



European Forum for Geostatistics EFGS

Overview and activities
Added value of gridded statistics
Dissemination with the aid of GIS

by Vilni Verner Holst Bloch, Norway
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Georgian Delegation Study Visit at SA

Tallinn, Estonia, 13.12 – 17.12.2010

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What is EFGS?

- Is a voluntary cooperation between National Statistical Institutions (NSIs) on implementation of GIS in the production of statistics
- Concentrates on the development of the best practices in the production of geostatistics in Europe
- Focused on development of gridded statistics
- Develops the geostatisticians network (regional, global)
 - professional network of geostatisticians from 29 European countries
- Formalisation of EFGS in 2012 is foreseen



Background of EFGS

- Started from professional geostatisticians co- operation of NSI in Nordic countries under the name of Nordic Grid Club
- First conference was hold in Norway, 1998
- Since 2000 holds annual conferences on GIS and geostatistics
- More participant countries, since 2007 European Forum for Geostatistics
- Conference of EFGS 2010 was hold in Tallinn – 1st time participants outside of Europe
- Conference of EFGS 2011 will be held in Lisboa in October

Who is who in EFGS?

EFGS Office



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Igor



LIPATZ,

Jean-Luc



FRANCE

MAKARENKO-PIIRSALU,

Diana

ESTONIA



SLOVENIA

SANTOS,
Ana Maria



PORTUGAL

TAMILETHO_LUODE,
Marja



FINLAND

VAN LEEUWEN,

Niek F.M.

NETHERLANDS



📍 EFGS office

📍 Austria

📍 Bulgaria

📍 Croatia

📍 Denmark

📍 Estonia

📍 Eurostat

📍 Finland

📍 France

📍 Germany

📍 Hungary

📍 Iceland

📍 Ireland

📍 Italy

📍 Kosovo

📍 Latvia

📍 Lithuania

📍 Netherlands

📍 Norway

📍 Poland

📍 Portugal

📍 Romania

📍 Slovakia

📍 Slovenia

📍 Spain

📍 Sweden

📍 Switzerland

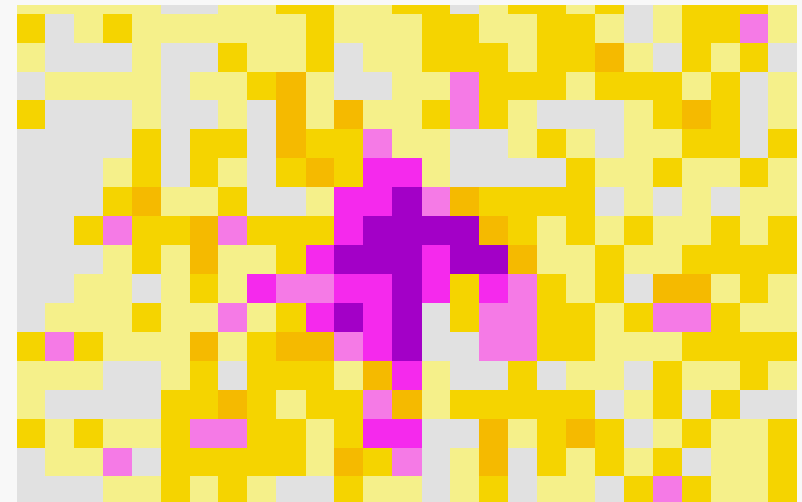
📍 Turkey

📍 United Kingdom

📍 Åland

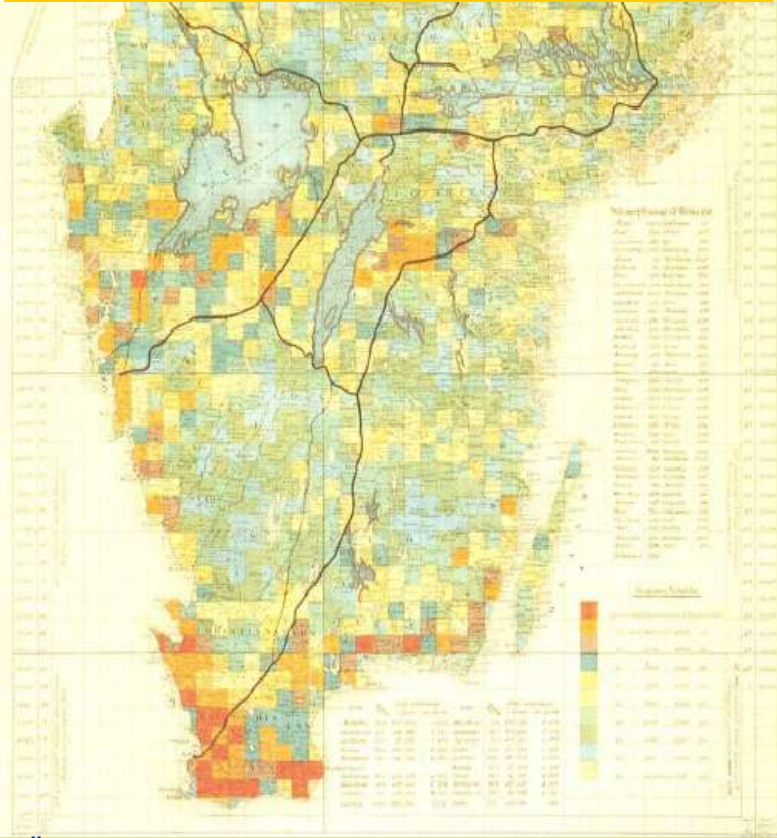
What is gridded statistics?

- Statistics disseminated in grids (100 x 100 m, 1 km x 1km etc)
- Enables spatial queries and analyses
- Map based visualisation



Background

Population density 1857.
South Sweden.



- First grid statistics made in 19th century
- Different grid definition
- Sporadic updates
- Laborous work at that time

Source: Öber, S. and Springfieldt, P. (1991).

The populations. The national Atlas of Sweden. Statistics Sweden.

EFGS Activities – ESSNet grant GEOSTAT



- **Geostat 1 A project — Representing Census data in a European population grid**
- Main goals are to develop the guidelines for datasets and methods to link 2010/11 Population and Housing Census results to a common harmonised grid.
- Project period 01.01.2010 – 31.12.2011
- Mainly funded by Eurostat

Geostat 1 A

- **Project co-ordinator** – Vilni Verner Holst Bloch, Norway
- **WP 1 — Collection of User Needs** – Ingrid Kaminger, Austria
 - analysing the real user needs for technically sound data specification
 - develops vision for gridded statistics
- **WP 2 — Geostatistics** – Marja Tammilehto – Loude, Finland
 - describes and tests disaggregation and aggregation methods
 - visualises harmonised European population grid data
 - demonstrates usage of grid data in spatial analysis
- **WP 3 — Infrastructure** - Niek van Leeuwen, the Netherlands
 - produces a sound description for a working infrastructure for the integration of geography and statistics
- **WP 4 — Dissemination** - Vilni Verner Holst Bloch, Norway
 - transfers knowledge and results gained to the NSI- s and to a wider audience

GEOSTAT I A project consortium

Coordinator:

Statistics Norway

Co - Partners:

Statistics Austria

Statistics Estonia

Statistics Finland

Statistics France

Statistics Netherlands

Statistics Poland

Statistics Portugal

Statistics Slovenia

Subcontractor:

MD Mapping

Challenges

- Legislation
- Confidentiality is treated differently in each country
- Different map projections
- Scales
- Coding system
- Methods for disaggregation (using the best suitable algorithm)
- Quality issues
- Data interoperability
- Metadata standards suitable for gridded statistics (ISO 19115 vs SDMX)
- Dissemination – licensing policy

Geostat 1 A user needs



Census 2010/11 round in Europe - Background environment of Geostat 1 A

- Not mandatory to produce gridded population dataset
- Mandatory is to produce population dataset for Local Administrative Units (LAU)
- Gentlemen's agreement –
 - Eurostat encourages member states to geo-reference census results
 - voluntary bases



EUROPEAN COMMISSION
EUROSTAT

Directorate E: Sectoral and regional statistics
Directorate F: Social and information society statistics

Luxembourg, 4. November 2009
ESTAT/E/F/GK/ho D(2009) 10232

**NOTE TO THE ATTENTION OF THE DIRECTORS
RESPONSIBLE FOR THE POPULATION AND HOUSING CENSUSES
IN THE EU MEMBER STATES**

Dear colleagues,

Current global concerns like climate change, threats to ecosystems or limited resources call for integrated policies for sustainable development. Statistical data is mostly reported against NUTS areas with all their inherent diversity in terms of size and population. But the causes of social and environmental phenomena do not follow the delineations of NUTS areas.

A way to overcome the gap between spatial entities of reported information and spatial distribution of their causes are spatially referenced statistics. For example, information reported on the basis of a stable and harmonised system of grids may better serve as a foundation for spatial analysis across disciplines. The 2011 census round is a unique occasion to collect such data for a demographic and socioeconomic description of human societies and their habitat. Statistical and spatial analysis are very important for supporting Community policy decision making in a number of domains already today, and Eurostat expects that they will gain in importance in the future.

Please note that the issue of georeferencing has been discussed for many years in the framework of the ESS working group on Geographical Information Systems for Statistics. An ESS-Net project called GEOSTAT with the aim of creating a standardised ESS wide population grid map useful for spatial analysis has recently been launched. During the recent meeting of the Directors of Social Statistics, we have drawn your attention to this project and have informed you in general about the importance we attach to the georeferencing of census data. The ESS Committee of 2 October 2009 was informed accordingly.

In order to further develop these initiatives, Eurostat would like to encourage the Member States to explore their possibilities of geo-referencing the data from the 2011 population census. This would happen on a voluntary basis!

To kick-off a co-operation, Eurostat would kindly like to ask you what action your NSI has already undertaken in that area and inform us about the national legislation in that regard. We would appreciate to receive your answer by the **end of November 2009**. Please send your reply to our e-mailbox ESTAT-census@ec.europa.eu.

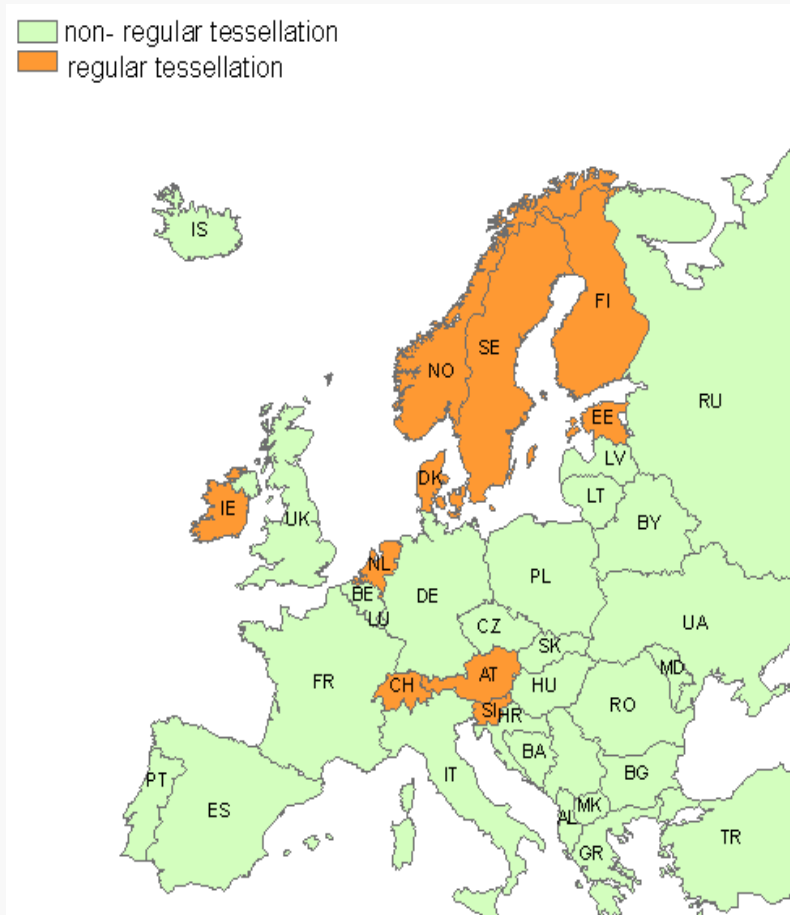
Thank you in advance for your cooperation.

Yours sincerely,

Pedro Diaz Muñoz
Director Eurostat Dir E

Inna Šteinbuka
Director Eurostat Dir F

Use of the Grids in dissemination , 2009



- 10 countries using regular tessellation - grids
- Others using non- regular tessellation - LAU; EA; postal areas etc
- Census 2010/11 – more NSI is expected to disseminated gridded population datasets (France, Poland, Latvia, Spain....)



Disadvantages of using non-regular tessellation

- Not suitable for many spatial analyses needed for:
 - Policy making
 - Spatial planning of infrastructure
 - Climate change analyses
 - Emergency planning, etc
- Due to
 - Different size of geographic unit
 - Scale issues

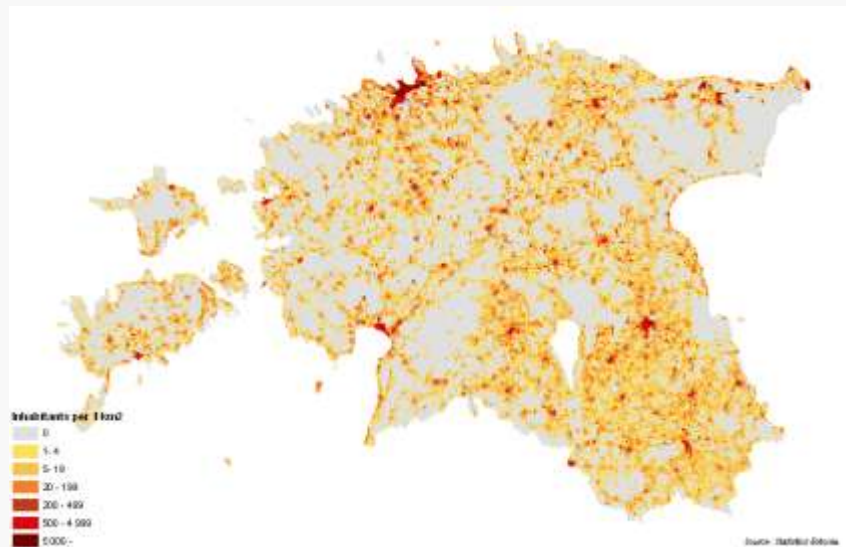


Methods for producing gridded statistics

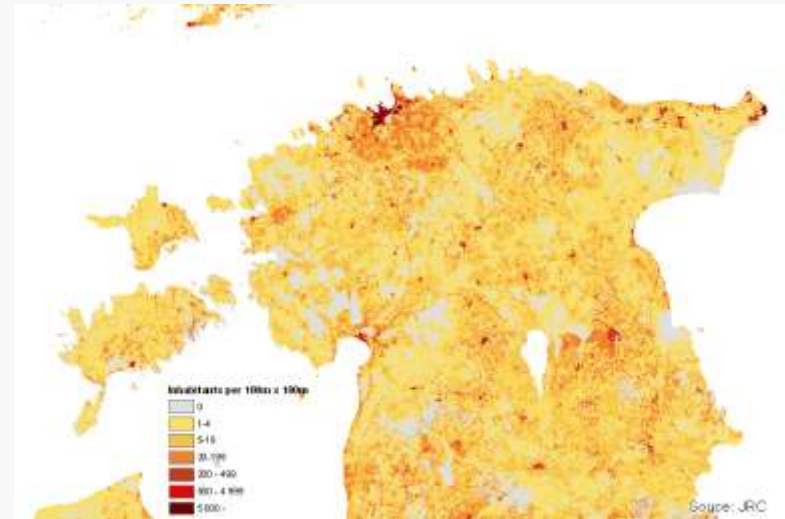
- Bottom-up approach
 - aggregating point data into grids
 - better quality and accuracy
- Top- down approach
 - disaggregating the data using modelling
 - disaggregated data for Europe (EU27+Croatia) is available for non-commercial use /produced by J. Gallego, JRC / EC

Comparison of bottom – up and top-down datasets, same classification

Bottom – up approach, Source: Statistics Estonia, Census 2000

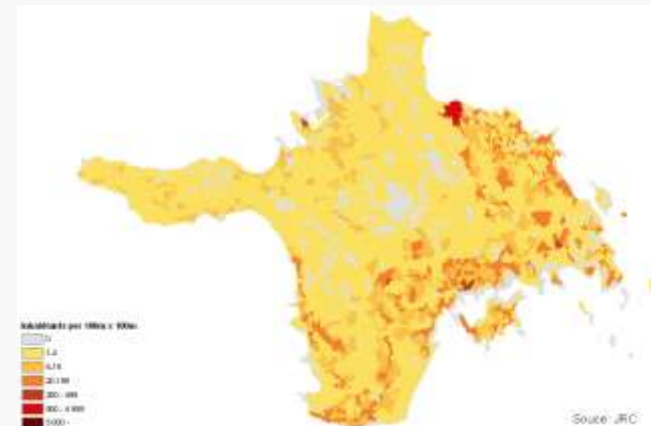
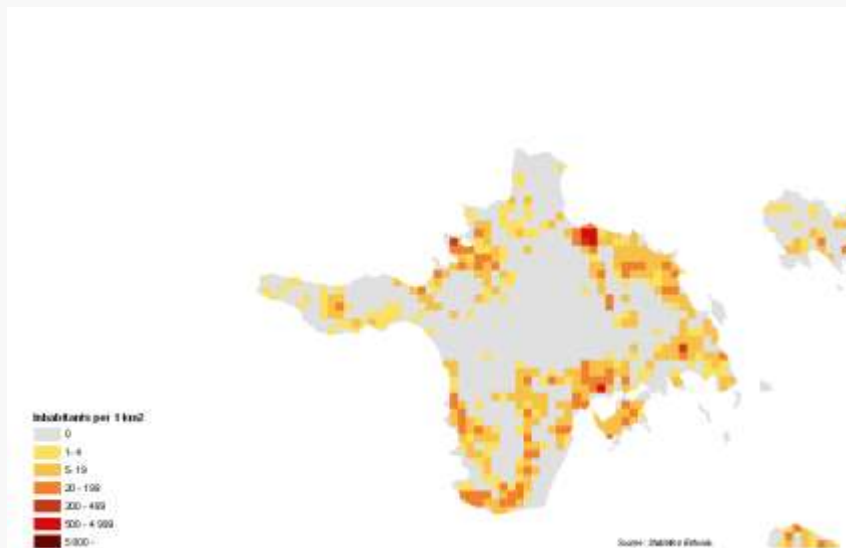


Top – down , Source: administrative units, CLC, Source: JRC, 2000



Visual inspection of bottom – up and top- down datasets, same classification

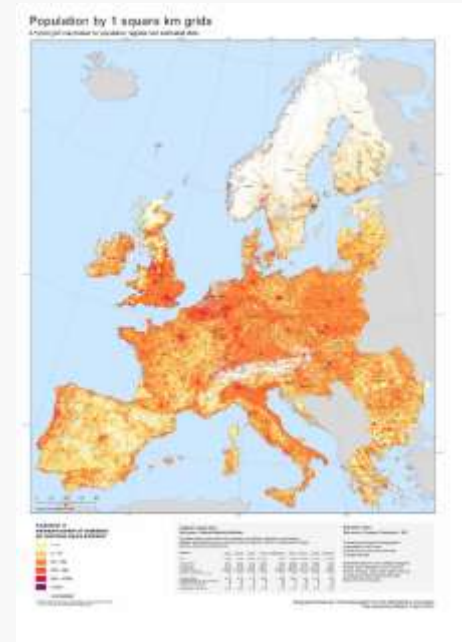
Top–down method tend to: overestimate rural population and underestimate urban population



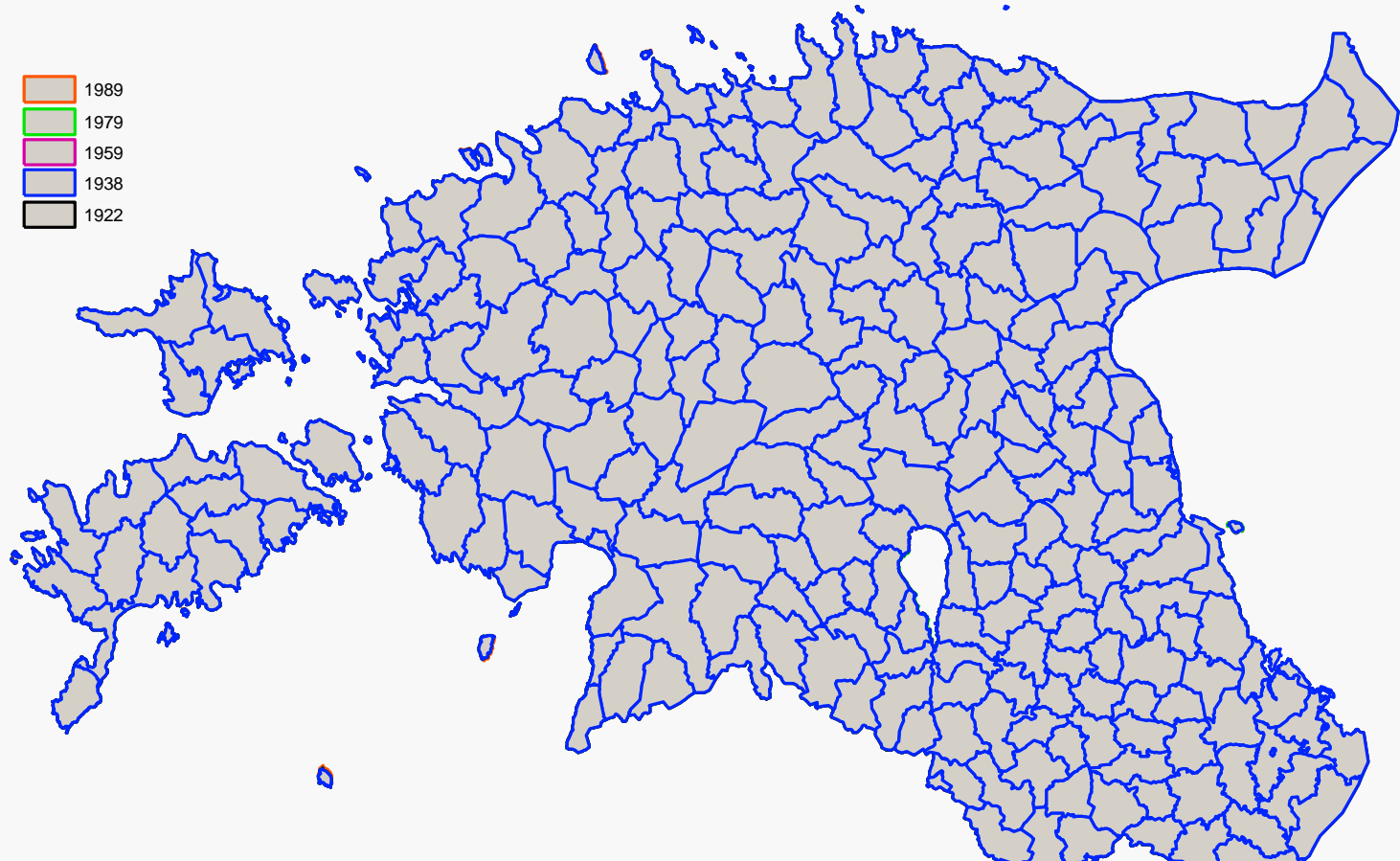
Bottom – up, Source: Census 2000, Statistics Estonia

Top – down , Source: administrative units, CLC, Source: JRC, 2000

EFGS bottom- up, top- down and hybrid population maps



Why gridded statistics are important?



Administrative borders tend to change over time, thus statistics from different years are not spatially comparable

Need for cross borders spatial analyses

- Any policy or decision making process
- Sustainable development
- Environmental planning
- Infrastructure planning
- Business in many economic

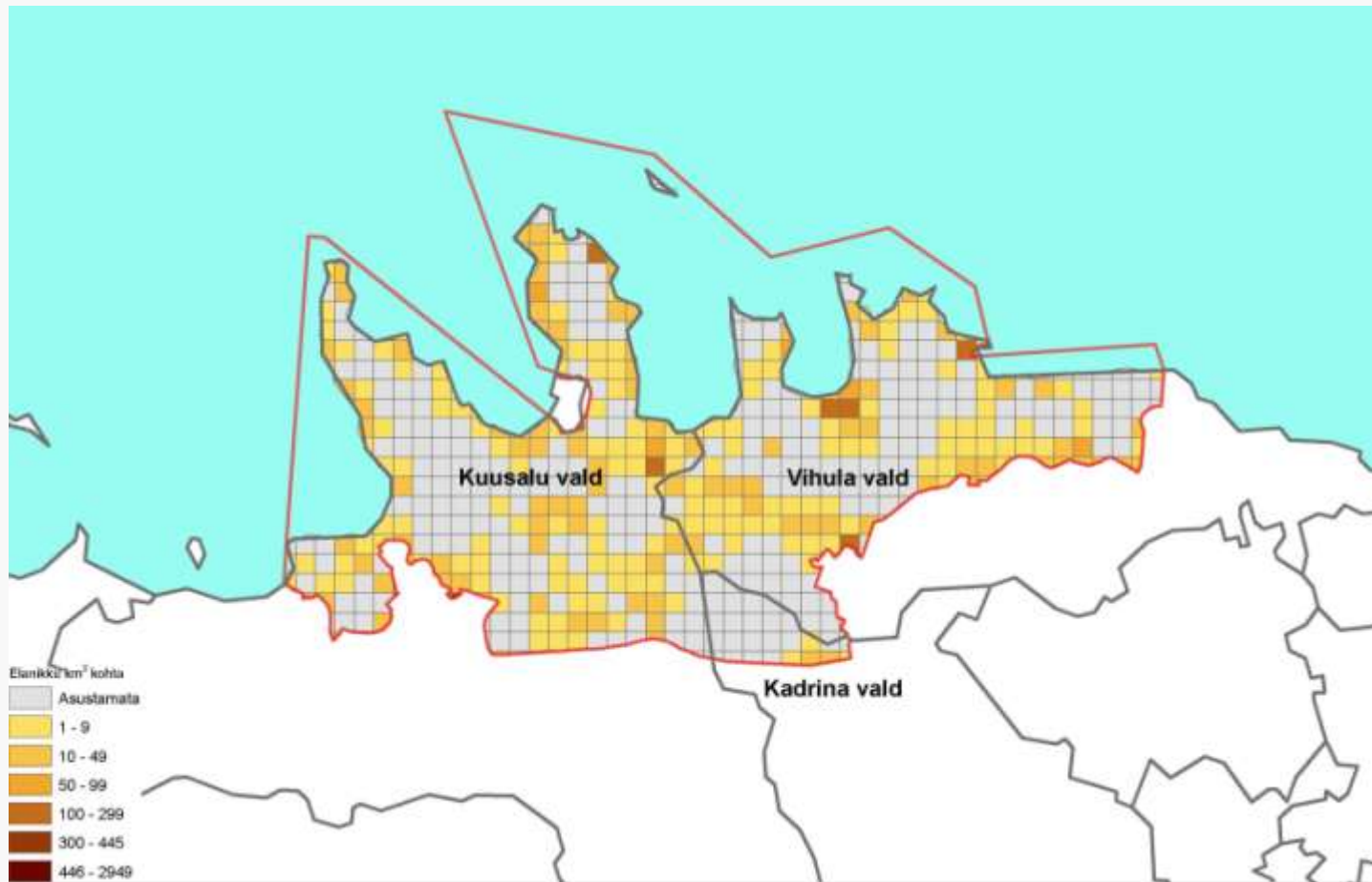
Each field has different territories

- Catchment areas in hydrology
- Service areas
- Landscape reserves
- Voting districts
- Postal zones / post code areas
- Land use areas
- etc

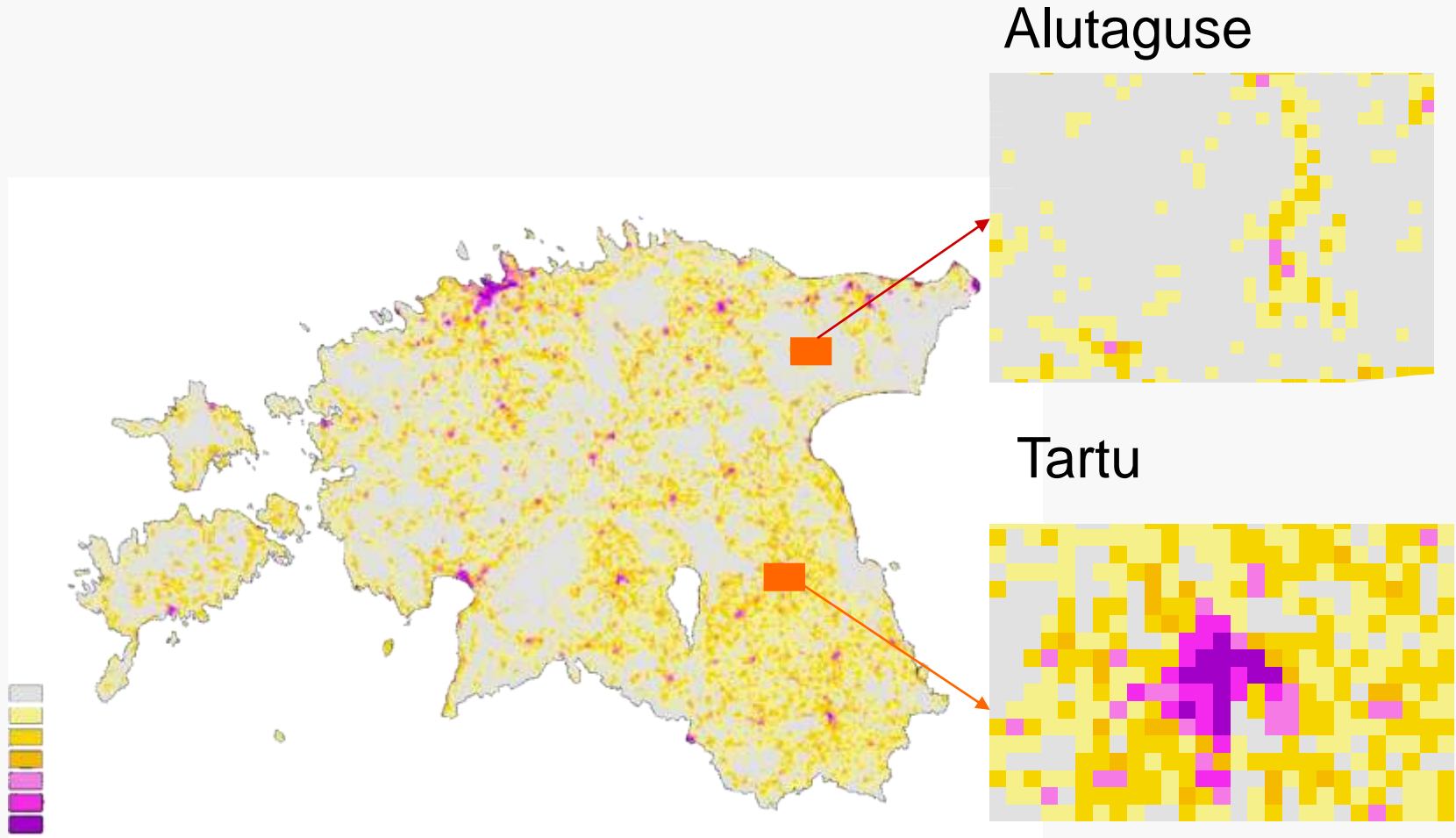
Statistics based on administrative units are not easily usable for trans – and interdisciplinary studies

Independent statistics from change of borders enables cross disciplinary studies

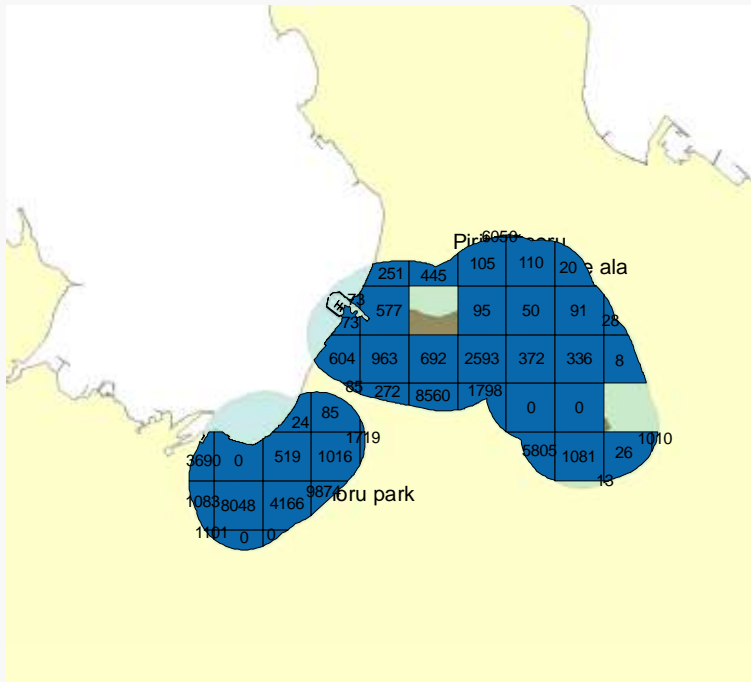
Example: How many people are living in Estonian nature reserve Lahemaa?



Gridded statistics represent the real population pattern realistically. Night – time population



For how many inhabitants are the recreation areas in the walking distance of 10 – 15 min?



Total: 57 908 inhabitants

Examples

Age structure

- 2 23-29 årige
- 3 23-29 årige
- 4 0-11 og 30-39 årige
- 5 11-16 og 40-49 årige
- 6 50-59 årige
- 7 50-59 årige
- 8 60-65 årige
- 9 66 år og derover
- 10 66 år og derover

Dwelling type

- 2 Enfamiliehus
- 3 Enfamiliehus
- 4 Stuehus til landbrug og andre
- 5 Række/kædehus
- 6 Flerfamiliehus og Række/kædehus
- 7 Flerfamiliehus og privat leje
- 8 Etagebolig
- 9 Etagebolig
- 10 Etagebolig

Ownership

- 2 Eje
- 3 Eje
- 4 Eje
- 5 Offentlig leje
- 6 Offentlig leje
- 7 Offentlig leje
- 8 Privat leje
- 9 Privat leje
- 10 Andel

100m x 100m cells

Age structure

- 2 Grundskole
- 3 Grundskole
- 4 Erhvervsgymnasial
- 5 Almen gymnasial og Ba
- 6 Bachelor
- 7 Lang videregående
- 8 Mellemlang videregåen
- 9 Kort videregående
- 10 Erhvervsfaglig

Income level

- 2 0 til 132.000 kr.
- 3 132.000 til 211.000 kr.
- 4 132.000 til 211.000 kr.
- 5 211.556 til 285.658 kr.
- 6 211.556 til 285.658 kr.
- 7 285.000 til 370.000 kr.
- 8 285.000 til 370.000 kr.
- 9 Større end 370.000
- 10 Større end 370.000

Houshold type

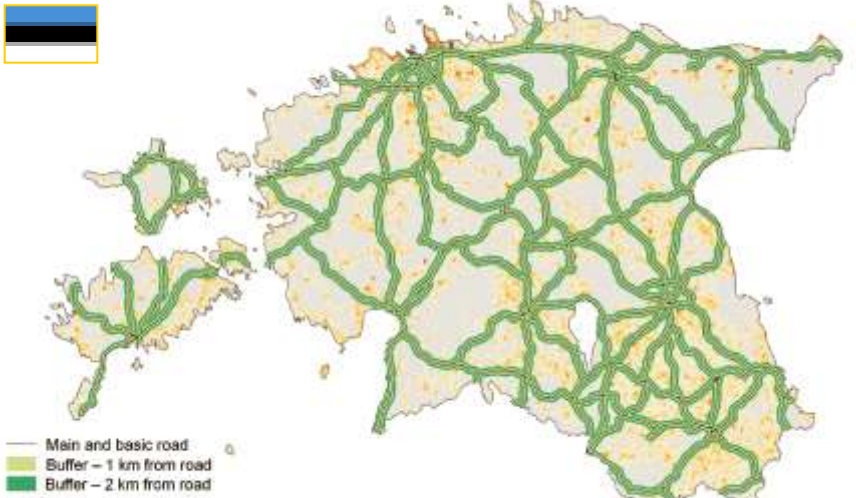
- 2 Enlig uden børn
- 3 Andre
- 4 Enlig med børn
- 5 Enlig med børn
- 6 Andre
- 7 Par med børn
- 8 Par med børn
- 9 Par uden børn
- 10 Par uden børn

Examples

PhD Tiit Tammaru from University of Tartu investigated the migration pattern of ethnic minorities. The main result was that the dominant migration flow is out of the main areas of ethnic concentration in Estonia.



Grid based population data were used by Estonian Road Administration to analyse the state traffic frequency and to plan the road covers



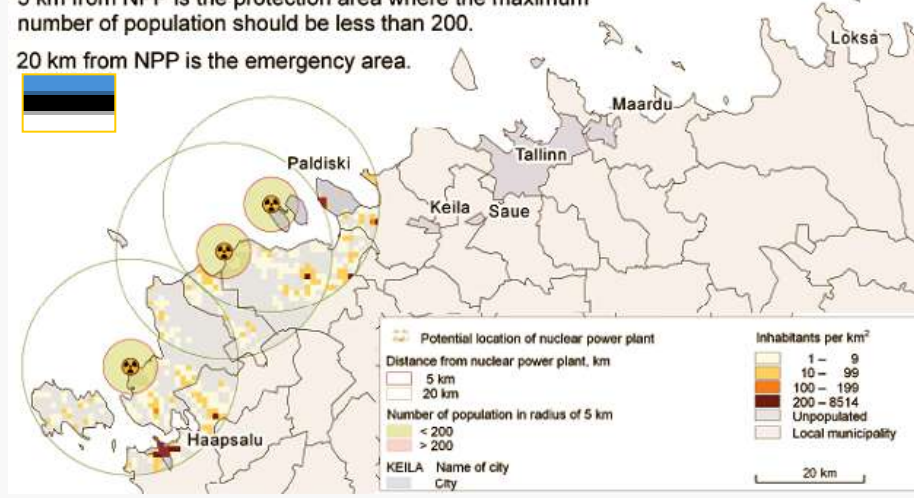
80% of population lives up to 1 km and 86% up to 2 km from main and basic roads

Different uses

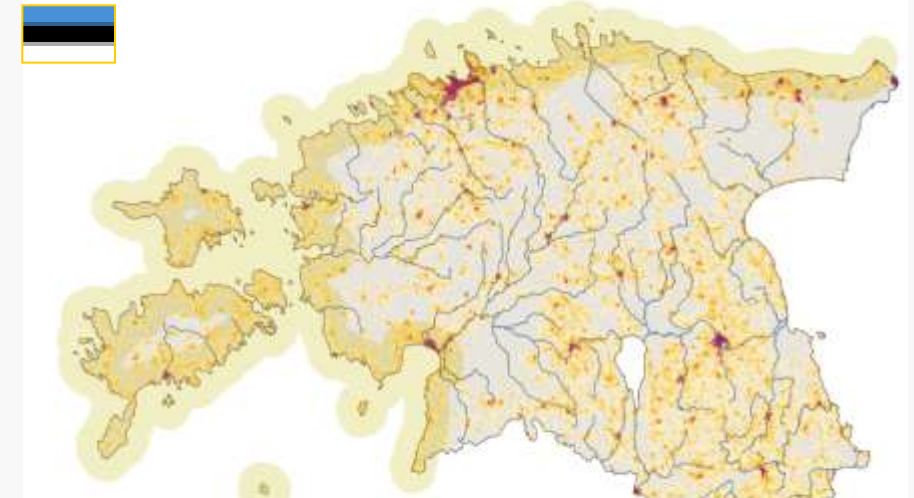
The data of people were used to analyse the best location of potential nuclear power plant.

5 km from NPP is the protection area where the maximum number of population should be less than 200.

20 km from NPP is the emergency area.

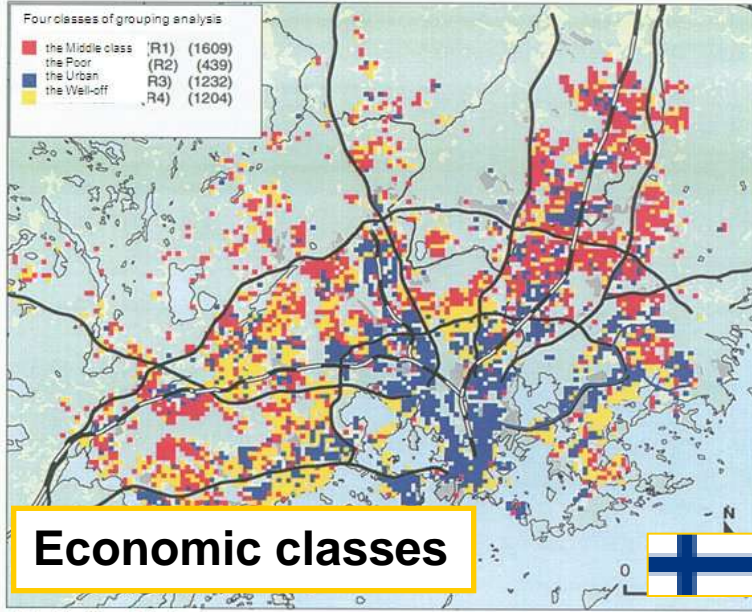


Number of people living up to 10 km from coastline is 696 270

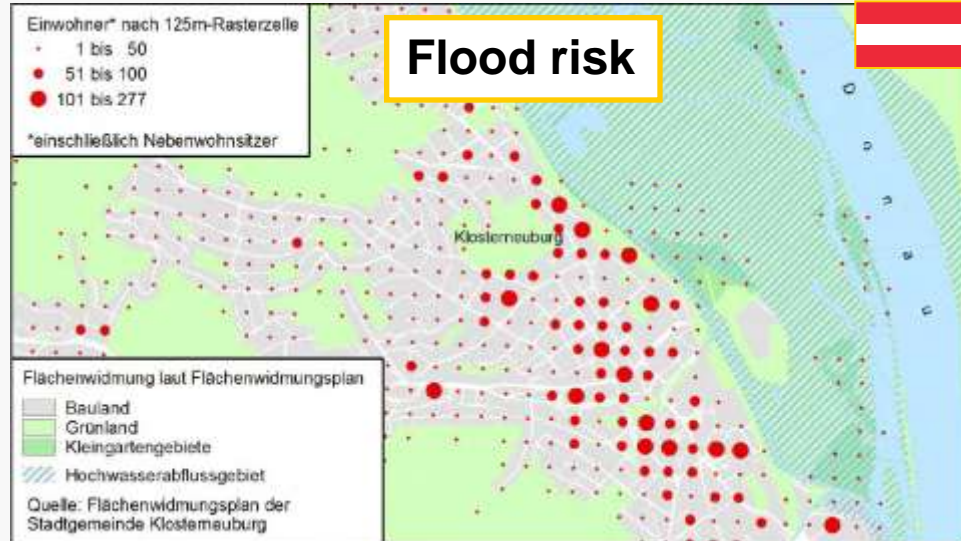
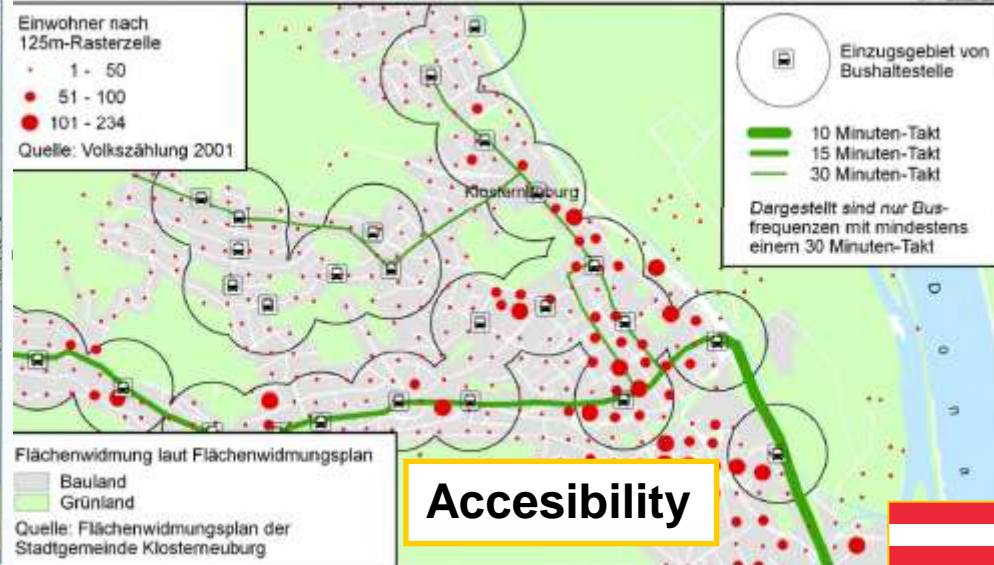


Buffer - up to 10 km from coast

Examples

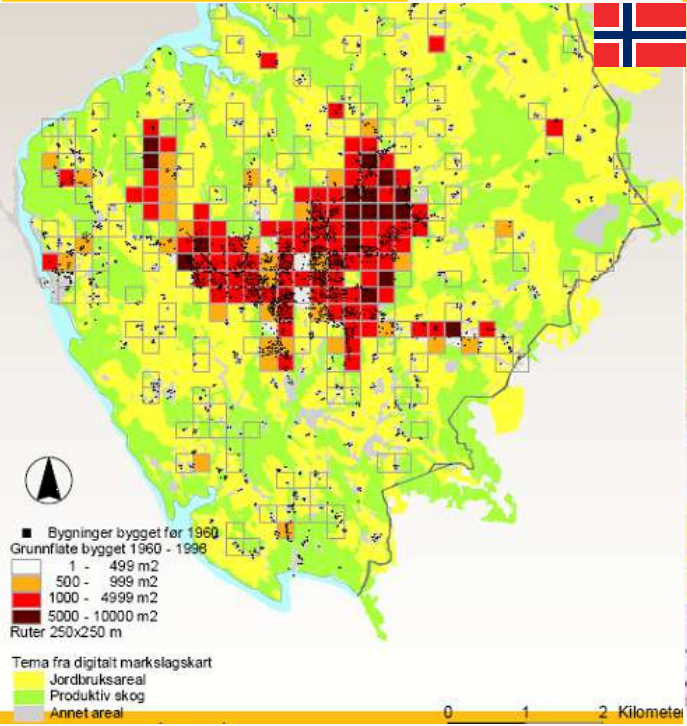


Data: Statistics Finland

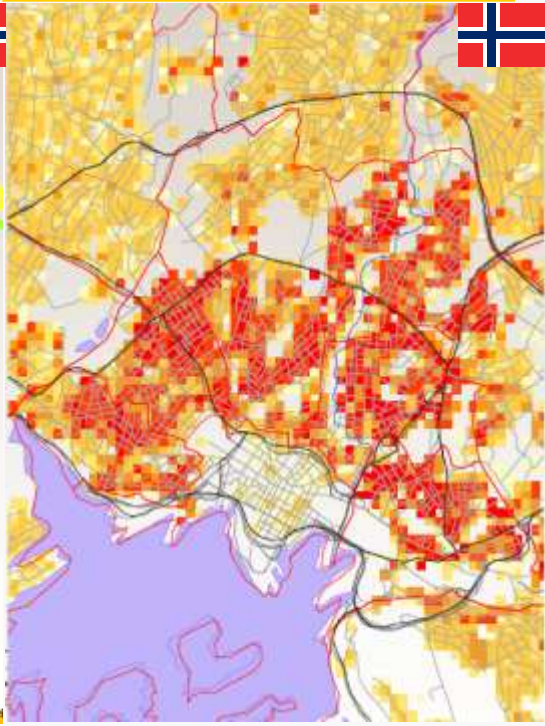


Examples

Built-up land



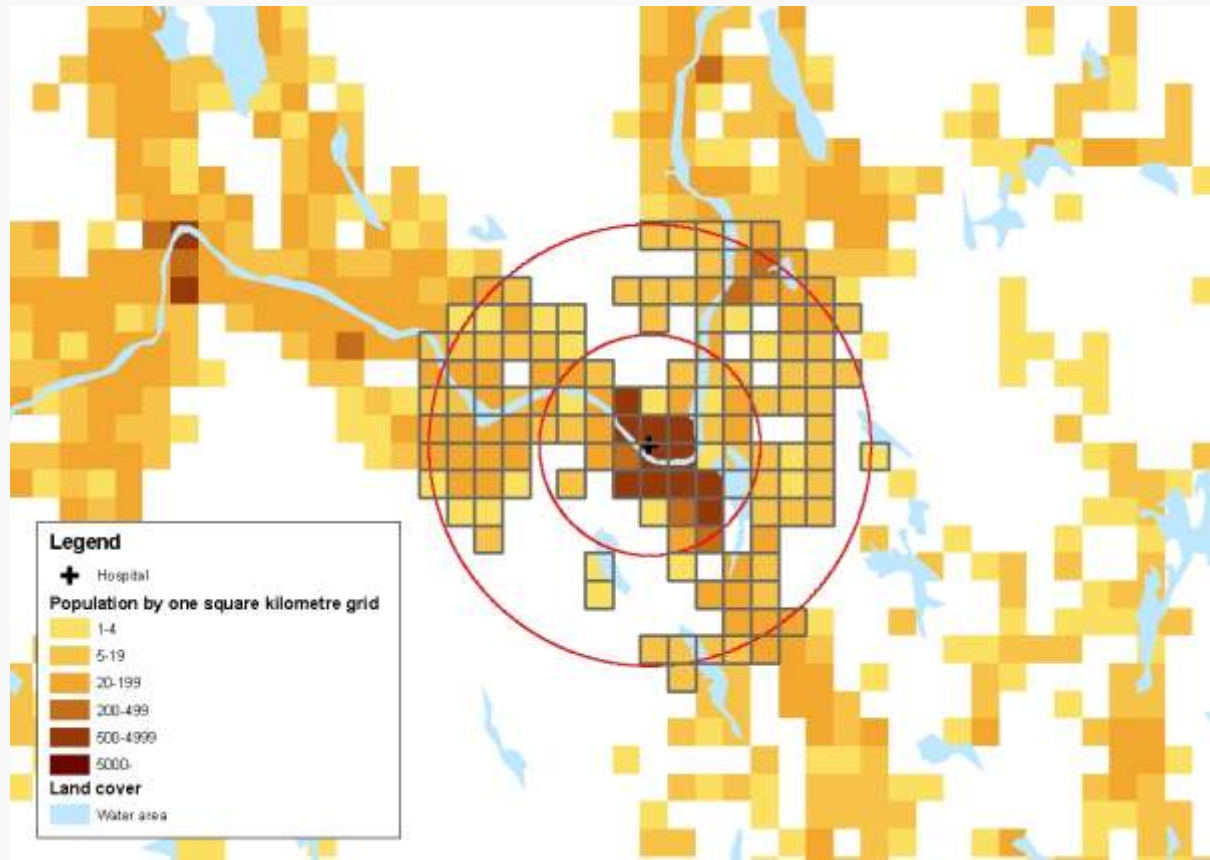
Night population



Day-time population



Example - Identification of residents within a distance from a hospital



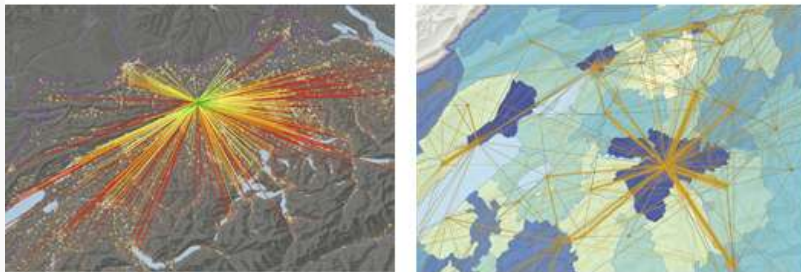
Uncountable opportunities for dissemination with aid of GIS

- Thematic maps
- Mapping applications
- Google Earth and maps
- SDI , geoportals, INSPIRE
 - WMS, WFS

Examples - Thematic maps

Source: Swiss Atlas, 2010

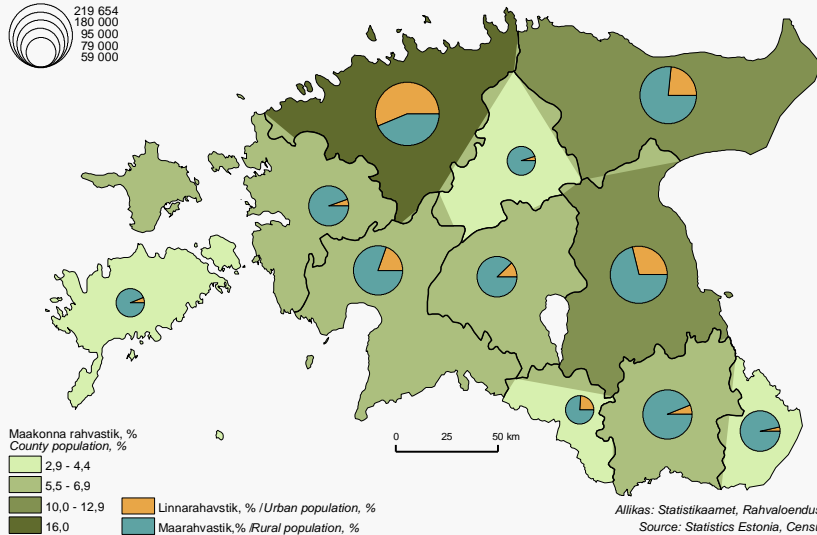
Fokuskarten



Kartendarstellung
ausgehend von einem
Ort (z.B. Stadt)

- Communication of concepts and ideas
- Support texts
- Summarize large amounts of information
- Spatial pattern can be observed etc

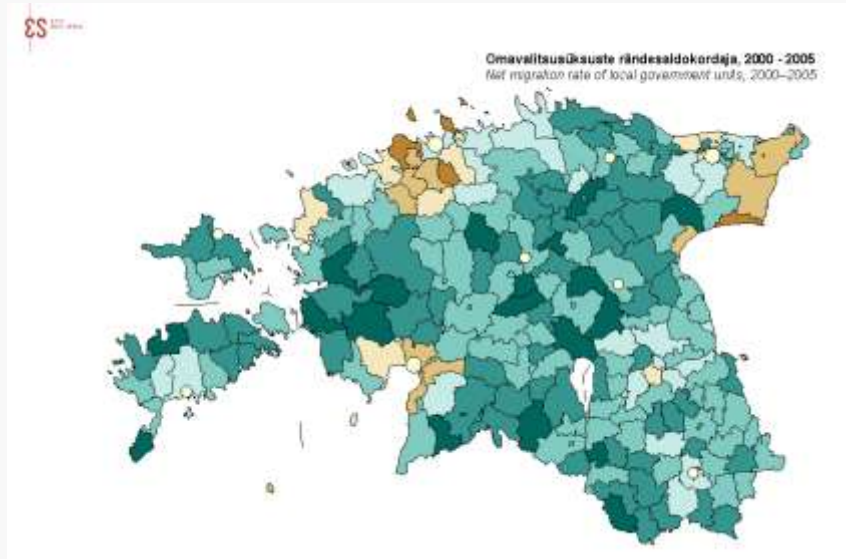
Rahvaarv maakonnas
Population number in counties



Maakonna rahvastik, %
County population, %

| | |
|-------------|--|
| 2,9 - 4,4 | Linnarahvastik, % /Urban population, % |
| 5,5 - 6,9 | Maarahvastik, % /Rural population, % |
| 10,0 - 12,9 | |
| 16,0 | |

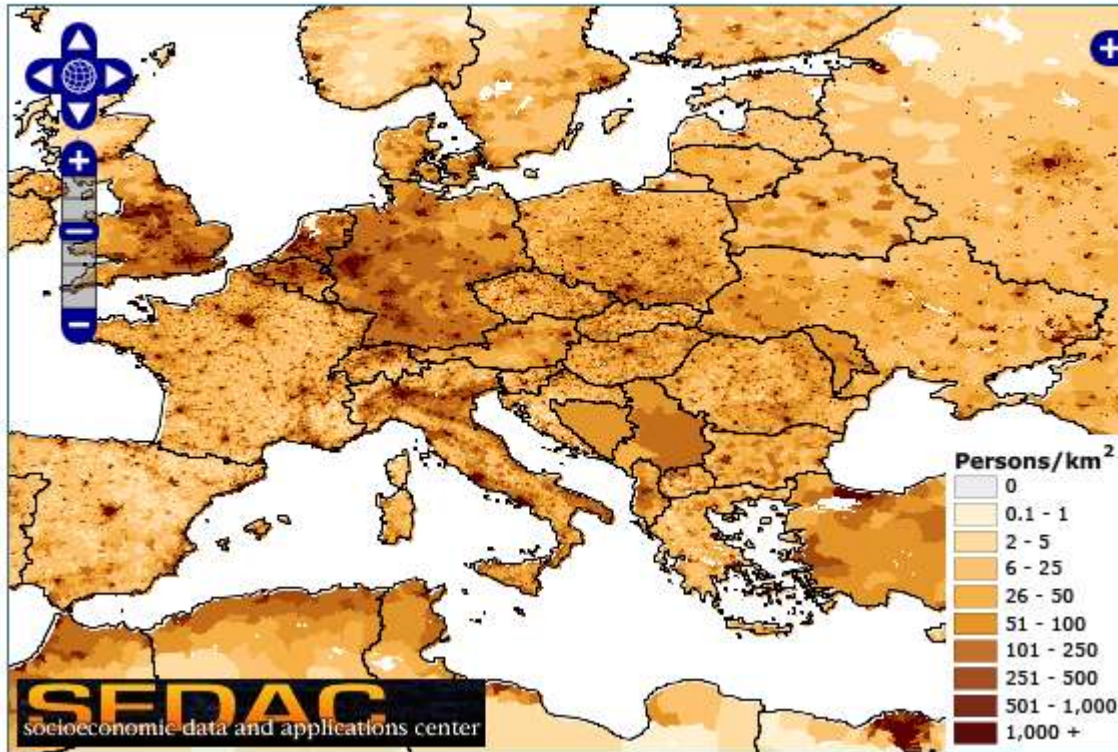
Allikas: Statistikaamet, Rahvaloendus, 1922.
Source: Statistics Estonia, Census 1922



Omavalitsusüksuste rändesaldokardaja, 2000 - 2005
Net migrator rate of local government units, 2000-2005

Examples – mapping application

Base Layer: GPWv3 2005 Pop Density

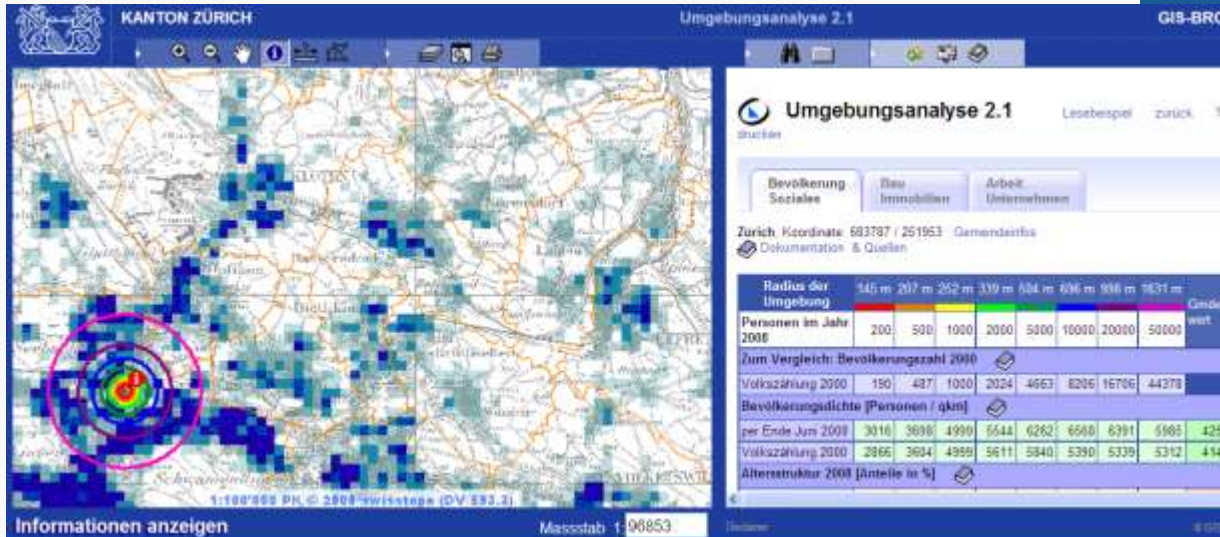


Reliability and presentation of mixed data quality

Examples – Census disseminating mapping applications

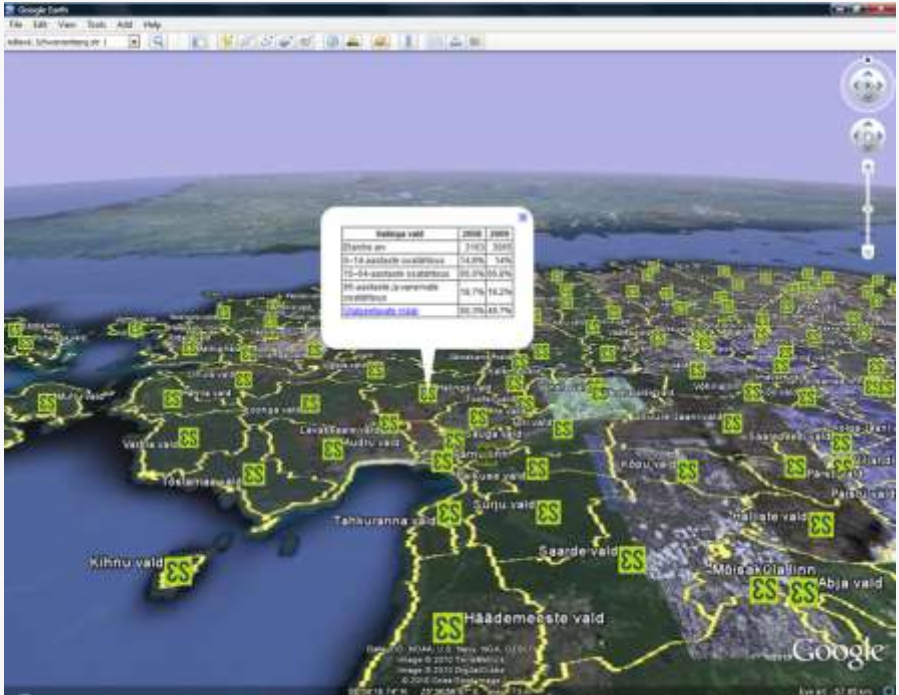


Source: US Census Bureau



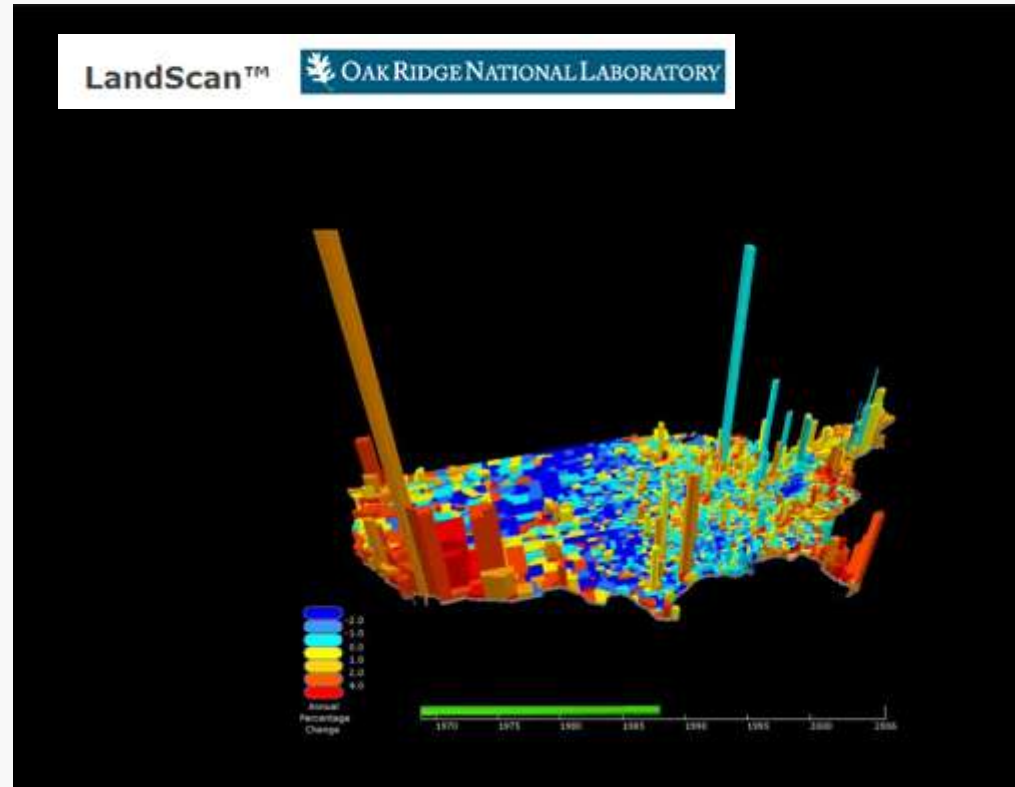
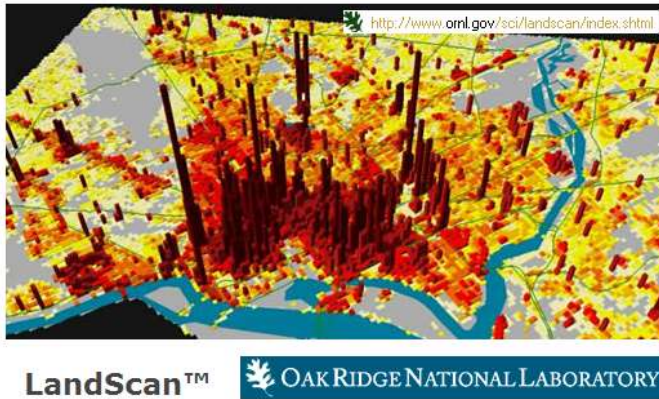
Source: Kanton Zürich, Switzerland

Example – LAU level population data in Google Earth



Examples - animations

- Source and copyright: Oak Ridge National Laboratory





Membership of EFGS

- Voluntary bases
- No obligations
- Interest in advancing GIS and geostatistics implementation into production of statistics
 - gridded statistical products
 - spatial analyses
 - Geo - infrastructure



Thank You!

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