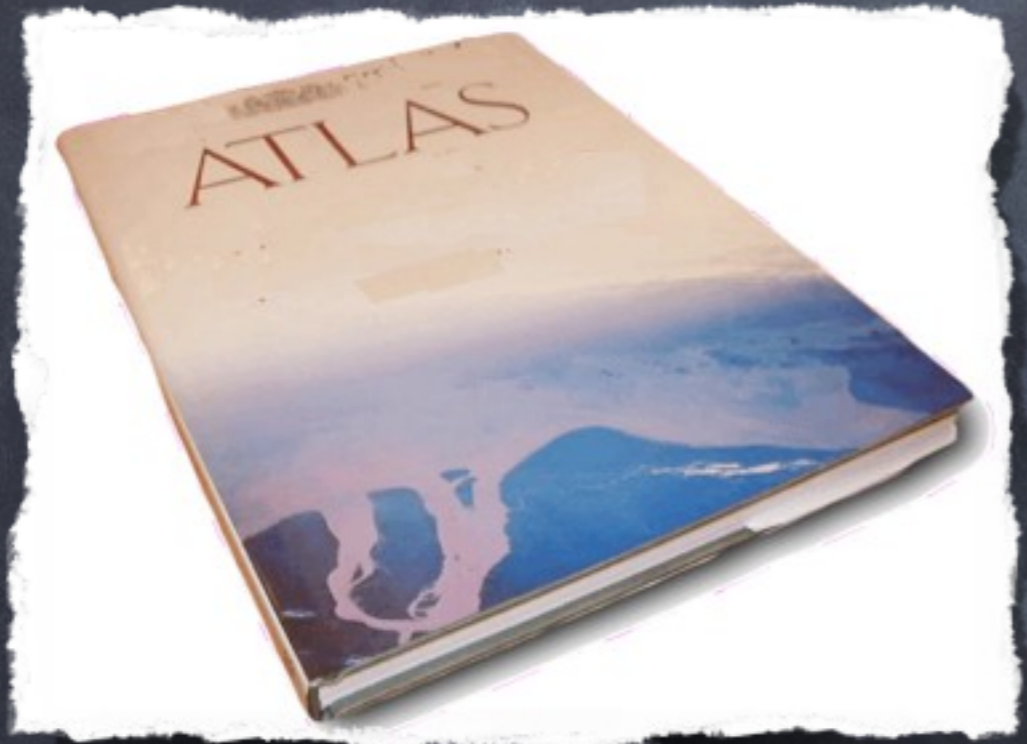
=> limited and fragmented academic
projects to keep atlas alive

2000:

digital facsimile of 2nd edition

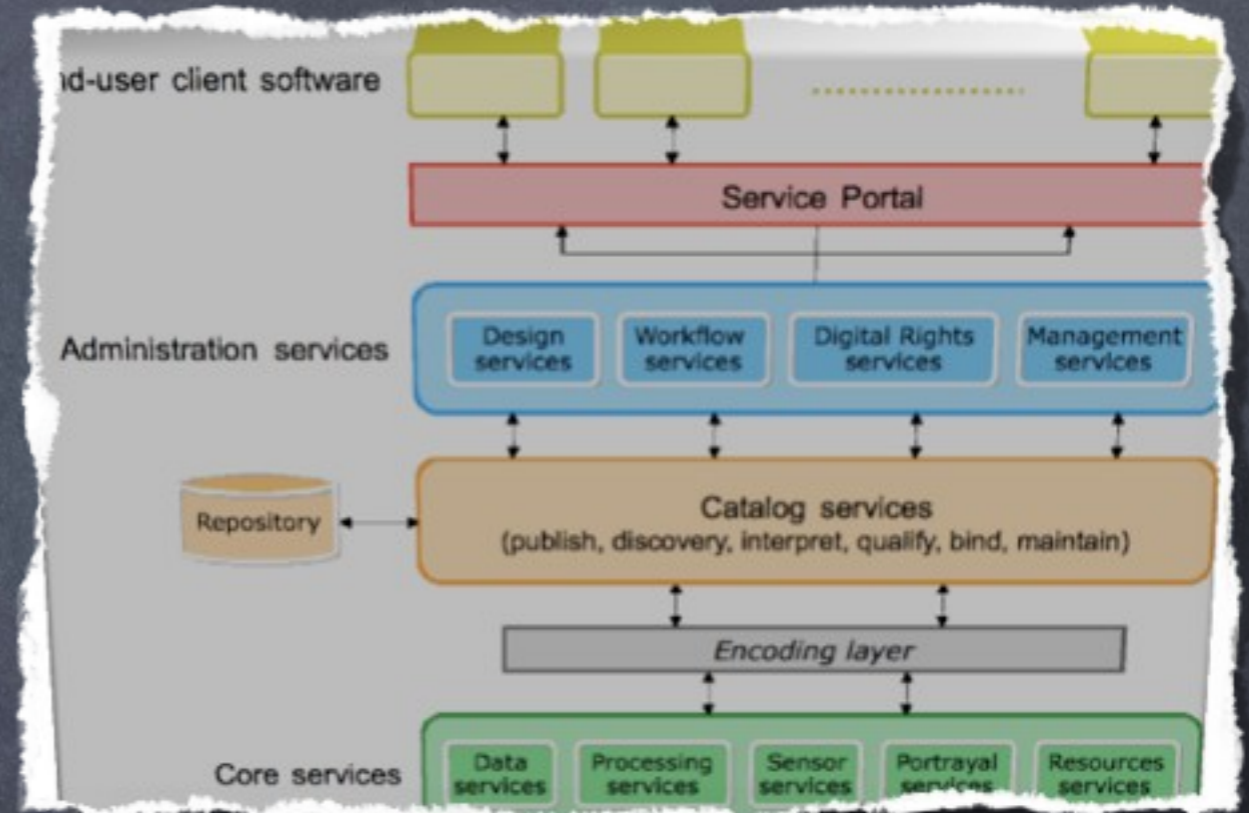
Atlas as part of a Spatial Data Infrastructure

Atlas as part of a Spatial Data Infrastructure



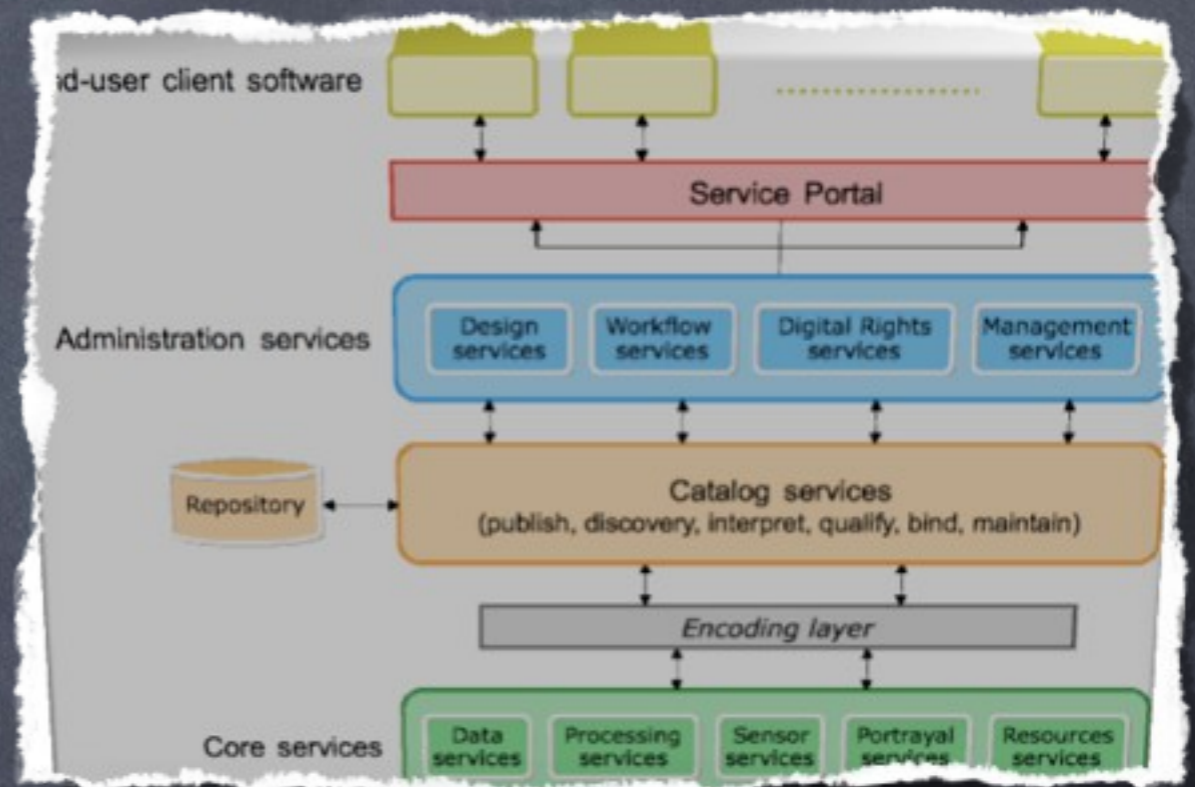
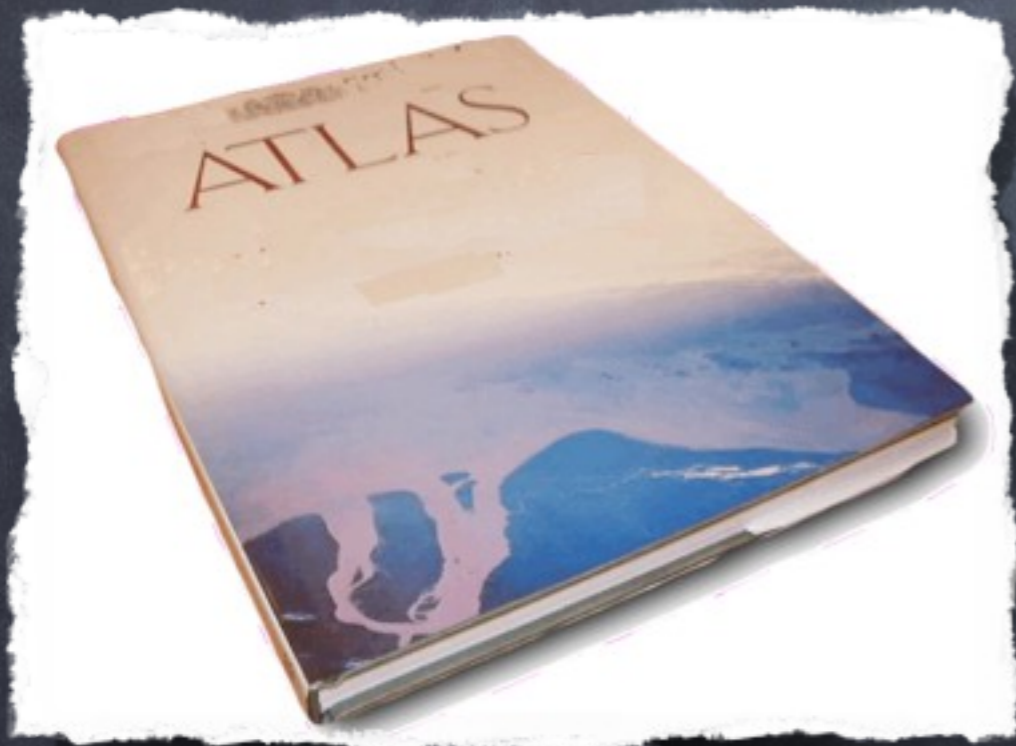
presents a synthesis
optimised for visualisation

Atlas as part of a Spatial Data Infrastructure



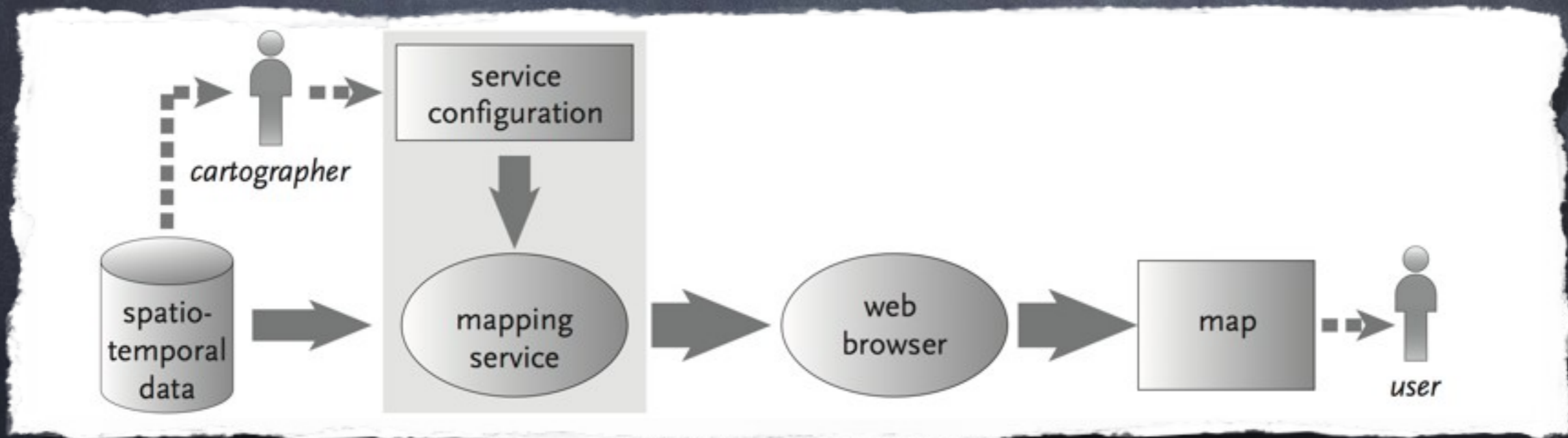
visualisation of separate data, not
optimised for combinations (synergy)

Atlas as part of a Spatial Data Infrastructure

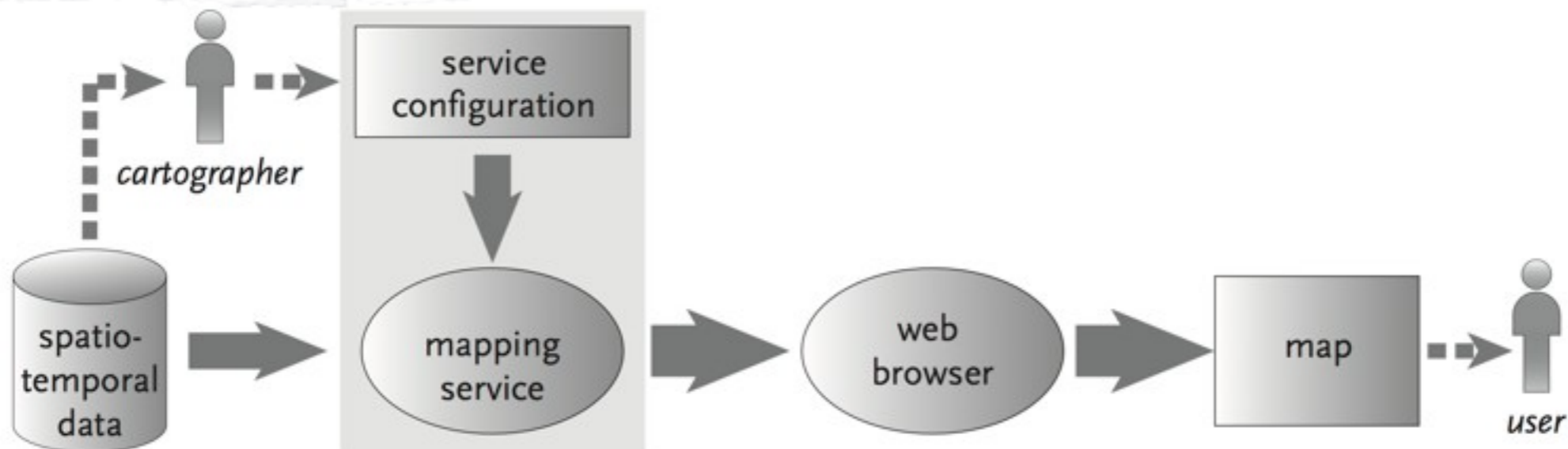


a combination of
two different worlds

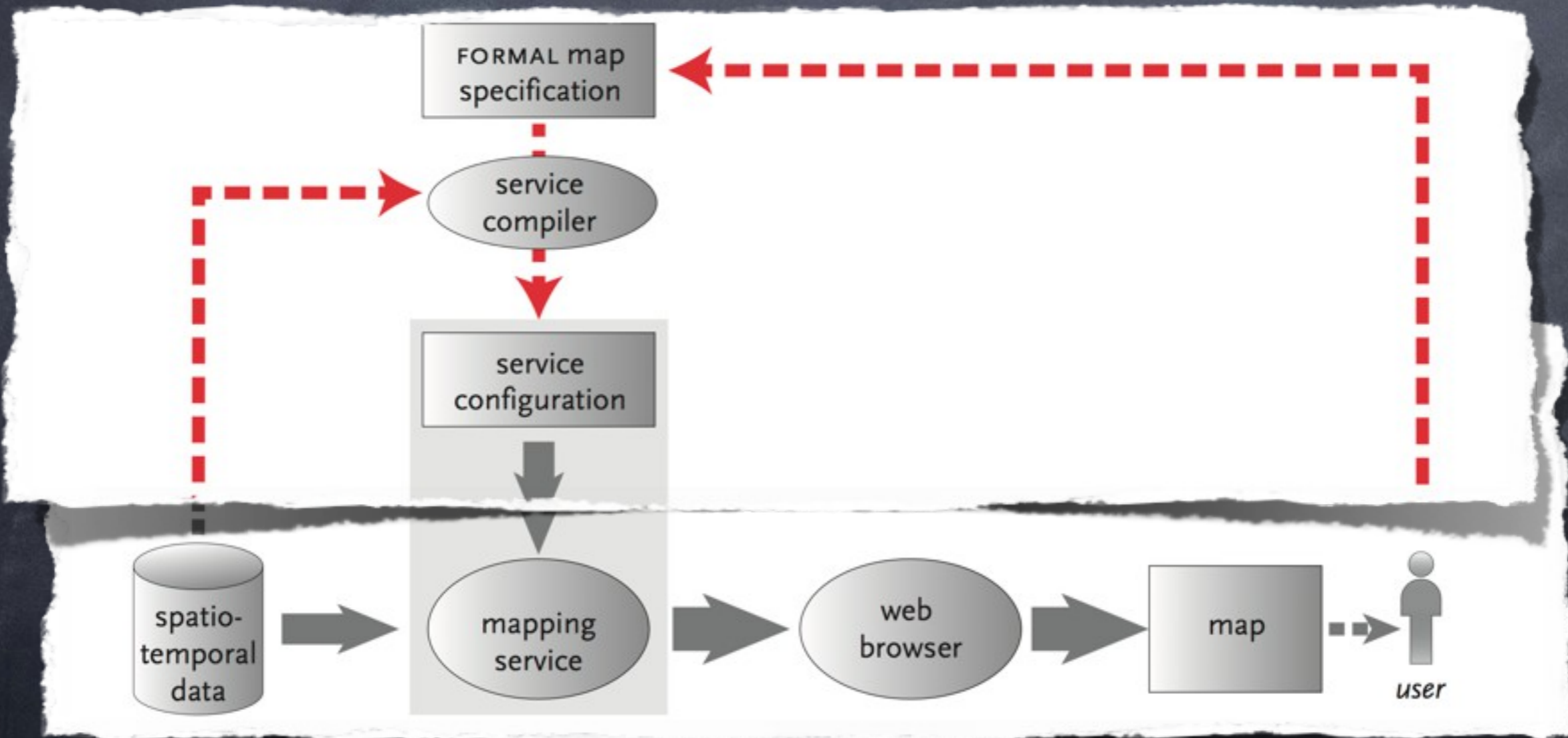
Mapping in a webservices environment



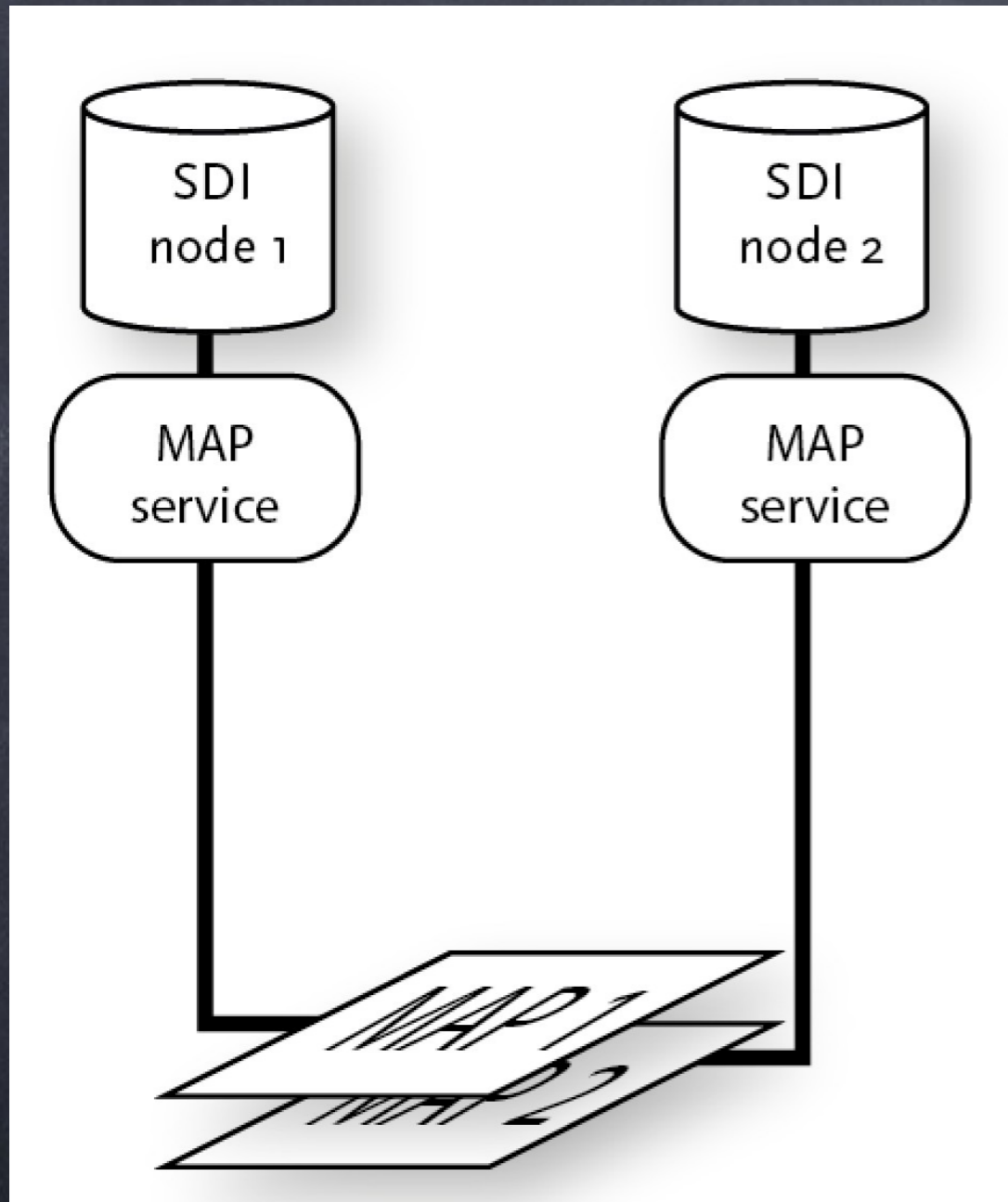
Mapping ~~in~~ a webservices environment as part of



Mapping ~~in~~ a webservices environment as part of

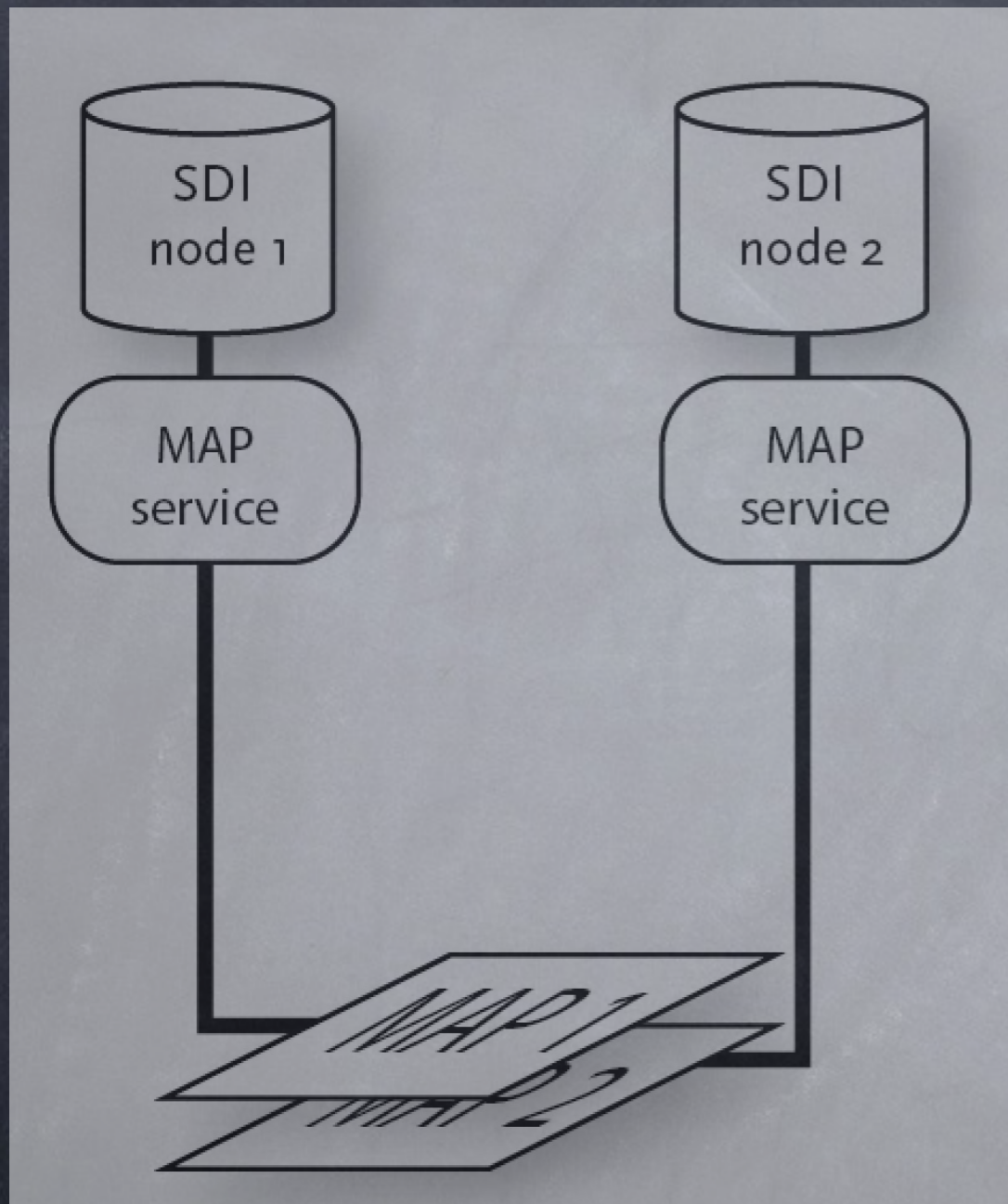


conceptual change needed

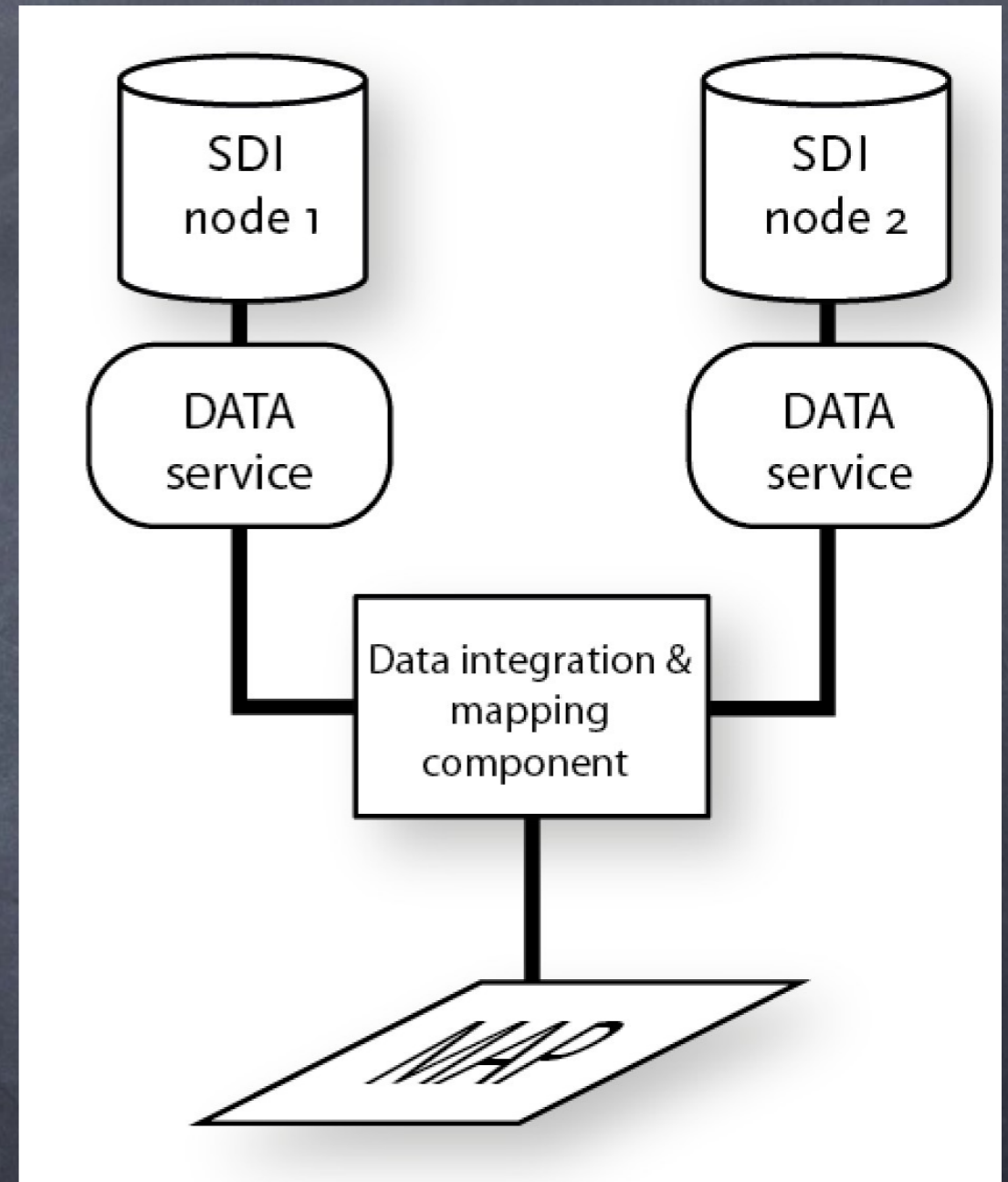
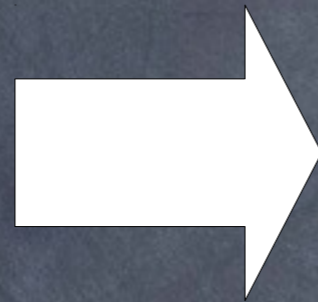


sub-optimal combination
of arbitrary map layers

conceptual change needed



sub-optimal combination
of arbitrary map layers



integrated mapping of
data layers

Statistics Dashboard

Building further on the Atlas prototype

Specifically for Statistical Data

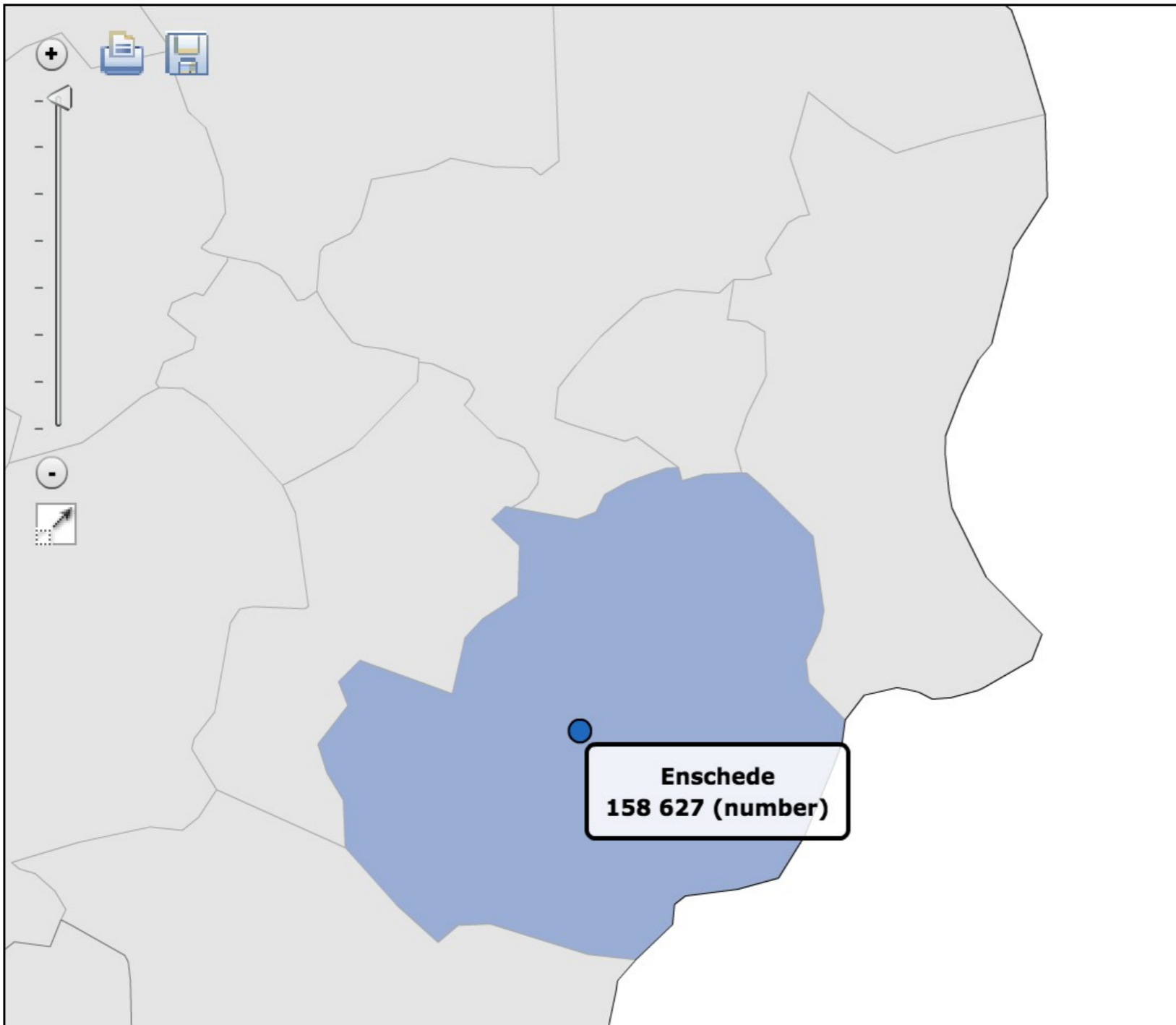
From Statistics Netherlands (CBS)

- Open Data, API using ODATA standard -
To be combined with other SDI data



Population dynamics; birth, death and migration per region

June 16 2014 | [more info](#)



Minimap

Options

Key (number)



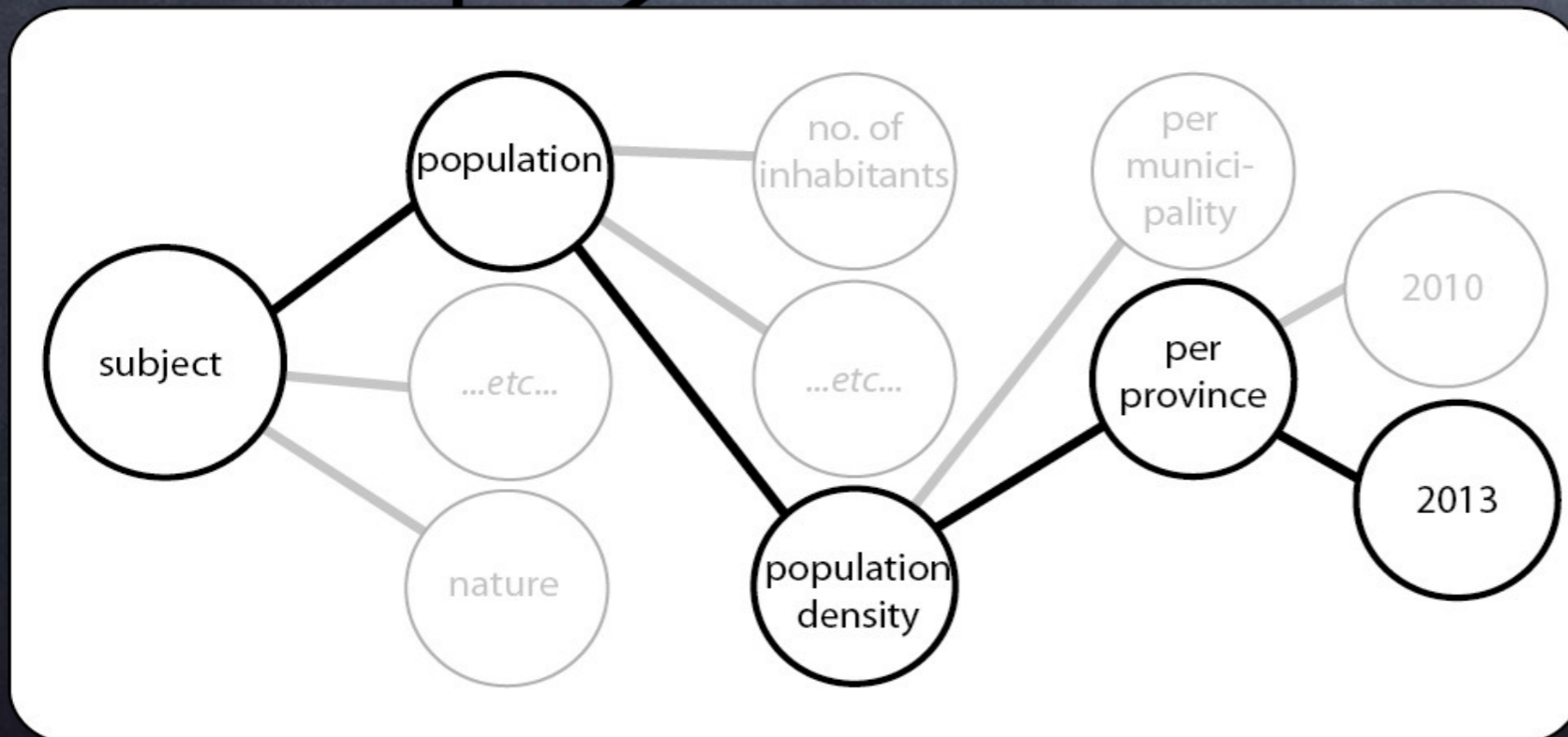
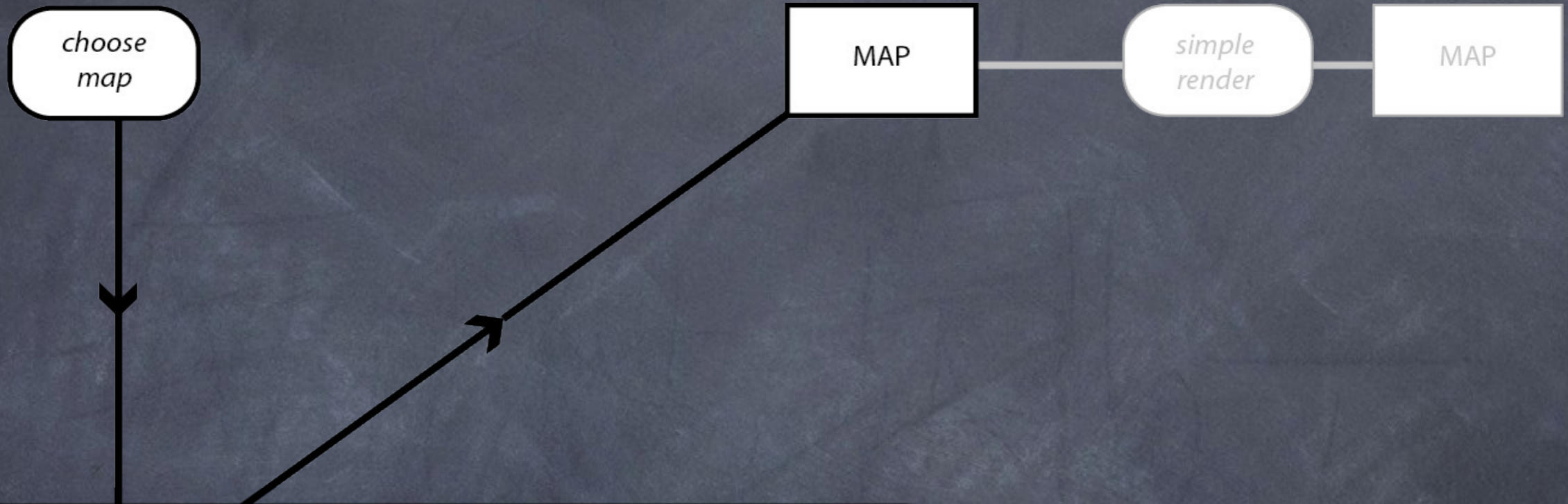
Selection

Subjects
Population on 1 January ▼

Sex
Males and females ▼

Periods
2013 ▼

Statistics Dashboard UI setup



DEMO TIME!

Statistics Dashboard

Building further on the Atlas prototype

Specifically for Statistical Data

Concentrating on ***comparison tools***:

in theme: same place and time, different variables

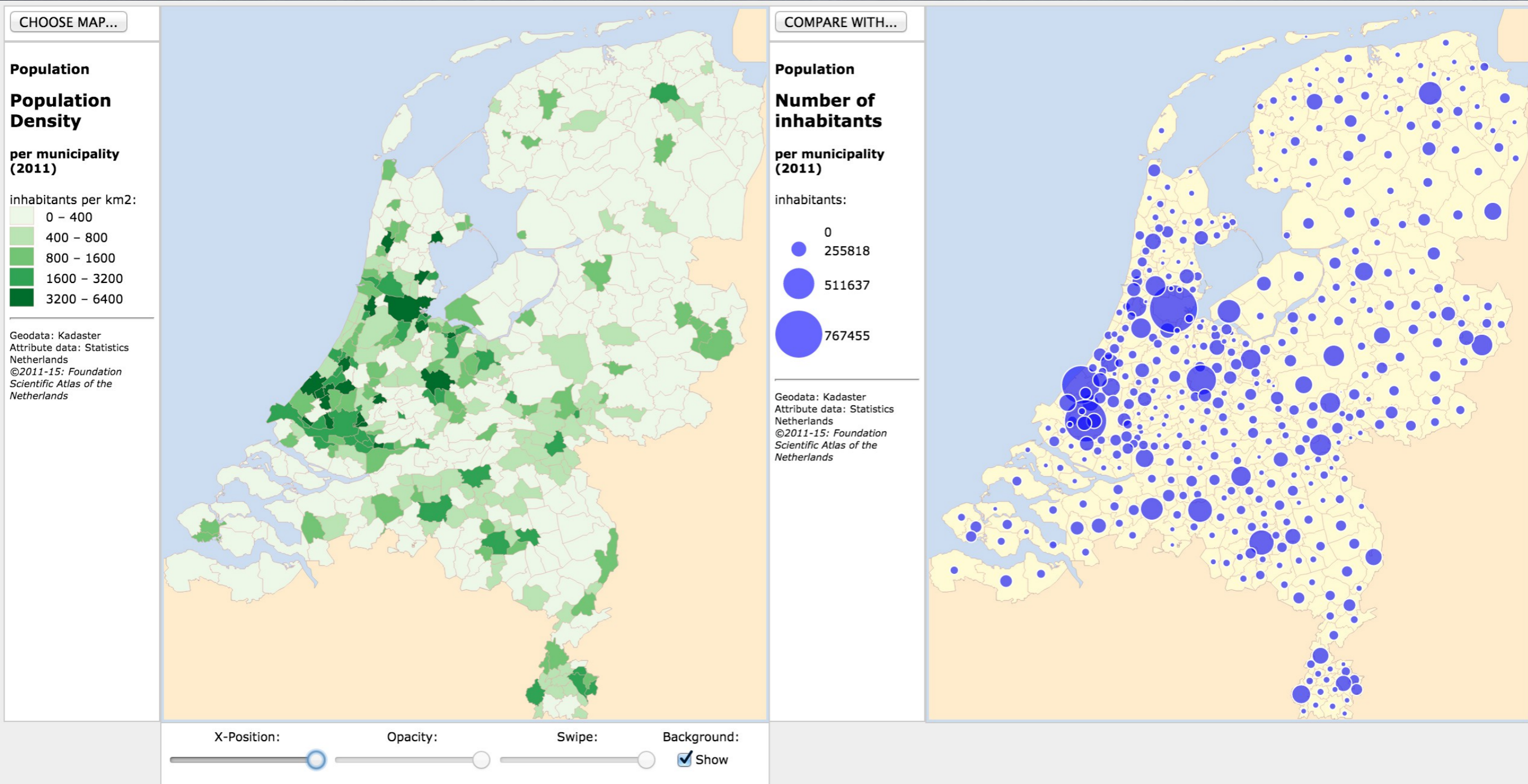
in time: same variable, different times

in space: same variable, different places/aggregation

Statistics Dashboard

comparison tools

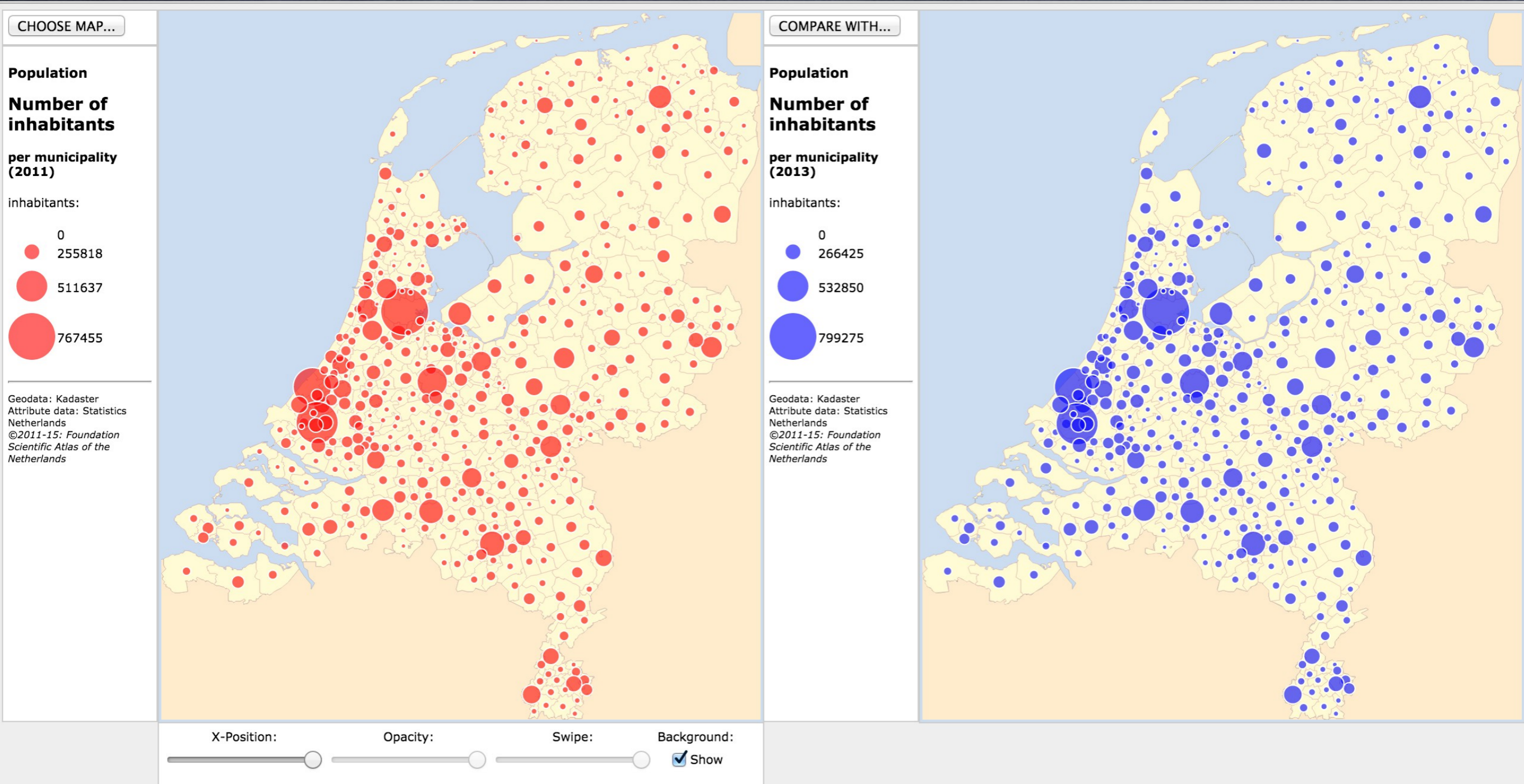
in theme: same place and time, different variables



Statistics Dashboard

comparison tools

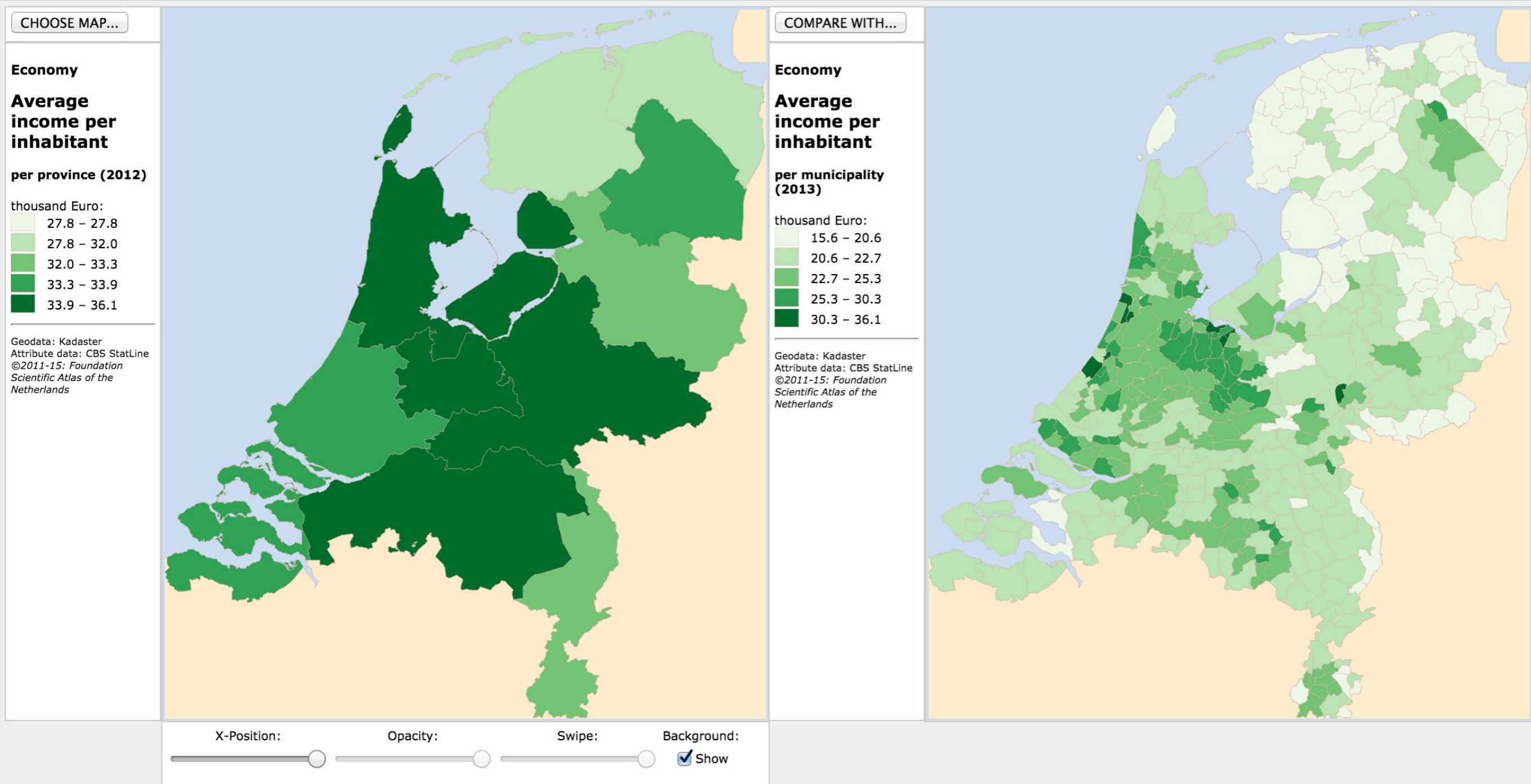
in time: same variable, different times



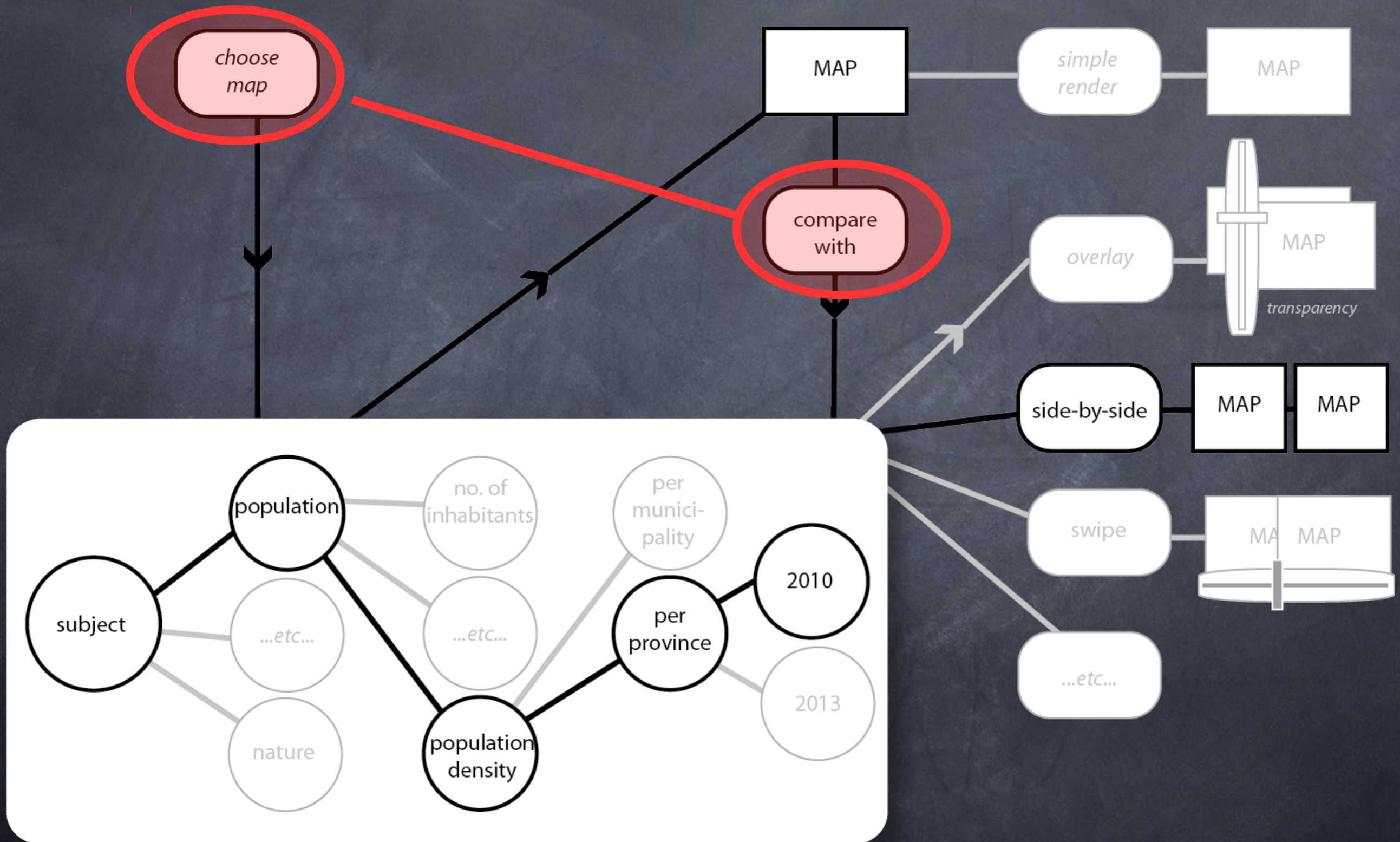
Statistics Dashboard

comparison tools

in space: same variable, different places/aggregation



Statistics Dashboard UI setup



SIDE BY SIDE

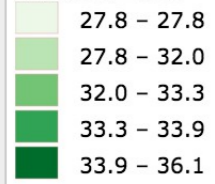
CHOOSE MAP...

Economy

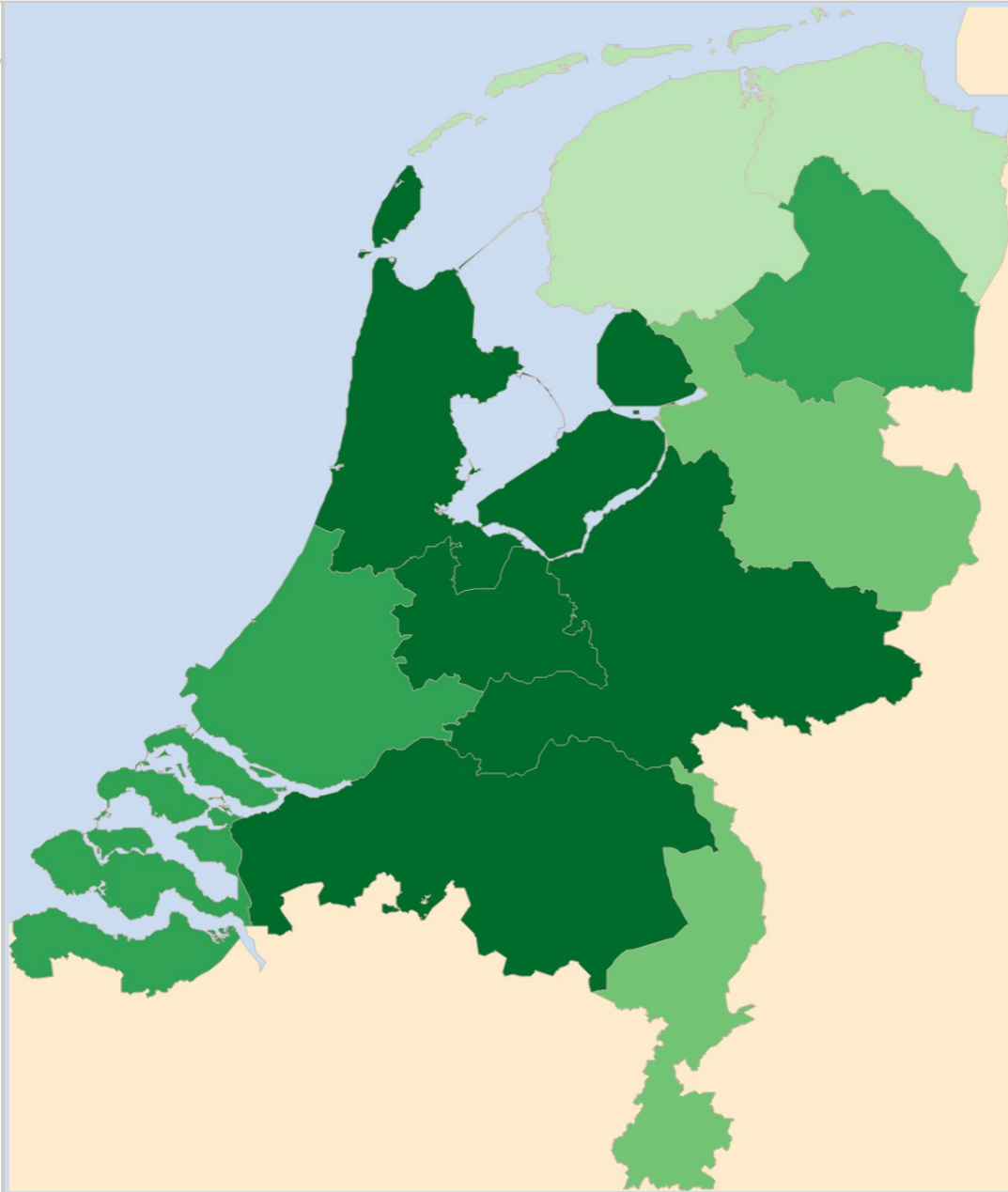
Average income per inhabitant

per province (2012)

thousand Euro:



Geodata: Kadaster
Attribute data: CBS StatLine
©2011-15: Foundation
Scientific Atlas of the
Netherlands



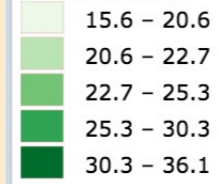
COMPARE WITH...

Economy

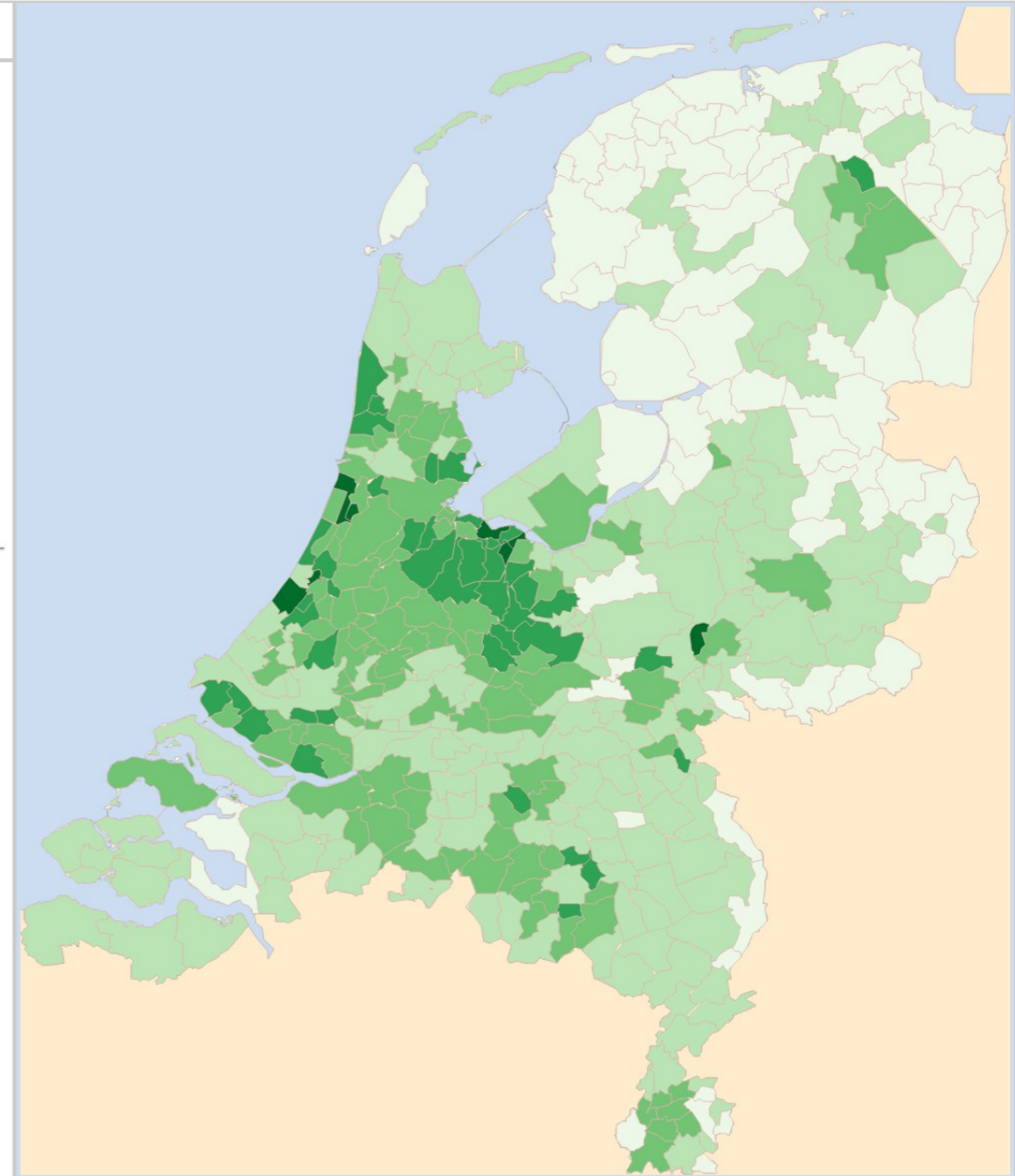
Average income per inhabitant

per municipality (2013)

thousand Euro:



Geodata: Kadaster
Attribute data: CBS StatLine
©2011-15: Foundation
Scientific Atlas of the
Netherlands



X-Position:



Opacity:



Swipe:



Background:

Show

TRANSPARENCY

CHOOSE Reload this page

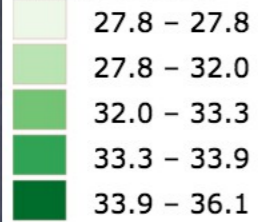
COMPARE WITH...

Economy

Average income per inhabitant

per province (2012)

thousand Euro:



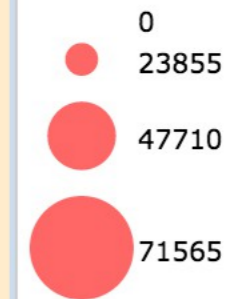
Geodata: Kadaster
Attribute data: CBS StatLine
©2011-15: Foundation
Scientific Atlas of the
Netherlands

Economy

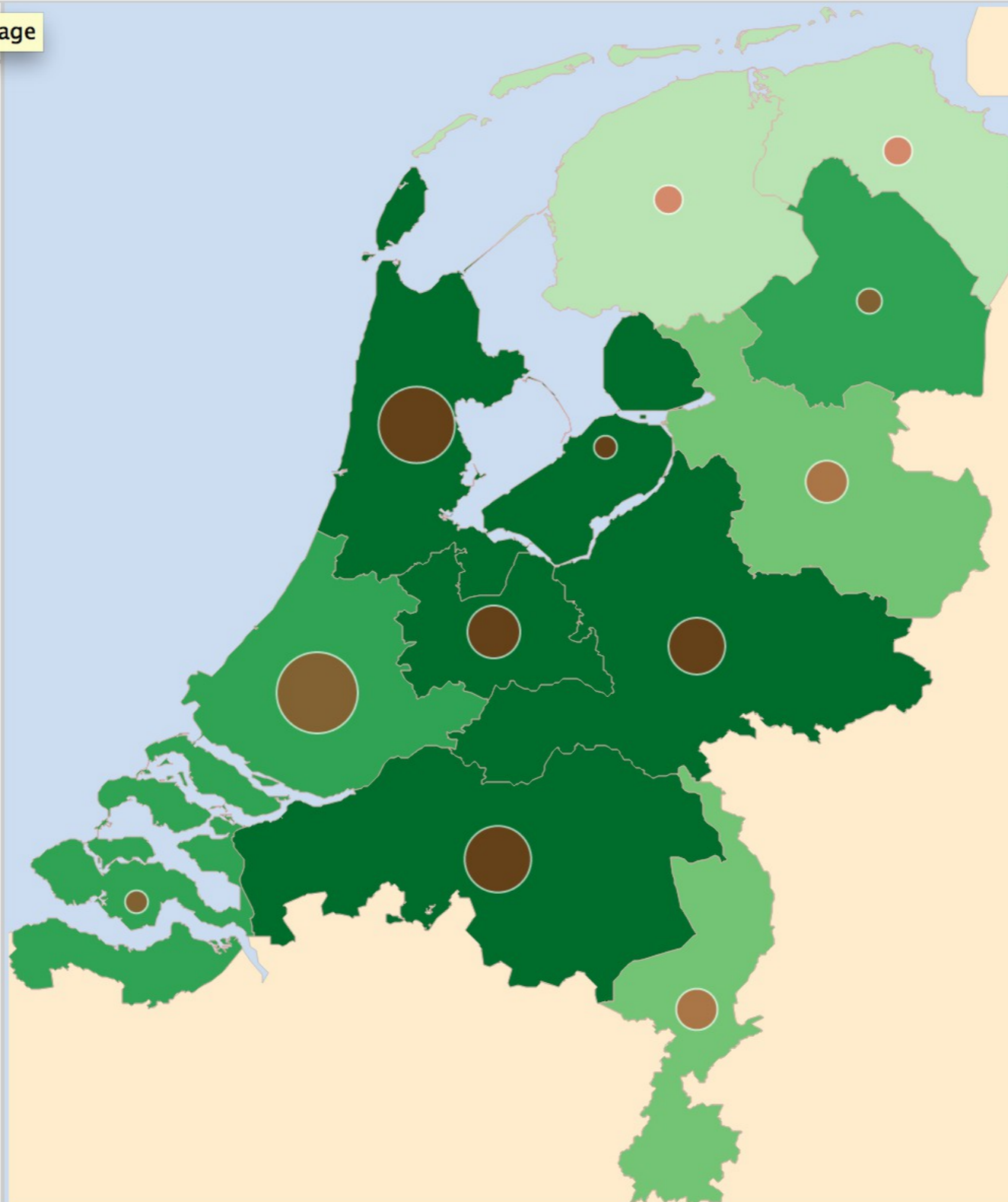
Salaries total

per province (2012)

million Euro:



Geodata: Kadaster
Attribute data: CBS StatLine
©2011-15: Foundation
Scientific Atlas of the
Netherlands



X-Position:

Opacity:

Swipe:

Background:



Show

SWIPE

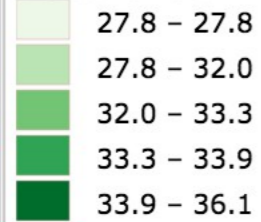
CHOOSE MAP...

Economy

Average income per inhabitant

per province (2012)

thousand Euro:



Geodata: Kadaster
Attribute data: CBS StatLine
©2011-15: Foundation
Scientific Atlas of the
Netherlands

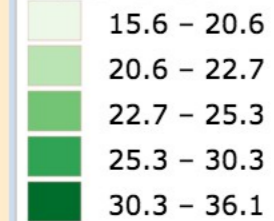
COMPARE WITH...

Economy

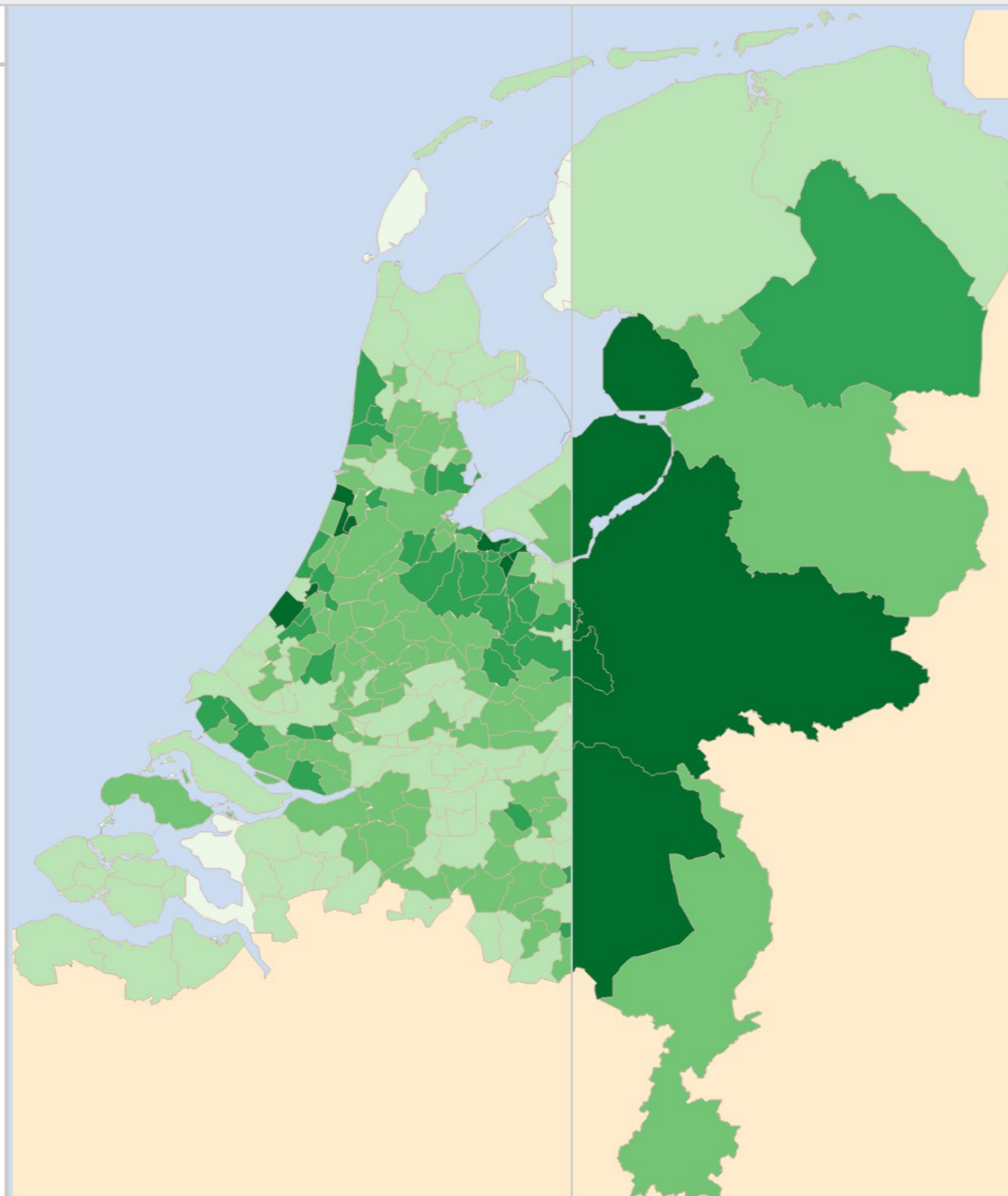
Average income per inhabitant

per municipality (2013)

thousand Euro:



Geodata: Kadaster
Attribute data: CBS StatLine
©2011-15: Foundation
Scientific Atlas of the
Netherlands



X-Position:



Opacity:



Swipe:



Background:

Show

How does it ACTUALLY work?

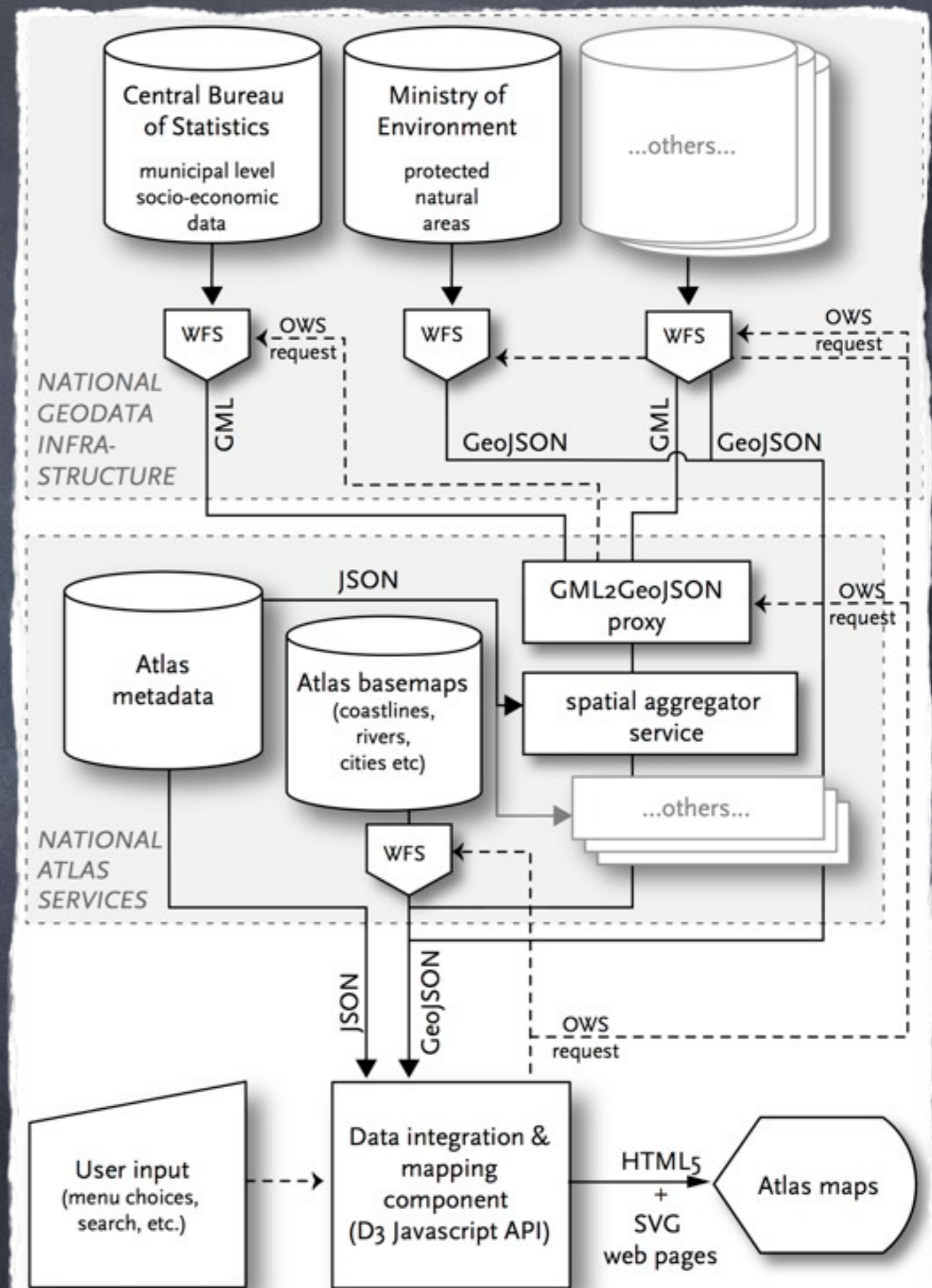
THE TECHNOLOGY

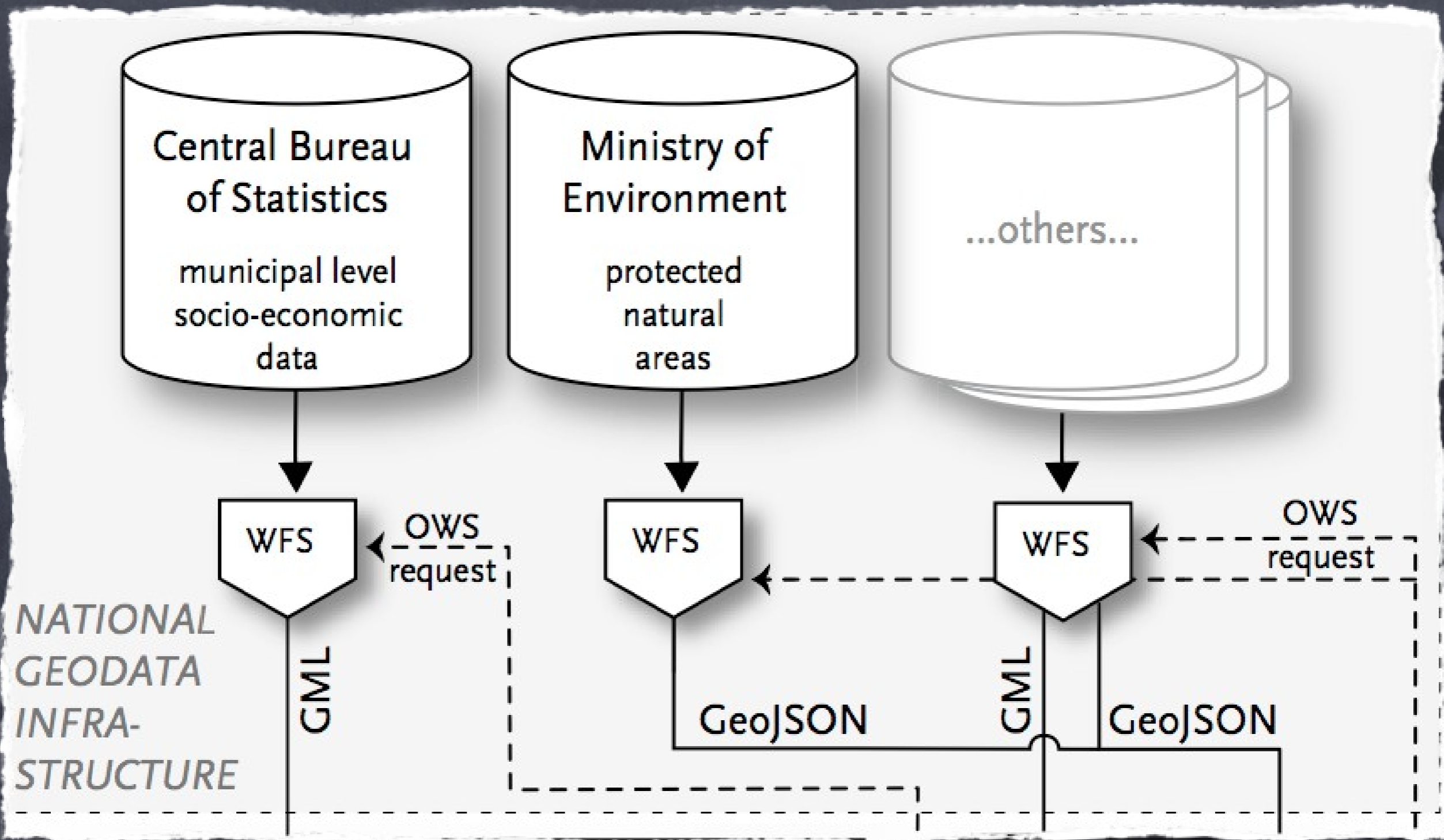
How does it ACTUALLY work?

THE TECHNOLOGY

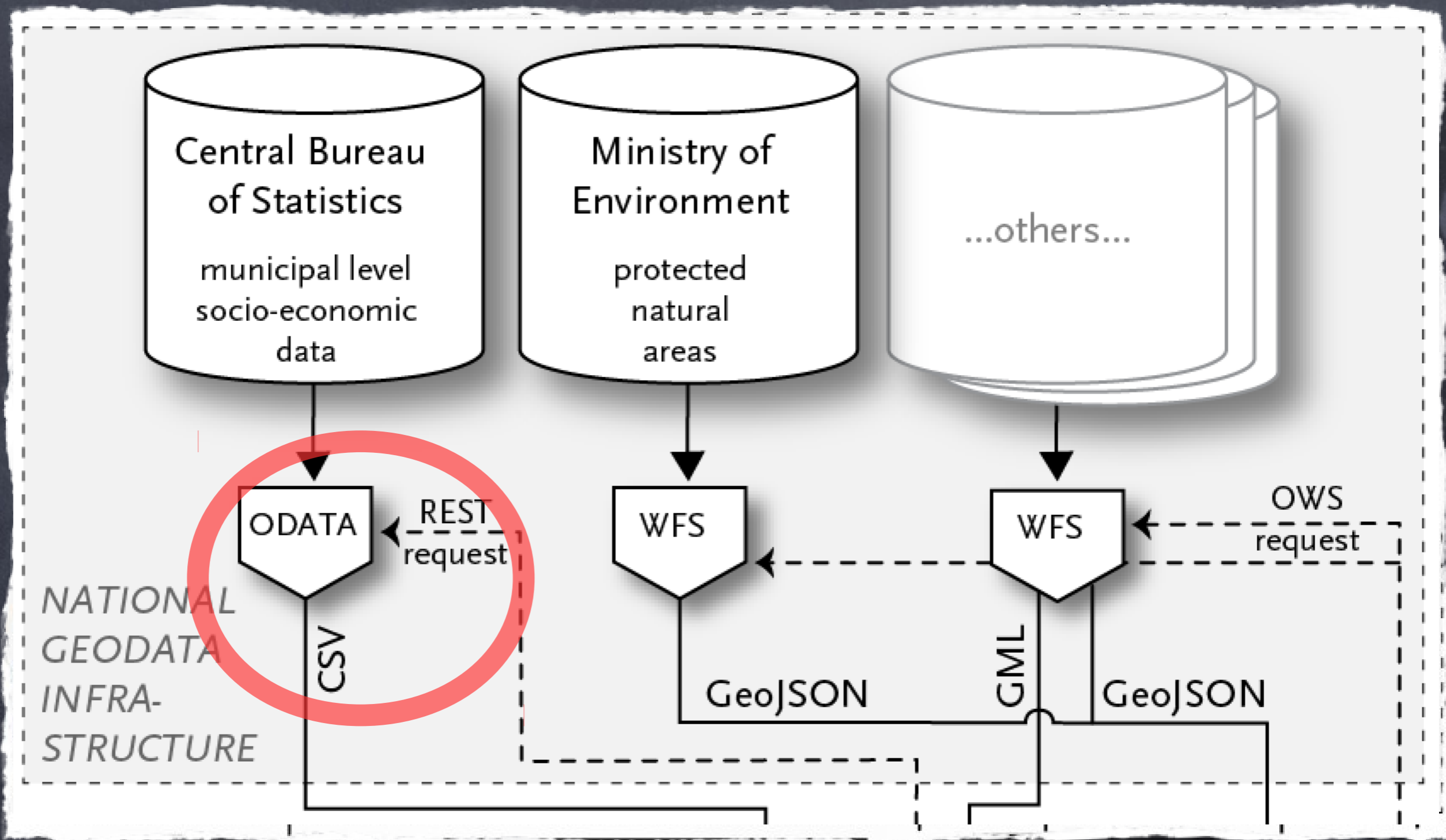
also is building further on the
NATIONAL ATLAS IN SDI
prototype

Architecture overview

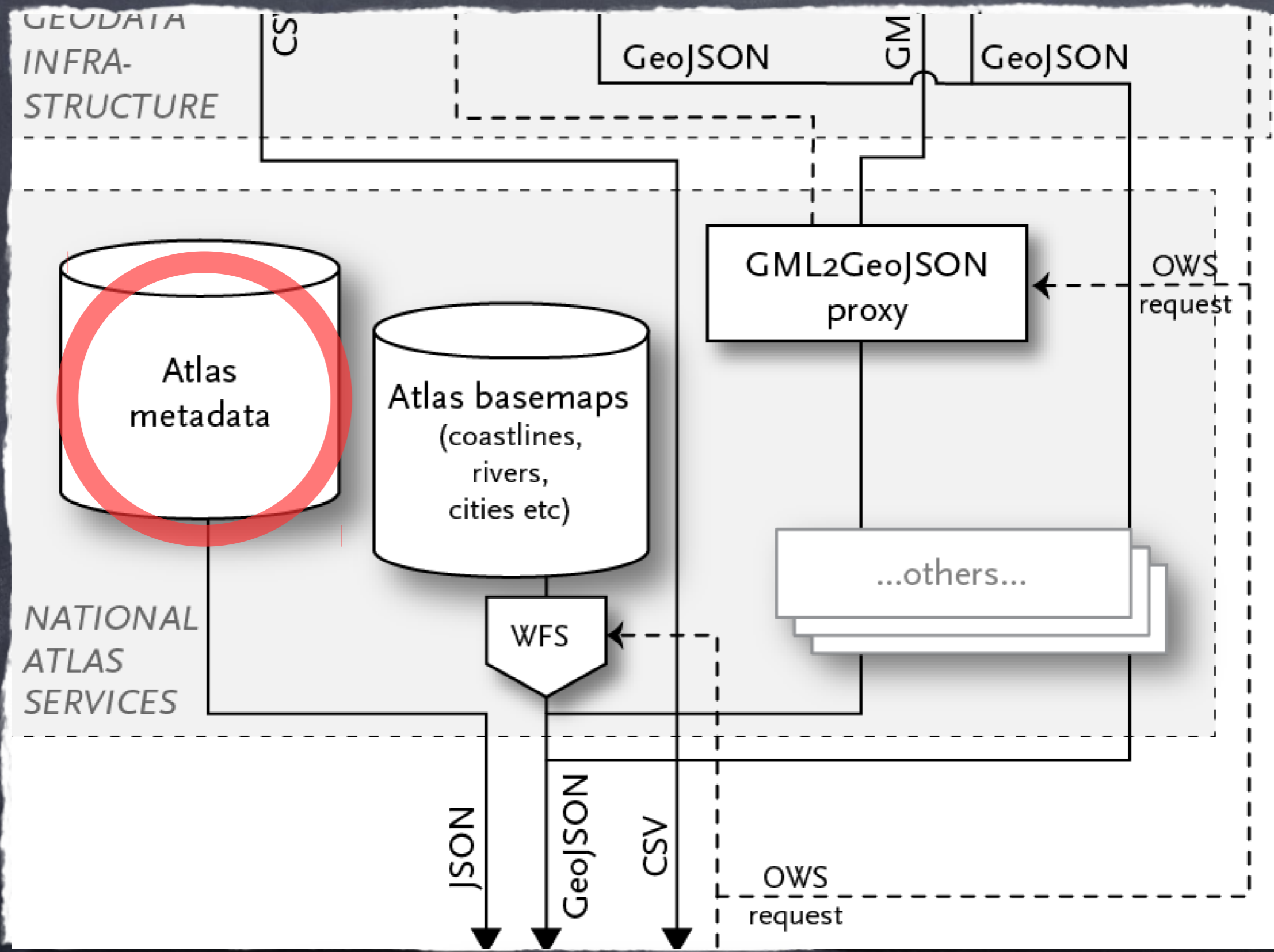




- use data services (WFS) requests
- GeoJSON output where possible



- use data services (WFS or REST) requests
- GeoJSON or CSV data output



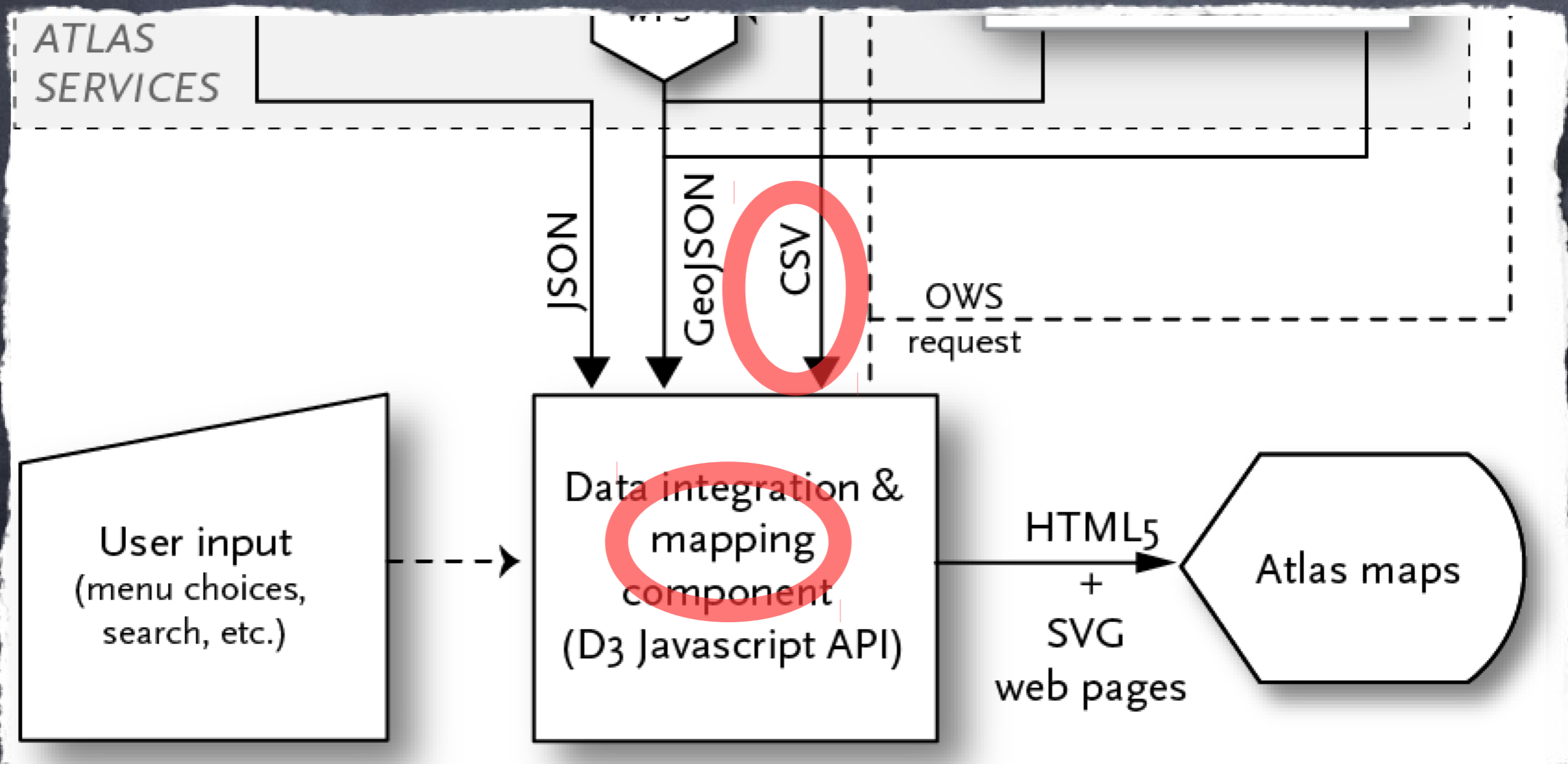
ATLAS utility services & basedata


```
"name": [
  "Bevolkings-dichtheid",
  "Population Density"
],
"data_unit": [
  "inwoners per km2",
  "inhabitants per km2"
],
"mapunits": [
  {
    "name": [
      "gemeente",
      "municipality"
    ],
    "mapdates": [
      {
        "date": "2011",
        "geo_data": 0,
        "attrib_data": 0,
        "FK": "GM_CODE",
        "attrib": "BEV_DICHTH",
        "label": "GM_NAAM"
      }, {
        "date": "2013",
        "geo_data": 2,
        "attrib_data": 2,
        "FK": "GM_CODE",
        "attrib": "BEV_DICHTH",
        "label": "GM_NAAM"
      }
    ]
  }
],
"maptype": "area_value",
"classification": {
  "type": "manual",
  "colours": "Greens",
  "numclasses": "5",
  "classes": [0,400,800,1600,3200,6400],
```

```
"geo_sources": [
  {
    "unitname": [
      "gemeente",
      "municipality"
    ],
    "description": [
      "Gegeneraliseerde gemeentegrenzen afkomstig uit de Basis
      Municipalities of the Netherlands, generalised from the
    ],
    "date": "2011",
    "FK_attrib": "GM_CODE",
    "source": [
      "Kadaster",
      "Kadaster"
    ],
    "serviceType": "localfile",
    "serviceURL": "./data/gemeenten/geo.topojson",
    "serviceName": "",
    "serviceOutputFormat": "topojson"
  },
```

Atlas Viewer:

- based on the Open Web Platform:
HTML5 + SVG + CSS + JavaScript
- uses D3 library



FUTURE WORK

Practical:

- make “compare to...” chooser context aware
- add more comparison methods
- add more Open Data connectors
- etc., etc...

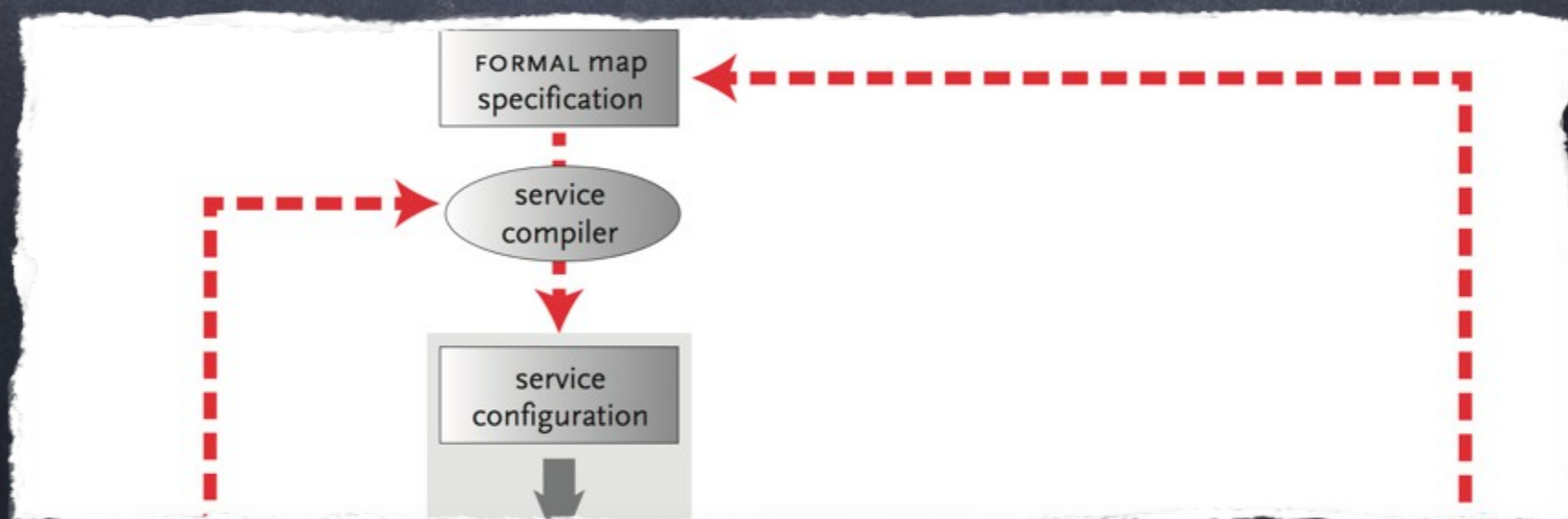
FUTURE WORK

Practical:

- make “compare to...” chooser context aware
- add more comparison methods
- add more Open Data connectors
- etc., etc...

Theoretical:

- formalising map specifications for further automating thematic map creation



Thank you!

<http://www.nationaleatlas.nl>

Barend Köbben

ITC – Universiteit Twente

b.j.kobben@utwente.nl – @barendkobben