

Guideline for the ONLINE S3 toolbox

Tool/application 2.4 Benchmarking

ONLINE S3 – 710659 – Guidelines for the pilot experimentation phase



Content

Background and rational	3
Description of the application	4
Benefits to key actors and stakeholders.....	5
Key issues and requirements.....	6
A STEP-BY-STEP GUIDE	7
Further information	7
References.....	11

Figures

Figure 1 Rational behind this ONLINE S3 application.....	3
Figure 2 Overview of the information flows within the Regional Assets Mapping application.....	4
Figure 3 Benefits to stakeholders when using the Regional Assets Mapping application.....	5
Figure 4 Key steps when using this Regional Assets Mapping application.	6
Figure 5: Step 1 –Import data from .xls file.....	7
Figure 6: Step 1 – Set reference region and group.....	8
Figure 7: Step 1 – Create new table	8
Figure 8: Step 2 – Descriptive statistics	9
Figure 9: Pop-up window for downloading the data in a table format	9
Figure 10: Step 2 – Quartile statistics.....	10
Figure 11: Step 2 – Quartile statistics in table format.....	10
Figure 12: Step 3 Density histogram and Kernel diagram.....	11

HISTORY OF CHANGES

Version	Date	Contributing partner	Summary of changes
Version 0.1	2016-10-07	RIM	Structure of the document, elaboration of required information as a template for all tools
Version 1	2017-04-25	Intelspace SA	Filling of the template with information regarding the 2.4 Benchmarking tool.

DISCLAIMER

The opinion stated in this report reflects the opinion of the ONLINE S3 consortium and not the opinion of the European Commission.

ACKNOWLEDGEMENT

This document has been elaborated within the framework of the ONLINE S3 project, which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 710659.

BACKGROUND AND RATIONAL

Benchmarking is the process of improving performance by continuously identifying, understanding and adapting outstanding practices and processes found inside and outside an organisation (company, public organisation, university, etc.). The increasing competition among countries and regions stemming from globalisation has led to the progressive transfer and application of benchmarking approaches to the territorial context, not only to national governments, but also to European Union policies and regions (Koellreuter, 2002).

Many regional strategy-building and development initiatives contain some form of benchmarking, in order to establish or further regional economic and innovation strategies (Huggins, 2008). Regions use international benchmarking practices as a tool to found their priority setting process (OECD, 2013). As it has been shown in the mapping exercise of RIS3 strategies, benchmarking is one of eight most common methods used across RIS3 strategy design. More than 60% of regions have used benchmarking during the context analysis phase and 30% also during the phases of vision building and/or policy mix. Some regions conduct systematic comparisons at a national and international regional level, in order to diagnose their current situation and improve their ranking, and others implement a benchmarking process in specific sectors or a combination of them.

Regional benchmarking differs considerably from business benchmarking where the transfer of best performances or best practices can be applied more easily. Unlike companies, territories do not have the ultimate goal of seeking to maximize profit. On the contrary, they are characterised by frequent trade-offs among multiple goals that public policies try and/or are compelled to pursue simultaneously (Schuldi, 2003). Regional benchmarking can be a very helpful tool for making strategic decisions within the process of the design and implementation of regional Research and Innovation Strategies for Smart Specialisation (RIS3) (Navarro et al., 2014). Through comparative analysis, it can provide us with useful information about the position of a region with respect to other regions as well as facilitate policy learning based on the transfer of good practices across borders.

Step 1. Objective and scope of the benchmarking exercise

- It is important to define the overall scope of benchmarking, in order to plan appropriately the process and obtain useful insights.

Steps 2, 3 & 4. Definition of the aspect(s) to be benchmarked in selected regions

- During the benchmarking exercise, the user is called to select the groups of regions to be compared, as well as the aspects to be benchmarked. The selected indicators should reflect the multifaceted nature of the benchmarking element more appropriately.

Step 5. Creation and production of the benchmarking results

- Calculations on selected indicators from different regions, providing the main statistics and graphs for the statistically significant indicators (minimum, maximum, mean, mode, quartiles). Based on the results, the region in focus is positioned within the statistical range of these statistics and the user can choose between different types of visualizations.

Step 6. Interpretation of statistics

- Fields for the interpretation of statistics, which show cause and effect in terms of the observed performance and the practices that are responsible for this performance; the fields will be part of a complete structured benchmarking report and will have to be filled by the regional authorities experts.

Figure 1 Rational behind this ONLINE S3 application

DESCRIPTION OF THE APPLICATION

Given the fact that benchmarking is one of the most prevailing RIS3 methods applied essentially by many regions, *Benchmarking* tool is the main tool for performing more sophisticated computational comparisons between regions, into a web-based dashboard. This application helps RIS3 stakeholders to derive basic information regarding the place of their region compared to others, in a quick manner.

The proposed tool provides a web interface where users can import regional data and then select a region of their preference to compare it against other regions. Various statistical metrics are obtained (minimum, maximum, mean, quartiles, Kernel density diagrams etc.). The user can export benchmarking results in the form of tables and figures, or print the final benchmarking report produced by this application. This framework provides the user with the ability to import his own data, by importing an excel file from his local space or use regional data using *Regional Assets Mapping* tool.

The logical steps of the application, based on its methodological description are:

- *Step 1*: Data **import** tables into the framework.
- *Step 2*: **Selection** of group of regions to examine.
- *Step 3*: Statistical **analysis** on regional data will be performed.
- *Step 4*: **Tables** and **charts** will be generated.
- *Step 5*: The user can **save** and **export** the results.
- *Step 6*: A final benchmarking **report** will be produced, for the user to be able to make an extended interpretation of the results.

Following the application architecture described in previous steps, the information flows within the application are given in **Figure 2**, below. It should be highlighted that the initial input coming from the user, defines the group of regions that will be analysed, as well as the period to which it refers to. The processing of these data, in terms of benchmarking analysis, is based on table or graphic format, which will be illustrated on the application. Individual tables or graphics including the results, can be extracted through the application.

The main output of the application is the final report of *Benchmarking* exercise, which will give the user a comprehensive picture regarding his/her region compared to a group of other regions, for the chosen time frame.

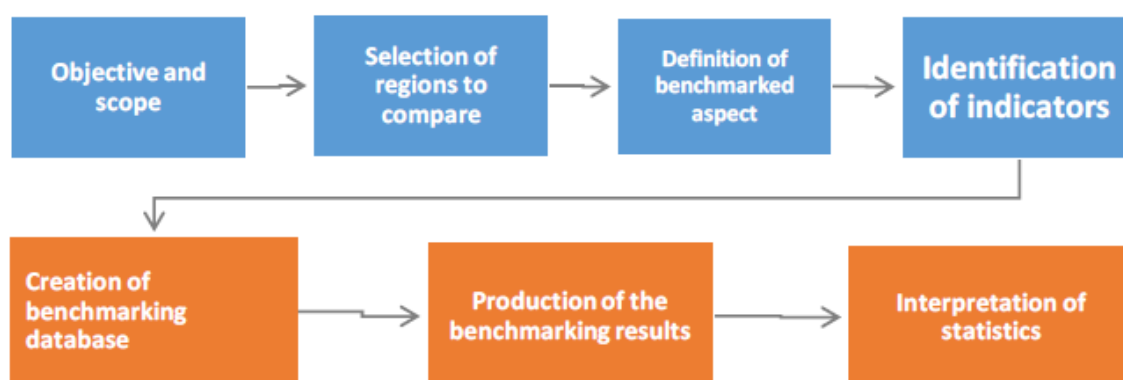


Figure 2 Overview of the information flows within the Regional Assets Mapping application.

BENEFITS TO KEY ACTORS AND STAKEHOLDERS

Benchmarking is considered a useful tool that can help to identify the strengths and weaknesses of territories (OECD, 2005). More specifically, it can be a valuable tool for the identification of regional specialisation patterns and the comparison of economic activities, including agriculture, as well as strengths with other regions in the EU. Together with other tools like cluster analysis, benchmarking can be used for starting the assessment of regional specialisation patterns and comparing statistical findings among regions (Foray et al. 2012).

Moreover, understanding factors underlying regional performance can provide useful knowledge that can be applied to strategic planning and policies. Benchmarking is an exercise generating applicable in-depth knowledge about the regional economy focusing on its comparative advantages and disadvantages (Iurcovich et al. 2006). The benchmarking process should be part of a holistic approach for strategic policy. This means that it should be conducted in coordination with other tools such as regional foresight and regional assets mapping.

The *Benchmarking* application introduces three crucial benefits to the users, which are complementary to the already existing application provided by the JRC (<http://s3platform.jrc.ec.europa.eu/regional-benchmarking>), and are related to the abovementioned general principles of the method. These include: i) a user-friendly environment for importing data sources into a web-based dashboard; ii) an easy way to perform more sophisticated comparisons through statistical indicators; and iii) an easy way to provide an overall picture regarding the position of a region within a user-specified group of regions (Figure 3).

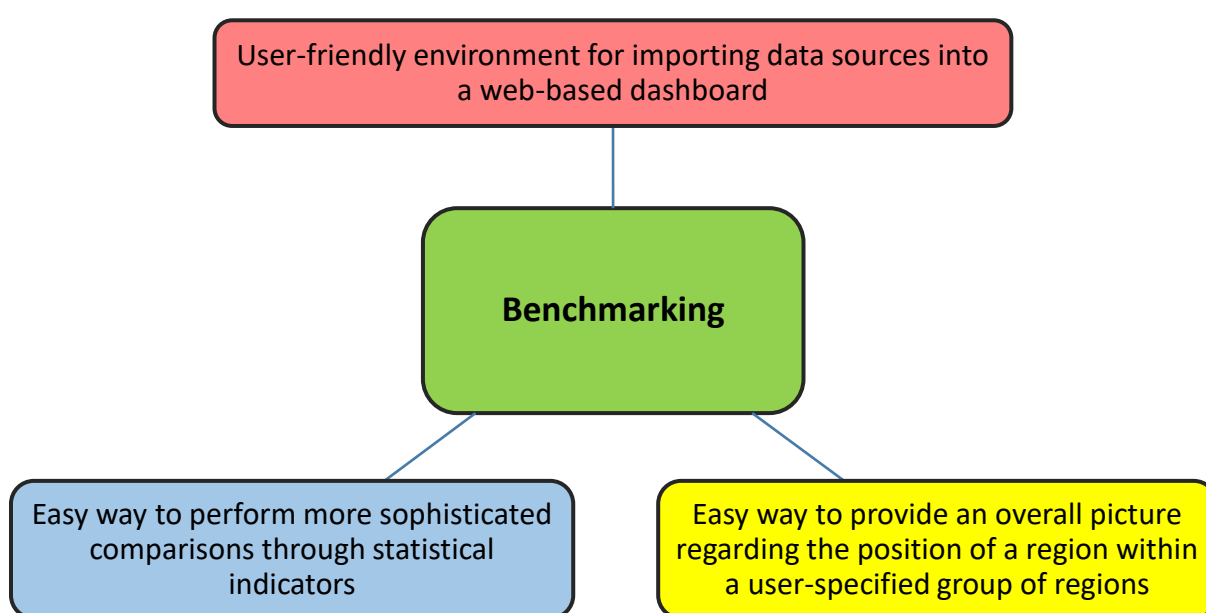


Figure 3 Benefits to stakeholders when using the Regional Assets Mapping application.

KEY ISSUES AND REQUIREMENTS

Various statistical calculations, such as min, max, average, and quartile analysis, are included in this tool, complementary to those applied by JRC Regional Benchmarking tool (<http://s3platform.jrc.ec.europa.eu/regional-benchmarking>). Thus, more detailed and analytical regional comparisons will be available to users of the application.

Calculations on regional data will produce:

1. min, max, medium and mean values
2. distance from min and max values regarding the reference region
3. quartile analysis for each indicator
4. probability density function of the reference region (Kernel diagram)

The benchmarking tool offers a variety of ways to generate visualizations:

1. tables with the basic statistical results
2. box plot generated per region and indicator or year (optional)
3. quartile analysis on a matrix format with colored cells
4. histogram and Kernel density estimates constructed using the regions' data per indicator selected.

In general, for the description and explanation of the obtained results, the user should not be limited to the *Benchmarking* tool results. Potential additional sources of information should be used by policy-makers, that could further help in the interpretation of the results, including policy documents and other literature sources, as well as key stakeholders' consultation processes. This process will help RIS3 designers (users) to correctly assess the statistical results and reach sensible and cohesive conclusions.

In general, the *Benchmarking* tool provides the set of available results, with respect to the selected indicators. Nonetheless, two important remarks need to be made. First, the appointment of indicators depends on the data availability and format that will be uploaded by the user, and second, benchmarking results cannot be obtained in the case of qualitative indicators. An outline illustrating the overall process of the *Benchmarking* tool is given in **Figure 4**, in order to present more clearly the steps that are included in this application.

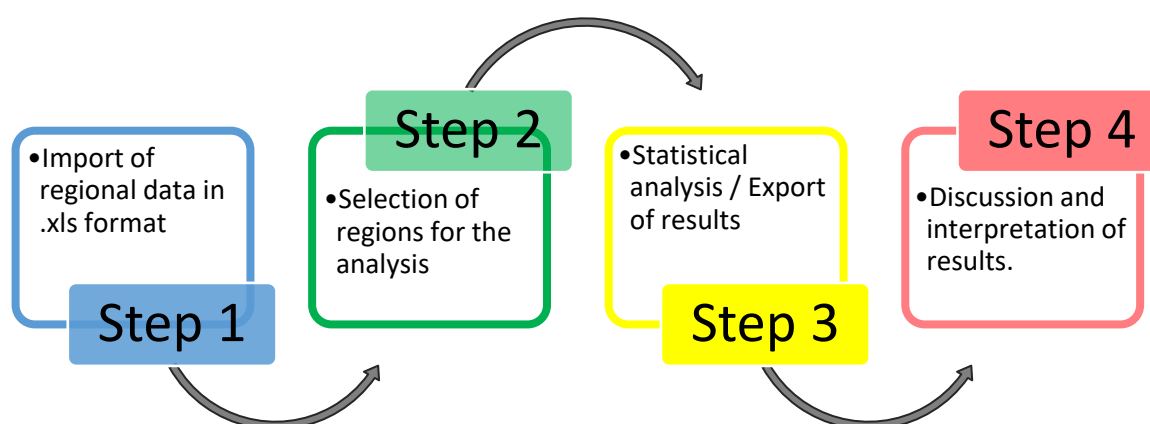


Figure 4 Key steps when using this Regional Assets Mapping application.

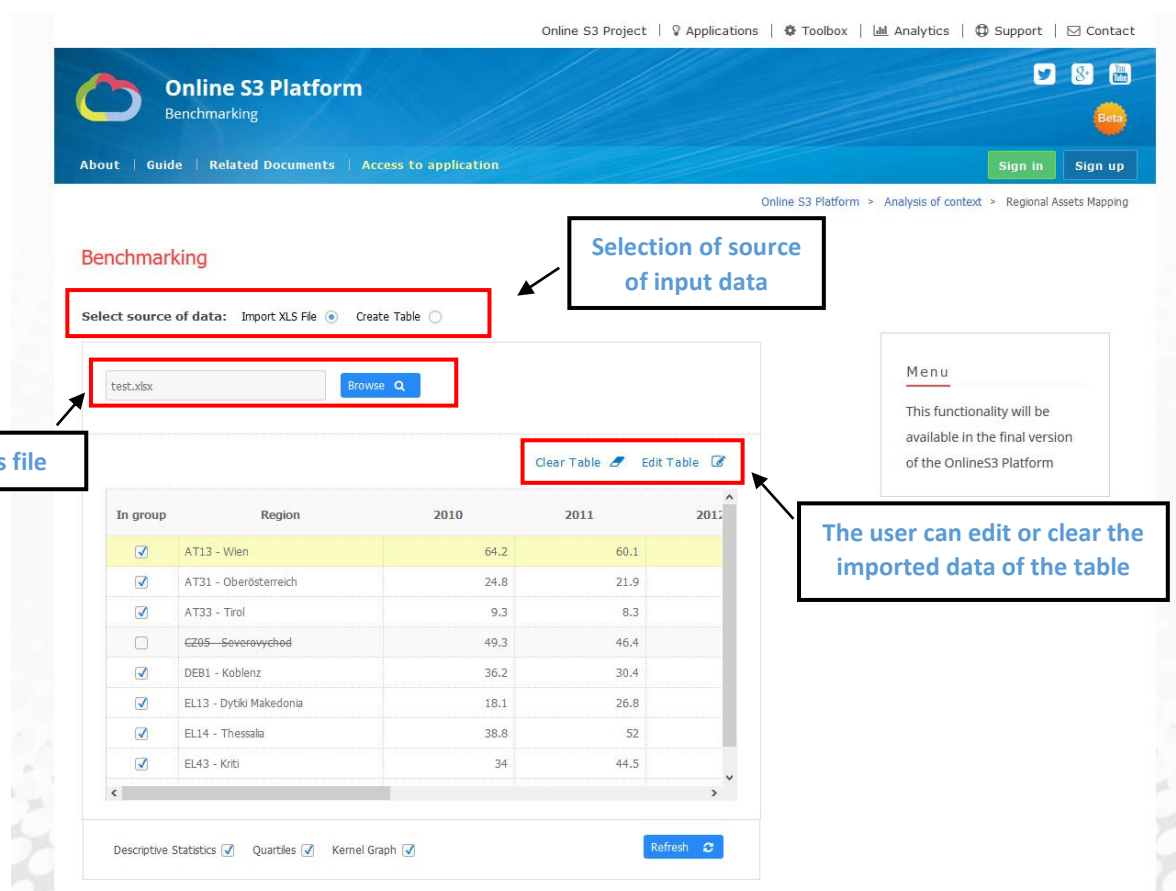
A STEP-BY-STEP GUIDE

How to use this application step-by-step?

Step 1 - Selection of source of input data and import data

During the first step of the application, the user will have to choose the main source of data for his analysis. The selection includes: a) import of an .xls file or b) generate a new table.

a) import of an .xls file: the user is able to edit or clear the imported data of the table.



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Benchmarking

Select source of data: ☒ Import XLS File ☐ Create Table

test.xlsx

Import xls file

Selection of source of input data

The user can edit or clear the imported data of the table

In group	Region	2010	2011	2012
<input checked="" type="checkbox"/>	AT13 - Wien	64.2	60.1	
<input checked="" type="checkbox"/>	AT31 - Oberösterreich	24.8	21.9	
<input checked="" type="checkbox"/>	AT33 - Tirol	9.3	8.3	
<input type="checkbox"/>	CZ05 - Severovyched	49.3	46.4	
<input checked="" type="checkbox"/>	DEB1 - Koblenz	36.2	30.4	
<input checked="" type="checkbox"/>	EL13 - Dytiki Makedonia	18.1	26.8	
<input checked="" type="checkbox"/>	EL14 - Thessalia	38.8	52	
<input checked="" type="checkbox"/>	EL43 - Krita	34	44.5	

Descriptive Statistics ☒ Quartiles ☒ Kernel Graph ☒

Menu

This functionality will be available in the final version of the OnlineS3 Platform

Figure 5: Step 1 –Import data from .xls file.

The application gives the user the opportunity to select specific regions that he/she wants to include in the benchmarking analysis. Regions that are selected in the *In group* column are included in the benchmarking exercise. Moreover, the user has to set a region as the reference region, for which the benchmarking will be performed.

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Select source of data: Import XLS File ☒ Create Table ☐

test.xlsx Browse

Clear Table Edit Table

In group	Region	2010	2011	2012
<input checked="" type="checkbox"/>	AT13 - Wien Set Reference	64.2	60.1	
<input checked="" type="checkbox"/>	AT31 - Oberösterreich	24.8	21.9	
<input checked="" type="checkbox"/>	AT33 - Tirol	9.3	8.3	
<input type="checkbox"/>	CZ05 - Severavychod	49.3	46.4	
<input checked="" type="checkbox"/>	DEB1 - Koblenz	36.2	30.4	
<input type="checkbox"/>	EL13 - Dytiki Makedonia	18.1	26.8	
<input checked="" type="checkbox"/>	EL14 - Thessalia	38.8	52	
<input checked="" type="checkbox"/>	EL43 - Kriti	34	44.5	

Descriptive Statistics ☒ Quartiles ☒ Kernel Graph ☒ Refresh

Menu

This functionality will be available in the final version of the OnlineS3 Platform

Figure 6: Step 1 – Set reference region and group

b) create a new table: the user will have to first define the table size (number of rows and columns) and then, complete the data that are going to be included on the table.

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Benchmarking

Select source of data: Import XLS File ☐ Create Table ☒

Rows: 5 Cols: 5 Generate Table

Clear Table Edit Table

In group	Region			
<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>				

Descriptive Statistics ☒ Quartiles ☒ Kernel Graph ☒ Refresh

Definition of table size (rows and columns)

Table inputs should be imported by the user

Figure 7: Step 1 – Create new table

Step 2 - Results of the analysis

In the second step of the application, the user will be able to see the selected indicators for the benchmarking exercise in a table format by pressing the **Run** button (**Fig. 8-11**). The results are grouped into three categories:

a) Descriptive statistics: this section includes information referring to the selected group of regions regarding the min, max and average values, as well as the differences between these values and the reference region.



Figure 8: Step 2 – Descriptive statistics

An additional functionality of the application offers the opportunity to export these data at an excel format or CSV format. This can be done by pressing the **Export** button at the end of the table (**Fig. 8**). The pop-up window gives the user the opportunity to open the file or Save it in his/her computer (**Fig. 9**).

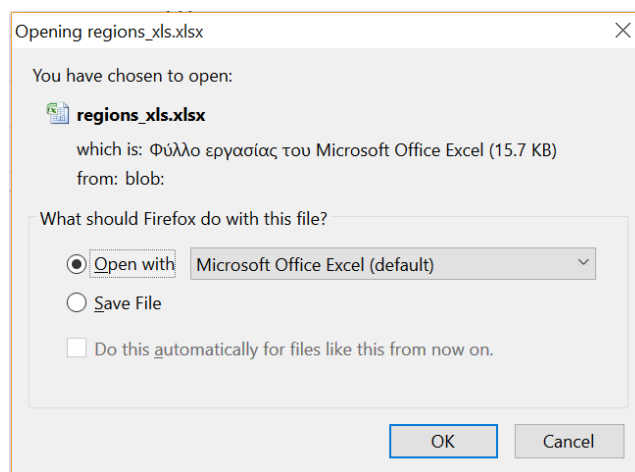


Figure 9: Pop-up window for downloading the data in a table format

b) Quartile statistics: this section includes information referring to the selected group of regions regarding the quartile distribution of the selected variables (**Fig. 10**). First, the quartile values of the distribution are given, and in addition to that the corresponding quartile ratios are also calculated. This information is essential, as it provides useful insights regarding the inequality that might exist within the selected group of regions that are investigated in each case. It moves one step further from the descriptive analysis.

Quartiles: ^

Reference Region: AT13 – Wien

Group: AT13 – Wien, AT31 – Oberösterreich, AT33 – Tirol, DEB1 – Koblenz, EL14 – Thessalia, EL43 – Kriti, FR22 – Picardie

	2010	2011	2012	2013	
Q1	24.8	21.9	21.9	25.3	
Q2	36.2	44.5	62.1	69.2	
Q3	64.2	60.1	70.1	77	
Q4	89.2	71.2	83.5	87.6	
Q4/Q1	3.60	3.25	3.81	3.46	
Q4/Q2	2.46	1.60	1.34	1.27	
Q2/Q1	1.46	2.03	2.84	2.74	



[Export CSV](#) 
[Export XLS](#) 

Figure 10: Step 2 – Quartile statistics

Moreover, the results referring to quartile analysis are also presented in a table format, including all grouped regions (**Fig. 11**). As it can be seen, different quartiles are indicated with different colours in this table, which can be exported as an image (.png) by pressing the *Export* button at the bottom of the graph.

Q1 ■ Q2 ■ Q3 ■ Q4 ■

	2010	2011	2012	2013	2014	2015	2016
AT13 - Wien	64.2	60.1	69.5	75.7	83.2	89.7	0
AT31 - Oberösterreich	24.8	21.9	21.9	29	28.1	28	0
AT33 - Tirol	9.3	8.3	8.5	10.1	11.1	10.8	0
DEB1 - Koblenz	36.2	30.4	27.7	25.3	28.6	23.8	0
EL14 - Thessalia	38.8	52	70.1	77	77.3	82.7	0
EL43 - Kriti	34	44.5	62.1	69.2	65	65.7	0
FR22 - Picardie	89.2	71.2	83.5	87.6	90.3	85.4	0

Export table as an image


Export as Image 

Figure 11: Step 2 – Quartile statistics in table format

Step 3 - Density plot and Kernel diagram

The third step of the application offers the opportunity to visualise the distribution of the selected group of regions on a density plot and a Kernel diagram (**Fig. 12**). The reference region is highlighted in this case, in order to ease the benchmarking process. As previously, it is possible to export the diagram in an image format (.png) by pressing the *Export* button at the bottom of the graph.

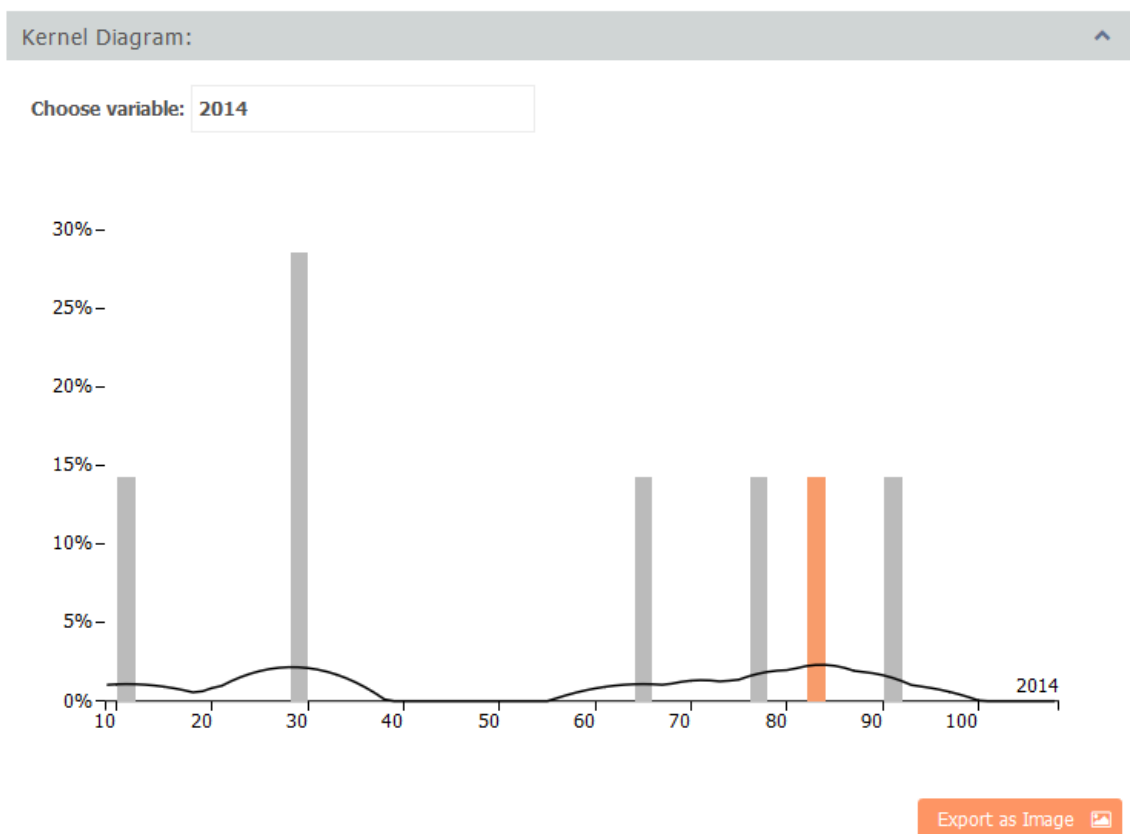


Figure 12: Step 3 Density histogram and Kernel diagram

FURTHER INFORMATION

Further information regarding the description of the method can be found on the site of the Online-S3 project (www.onlines3.eu).

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