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GOSTEAM Hands-on Activity Template *(Classroom-Formal)*

Title:

Exploring the Eurostat – Statistical Atlas

Environment and natural Resources

In this practical exercise, the students are taught how to navigate and use the Eurostat statistical atlas in exploring statistical patterns of different variables related to the Environment and natural Resources.

Keywords: Geo-spatial statistics, eurostat, statistical maps (choropleth maps).

Information about the Implementation

Age and language of the students: 9-12 12-15 15-18 18+

Language: English Age: ☐ ☒ ☒ ☒

Number of Lessons – Duration (per lesson):

Number of Lessons: 2-3 Duration per Lesson: 45

Subjects

For which subject(s) the activity is usable, is it an interdisciplinary activity?

Science ☒

Physics ☐ Chemistry ☐ Biology ☐ Geosciences ☒ Environmental ☒ Other ☒

Technology ☐

Engineering ☐

Arts ☐

Mathematics ☒

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Information about the Scenario

Curriculum and country:

Link of the current activity to the curriculum:

Country: Europe	Class:	Grade: 8-12

Topic:	Cartography, Science, Mathematics (Statistics)

Objectives (Max 100 words):

Description of the learning objectives

The objective is to get understanding how to interpret maps, and to discuss differences regarding spatial patterns of a variety of statistical variables related to People and Society in Europe. Additionally the students will explore and discuss how the variables look like in and around their own living environment. The scenario is recommended for group work to explore differences in the statistical variables between different countries and regions. The output of this scenario can be reports or presentations including choropleth maps including all relevant cartographic items.

Materials (Max 100 words):

Which resources and materials (software, hardware) are needed?

- Computer with internet connection

Spatial concepts, skills and abilities:

Which spatial concepts and skills are covered by the activity?

Spatial concepts:

Primitives: Identity/Name [X] Location [X] Space/Time [X]

Simple: Distance [ ] Direction [ ] Connectivity [ ] Movement [ ]

Boundary [X] Shape/Area [X] Adjacency [ ]

Difficult: Overlay [ ] Buffer [ ] Topology [ ] Coordinate [ ]

Map [X] Scale [X] Shortest Path [ ] Navigation [ ]

Surface ☐ Slope/Gradient ☐ Aspect ☐ Contour ☐

Complex: Interpolation ☐ Map Projection ☐ Spatial Dependency ☐

Other:

Spatial skills:

- ☒ Map literacy
- ☒ Navigation/orientation
- ☐ Estimating distances and directions
- ☐ Recognizing and understanding patterns/Understand and identify models of spatial organization
- ☐ Select an ideal location based on the given spatial features
- ☒ Visualization
- ☒ Understand and identify spatial correlations/ dependencies
- ☐ Categorize spatial entities/ geographic features and identify hierarchies
- ☒ Compare spatial entities and draw analogies among them
- ☐ Identify/determine connections/relations
- ☐ Understanding scale in space and time
- ☒ Delineation of spatial regions/ zones based on given features/ properties

Short Description

Map literacy: The students get familiar how to read and interpret map data showing different statistics. Learning from, and communicating acquired spatial knowledge from maps, comprehension of geographic features represented as points, lines, or polygons.
Navigation/orientation: How does the statistical variables vary between countries and regions? Where is their own region located in the map?
Visualization: The students will learn how cartographic variables are used to visualize spatial entities represented by statistical data.
Understand and identify spatial correlations/ dependencies: The students will explore differences in a variety of statistical data, discuss, and draw conclusions about why they differ between countries/regions and how it looks in their own home region.
Compare spatial entities and draw analogies among them: The students will explore differences in a variety of statistical data, discuss, and draw conclusions about why they differ between countries/regions and how it looks in their own home region.
Delineation of spatial regions/ zones based on given features/ properties: The students will understand spatial administrative regions (NUTS) and how they build up a country, and how statistics can be linked to an administrative region.

Geospatial concepts and spatial abilities documentation (see Section 3.2):

http://www.gosteam.eu/wp-content/uploads/2021/05/GOSTEAM_IO1_A1_final.pdf

Description of the activity in detail

Classroom activities

Lesson 1 (45 minutes):

The scenario is shared among the class pupils and they follow the instructions provided. The first part introduces the Statistical Atlas as a concept and how to navigate in it. This should keep the students busy for the first lesson.

Lesson 2 (45 min)

The second lesson is used for part 2 of the scenario where the pupils explore spatial patterns for a variety of statistics related to the environment and natural resources for the European countries. The instructions ask the pupils to reflect on how each variable looks like in their own home region, and also try to discuss why the statistical variable differ between countries and regions. In the end, the pupils are encouraged to explore and discuss in more detail the spatial pattern, the value of the variable and the reason for the differences.

Lesson 3. (45 min) (Optional depending on school topic and grade)

Depending on the grade of the class, lesson 2 can be extended for a more extensive research of the statistical variables of the scenario theme. The output here can be a report or a presentation of how it looks in Europe and possible reasons for it.

Online activities

The scenario can also be done as on-line activity if Internet access is available.

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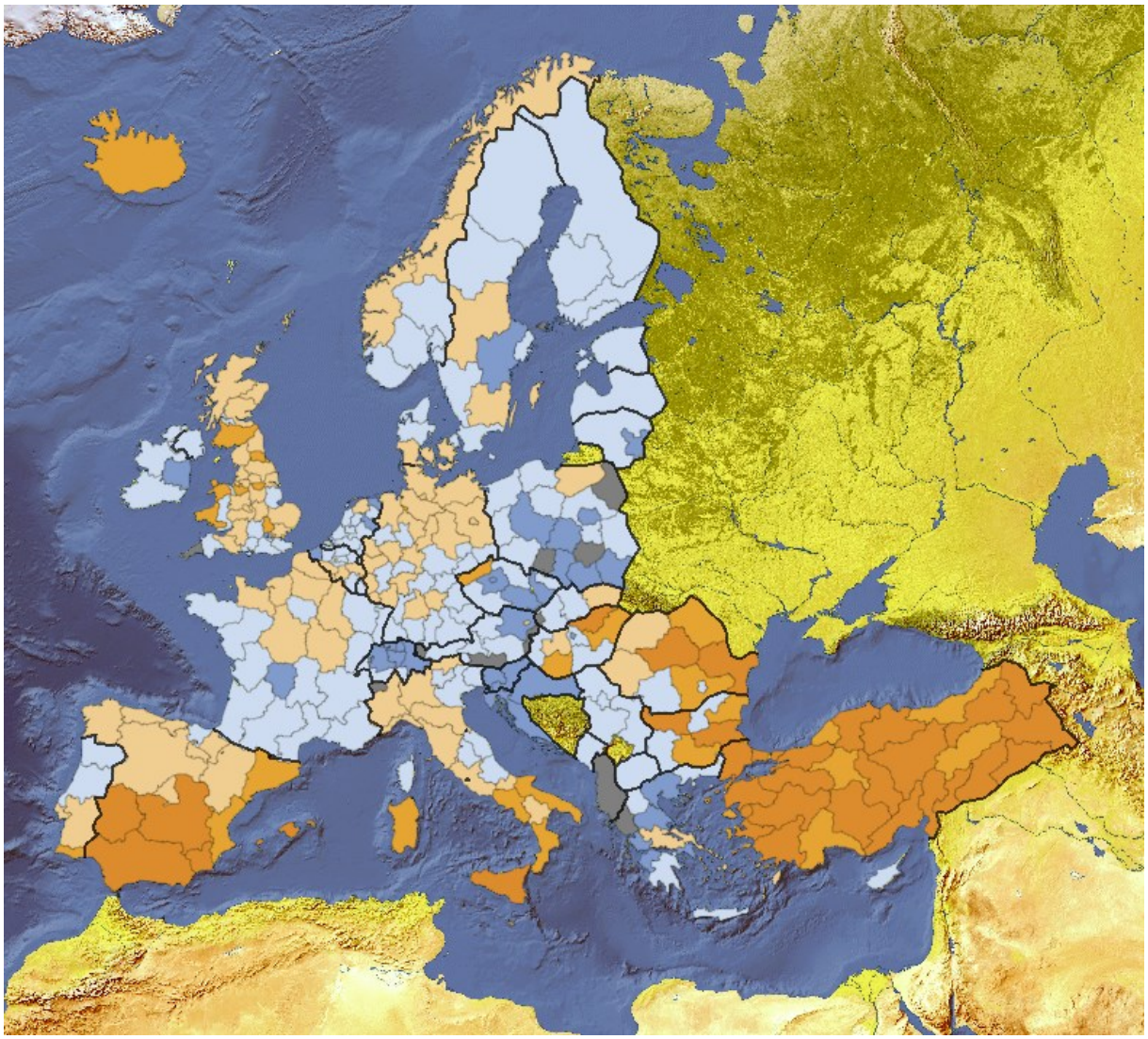
Exploring eurostat – Statistical Atlas

Environment and natural Resources

eurostat | Statistical Atlas
Eurostat regional yearbook 2020



All figures in this exercise have been copied from the Eurostat homepage:
https://ec.europa.eu/eurostat/statistical-atlas/gis/viewer/

The Statistical Atlas is a Web Map Service (WMS) application that provides linked statistics in a map form and provides the possibility to study how a chosen statistical variable e.g. population, varies in a country and between countries.

Geostatistics mean that the collected statistics e.g. population, have a geographical location. This makes it possible show geostatistics as maps and not only by graphs and tables. Regional and national differences, and spatial pattern of a variable can be explored, both visibly but also quantitatively, by reading the value of the spatial variable.

Collected geostatistics, e.g. population is aggregated to a certain administrative region and are linked to the corresponding regions in a digital map through a Geographic Information System (GIS). Statistics can also have different location in time, providing a time series of the same data, where change of the variable can be assessed.

Eurostat gathers statistics for the member states, but some are also available for Candidate countries, Potential candidates, and EFTA countries.

In the Statistical Atlas, data are available for different themes; People and society, Economy and business, Environment and natural resources. They are dealt with in three different exercises depending on what topic you are studying in school.

This exercise focusses on exploring statistics regarding People and Society.

Objective

In this exercise you will explore geostatistics collected about the Member states of the European Union and get skills and understanding of how to display and interpret geostatistics in the Statistical Atlas.

Learning outcome:

To be able to handle the Eurostat Statistical Atlas to service, and to produce a map of a chosen statistical variable for use in a report or for group discussions regarding spatial patterns and regional differences of different statistical variables.

You will interpret and analyse spatial patterns of different geostatistics. You will discuss and elaborate what the pattern says and how chosen statistics varies between states but also around your home region. You can compare and discuss with a peer and teacher, national, regional and local patterns of the statistics. You will also learn how to export a map of your chosen statistics, that can be used for discussion and reporting in school assignments.

What is a map?

Look at the cover map (above). What do think this map is showing? The map is centred in the middle of Europe but also parts of Africa and Asia are visible. In the Atlas you can move around to other countries or continents. However, the statistics are only provided for EU member states and close bilateral connected states.

The map has no title that describes what the map is showing so it is difficult to really know what the map is showing. We can see that the statistical variable is available at sub-state level in the map (smaller administrative regions within a state e.g. maybe municipality).

It is also obvious that the statistical value varies between states and also within a state. The figure is not a real map as it doesn't have a title, nor a legend informing the reader about the map data and the scale of the map. The legend should explain what the data is, when it was gathered, in what unit the data variable has (e.g. %, absolute numbers, area (km^2)). Additionally, an explanation needs to be provided what the relationship is between colours or symbols and the data value. A colour ramp is often used as a cartographic tool to stretch data from bright colours for low values of the statistics, to dark colours for high values, in order to address our built-in perception of how to interpret spatial patterns in the map.

Start exploring the Statistical Atlas by pressing the link below:

https://ec.europa.eu/eurostat/statistical-atlas/gis/viewer/

A map should now be shown covering the entire world but only with data mapped over Europe. (Your start map view may look different!)

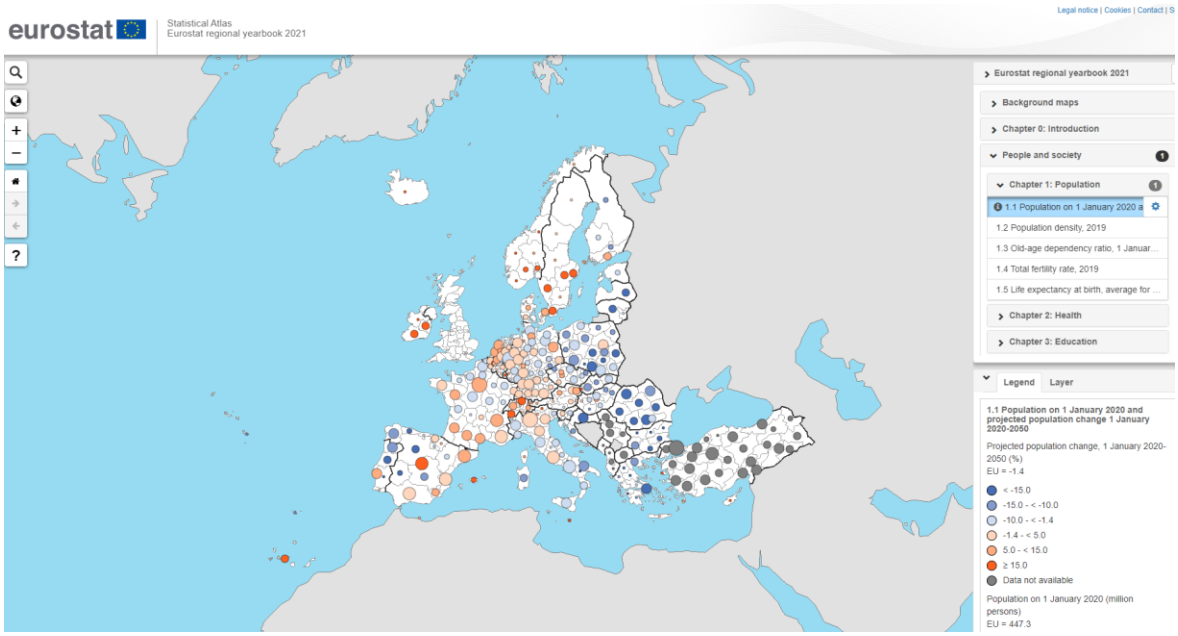
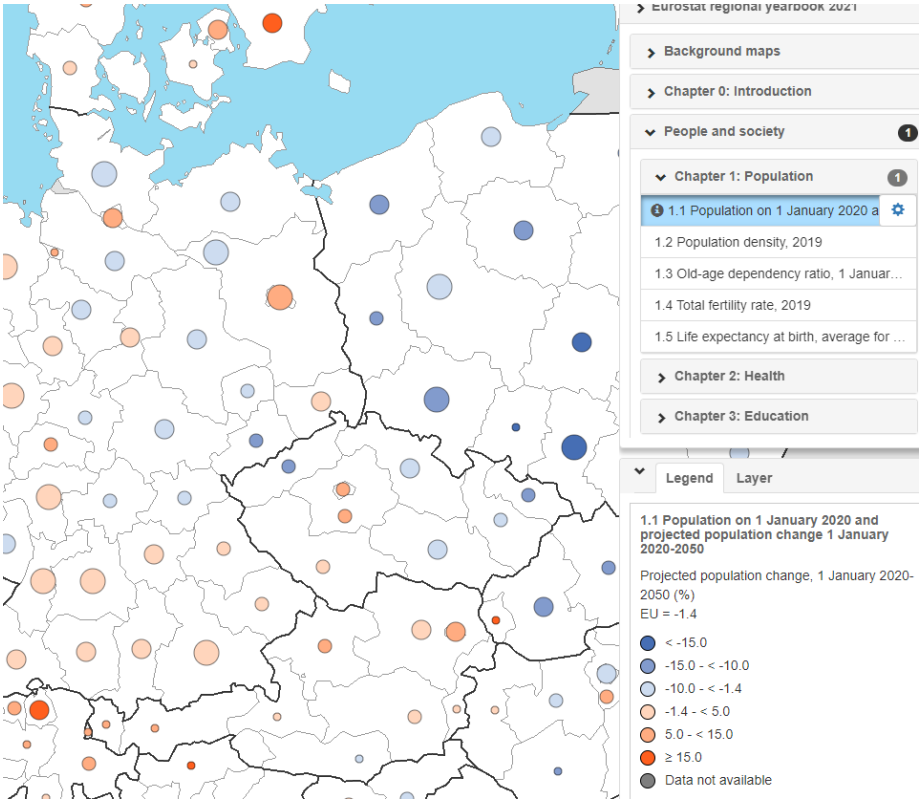


Figure 1. Eurostat Statistical Atlas

What you see in the map (figure 1) are different circles with different size. The circles are related to population 1st of January 2020 (should be updated every year). The bigger the circle is the more people are registered at that location. If we zoom into the map (scrolling or using the + icon on the left) it is easier to compare the size of different circles and additionally see that each circle represents accumulated population value for a specific region (NUTS 2 level), (one point for each polygon area).

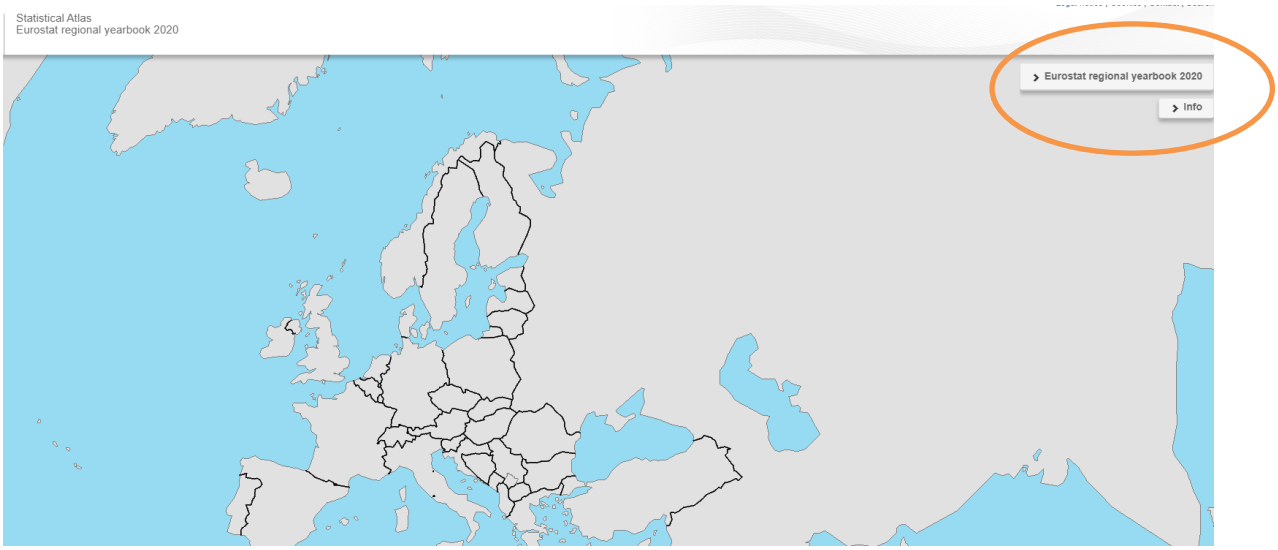


The legend explains the code between the statistical data and the map objects (circle size, colour etc.).

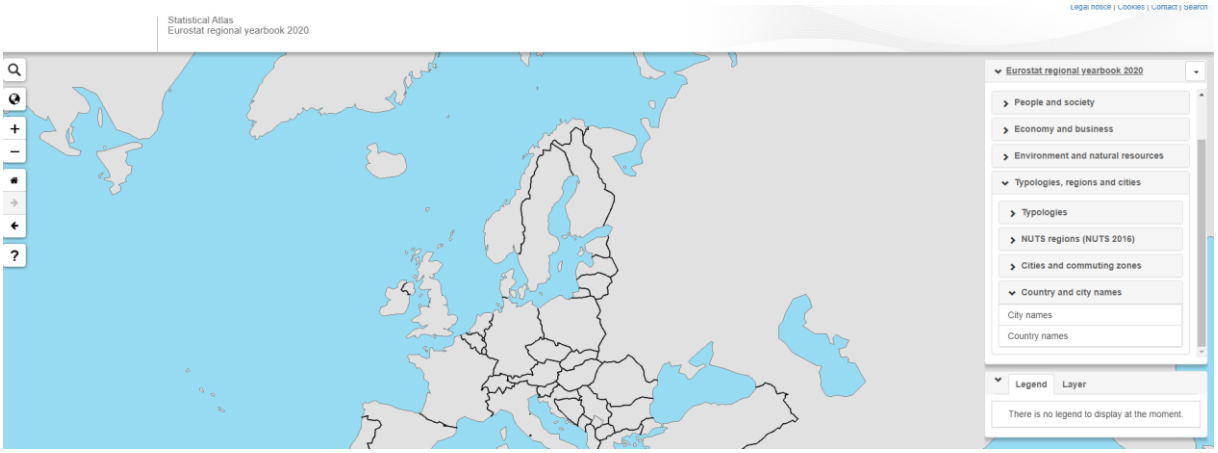
Figure 2. Zoomed into NUTS 2 level.

You will now explore what data you can display and visualize in the Eurostat Atlas and how you can download a professional map of your choice of statistical variable, with all necessary cartographic principles (title, scalebar, legend, etc.) attended to.

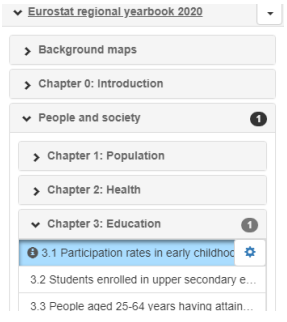
Activate the Web map service window and clear the view. We start with a view like this:



If you click on the small ribbon to the right (encircled in figure above) a menu is shown where you can decide what statistical data you want the map to show.

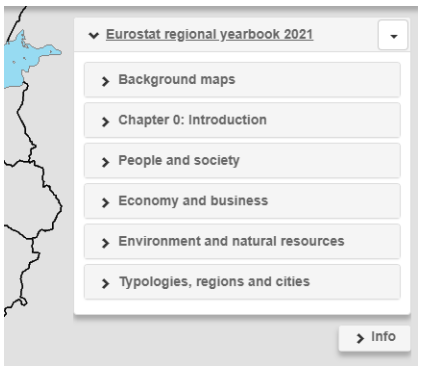


When data is loaded in the map the menu shows a number icon so you know from where and what data has been loaded to the map view.



If you want to disconnect a statistical variable from the map, just click on the blue ribbon, and it will not be visible in the map and the icon will disappear.

Click on the *Eurostat regional yearbook 2021* to open the menu of available features and statistics.

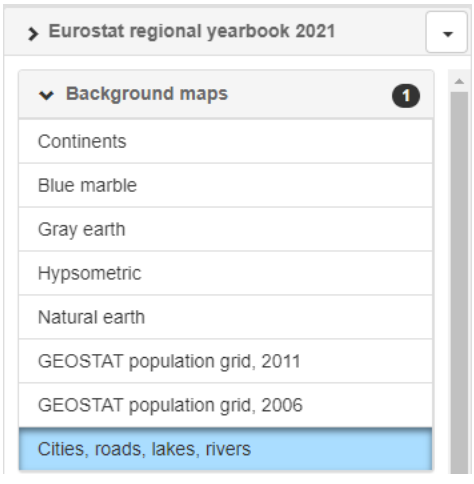


As you can see there are ***Background maps*** that you can activate e.g. showing the Earth as a Blue Marble or a hypsometric map showing relief in the landscape and the oceans.

The statistical data is grouped into different categories. Statistics about population, health, education etc. can be found in the *People and society room*. Statistics about *Economy and business* and *Environment and natural resources* are also available in the Statistical Atlas.

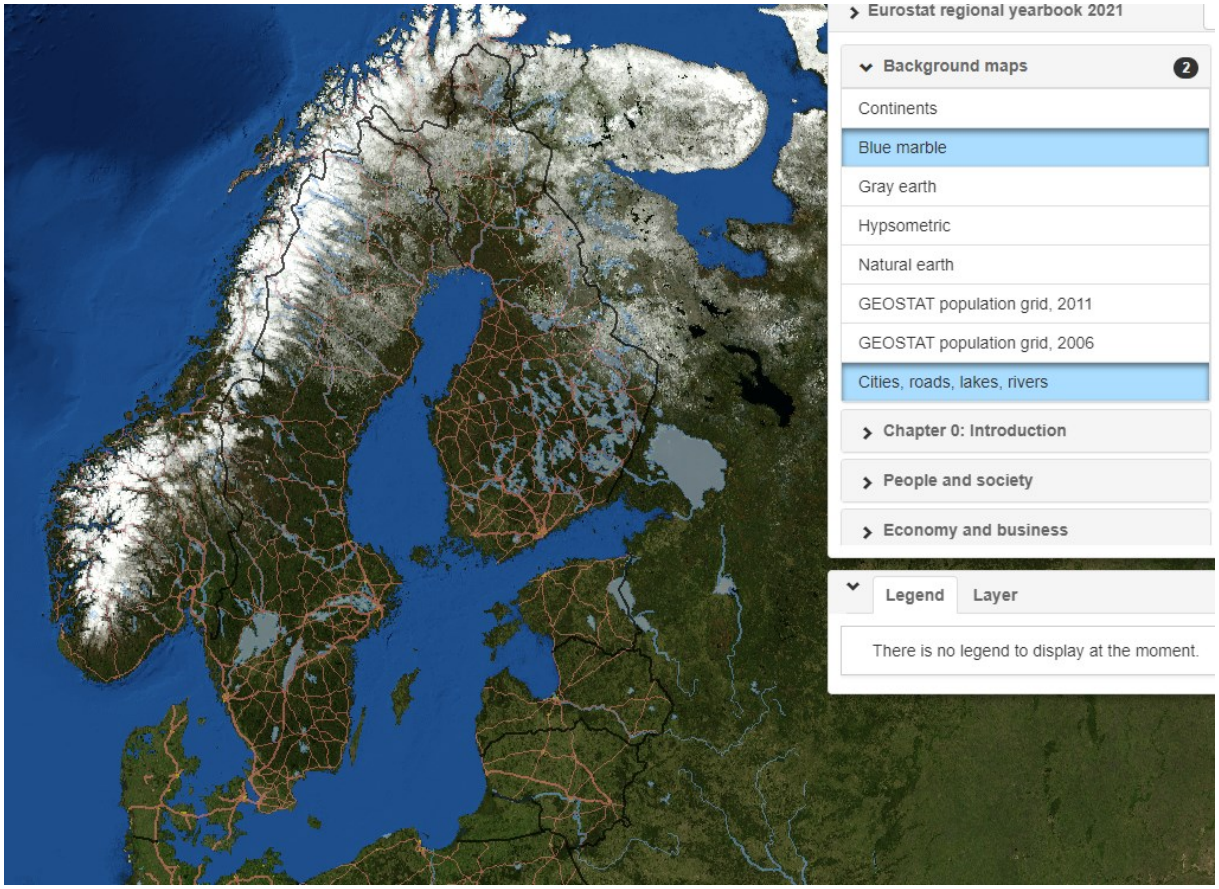
Start with a clean map by removing all data layers that are loaded into the map window, if there are any, and start to explore the Background maps.

Enter by clicking *Background maps* to discover what is there.



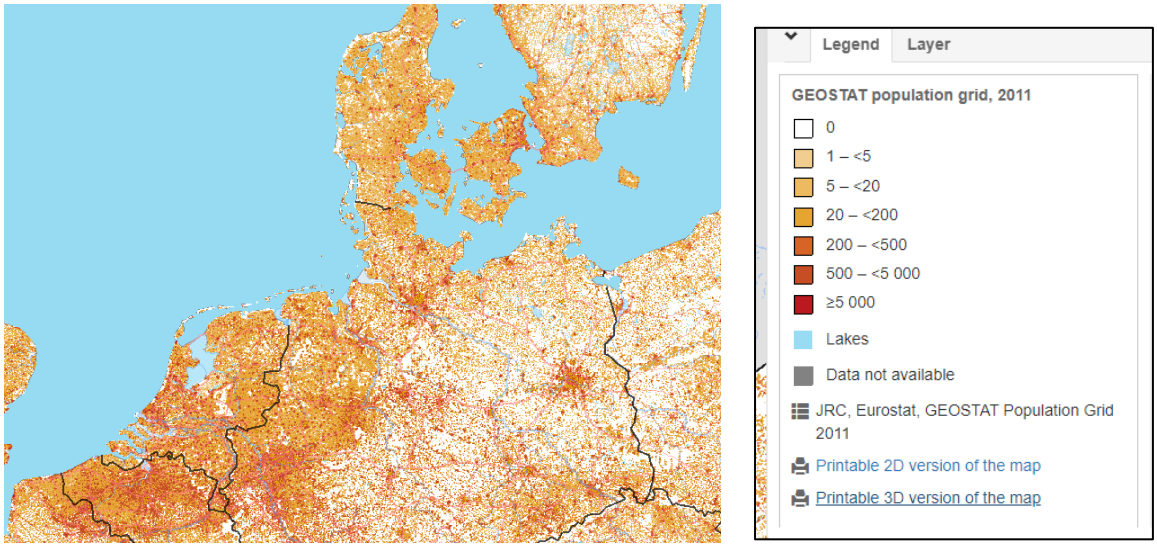
Load the different background maps, Blue marble etc. and discuss what they show and how they differ. You can also add cities, roads, lakes, and rivers, to the map.

Many of the backgrounds are images and measurements from satellite sensors that have been stitched together e.g. altitude, height above or below sea level. This provides a perception of the topography in the map, landscape features such as mountains and valleys in the terrestrial world but also of the ocean floor.



As you can see there is no legend to the background maps so you would have to interpret colours and features by yourself.

Add the GEOSTAT population grid, 2011, and notice that also 2006 is available (the years may have changed since the instructions were written in 2021).



This map shows the population registered inside each 1 km^2 grid cell. When population is divided by area, it becomes a measurement of *Population density* (number of people / unit area). Grid cells with high population value (coloured dark red), and bright yellow for low population amounts, and even white for no population.

In the map the colouring of population gives a good picture of where cities and villages are located in the geography and at the same time where less people live.

Notice that you have an option to print the map to a *.pdf* file that you can use for school projects. The 2 D map is most common but even a 3 D map is possible to get (high population values are then shown as mountain peaks, population is shown on the Z axis. When you press any of

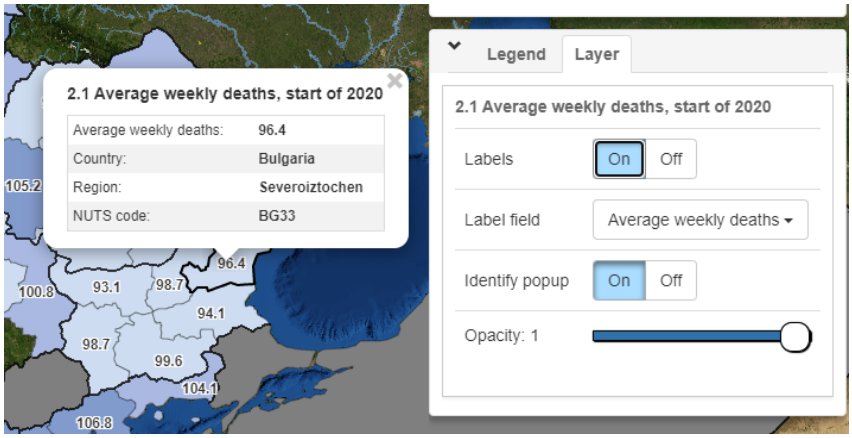
Printable 2D version of the map

Printable 3D version of the map

the pdf map should open up your browser or by another program. You don't have to print the map, just explore it. It contains important cartographic elements such as a Title, what data is shown, when in time it is valid, what unit the data is etc. There is also a scalebar so you are able to estimate distances in the map, and also a legend explaining the colour code for the population values.

Zoom into your own home region and **explore the population patterns**. What about the grid cell where you live? Can you distinguish the larger villages around where you live? Try to compare the value in your own grid cell to the colour scale in the legend. How densely populated is your own grid cell? If a grid cell is 1 km^2 and the number of people in the cell is 10 000 individuals. How much space/area (m^2) does every person have? **Discuss your findings and understandings with a peer and your teacher.**

Notice that you can label the values in the map or have a pop-up window when you click on the different administrative regions.



Part 2: Environment and natural Resources

Now you understand how the Web map service works and you will now explore statistics regarding the Environment and natural Resources for Europe.

Notice that the statistical data is divided into Chapters.

Open the statistics for the *Environment and natural resources.*

Here data have been categorized into 3 chapters:

Chapter 11: Transport,

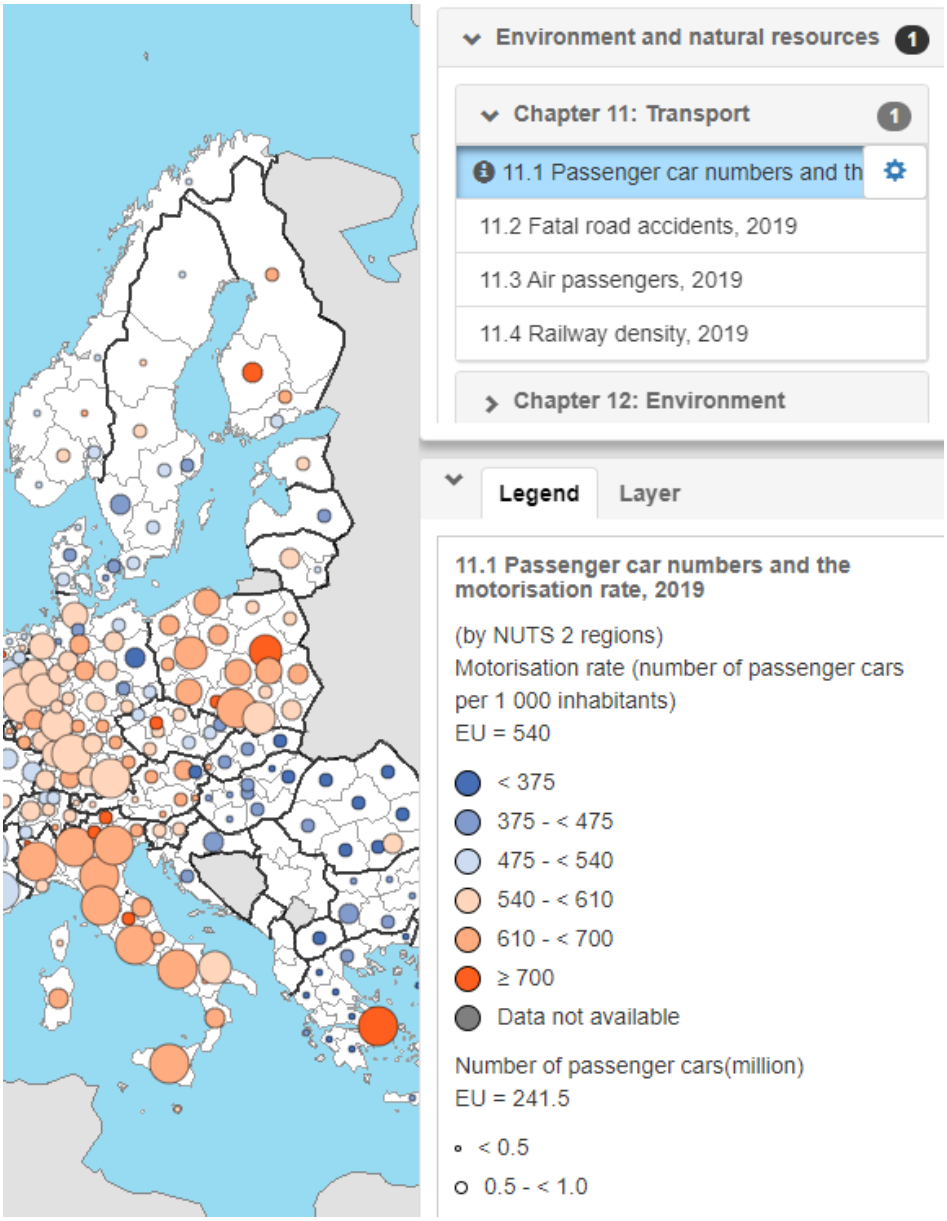
Chapter 12: Environment, and

Chapter 13: Agriculture

Add

11.1 Passenger car numbers …

to the map.

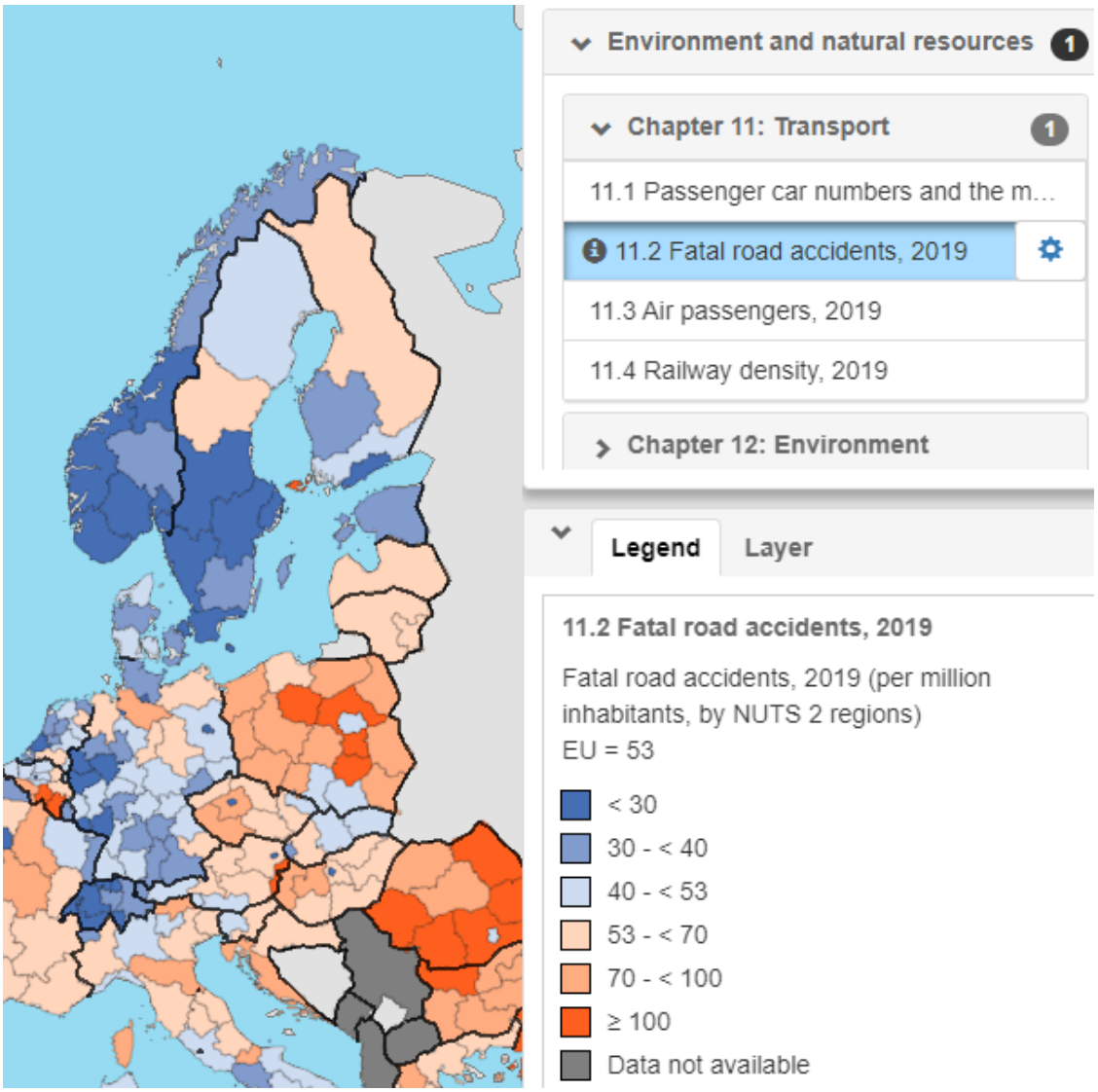


The map shows statistics of the number of passenger cars / 1000 inhabitants, and reflects the motorization rate. Red circles show where the motorization rate is high, and blue circles where it is low. The circles have different size and provide additional information about the number of passenger cars in the NUTS 2 region.

- NUTS 1: major socio-economic regions
- NUTS 2: basic regions for the application of regional policies
- NUTS 3: small regions for specific diagnoses

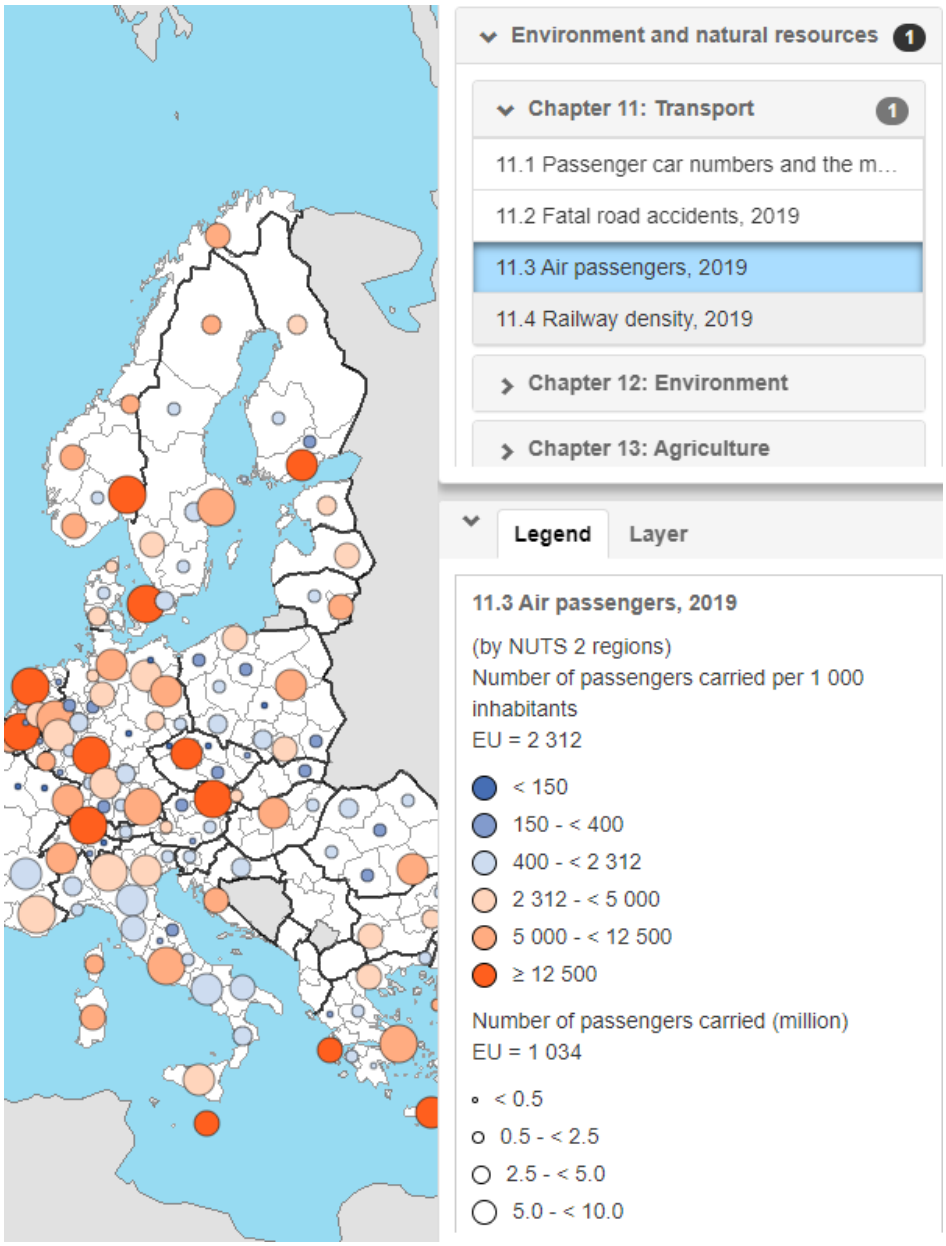
How does it look around your own home region? How many cars per 1000 inhabitants is it in your home region? Discuss with your peers and eacher.

Add 11.2 Fatal road accidents. The map shows where most deadly road accidents occur in Europe. Red areas indicate a higher number of fatal accidents compared to blue NUTS 2 regions.



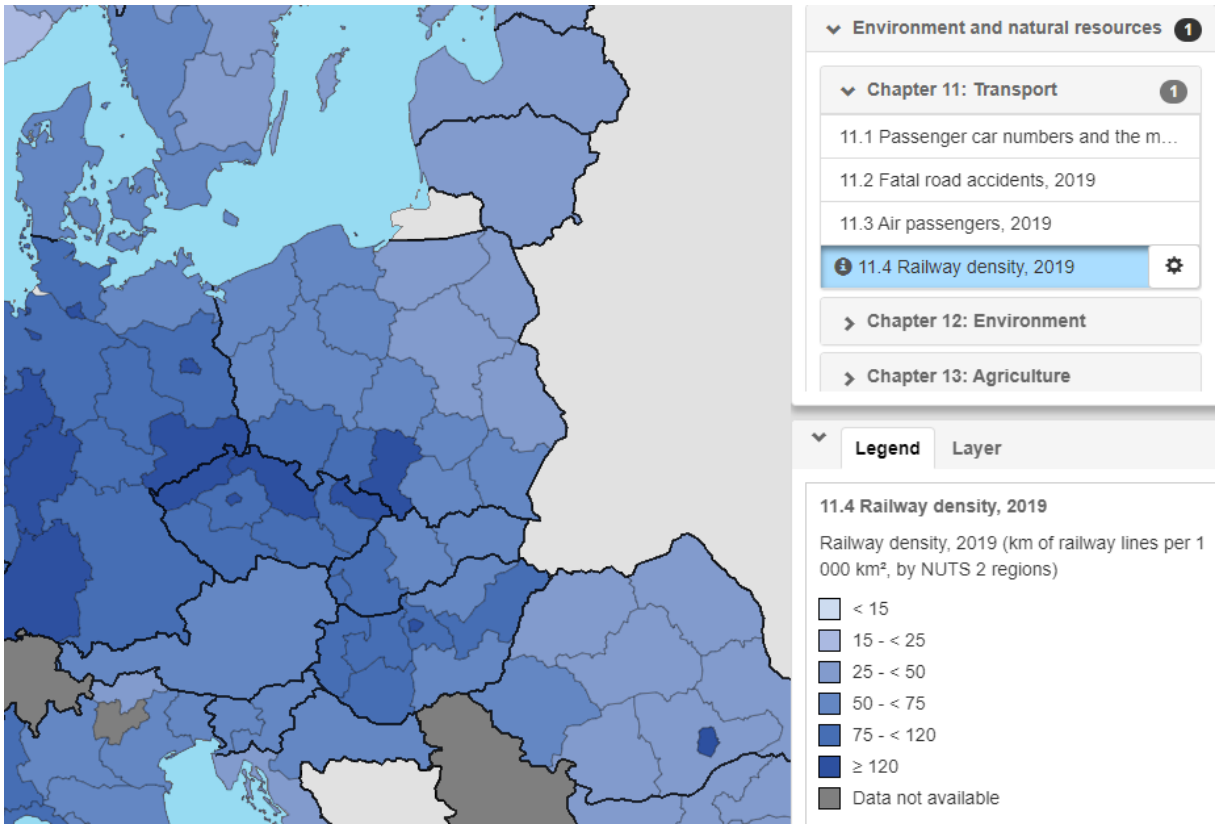
How does it look around your own home region? Is there a lot of fatal road accidents where you live? Why do think that fatal road accidents are more frequent in some places? What do you think is different with regions that have a low number of deadly road accidents? Discuss with your peers and teacher.

Add 11.3 Air passengers The map shows the number of passengers by air for each NUTS 2 region. Notice that the different sizes relates to the absolute number of carried passengers. The big airports in Europe are of course clearly visible in the map.



How does it look around your own home region? Do you have a big airport close by? Discuss with your peers and teacher.

Add 11.4 Railway density. The map shows a ratio that express kilometre of railway lines per 1 000 km^2. The dark bluer the colour the more railway tracks. Which regions have high/low railway density? Why do you think this is and what do you think that means in the society? Discuss with your peers and teacher.



Now go through the other chapters (Chapter 12: Environment, and Chapter 13: Agriculture.

Select at least one statistical variable from each chapter to discuss in more detail regarding the spatial pattern in EU and also locally around your own home region. What does it say and why do you think this is. How will it change the society where you live? Discuss with your peers and teacher.

End of exercise