



Monitoring Programme and Procedures

D4.2

Due date of deliverable: 31-03-2019

Actual submission date: 31-03-2019

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Call: H2020-SC5-2016-2017

Number: 776465



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776465

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2. Background Information

Table 1: Technical Information.

Project Full title		Rural regeneration through systemic heritage-led strategies	
Project Acronym		RURITAGE	
Grant Agreement No.		776465	
Coordinator		University of Bologna (UNIBO)	
Project start date and duration		June 2018 – May 2022 (48months)	
Project website		www.ruritage.eu	
Deliverable Nr.	4.2	31/03/2019	March 2019 (month 10)
		31/03/2019	March 2019 (month 10)
Work Package No		4	
Work Package Title		Monitoring System and Assessment Procedures	
Responsible		CARTIF	
Author(s)		David, Olmedo; Pedro, Martín-Lerones; Francisco, Barrientos (CARTIF)	
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Reviewer(s) (if applicable)		Claudia, de Luca; Simona, Tondelli (UNIBO)	
Status:		Final (F)	●
		Draft (D)	
		Revised draft (RV)	
Dissemination level:		Public (PU)	●
		Confidential, only for members of the consortium (CO)	

Table 2: Revision History.

D	Deliverable
WP	Work Package
M	Month
RHH	Rural Heritage Hub
RM	Role Model
R	Replicator
SIA	Systemic Innovation Area
CNH	Cultural and natural heritage
AOM	Alternative Ordering Method
GDM	Group Decision Making
...	

3. Summary / Abstract

The goal of the Monitoring Programme is to provide evidence of the role of cultural and natural heritage in rural areas as a driver for sustainable growth. This document shows the elaboration of RURITAGE monitoring programme implemented within the Replicators during project development. Several data collection options are described, including regular, non-regular and co-monitoring. In order to combine the pre-selected and multiscale KPI, weights have been assigned to indicators, according to the knowledge provided by the experts of the consortium.

A detailed description of the dashboards developed for the monitoring programme and the database that stores all the gathered information is included. Four dashboards have been designed, two of them focused on KPIs values and the evolution of these values along project development, and the other two related to Community Capitals assessment and evolution. This deliverable, together with the illustrative videos that have been developed, contain the main features of the platform and serve also as a user manual.

Complimentary information is provided in the annexes section. Annex I contains the results of the analysis performed to the ranking and scoring provided by partners involved in this process, while Annex II includes the script used to create de database.

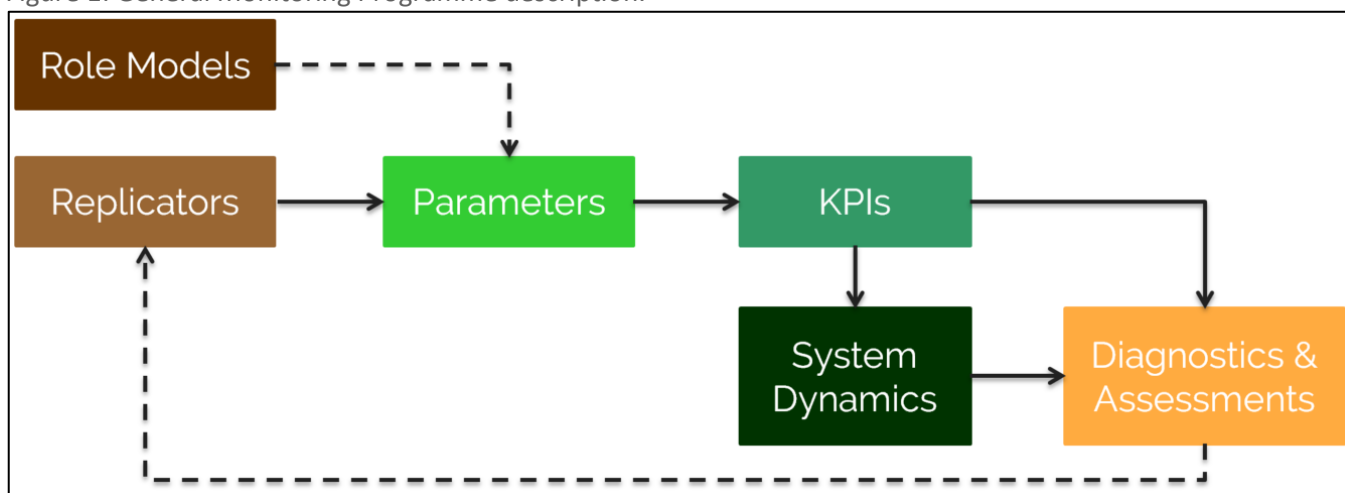
4. Monitoring Procedures

The main objective of the Monitoring Programme is to provide quantifiable evidence of the potential role of CNH as a driver for sustainable growth. To this aim, WP4 deals with performance monitoring of deployed regeneration schemes in the 6 Replicators through selected cross-thematic and multiscale Key Performance Indicators (KPIs) and through the implementation of a holistic approach based on Systems Dynamics (SD) for properly assessing the heritage-led regeneration. Last, WP4 contributes to creating a sense of ownership of CNH developing a participatory co-monitoring approach.

Once the RURITAGE conceptual framework is consolidated, and the methodologies and tools for fostering participatory management and ownership of CNH in Role Models and Replicators are developed and transferred, the established RHHs will be able to start their work at local level. This stage will allow Replicators to start the co-creation process that will include a series of workshops -i.e. serious game and business models development workshop- and public events to attract the local rural communities in shaping their heritage-led rural regeneration plans. Replicators will then be able to start the implementation of large-scale demonstration projects, supported by local stakeholders and by the continuous knowledge transfer that will last throughout the project implementation. In order to compare and appraise the effectiveness, impact and validity of the implemented actions, RURITAGE has established a robust monitoring system through a set of KPIs and evaluation procedures that ensure the production of a solid and reliable impact assessment of the strategies in place.

Parameters obtained from Role Models and Replicators baseline have been used to define a set of KPIs (see Deliverable 4.1), that will be used for an initial appraisal of Replicators baseline, that will be produced as a result of Task 1.4. The impact of the strategies will be assessed through KPIs in terms of Cultural and Natural Heritage, economic growth, social inclusion and Environmental balance, grouped according to the Community Capitals Framework, as stated in D4.1. The KPIs initially considered at the proposal stage for each Replicator have been re-tailored in previous task and will be further analysed by means of System Dynamics and diagnostics at the final stages of the project.

Figure 1: General Monitoring Programme description.



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This document includes the elaboration of the monitoring programme implemented within the Rs during the large-scale demonstration projects implementation. CARTIF and UNIBO have guided this framework on two different levels: at SIA level and with reference to the identified cross-cutting themes. This framework includes methodologies and tools used for the impact assessment and related necessary data to perform the assessment. Guidelines and tips for Rs regarding the monitoring programme implementation are included in this framework.

This deliverable describes the development of a **robust and complete monitoring programme** that includes a methodology for the monitoring of the project activities and also allows the collection of future data after the

project ends. Main necessary requirements were considered and systems for monitoring, metering and data acquisition have been adopted according the selected KPIs and evaluation procedure. Considering the baseline for the Rs, the monitoring program defines the necessary requirements for metering the implemented activities.

4.1 Dataset Definition

The monitoring dataset is the collection of data gathered along the project to perform the monitoring of Replicators' activities. The definition of the dataset is based on the KPIs selected in Task 4.1 (see Deliverable 4.1: KPIs Definition and evaluation procedures).

Table 3: KPI List.

Code	KPI	Values	Notes
CC-01	Number of enterprises in the cultural sector	Integer	Range of values is case dependant
CC-02	Increment in number of mentions of CNH in social media, media, press, etc.	Percentage	Range [0, 100]
CC-03	Number of users registered in the digital hub or following the social networks (Facebook, Twitter...)	Integer	Range of values is case dependant
CC-04	Number of posts in the digital hub	Integer	
CC-05	Number of posts mentioning RURITAGE at local level	Integer	
CC-06	Number of actions and cultural events produced by citizens at local level	Integer	Range of values is case dependant
CC-07	Number of people reached by actions and cultural events produced by citizens at local level	Integer	Range of values is case dependant
CC-08	Number of crowdfunding campaigns launched	Integer	Range of values is case dependant
CC-09	Number of people trained in traditional skills	Integer	Range of values is case dependant
CC-10	Number of places involved in the tourism offer	Integer	
CC-11	Total number of arrivals of tourist in the last year	Integer	
NC-01	Value of ecosystem services		
NC-02	Number of designations	Integer	
NC-03	Area of designations	Integer	

NC-04	Emission of greenhouse gases	Integer	
NC-05	Share of renewable energy in gross final energy consumption	Percentage	Range [0, 100]
NC-06	Number of companies and organizations with sustainability certifications and labelling	Integer	
NC-07	Number of shops, restaurants and tourism facilities selling local products (KM0)	Integer	
NC-08	Number of "green tourism packages"	Integer	
BC-01	Number of hotspots provided	Integer	
BC-02	Number of people reached through RURITAGE digital tools	Integer	Range of values is case dependant
BC-03	Number of CNH objects mapped trough ATLAS	Integer	
BC-04	Number of beds	Integer	
BC-05	Number of restaurants	Integer	
BC-06	Cycle paths (Km)	Integer	
BC-07	Pedestrian/hiking paths (km)	Integer	
BC-08	Share of people served by public transport services	Percentage	Range [0, 100]
BC-09	Number of shared transport services (bike sharing, car sharing, etc.)	Integer	
BC-10	Number of sites accessible by people with disabilities	Integer	
BC-11	Number of buildings restored/retrofitted	Integer	
BC-12	Number of reused buildings	Integer	
BC-13	Number of brands and labels granted for local products and services	Integer	
BC-14	Number of fairs and tourism events per year related to the promotion of the area and related products	Integer	
BC-15	Number of sites provided with signals and explanation panels to help describing the sites and orienteering visitors	Integer	

BC-16	Number of km of routes provided with signals and explanation panels to help describing the sites and orienteering visitors	Integer	
SC-01	Number of citizens engagement activities	Integer	
SC-02	Number of participants in citizens engagement activities	Integer	
SC-03	Number per type of stakeholder involved (according to the ones defined in D.3.1)	Integer	
SC-04	Number of local associations involved	Integer	
SC-05	Number of participants in formal or informal voluntary activities or active citizenship in the last 12 months	Integer	
SC-06	Number of projects addressing migrants	Integer	
SC-07	Number of people involved in projects addressing migrants	Integer	
SC-08	Number of projects addressing people with disabilities	Integer	
SC-09	Number of people involved in projects addressing people with disabilities	Integer	
SC-10	Number of disadvantaged people engaged (elderly, migrants, unemployed)	Integer	
HC-01	Level of education	Percentage	Range [0, 100]
HC-02	Number of recreational facilities/events	Integer	
HC-03	Number of immigrants involved in educational-training programs	Integer	
HC-04	Number of internship for immigrants activated	Integer	
HC-05	Number of self-employees	Integer	
HC-06	Number of internship for students	Integer	
HC-07	Number of people trained in IT and tourism (in specific SIA)	Integer	
HC-08	Number of people involved in professional	Integer	

	management training course (summer school and master)		
HC-09	Number of publication as recommendation and guidelines provided	Integer	
FC-01	Nights spent at tourist accommodation establishments	Integer	
FC-02	Year revenues per sector/municipality (in specific SIA)	Integer	
FC-03	Number of PPPs set and signed	Integer	
FC-04	Unemployment rate (%)	Percentage	Range [0, 100]
FC-05	Number of start-ups and spin-off created/Birth of enterprises	Integer	
FC-06	Number of companies supported in defining new business models and innovative processes of production	Integer	

4.2 Data Collection

Main data sources are Replicators through surveys and questionnaires and RURITAGE Framework that includes tools like Atlas and co-monitoring apps. The reliability of some data sources should be taken into account, but in general terms Replicators and RURITAGE Framework provides more specific and updated data, and closer to the source of information. Several data collection campaigns are planned, as stated in the following sections.

There are various issues to consider whenever updated or new information are sought to be included into the database. The most critical issues are probably:

- the format of the new data to be included
- the format used for the representation of data in the database
- the quality of the data
- possible conflicts that result in inconsistencies in the data

The ETL-process (**E**xtract, **T**ransform, **L**oad) provides general guidelines on how the task of including newly available data into the database can be accomplished. The first step is to request the newly available data. The other steps in the ETL-process depend on the success of the first step. In the second step, the data that was extracted or obtained from various sources:

- is checked for possible errors (e.g. formatting errors and inconsistencies), and
- may need to be converted into a common format such that the data can be included in the database

Checking data for errors is another very important issue which requires information about the format, the individual elements in the data, their expected data type, range (whenever is this applicable), and other parameters. Adding incorrect data to the database may lead to severe problems during data analysis and lead to false conclusions on the basis of the analysis. Hence, this important issue can be addressed on the basis of a detailed description of the format of the available data and any expert knowledge associated with the data.

Provided that the entire dataset to be included in the database is in accordance with these constraints, it will be added to the database. Otherwise, if only a part of the dataset is in accordance with the constraints, options are:

- reject lines/parts from the data that are not in accordance with the constraints, but add the remaining valid lines to the database, or
- reject the complete dataset from being inserted into the database

Adding parts of new data into the database might lead to problems and shall only be performed with extreme caution, as the context may be lost resulting in possible problems during the analysis of the data. Hence, it is often preferred to determine the reason for those parts/lines not being in accordance with the constraints and the Replicator could then be informed.

Another issue that is closely related to the validation of the data is finding a way of dealing with missing values in the new data to be included. It is likely a good idea to obtain the opinion of experts on how missing values in the datasets shall be dealt with, if such cases occur.

Other tasks that may also need to be included in the second step of the ETL process are:

- transforming individual elements of the data, e.g. transform a value from one unit to another (such as transforming an area from square miles to km²) in order to harmonize the data
- conversion of data types (e.g. converting a string to a double value or to a date)
- deriving new values on the basis of the present values, in order to allow for easier analysis
- sorting the data

The quality of the data is another issue that needs to be considered both when initially building the database and whenever it shall be updated. As it is usually not possible to fully automatically determine if the amount of data is large and representative enough for any assessment task on the basis of the data, the RURITAGE project needs to ensure that the data from Replicators is of high quality, representative and can indeed be used for the considered purposes.

4.2.1 Baseline (from Task 1.4)

Task 1.4 is focused on deep analysis and validation of Replicators' needs and state of the art for a preliminary diagnosis at different dimensions. Replicators' qualitative and quantitative baseline is analysed from different points of view. The procedure will allow not only to get a baseline, but also to enrich the diagnosis of the current situation which allows detecting the Solutions to be replicated that could be able to solve or mitigate the identified problems.

The collated data will be categorized to make them readily usable for the subsequent activities: capacity building activities (Task 2.3, 2.4 and 2.5) action plan development (Task 3.3), large-scale demonstration projects (Tasks 3.5), impact assessment (Task 4.5), RURITAGE Branding (Task 6.3), and stakeholder engagement (Task 3.1).

Baseline includes KPI values together with contextual information from Replicators. With regard to Monitoring Programme, mainly KPI data is taken into account, in order to get the initial state of Replicators, while context information will be used or deliverable 1.4. These data come from the online survey (see Figure 2) performed in the scope of Task 1.4 and results are in a spreadsheet file. Once data are validated, they will be included in the database.

Figure 2: Replicators Baseline online survey.

General Information

Please, provide some information from your Replicator.

***Name of the Replicator.**

test

Promotional descriptive phrase of the Replicator

Please, provide a promotional phrase that describes main characteristics of the Replicator, e.g. 'Toscany, the land of wine and smiles'.

Please, upload a shapefile (ESRI) or KML file (Google) with the geometry of the Replicator.

1 Please upload at most one file

Upload files

Title	Comment	File name
		doc.kml

Edit

1 Please, take into account that the figures you provide in this survey must be referred to the area here defined.
More info: Creating a shapefile.

***Number of inhabitants in the area of the Replicator.**

1 Your answer must be at least 0
1 Only an integer value may be entered in this field.

0

1 Please, provide the number of inhabitants in the area covered by the Replicator. If you can not find this number, please provide the number of inhabitants in the municipality (or the sum of the municipalities) where the Replicator is located.
Note: Please, use official statistics where available, Wikipedia numbers are not always correct or up to date.

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4.2.2 Regular Data Collection Campaigns

Data collection and KPI calculation will last for 2.5 years, from December 2019 to May 2022. Along this time, a full set of data will be collected and task leader will report each 6 months about the data collection process, in order to ensure a proper supervision and analysis. To achieve this objective, regular data collection campaigns will be run every 6 months. An online survey, similar but simpler, to the one developed to the Baseline will be available for Replicators, in order to ease the process of data collection. As in the previous case, results will be collected in a spreadsheet and uploaded to the database once they are reviewed and validated.

4.2.3 Non-Regular Data Collection

Some data can be collected in a regular basis, but in other cases it is preferable to collect them directly after the event/action that is going to be included in the monitoring system. As this way of collecting data should be available at any moment along project development, the procedure to collect this information is a survey available at SharePoint, where every project partner has access. Each Replicator can fill out as many surveys as needed, every time a new event/action is produced. Results will be collected in an excel file and included in the database once validated.

4.3 Co-Monitoring

In order to monitor changes to cultural heritage with rural communities, an ecosystem service framework is employed and the key cultural ecosystem services (underpinning cultural heritage) are identified by community groups (local and visitor) through workshops and surveys (online, via Apps and Participatory GIS (PGIS)). Current values and perceptions (linked to economic, social and environmental attributes of cultural ecosystem services including values associated with cultural heritage) are recorded. Local and visitor perceptions of changes to cultural ecosystem services and heritage as a result of actions in Replicator sites will be monitored by employing ubiquitous technologies and community workshops (Tagscape).

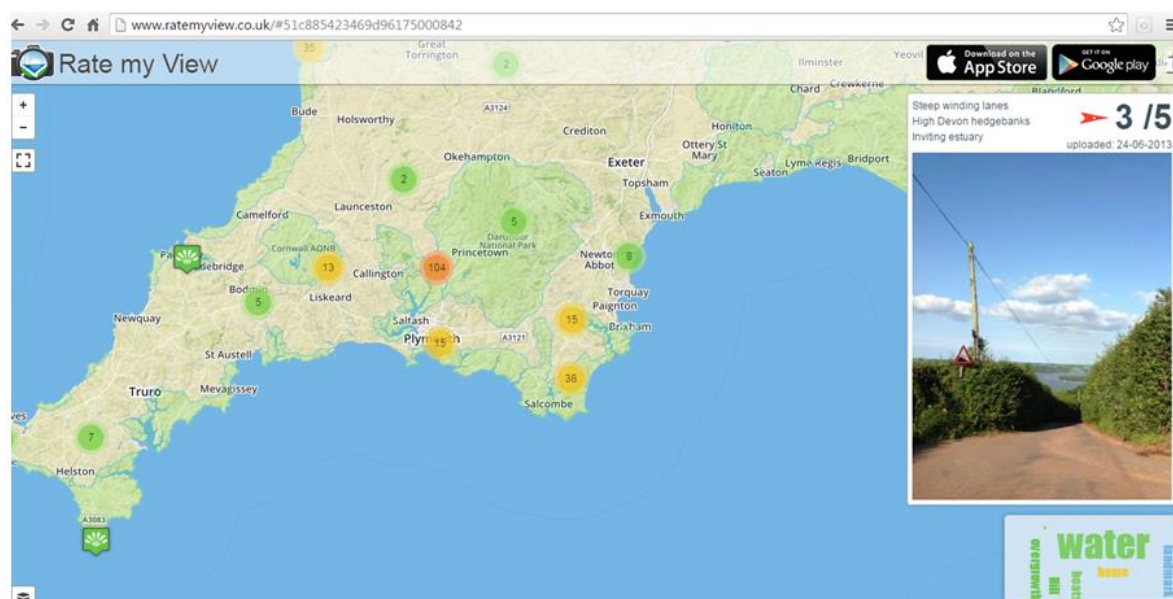
Figure 3: My Cult-Rural Toolkit.



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The My Cult-Rural Toolkit (see Figure 3) helps building capacity within the communities of Replicator sites to monitor and evaluate the success of actions/projects designed to enhance cultural heritage values in the region. My Cult-Rural toolkit is composed by PGIS tools, two Apps ('Rate my View', Figure 4 and 'Landscape Connect', Figure 6) and the Tagscape methodology.

Figure 4: Rate My View web page.



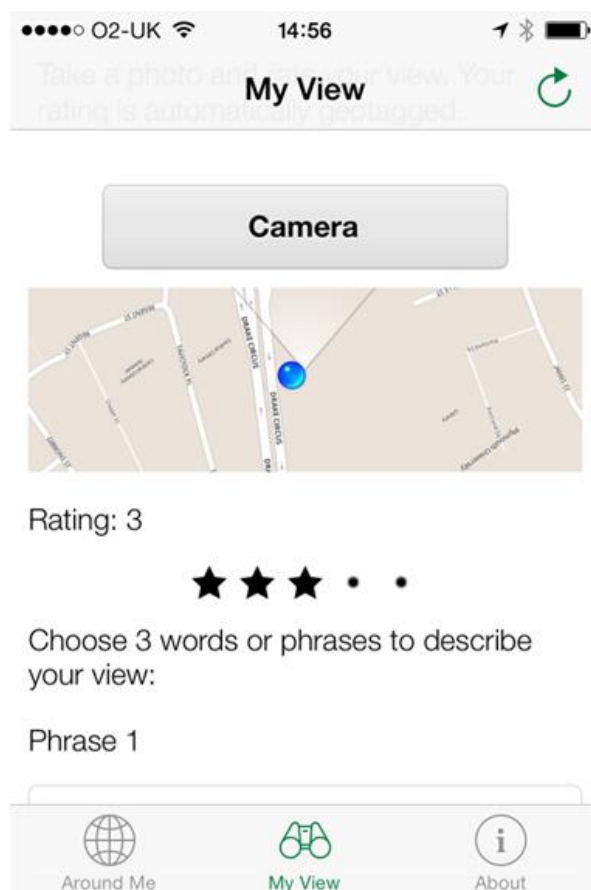
© Plymouth University.

The Apps allow text and images to be collected and geo-referenced. This data will then be presented and exported to the RURITAGE Atlas on the RURITAGE Resources Ecosystem. The Rate My View App allows a standard set of questions related Landscapes to be answered by the user, following the steps highlighted below. In contrast, the Landscape Connect App allows the questions to be designed to meet the needs of workshops and users and then published on the App. Hence allowing data on various types of cultural ecosystem services to be collected.

Rate My View (RmV) users should follow the next 5 steps (see Figure 5):

1. Identify location and direction of view
2. Take photo
3. Rate the view – 1-5 stars
4. Describe how the view makes you feel in three words or short phrases
5. Submit

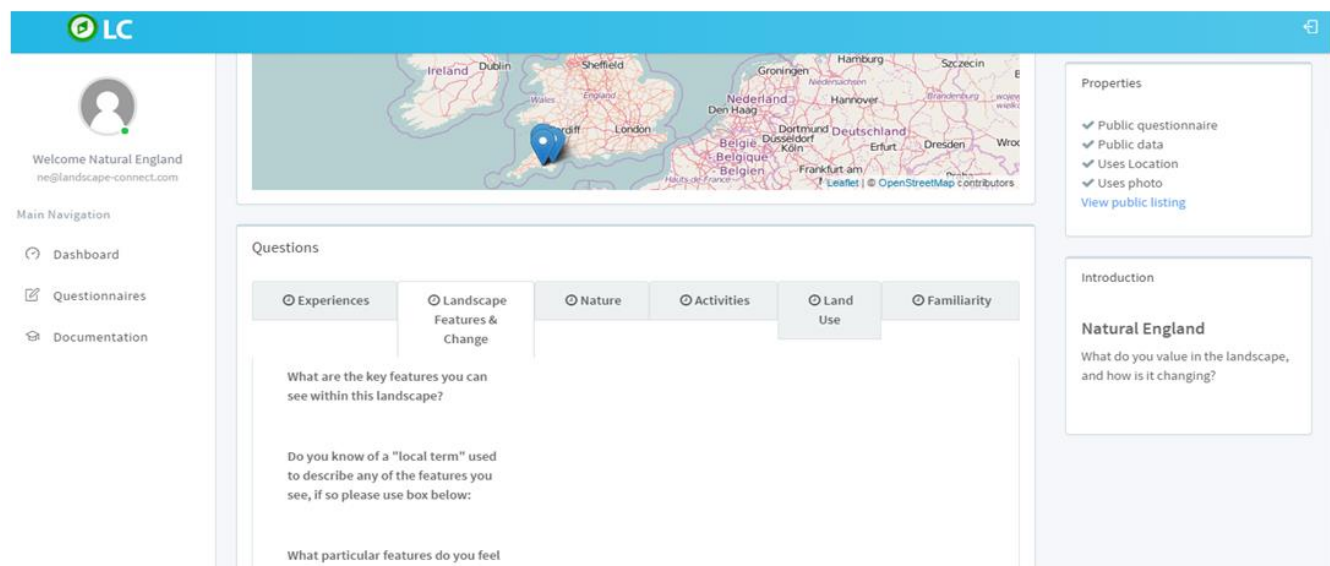
Figure 5: Rate My View app.



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The Tagscape methodology involves gathering cultural and perceptual data through the creation of 'mini-landscapes' and visually innovating maps to display information. The methodology is based around community workshops and will feed data to the RURITAGE Atlas.

Figure 6: Landscape Connect.



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4.4 Data Analytics

Data pre-processing is a relevant step in statistic processes. Available data are often obtained in a not well controlled domain. Out-of-range values (e.g. Income: -100), impossible data combinations (e.g. Gender: Male, Pregnant: Yes), missing values, outliers, are often included into datasets. Models that were built with that data can produce misleading results. The improvement of the quality of available data is an essential step that must be carried out in order to obtain accurate results.

An outlier is a value far from most others in a dataset. There are several methods to deal with outliers, depending on the type of variable. For nominal variables, frequency analysis is a common solution, discarding those values with a frequency of 1% or less. If the variable is continuous and normally distributed, distance from the standard deviation is often used, discarding those values farther than 3 times the standard deviation.

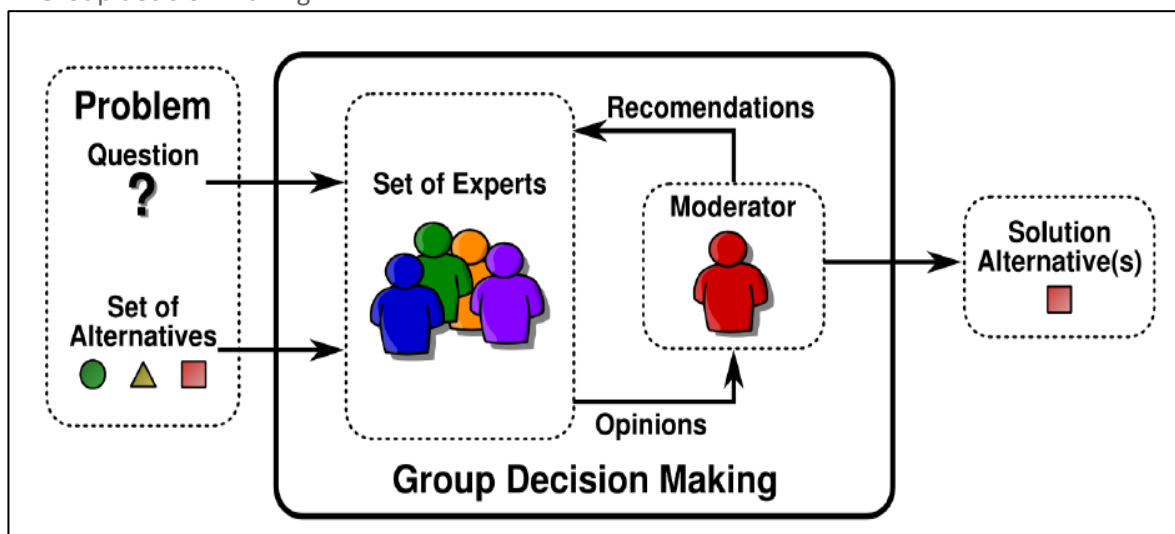
When handling data from different sources, there might be some undesirable effects such as different units for the same measure or different ranges. In order to avoid these effects, it is necessary to employ methods like data normalization or standardization to convert all data into a common format that allows comparing data originating from different sources. Normalization, for instance, is used to scale numeric values to a particular range, usually to the interval [0, 1] or z-score normalization. Data harmonization is based on a detailed description of the individual elements in the data coming from different sources.

4.5 KPI Weighting and Evaluation

Decision making is the cognitive process of selecting the best alternative (or alternatives) from among multiple different alternatives. Decision making not only occur for isolated individuals. Some of them have to be solved by a group of persons (usually experts). Then it is known as group decision making (GDM), i.e. selecting the best

alternative, or alternatives, from a finite set of feasible alternatives taking into account the preferences of a group of experts (see Figure 7).

Figure 7: Group decision making.

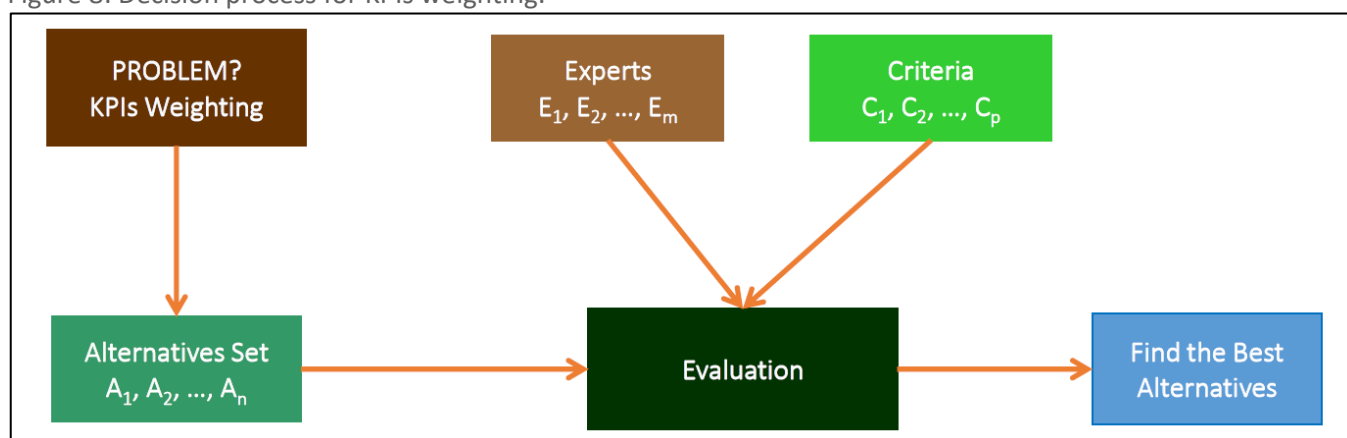


Source: E. Herrera-Viedma, SECABA LAB, Granada University.

When calculating the capital values and the global value for each Replicator, not every KPI has the same impact. The way to obtain KPIs' weights is by GDM. Opinions from experts in the RURITAGE consortium have been collected and analysed.

The proposed way to estimate the KPI weights (see Figure 8) is to generate a model from the opinions provided by the experts. These data were collected in AOM matrices (Alternative Ordering Method). The objective is to shed light on what degree of importance has each KPI in its specific Community Capital. To do this, for each Community Capital, the percentage that can be attributed to each KPI is estimated, based on the opinion of the group of experts. The method consists in perform a ranking with the KPIs according to their importance for the Community Capital and assigning a score (see Table 4) according to its relevance compared to the next KPI in the ranking.

Figure 8: Decision process for KPIs weighting.



Source: Adapted from E. Herrera-Viedma, SECABA LAB, Granada University.

Table 4: Relative relevance of each KPI compared to the next.

Score	Relevance
3	Much more important than...
2	More important than...
1	Slightly more important than...
0	Same important than...

Cultural Capital tables are included next, as an example to illustrate the procedure. Full detailed tables with the other Community Capitals are included in Annex I.

Table 5: Cultural Capital ranking assignment by experts (E_i).

Code	Description	Ranking					
		E1	E2	E3	E4	E5	E6
CC-01	Number of enterprises in the cultural sector	6	1	3	3	2	1
CC-02	Increment in number of mentions of CNH in social media, media, press, etc.	8	4	5	8	7	8
CC-03	Number of users registered in the digital hub or following the social networks (facebook, twitter...)	10	8	6	9	9	9
CC-04	Number of posts in the digital hub	7	10	11	10	10	10
CC-05	Number of posts mentioning RURITAGE at local level	11	11	8	11	11	11
CC-06	Number of actions and cultural events produced by citizens at local level	4	3	2	1	1	4
CC-07	Number of people reached by actions and cultural events produced by citizens at local level	3	5	1	2	3	3
CC-08	Number of crowdfunding campaigns launched	5	9	10	4	8	7
CC-09	Number of people trained in traditional skills	9	2	4	5	5	2
CC-10	Number of places involved in the tourism offer	2	7	7	6	6	6
CC-11	Total number of arrivals of tourist in the last year	1	6	9	7	4	5

First step is assigning a ranking, or relevance order, to every indicator. No repetition is allowed in this point, but in the next step it is possible to state if an indicator has similar relevance to other, through the scores previously introduced (see Table 4). Table 5 shows the rankings assigned by the experts to Cultural Capital indicators.

Table 6: Cultural Capital score assignment by expert no.1 (E1).

Ranking	Code	Score	CC-11	CC-10	CC-07	CC-06	CC-08	CC-01	CC-04	CC-02	CC-09	CC-03	CC-05	+1	%
1	CC-11	0	0	0	0	1	1	2	4	4	4	5	8	9	13%
2	CC-10	0		0	0	1	1	2	4	4	4	5	8	9	13%
3	CC-07	1			0	1	1	2	4	4	4	5	8	9	13%
4	CC-06	0				0	0	1	3	3	3	4	7	8	11%
5	CC-08	1					0	1	3	3	3	4	7	8	11%
6	CC-01	2						0	2	2	2	3	6	7	10%
7	CC-04	0							0	0	0	1	4	5	7%
8	CC-02	0								0	0	1	4	5	7%
9	CC-09	1									0	1	4	5	7%
10	CC-03	3										0	3	4	6%
11	CC-05	-											0	1	1%
														70	100%

The next step is sorting the indicators according to the ranking previously stated. Table 6 illustrates the results for Expert 1. Every cell is filled with the sum of the cumulative scores among current indicator and the previous indicators. It is necessary to do a similar table with every experts scoring. As a result, last column shows the relative relevance of every indicator, expressed as a percentage.

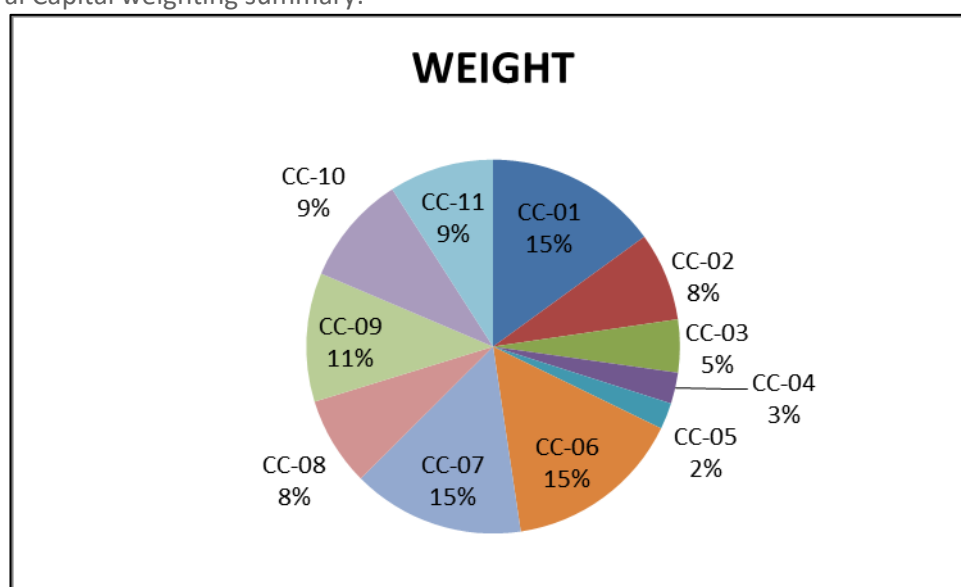
Table 7: Cultural Capital indicators weighting.

Code	Description	Ranking						Weight
		E1	E2	E3	E4	E5	E6	
CC-01	Number of enterprises in the cultural sector	0.10	0.16	0.15	0.16	0.17	0.16	0.15
CC-02	Increment in number of mentions of CNH in social media, media, press, etc.	0.07	0.13	0.10	0.03	0.07	0.05	0.08
CC-03	Number of users registered in the digital hub or following the social networks (facebook, twitter...)	0.06	0.06	0.09	0.03	0.02	0.01	0.05
CC-04	Number of posts in the digital hub	0.07	0.02	0.01	0.03	0.02	0.01	0.03

CC-05	Number of posts mentioning RURITAGE at local level	0.01	0.01	0.05	0.03	0.02	0.01	0.02
CC-06	Number of actions and cultural events produced by citizens at local level	0.11	0.13	0.16	0.23	0.17	0.13	0.15
CC-07	Number of people reached by actions and cultural events produced by citizens at local level	0.13	0.12	0.16	0.19	0.15	0.14	0.15
CC-08	Number of crowdfunding campaigns launched	0.11	0.04	0.03	0.13	0.07	0.08	0.08
CC-09	Number of people trained in traditional skills	0.07	0.14	0.13	0.06	0.10	0.16	0.11
CC-10	Number of places involved in the tourism offer	0.13	0.08	0.08	0.06	0.10	0.11	0.10
CC-11	Total number of arrivals of tourist in the last year	0.13	0.10	0.04	0.03	0.12	0.13	0.09
								1

The last step is to estimate the average weight of the indicators, collecting the weights assigned by every expert (see Table 7). Results are also illustrated by Figure 9. This way it is possible to see at a glance what are the most and the least relevant indicators.

Figure 9: Cultural Capital weighting summary.



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5. Monitoring Programme

5.1 Introduction

In a world of big data, where even rural environments are generating vast amounts of data, once figured out how to tap into the various data sources, and the method for collecting, processing and storing them (D4.1), the next step is analysis. Monitoring and visualizing the data (logs, metrics or traces) is considered a key success practice to detect patterns and take action when identifying anomalous behaviour, providing the visibility required for understanding what is happening at a given point in time.

KIBANA and GRAFANA are the two most popular open source tools that help users visualize and understand trends within large amounts of log data. A proper comparison between these tools is easily found in: <https://logz.io/blog/grafana-vs-kibana/> (logs vs. metrics; setup, installation and configuration; data sources and integrations; access control and authentication; querying; dashboards and visualizations; alerts; community).

Based on CARTIF experience, GRAFANA is selected since can work with multiple time-series data stores, including built-in integrations with the most popular data sources and additional ones using plugins.

Short Grafana's Description Grafana¹ is an open source metric analytics & visualization suite. It is most commonly used for visualizing time series data for infrastructure and application analytics but many use it in other domains including industrial sensors, home automation, weather, and process control.

It supports many different storage backends for time series data (data source). Each data source has a specific query editor that is customized for the features and capabilities that the particular data source exposes. Grafana also allows combining data from multiple data sources onto a single dashboard.

The following data sources are officially supported: *Graphite, InfluxDB, OpenTSDB, Prometheus, Elasticsearch, CloudWatch*, but other data sources can be used through specific plugins.

Grafana supports a wide variety of internal and external ways for users to authenticate themselves. These include from its own integrated database, from an external SQL server, or from an external LDAP server.

From Grafana 3.0+ not only are data source plugins supported but also panel plugins and apps. Having panels as plugins make it easy to create and add any kind of panel, to show data or improve dashboards. Apps is something new in Grafana that enables bundling of data sources, panels, dashboards and Grafana pages into a cohesive experience.

Grafana already has a strong community of contributors and plugin developers. By making it easier to develop and install plugins it is hoped that the community can grow even stronger and develop new useful plugins.

5.2 Dashboards designed

Four dashboards have been designed using Grafana:

- KPIs Values Dashboard
- KPIs Evolution Dashboard
- Community Capitals Assessment Summary Dashboard
- Community Capitals Assessment Evolution Dashboard

¹ <https://grafana.com/>

These dashboards are fed up by the specific database created for the project (see section 5.3).

Figure 10: Dashboards developed for the project.



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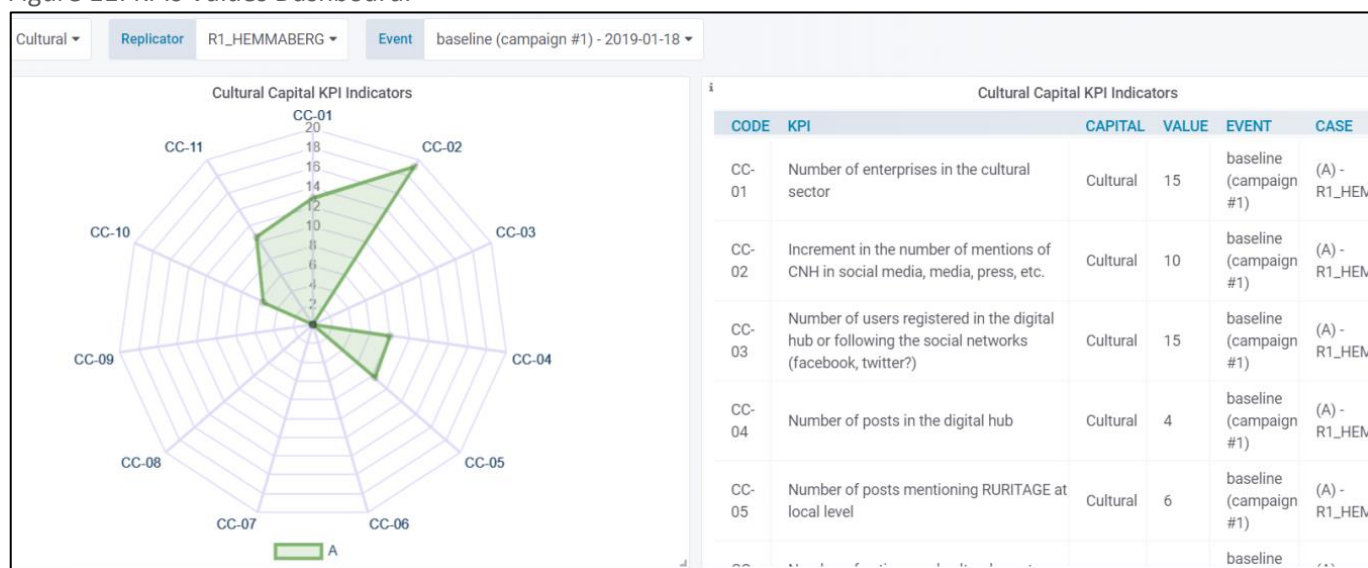
Their main features are the following:

- The dashboards provide a very intuitive and visual way to show information
- They are totally online. It is not necessary to install any app in any device.
- The information to be displayed is fully customizable through filters
- They allow making comparison among Community Capitals / KPIs / Replicators
- Possibility to see the information evolution over time

These four dashboards will now be described in the following sections.

5.2.1 KPIs Values Dashboard

Figure 11: KPIs Values Dashboard.



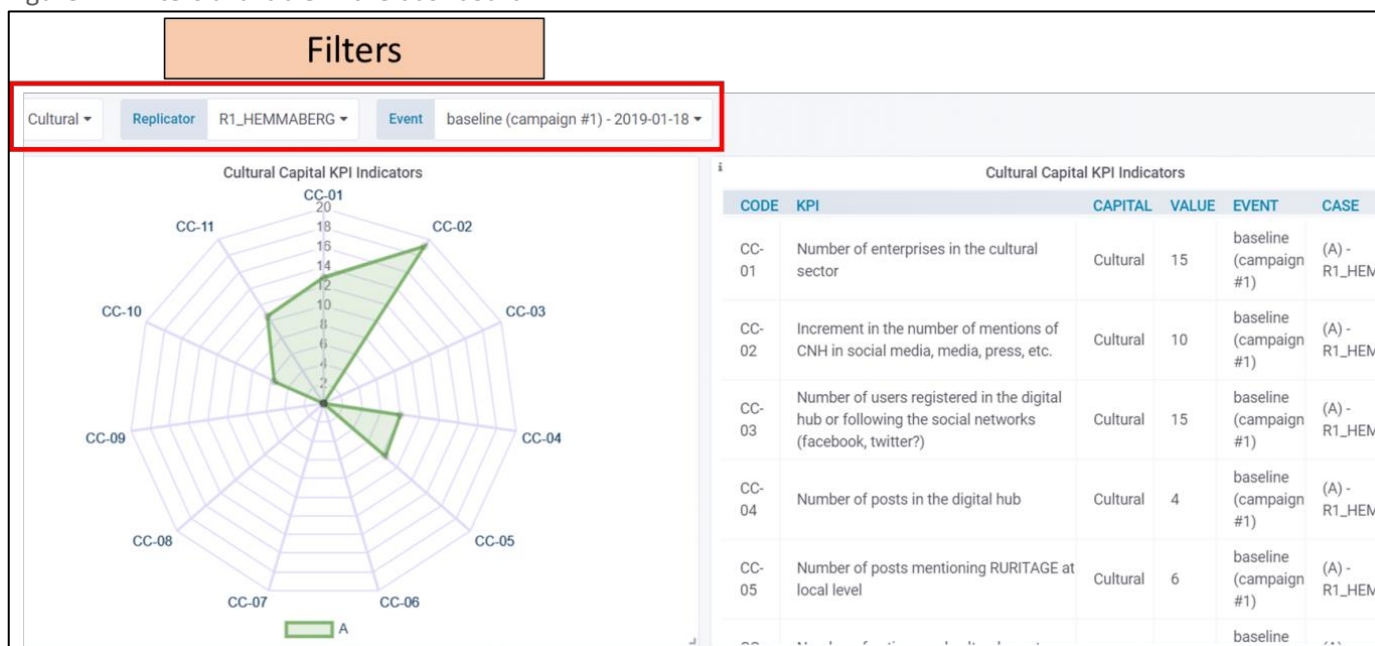
© RURITAGE own development.

This dashboard is intended to show the KPIs values according to the selected:

1. Community Capital
2. Replicators
3. Event or campaign when the data was collected

To do so, the dashboard has some filters at the top of it.

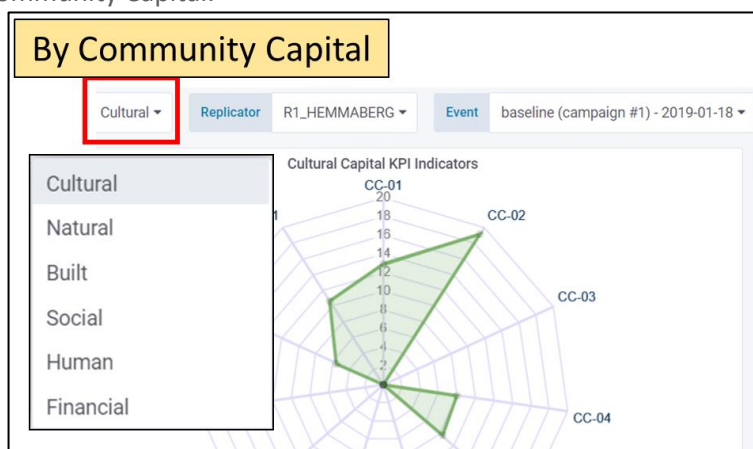
Figure 12: Filters available in the dashboard.



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These filters allow customizing the data to be displayed. It is possible to filter by Community Capital, by Replicator and/or by the event when the data was collected.

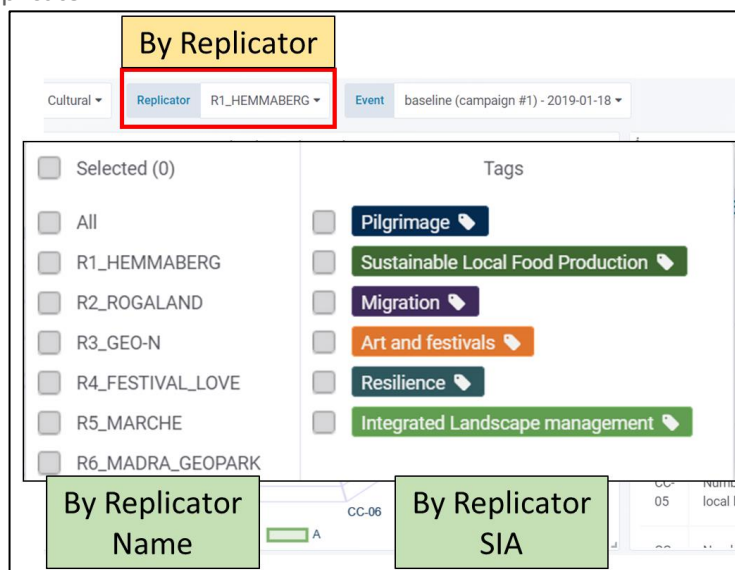
Figure 13: Filtering by Community Capital.



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Only one Community Capital can be selected at a time, limiting the KPIs to be displayed (since only the KPIs which belongs to the selected Community Capital will be shown).

Figure 14: Filtering by Replicator.

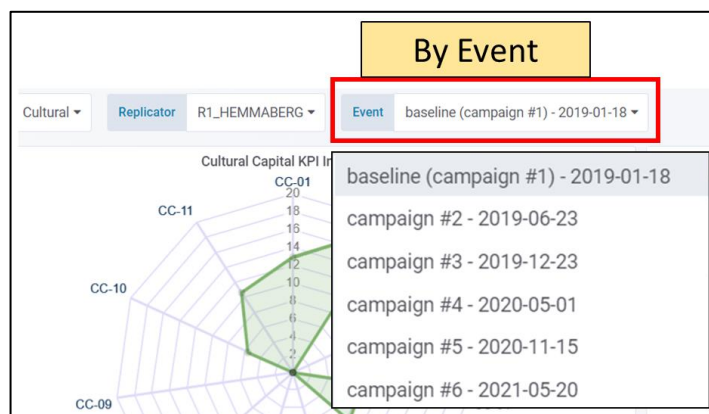


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On the other hand, several Replicators may be selected, which allows making comparisons among them. The selection can be done using the Replicator name and/or using its SIA, which could be useful in some situations.

The latter has been implemented through tags, which has the main advantage of being able to select several Replicators at a time, while through the Replicator name, only one is selected. Besides, this makes it easier to make comparisons among SIAs.

Figure 15: Filtering by event or campaign.



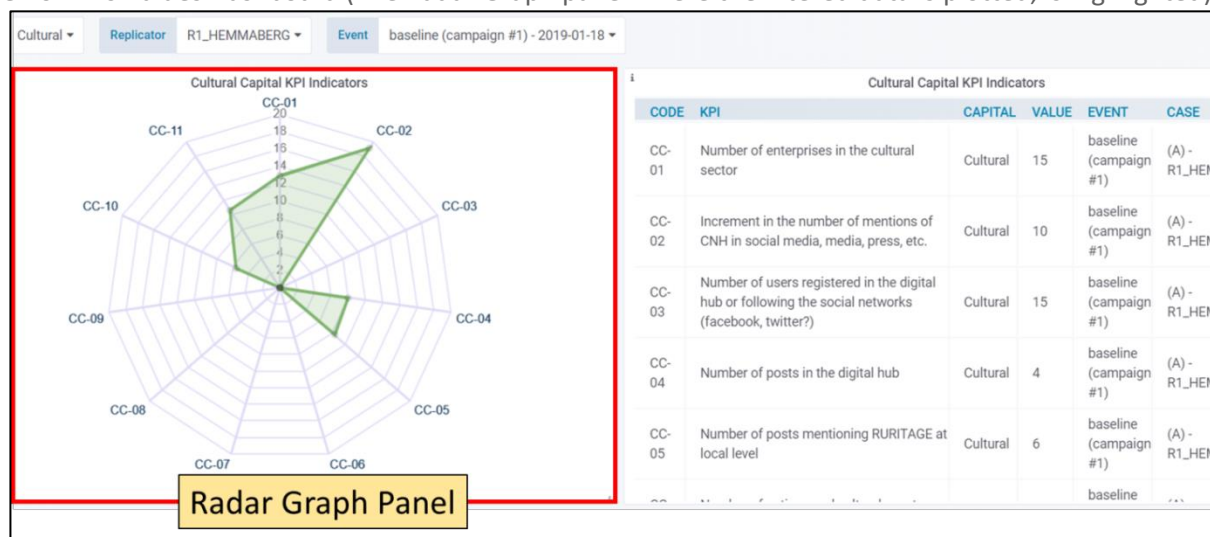
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The event filter allows the user to select the specific event or campaign the data was collected. As with the Community Capital filter, only one event can be selected at a time and it is mandatory to select one in order to some data be displayed.

Should the user wish to see data from different events or campaigns, a specific dashboard has been developed for that purpose (see the KPIs evolution dashboard, section 5.2.2).

The information according to all these filters is displayed in an intuitive and visual way through a Radar Graph panel on the left dashboard area.

Figure 16: KPIs Values Dashboard (The Radar Graph panel where the filtered data is plotted, is highlighted)



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It is necessary to point out that the Radar Graph panel does not show the real KPIs values, but the normalized ones. The reason is simple. The data comes from different sources, has different units, different scales, etc. This makes it impossible to represent this information properly in the same graph without a previous data treatment such as a normalization (see section 4.4).

The real values related to the graph displayed are available in a table located on the right dashboard area (along with some extra information).

All this allows the user to have an intuitive and general idea simply seeing the radar graph panel on the left (see Figure 16), but if necessary, it also allows studying carefully all the information, including the real numeric values, in the table located on the right dashboard area (see Figure 17).

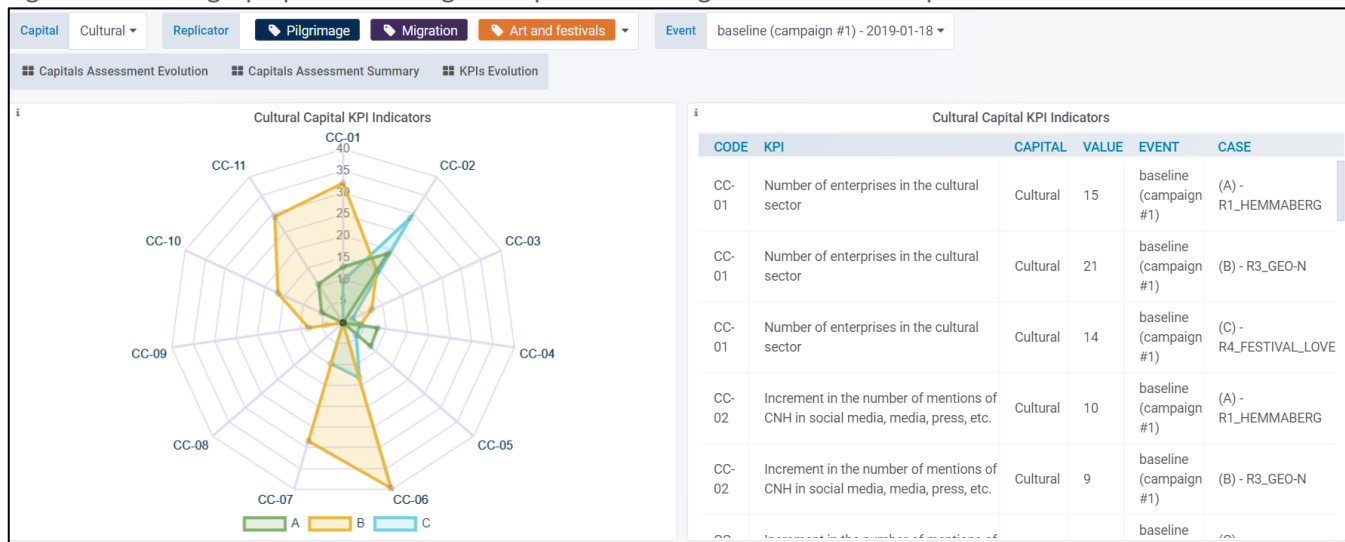
Figure 17: KPIs Values Dashboard (The table with extra information is highlighted)



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An example of this can be seen in the Figure 18.

Figure 18: Radar graph panel showing a comparison among three different replicators.



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5.2.2 KPIs Evolution Dashboard

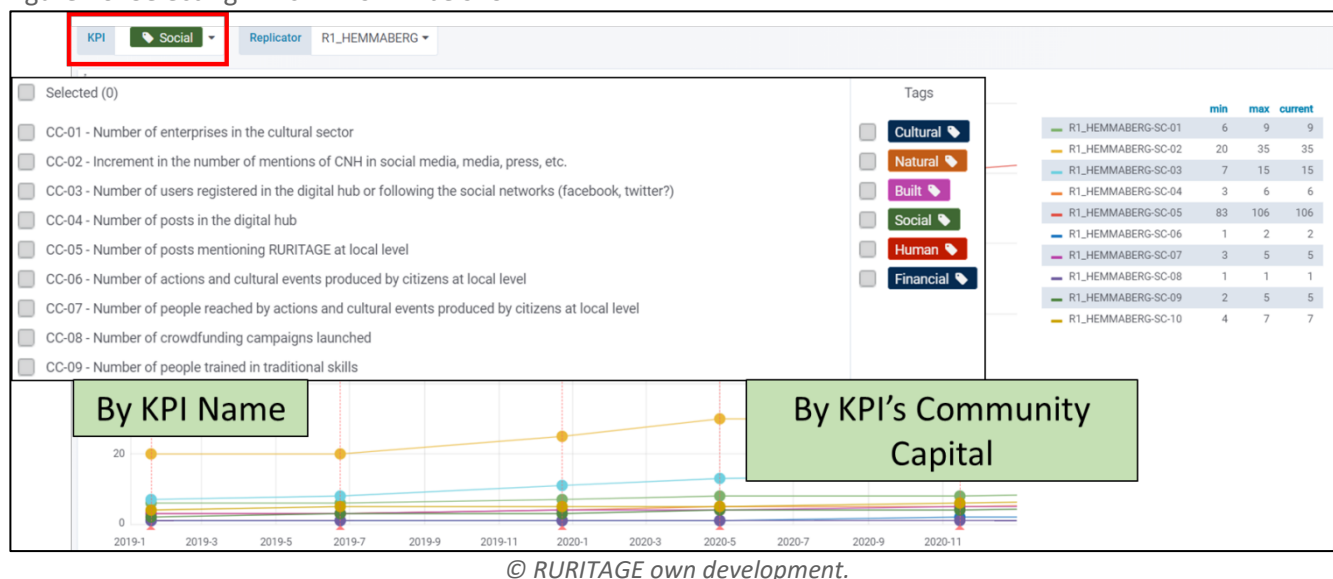
Figure 19: KPIs Evolution Dashboard.



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This dashboard is intended to show the evolution over time of the chosen KPIs values according to the selected replicators. As with the KPIs Values Dashboard, it has some filters at the top of it to customize the information to be displayed. The first one is for selecting the KPIs which will be shown.

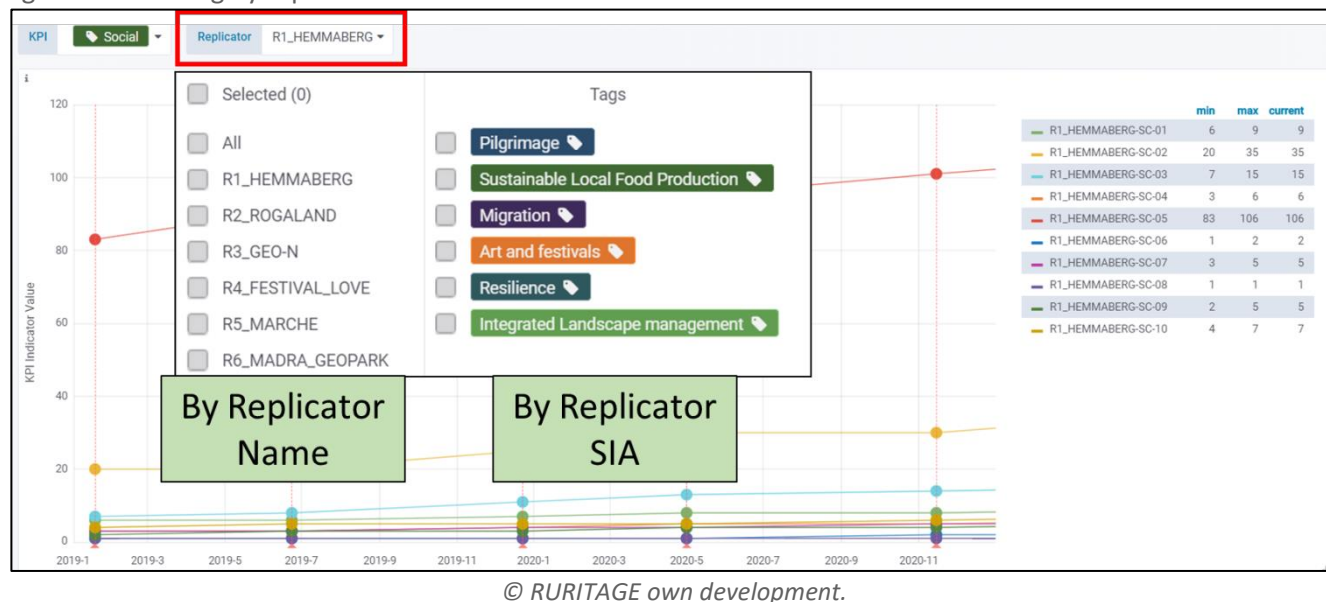
Figure 20: Selecting which KPIs will be shown.



Any desired KPI among the full KPI list can be selected. Furthermore, it is possible to pick all the KPIs related to a specific Community Capital through several tags specially implemented for that purpose (see Figure 20).

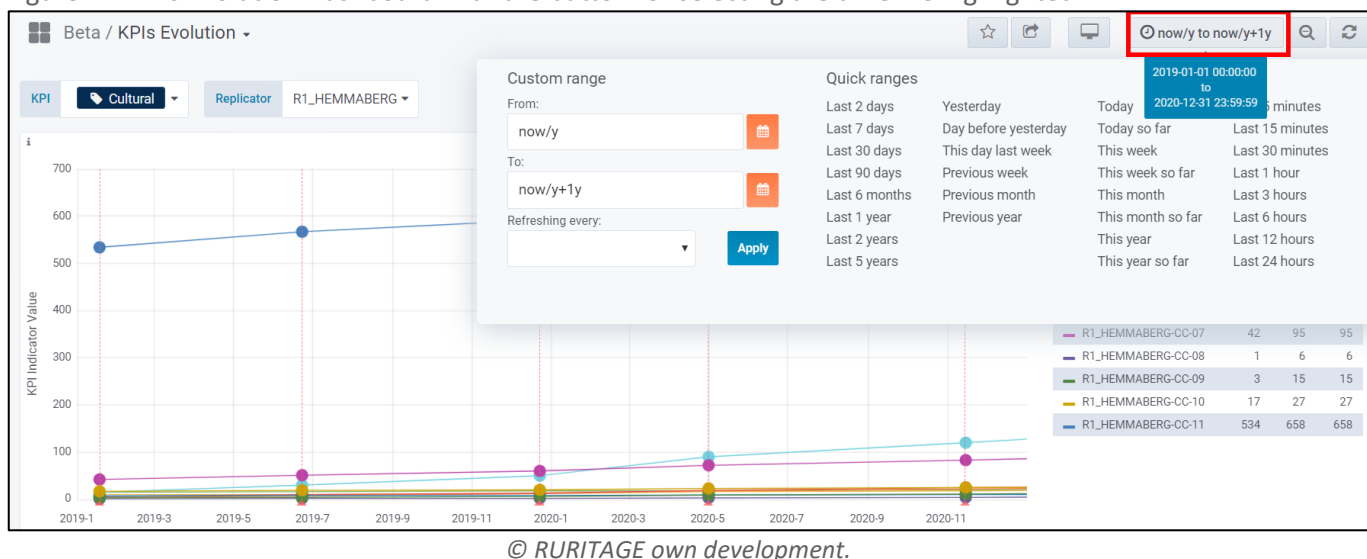
Thus, for instance, if the user wants to select all the KPIs related to the Natural Capital and the Human Capital, this could be done by either picking one by one by the KPI name (17 mouse clicks) or just selecting the tags related to these community capital (only 2 mouse clicks). The second filter implemented allows showing only the KPIs related to the selected replicators by the own filter.

Figure 21: Filtering by replicator.



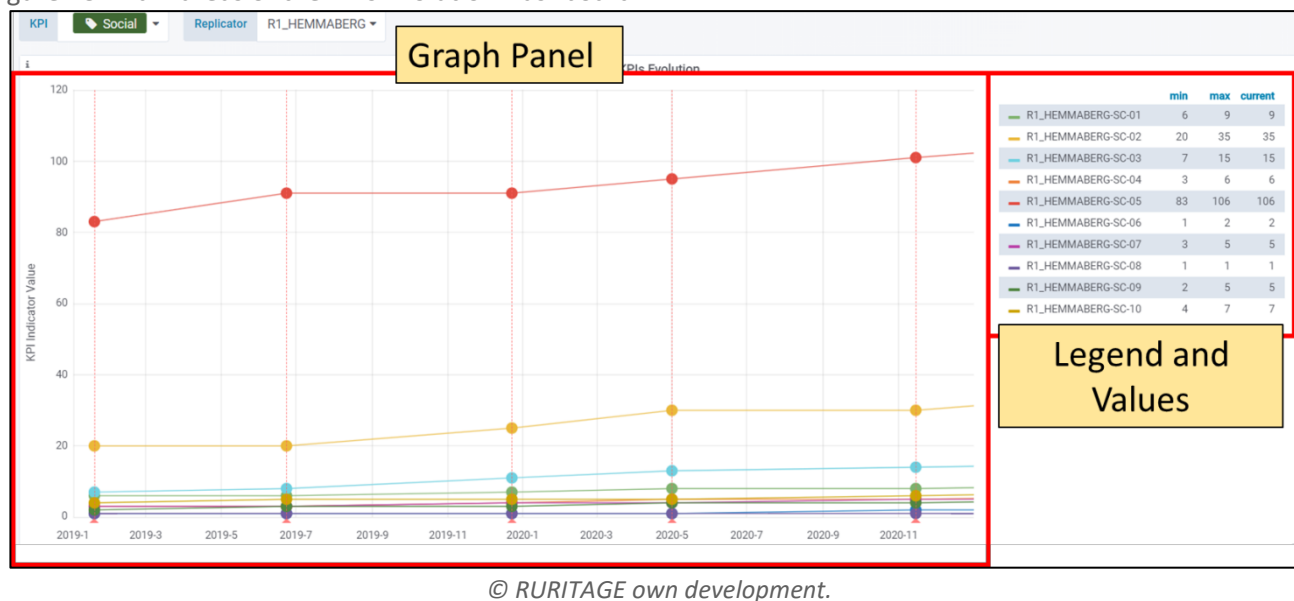
As with the KPIs Values Dashboard, this filter allows the user to select the replicators via the replicator name and/or via its SIA. The latter has also been implemented through tags, which, as mentioned before, has the main advantage of being able to select several replicators at a time. Furthermore, Grafana natively includes a button at the top of the screen to specify the dashboard timeline (see Figure 22). In this way, the user may visualize just the KPIs Values over the specified time according to the selected replicators.

Figure 22: KPIs Evolution Dashboard with the button for selecting the timeline highlighted.



The dashboard is made up of a graph panel (on the left) and an area with a legend that also shows some values and statistics (on the right).

Figure 23: Main areas of the KPIs Evolution Dashboard.

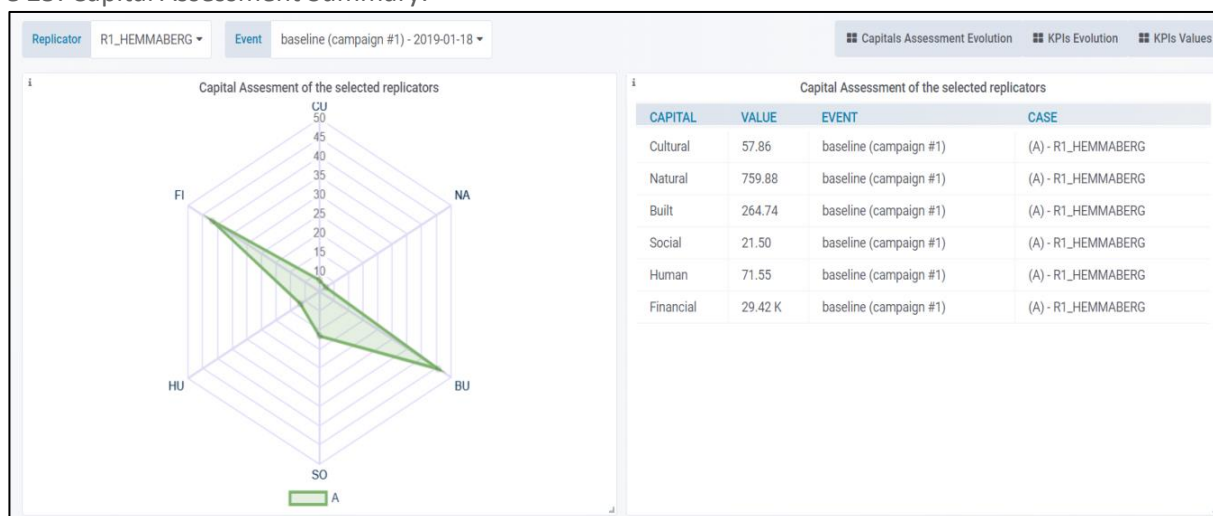


The graph panel plots the graphs related to the user choice via the aforementioned filters, while the area located on the right dashboard side, shows a legend along with some values and statistics to make it easier the graph interpretation.

Besides, the same as happens with the KPIs Values Dashboard, the graph actually shows the normalized KPIs Values, since otherwise, the graph would be illegible. The real values are included in the right area along with the legend. The dashboard allows making all kind of comparisons simply changing the filters. This provides the user with great flexibility when it comes to customizing the data to be shown.

5.2.3 Community Capital Assessment Summary Dashboard

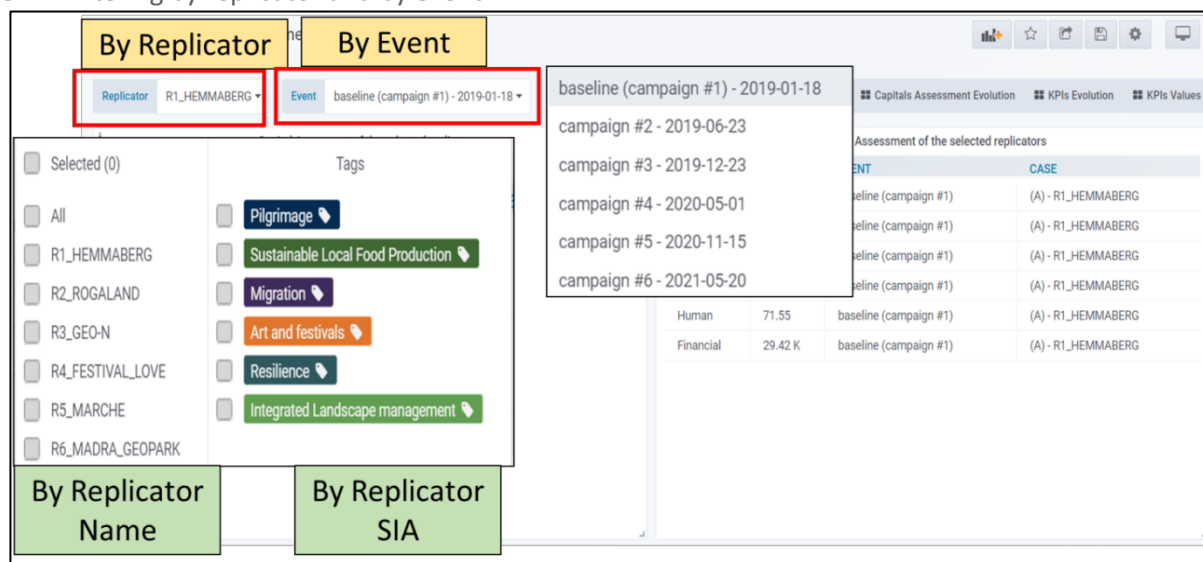
Figure 25: Capital Assessment Summary.



© RURITAGE own development.

The third dashboard developed is intended to display a community capital assessment summary. A community capital assessment basically indicates how is the performance of a specific replicator regarding the six community capitals. The dashboard allows filtering by replicator and by event in the same vein as the KPIs Values Dashboard.

Figure 24: Filtering by replicator and by event.



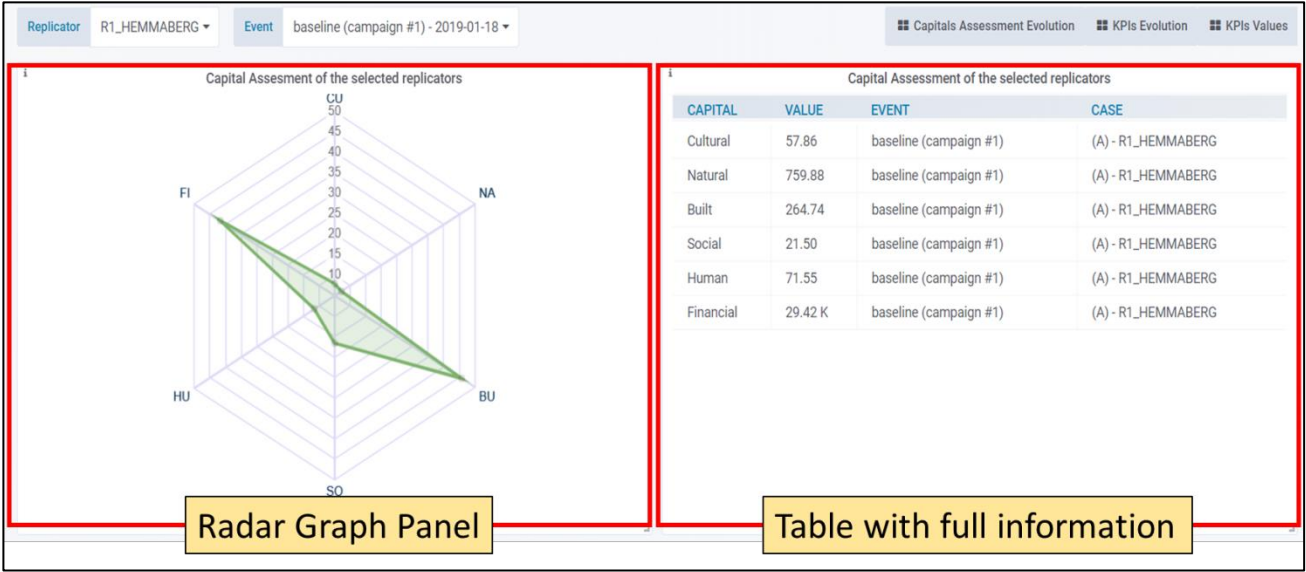
© RURITAGE own development.

Hence, the dashboard will show the community capital assessment of the selected:

- replicators (via replicator name and/or replicator SIA)
- the event when the data was collected

The dashboard is also made up of a Radar Graph Panel and a table which shows detailed information regarding the data displayed (see Figure 25). It is quite similar to the KPIs Values Dashboard (see section 5.2.1), therefore more details probably should not be necessary to know how to use it.

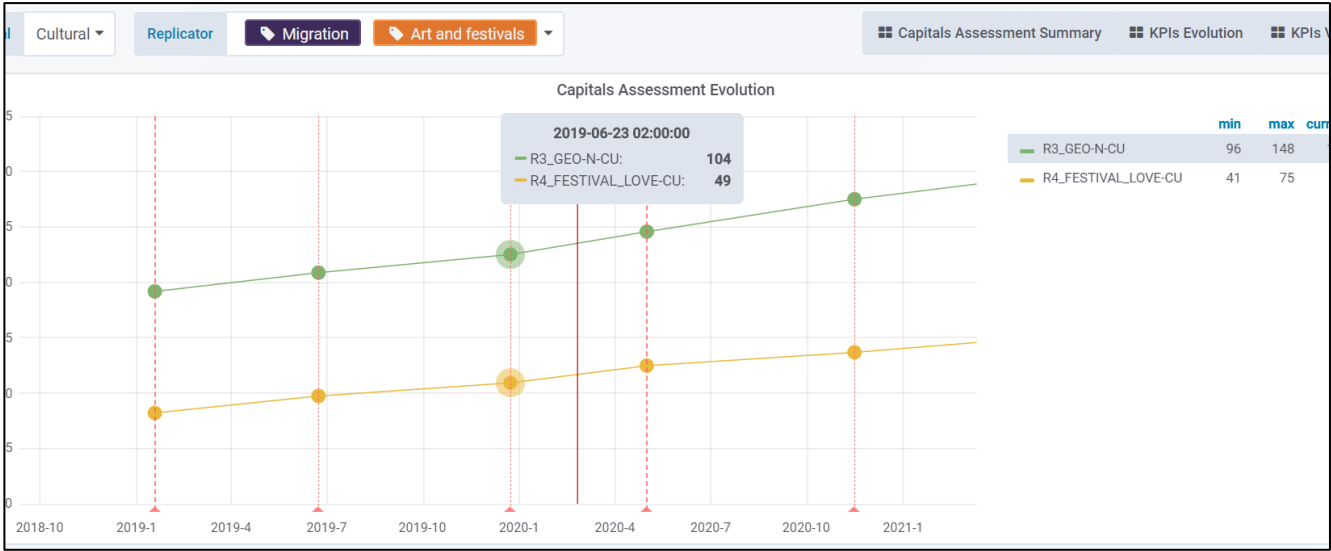
Figure 26: Main areas of the Community Capital Assessment Dashboard.



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5.2.4 Community Capital Assessment Evolution Dashboard

Figure 25. Community Capital Assessment Dashboard.

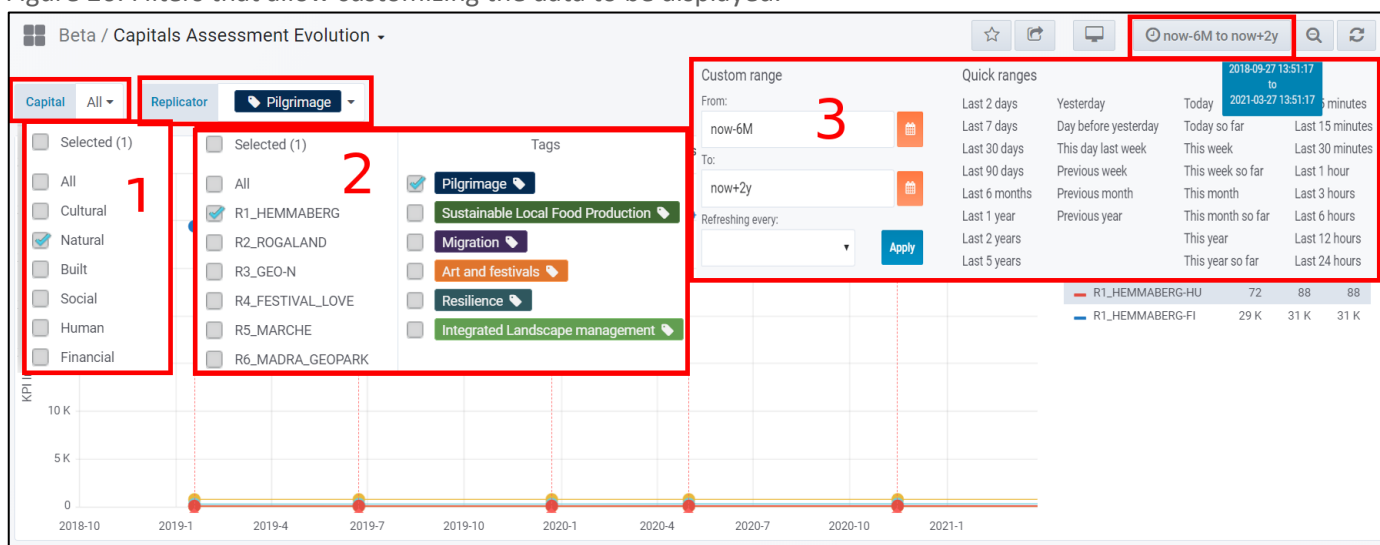


© RURITAGE own development.

The last but not least dashboard developed is intended to display the evolution over time of the chosen community capitals according to the selected replicators. As with the KPIs Evolution Dashboard, several filters have been included along with the filter Grafana already natively provides to specify the timeline.

Therefore, the user can pick which community capitals (via a specific filter see Figure 26 – filter #1) to be shown, according to the selected replicators (via its name and/or its SIA tag) (see Figure 26 – filter #2) over the specified timeline (via Grafana native filter, see Figure 26 – filter #3).

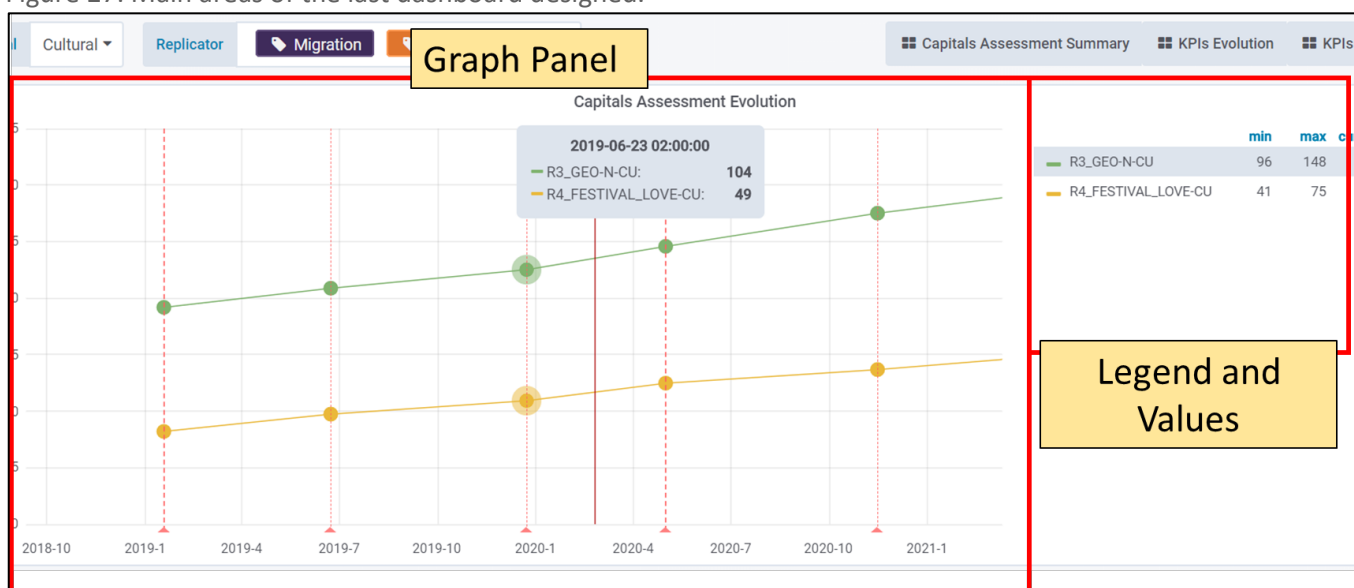
Figure 26: Filters that allow customizing the data to be displayed.



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The dashboard is made up of a graph panel (on the left) and an area with a legend that also shows some values and statistics (on the right) (see Figure below).

Figure 27: Main areas of the last dashboard designed.



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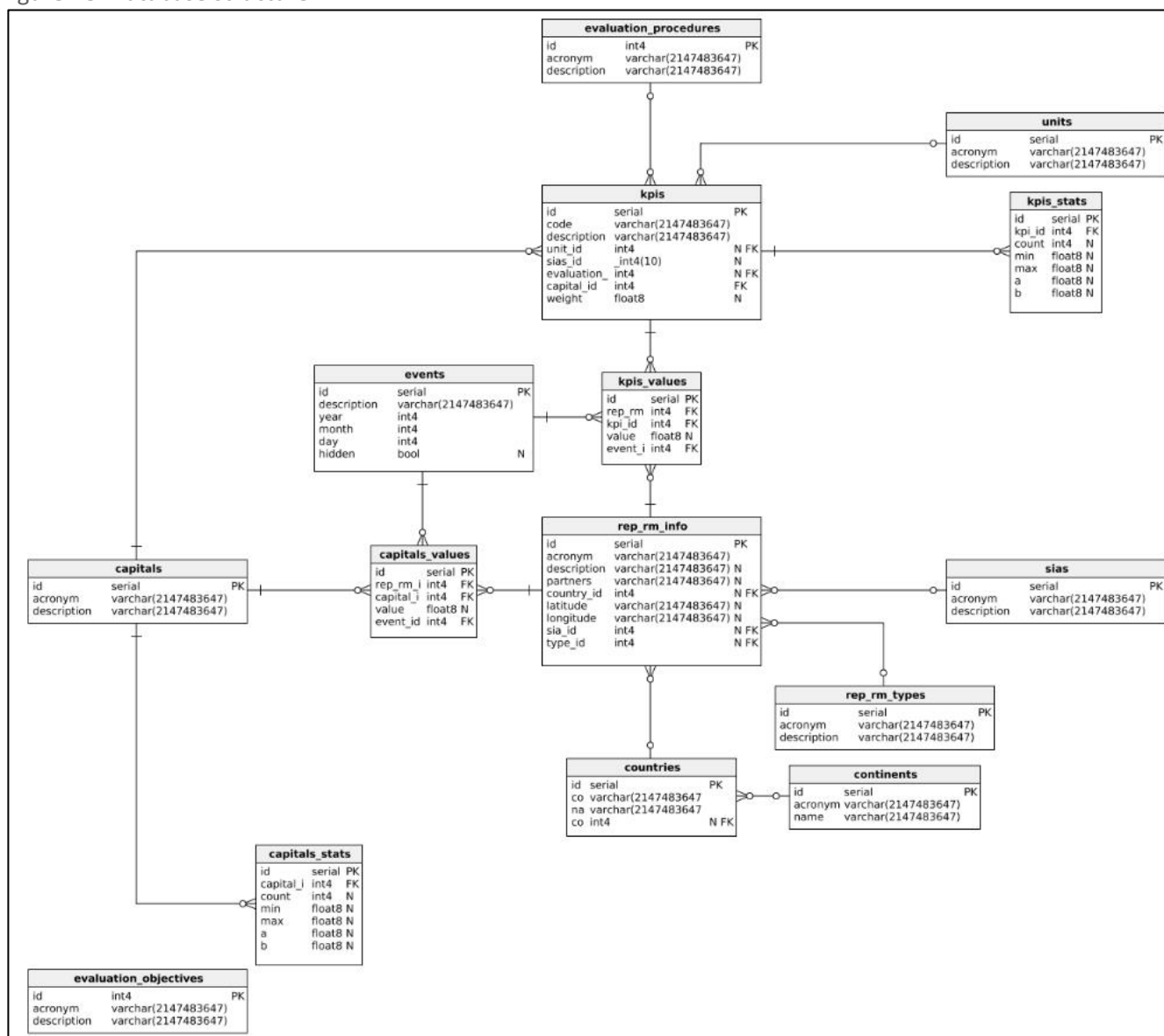
As it happens with the KPIs Evolution Dashboard, the graph panel plots the graphs related to the user choice via the aforementioned filters, while the area located on the right dashboard side, shows a legend along with some values and statistic to make it easier the graph interpretation. It also allows making all kind of comparisons simply changing the filters.

5.3 Database Description

5.3.1 General Database Structure

The structure of the database describes the different parts that make it up. Subsequently, a complete description of each table is provided, field by field.

Figure 28: Database structure.



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5.3.2 Database Components

The different types of tables can be divided in three groups:

- Data tables: these tables store data records.
- Parametric tables: are where enumeration values are stored.
- Relational tables: these tables support the relationships among the different entities.

A description, field by field, of the database showed in Figure 28 is provided. To facilitate their identification, tables have been grouped according to the type they belong to. Thus, first the parametric tables will be described, then the data tables and, finally, the relational tables. For the documentation of the fields of the tables, a series of labels or flags are used, such as those shown in Table 8, which indicate whether the field has any special characteristic that defines it.

Table 8: Labels or flags for table fields.

Flag	Description
PK	Primary Key: Unique identifier for every element on the table
NN	Not Null: The field cannot be null
AI	Auto Increment: Field value auto increments itself
FK	Foreign Key: References to the primary key of other table that is related to this

Parametric Tables

The following tables store the parametric information needed for the functioning of the system, i.e. the values of predefined enumerations.

- Table capitals:

Table 9: Parametric table capitals.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier for capitals
acronym	varchar		Code or abbreviate name
description	varchar		Description

Table 10: Content of the table capitals.

id	acronym	Description
1	CU	Cultural

2	NA	Natural
3	BU	Built
4	SO	Social
5	HU	Human
6	FI	Financial

➤ Table countries:

Table 11: Parametric table countries.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier for countries
code	varchar		Code or abbreviate name
name	varchar		Country name

Table 12: Content of the table countries.

id	acronym	Description
1	AT	Austria
2	ES	Spain
3	RO	Romania
4	BR	Brazil
5	NO	Norway
6	IT	Italy
7	CO	Colombia
8	DE	Germany
9	GR	Greece
10	SI	Slovenia

11	FR	France
12	HU	Hungary
13	IS	Iceland
14	TR	Turkey
15	CL	Chile

➤ Table evaluation_objectives:

Table 13: Parametric table evaluation_objectives.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier
acronym	varchar		Code or abbreviate name
description	varchar		Description

Table 14: Content of the table evaluation_objectives.

id	acronym	Description
1	HIA	Heritage impact assessment of the selected strategies
2	NCPS	New cultural products & services
3	NT	New tourists
4	SG	Socioeconomic growth due to interventions
5	SU	Start-ups in new productive activities
6	ANI	Attracting new investment in the regeneration sector
7	IQL	Improvements in the quality of life of the citizens
8	BCI	Behaviour change due to the different interventions
9	EC	Evaluating the acceptance and perception of the citizens
10	DT	Developing talent

11	IEP	Improvement of the energy performance and comfort due to building reuse and maintenance
12	LCM	Environmental impact due to interventions from whole life cycle of materials

➤ Table evaluation_procedures:

Table 15: Parametric table evaluation_procedures.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier
acronym	varchar		Code or abbreviate name
description	varchar		Description

Table 16: Content of the table evaluation_procedures.

id	acronym	Description
1	EFF	Based on EFFESUS
2	TP	Tailored procedure
3	CON	Based on CONCERTO
4	IP	IPMVP
5	STD	Standard (simplified)
6	EURO01	Data obtained from Eurostat dataset: Number and average size of enterprises in the cultural sectors by NACE2 activity
7	GOOGLE	Data obtained from Google Trends/Analytics
8	RURITAGE	Data provided by RURITAGE Framework
9	CROWDF	Data obtained from main crowdfunding platforms or provided by Replicators
10	LOCALDB	Local databases
11	NATLOCDB	National / Local databases

12	EURO02	Eurostat dataset: Air emissions accounts by NACE2 activity
13	EURO03	Eurostat dataset: share of renewable energy in gross final energy consumption by sector
14	LOCDBGIS	Local databases / GIS
15	AD-HOC	Ad hoc measurement
16	EURO04	Eurostat dataset: Participation in formal or informal voluntary activities, or active citizenship by income quintile, household type and degree of urbanisation
17	EURO05	Eurostat dataset: http://ec.europa.eu/eurostat/web/products-datasets/-/tgs00091
18	QUEST	Questionnaire
19	EURO06	Eurostat dataset: http://ec.europa.eu/eurostat/web/products-datasets/-/lfst_r_e2sganu
20	EURO07	Eurostat dataset: Nights spent at tourist accommodation establishments by degree of urbanisation and by NUTS 2 regions
21	EURO08	Eurostat dataset: Unemployment rates by sex, age and degree of urbanisation

➤ Table kpis:

Table 17: Parametric table kpis.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier
code	varchar		Code or abbreviate name
description	varchar		Description
unit_id	int	FK, NN	Unit identifier
sias_id	int	FK, NN	SIA identifier
evaluation_procedure_id	int	FK, NN	Evaluation procedure id.

capital_id	int	FK, NN	Capital identifier
weight	float	NN	Assigned weight

Table 18: Content of the table kpis.

id	code	description	unit_id	sias_id	eval_proc_id	capital_id	weight
1	CC-01	Number of enterprises in the cultural sector		{4}	6	1	1
2	CC-02	Increment in the number of mentions of CNH in social media, media, press, etc.			7	1	7
3	CC-03	Number of users registered in the digital hub or following the social networks (Facebook, Twitter,...)			8	1	6
4	CC-04	Number of posts in the digital hub			8	1	4
5	CC-05	Number of posts mentioning RURITAGE at local level			8	1	5
6	CC-06	Number of actions and cultural events produced by citizens at local level		{4}	8	1	5
7	CC-07	Number of people reached by actions and cultural events produced by citizens at local level		{4}	8	1	5
8	CC-08	Number of crowdfunding campaigns launched			9	1	10
9	CC-09	Number of people trained in traditional skills			8	1	3
10	CC-10	Number of places involved in the tourism offer			8	1	5
11	CC-11	Total number of arrivals of tourist in the last year			8	1	5
12	NC-01	Value of ecosystem services		{2,5}	10	2	3
13	NC-02	Number of designations			11	2	1

14	NC-03	Area of designations			11	2	1
15	NC-04	Emission of greenhouse gases			12	2	2
16	NC-05	Share of renewable energy in gross final energy consumption			13	2	5
17	NC-06	Number of companies and organizations with sustainability certifications and labelling		{2}	11	2	6
18	NC-07	Number of shops, restaurants and tourism facilities selling local products (KM0)		{2}	11	2	4
19	NC-08	Number of "green tourism packages"			10	2	10
20	BC-01	Number of hotspots provided			10	3	4
21	BC-02	Number of people reached through RURITAGE digital tools			8	3	3
22	BC-03	Number of CNH objects mapped through ATLAS			8	3	8
23	BC-04	Number of beds			11	3	7
24	BC-05	Number of restaurants			11	3	1
25	BC-06	Cycle paths (Km)			14	3	9
26	BC-07	Pedestrian/hiking paths (km)			14	3	6
27	BC-08	Share of people served by public transport services			10	3	3
28	BC-09	Number of shared transport services (bike sharing, car sharing, etc.)			10	3	7
29	BC-10	Number of sites accessible by people with disabilities			10	3	3
30	BC-11	Number of buildings restored/retrofitted			10	3	1
31	BC-12	Number of reused buildings			10	3	10
32	BC-13	Number of brands and labels granted for local products and		{2}	11	3	7

		services					
33	BC-14	Number of fairs and tourism events per year related to the promotion of the area and related products			11	3	1
34	BC-15	Number of sites provided with signals and explanation panels to help describing the sites and orienteering visitors			11	3	6
35	BC-16	Number of km of routes provided with signals and explanation panels to help describing the sites and orienteering visitors			11	3	6
36	SC-01	Number of citizens engagement activities			10	4	1
37	SC-02	Number of participants in citizens engagement activities			10	4	1
38	SC-03	Number per type of stakeholder involved (according to the ones defined in D.3.1)			15	4	5
39	SC-04	Number of local associations involved			15	4	3
40	SC-05	Number of participants in formal or informal voluntary activities or active citizenship in the last 12 months			16	4	9
41	SC-06	Number of projects addressing migrants			15	4	9
42	SC-07	Number of people involved in projects addressing migrants			15	4	9
43	SC-08	Number of projects addressing people with disabilities			15	4	1
44	SC-09	Number of people involved in projects addressing people with disabilities			15	4	1
45	SC-10	Number of disadvantaged people engaged (elderly, migrants, unemployed)			15	4	1

46	HC-01	Level of education			17	5	7
47	HC-02	Number of recreational facilities/events			18	5	6
48	HC-03	Number of immigrants involved in educational-training programs		{3}	18	5	6
49	HC-04	Number of internship for immigrants activated		{3}	18	5	6
50	HC-05	Number of self-employees			19	5	2
51	HC-06	Number of internship for students			18	5	1
52	HC-07	Number of people trained in IT and tourism (in specific SIA)			18	5	10
53	HC-08	Number of people involved in professional management training course (summer school and master)			18	5	7
54	HC-09	Number of publication as recommendation and guidelines provided			18	5	4
55	FC-01	Nights spent at tourist accommodation establishments			20	6	5
56	FC-02	Year revenues per sector/municipality (in specific SIA)			10	6	4
57	FC-03	Number of PPPs set and signed			10	6	6
58	FC-04	Unemployment rate (%)			21	6	7
59	FC-05	Number of start-ups and spin-off created / Birth of enterprises			11	6	2
60	FC-06	Number of companies supported in defining new business models and innovative processes of production			10	6	10

➤ Table rep_rm_types:

Table 19: Parametric table rep_rm_types.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier
acronym	varchar		Code or abbreviate name
description	varchar		Description

Table 20: Content of the table rep_rm_types.

id	acronym	description
1	RM	Role Model
2	REP	Replicator

➤ Table sias:

Table 21: Parametric table sias.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier
acronym	varchar		Code or abbreviate name
description	varchar		Description

Table 22: Content of the table sias.

id	acronym	description
1	PIL	Pilgrimage
2	FOOD	Sustainable Local Food Production
3	MIG	Migration
4	A&F	Arts and festivals

5	RSL	Resilience
6	LAND	Integrated Landscape Management

➤ Table units:

Table 23: Parametric table units.

Field	Type	Flags	Description
id	serial	PK, NN, AI	Unique identifier
acronym	varchar		Code or abbreviate name
description	varchar		Description

Data Tables

The following tables store information records relevant to the management of the monitoring programme. Information is variable and depends on contents provided or modified by the user, so table contents are not listed here. This is specific information about the KPIs values and the data gathering events. A user with the appropriate permissions can access these records, modify them or include new information in the database.

- Table capitals_stats
- Table events
- Table kpis_stats
- Table rep_rm_info

Relational Tables

Sometimes there are complex relationships between the different entities that make up the system. A relationship between two tables is "many to many" when each element of a table can be related to one or more of the elements of the other table, and vice versa.

The way to store these relationships between elements of different tables is through a relational table that links them. Sometimes, this new table can have additional fields to store variables of the represented relation. The following tables contain information that relates entities to each other. As in the case of data tables, the content of these tables is not listed since it is not static.

- Table capitals_values
- Table kpis_values

6. Annex I: KPI Weights Analysis

A complete description of the analysis done for KPI weighting is included in this annex. Methodology is according to what was described in section 4.5.

Table 24: Natural Capital ranking assignment by experts (E_i).

Code	Description	Ranking					
		E1	E2	E3	E4	E5	E6
NC-01	Value of ecosystem services	1	1	1	1	1	1
NC-02	Number of designations	7	7	6	3	5	2
NC-03	Area of designations	5	8	5	2	4	3
NC-04	Emission of greenhouse gases	8	4	4	4	8	8
NC-05	Share of renewable energy in gross final energy consumption	4	5	3	5	7	6
NC-06	Number of companies and organizations with sustainability certifications and labelling	6	2	8	8	6	7
NC-07	Number of shops, restaurants and tourism facilities selling local products (KM0)	2	3	2	7	3	4
NC-08	Number of "green tourism packages"	3	6	7	6	2	5

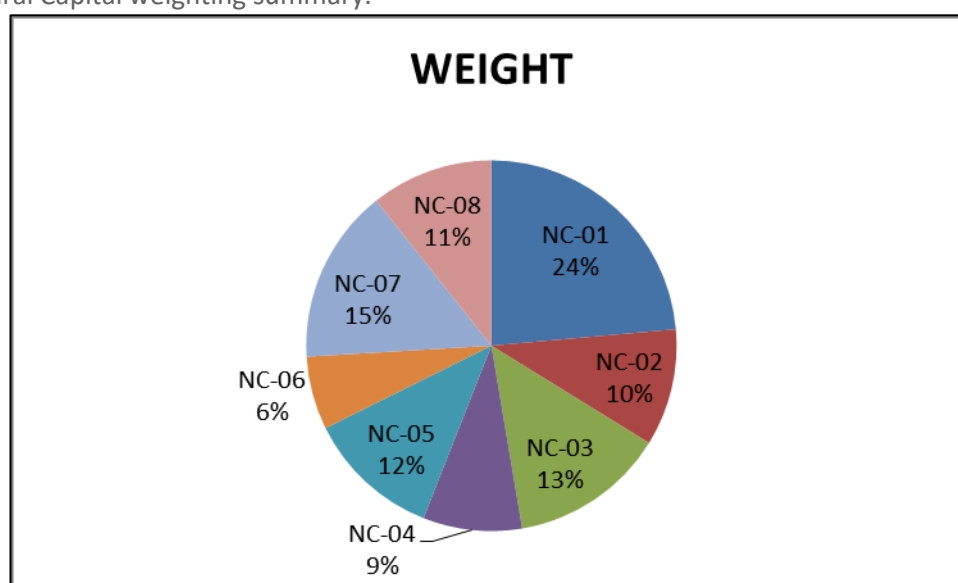
Table 25: Natural Capital score assignment by expert no.1 (E1).

Ranking	Code	Score	NC-01	NC-07	NC-08	NC-05	NC-03	NC-06	NC-02	NC-04	+1	%
1	NC-01	0	0	0	2	2	2	5	5	5	6	22%
2	NC-07	2		0	2	2	2	5	5	5	6	22%
3	NC-08	0			0	0	0	3	3	3	4	15%
4	NC-05	0				0	0	3	3	3	4	15%
5	NC-03	3					0	3	3	3	4	15%
6	NC-06	0						0	0	0	1	4%
7	NC-02	0							0	0	1	4%
8	NC-04	-								0	1	4%
											27	100%

Table 26: Natural Capital indicators weighting.

Code	Description	Ranking						Weight
		E1	E2	E3	E4	E5	E6	
NC-01	Value of ecosystem services	0.22	0.24	0.24	0.26	0.25	0.21	0.24
NC-02	Number of designations	0.04	0.02	0.09	0.16	0.12	0.18	0.10
NC-03	Area of designations	0.15	0.02	0.11	0.19	0.15	0.18	0.14
NC-04	Emission of greenhouse gases	0.04	0.14	0.16	0.13	0.02	0.03	0.09
NC-05	Share of renewable energy in gross final energy consumption	0.15	0.14	0.16	0.13	0.04	0.08	0.12
NC-06	Number of companies and organizations with sustainability certifications and labelling	0.04	0.17	0.02	0.03	0.08	0.05	0.06
NC-07	Number of shops, restaurants and tourism facilities selling local products (KMO)	0.22	0.17	0.18	0.03	0.15	0.16	0.15
NC-08	Number of "green tourism packages"	0.15	0.10	0.04	0.06	0.19	0.11	0.11
								1

Figure 29: Natural Capital weighting summary.



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Table 27: Built Capital ranking assignment by experts (E_i).

Code	Description	Ranking					
		E1	E2	E3	E4	E5	E6
BC-01	Number of hotspots provided	16	7	16	8	14	14
BC-02	Number of people reached through RURITAGE digital tools	15	16	11	16	15	16
BC-03	Number of CNH objects mapped through ATLAS	14	15	15	14	16	15
BC-04	Number of beds	9	4	10	13	10	12
BC-05	Number of restaurants	13	5	14	12	9	11
BC-06	Cycle paths (Km)	2	6	4	2	5	4
BC-07	Pedestrian/hiking paths (km)	1	8	2	1	3	5
BC-08	Share of people served by public transport services	11	9	1	3	4	8
BC-09	Number of shared transport services (bike sharing, car sharing, etc.)	8	10	9	7	11	13
BC-10	Number of sites accessible by people with disabilities	10	13	8	6	6	3
BC-11	Number of buildings restored/retrofitted	4	12	12	11	2	1
BC-12	Number of reused buildings	3	11	3	10	1	2
BC-13	Number of brands and labels granted for local products and services	12	3	7	9	12	9
BC-14	Number of fairs and tourism events per year related to the promotion of the area and related products	7	1	6	15	13	10
BC-15	Number of sites provided with signals and explanation panels to help describing the sites and orienteering visitors	5	2	13	5	8	6
BC-16	Number of km of routes provided with signals and explanation panels to help describing the sites and orienteering visitors	6	14	5	4	7	7

Table 28: Built Capital score assignment by expert no.1 (E1).

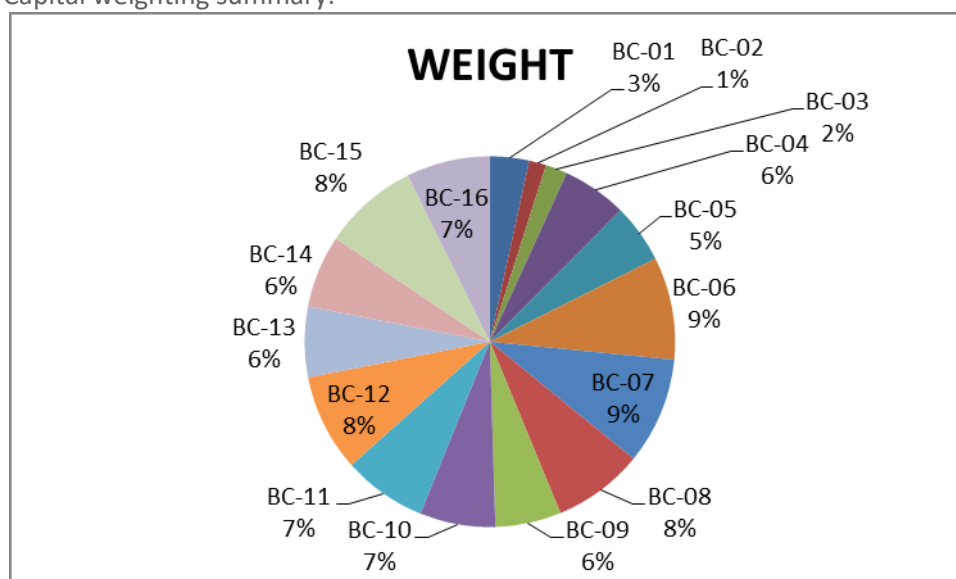
Ranking	Code	Score	BC-07	BC-06	BC-12	BC-11	BC-15	BC-16	BC-14	BC-09	BC-04	BC-10	...	+1	%
1	BC-07	0	0	0	0	0	1	1	3	4	5	5	5	8	11%
2	BC-06	0		0	0	0	1	1	3	4	5	5	5	8	11%
3	BC-12	0			0	0	1	1	3	4	5	5	5	8	11%
4	BC-11	1				0	1	1	3	4	5	5	5	8	11%
5	BC-15	0					0	0	2	3	4	4	4	7	10%
6	BC-16	2						0	2	3	4	4	4	7	10%
7	BC-14	1							0	1	2	2	2	5	7%
8	BC-09	1								0	1	1	1	4	5%
9	BC-04	0									0	0	0	3	4%
10	BC-10	0										0	0	3	4%
11	BC-08	0											0	3	4%
12	BC-13	1												3	4%
13	BC-05	0												2	3%
14	BC-03	1												2	3%
15	BC-02	0												1	1%
16	BC-01	-												1	1%
														73	100%

Table 29: Built Capital indicators weighting.

Code	Description	Ranking						Weight
		E1	E2	E3	E4	E5	E6	
BC-01	Number of hotspots provided	0,01	0,07	0,01	0,06	0,02	0,03	0,03
BC-02	Number of people reached through RURITAGE digital tools	0,01	0,01	0,04	0,01	0,02	0,00	0,01
BC-03	Number of CNH objects mapped through ATLAS	0,03	0,01	0,02	0,02	0,02	0,02	0,02

BC-04	Number of beds	0,04	0,09	0,05	0,03	0,06	0,05	0,06
BC-05	Number of restaurants	0,03	0,09	0,04	0,04	0,06	0,05	0,05
BC-06	Cycle paths (Km)	0,11	0,07	0,09	0,10	0,08	0,08	0,09
BC-07	Pedestrian/hiking paths (km)	0,11	0,07	0,09	0,10	0,10	0,08	0,09
BC-08	Share of people served by public transport services	0,04	0,07	0,11	0,10	0,10	0,07	0,08
BC-09	Number of shared transport services (bike sharing, car sharing, etc.)	0,05	0,07	0,07	0,08	0,03	0,04	0,06
BC-10	Number of sites accessible by people with disabilities	0,04	0,03	0,07	0,09	0,08	0,09	0,07
BC-11	Number of buildings restored/retrofitted	0,11	0,03	0,04	0,06	0,11	0,09	0,07
BC-12	Number of reused buildings	0,11	0,05	0,09	0,06	0,11	0,09	0,08
BC-13	Number of brands and labels granted for local products and services	0,04	0,10	0,08	0,06	0,03	0,06	0,06
BC-14	Number of fairs and tourism events per year related to the promotion of the area and related products	0,07	0,13	0,08	0,01	0,03	0,06	0,06
BC-15	Number of sites provided with signals and explanation panels to help describing the sites and orienteering visitors	0,10	0,11	0,04	0,09	0,08	0,08	0,08
BC-16	Number of km of routes provided with signals and explanation panels to help describing the sites and orienteering visitors	0,10	0,01	0,09	0,09	0,08	0,08	0,07
								1,00

Figure 30: Built Capital weighting summary.



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Table 30: Social Capital ranking assignment by experts (E_i).

Code	Description	Ranking					
		E1	E2	E3	E4	E5	E6
SC-01	Number of citizens engagement activities	1	3	2	1	2	3
SC-02	Number of participants in citizens engagement activities	4	1	1	2	1	2
SC-03	Number per type of stakeholder involved (according to the ones defined in D.3.1)	3	2	7	3	3	10
SC-04	Number of local associations involved	6	4	6	4	4	4
SC-05	Number of participants in formal or informal voluntary activities or active citizenship in the last 12 months	2	5	10	5	5	1
SC-06	Number of projects addressing migrants	10	8	9	7	10	6
SC-07	Number of people involved in projects addressing migrants	7	6	5	9	9	5
SC-08	Number of projects addressing people with disabilities	9	10	8	8	8	8
SC-09	Number of people involved in projects addressing people with disabilities	8	9	4	10	7	7
SC-10	Number of disadvantaged people engaged (elderly, migrants, unemployed)	5	7	3	6	6	9

Table 31: Social Capital score assignment by expert no.1 (E1).

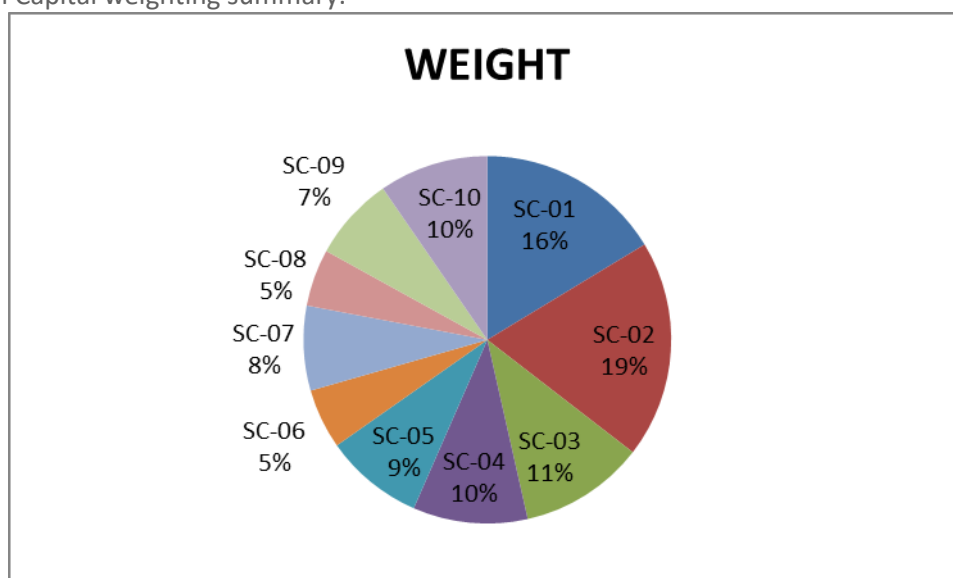
Ranking	Code	Score	SC-01	SC-05	SC-03	SC-02	SC-10	SC-04	SC-07	SC-09	SC-08	SC-06	+1	%
1	SC-01	0	0	0	0	1	2	3	3	3	5	7	8	14%
2	SC-05	0		0	0	1	2	3	3	3	5	7	8	14%
3	SC-03	1			0	1	2	3	3	3	5	7	8	14%
4	SC-02	1				0	1	2	2	2	4	6	7	13%
5	SC-10	1					0	1	1	1	3	5	6	11%
6	SC-04	0						0	0	0	2	4	5	9%
7	SC-07	0							0	0	2	4	5	9%
8	SC-09	2								0	2	4	5	9%
9	SC-08	2									0	2	3	5%
10	SC-06	-										0	1	2%
													56	100%

Table 32: Social Capital indicators weighting.

Code	Description	Ranking						Weight
		E1	E2	E3	E4	E5	E6	
SC-01	Number of citizens engagement activities	0,14	0,13	0,19	0,22	0,18	0,13	0,16
SC-02	Number of participants in citizens engagement activities	0,13	0,21	0,23	0,17	0,29	0,13	0,19
SC-03	Number per type of stakeholder involved (according to the ones defined in D.3.1)	0,14	0,18	0,04	0,15	0,12	0,03	0,11
SC-04	Number of local associations involved	0,09	0,10	0,08	0,15	0,06	0,13	0,10
SC-05	Number of participants in formal or informal voluntary activities or active citizenship in the last 12 months	0,14	0,08	0,02	0,10	0,06	0,13	0,09
SC-06	Number of projects addressing migrants	0,02	0,08	0,02	0,05	0,06	0,09	0,05

SC-07	Number of people involved in projects addressing migrants	0,09	0,08	0,10	0,02	0,06	0,09	0,07
SC-08	Number of projects addressing people with disabilities	0,05	0,03	0,02	0,05	0,06	0,09	0,05
SC-09	Number of people involved in projects addressing people with disabilities	0,09	0,05	0,13	0,02	0,06	0,09	0,07
SC-10	Number of disadvantaged people engaged (elderly, migrants, unemployed)	0,11	0,08	0,17	0,07	0,06	0,09	0,10
								1

Figure 31: Social Capital weighting summary.



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Table 33: Human Capital ranking assignment by experts (E_i).

Code	Description	Ranking					
		E1	E2	E3	E4	E5	E6
HC-01	Level of education	1	1	1	1	1	6
HC-02	Number of recreational facilities/events	9	7	4	8	2	8
HC-03	Number of immigrants involved in educational-training programs	8	8	2	6	4	1
HC-04	Number of internship for immigrants activated	5	6	3	7	5	3
HC-05	Number of self-employees	3	2	6	4	3	2
HC-06	Number of internship for students	6	4	9	5	6	5
HC-07	Number of people trained in IT and tourism (in specific SIA)	4	3	7	2	7	4
HC-08	Number of people involved in professional management training course (summer school and master)	2	5	8	3	8	7
HC-09	Number of publication as recommendation and guidelines provided	7	9	5	9	9	9

Table 34: Human Capital score assignment by expert no.1 (E₁).

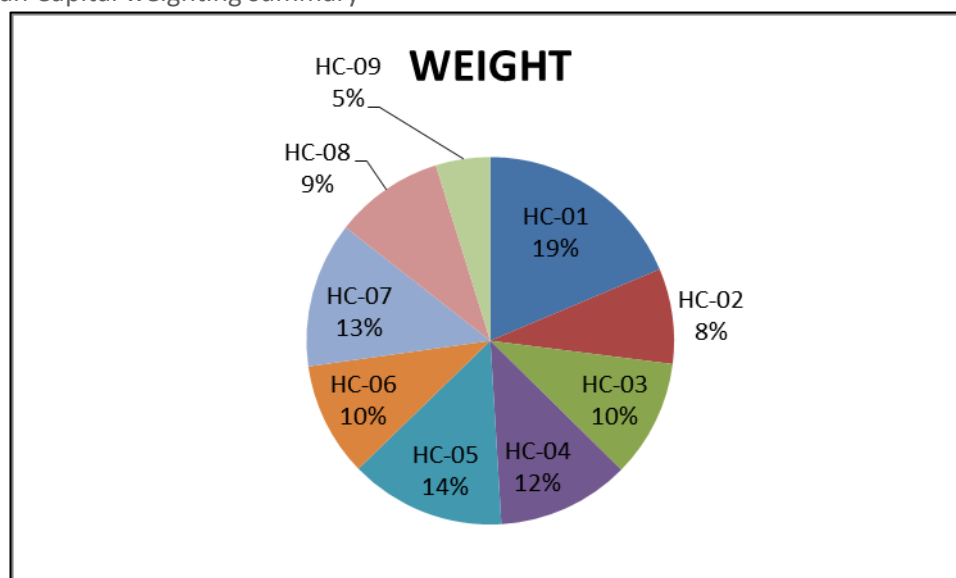
Ranking	Code	Score	HC-01	HC-08	HC-05	HC-07	HC-04	HC-06	HC-09	HC-03	HC-02	+1	%
1	HC-01	0	0	0	1	1	2	2	3	4	5	6	17%
2	HC-08	1		0	1	1	2	2	3	4	5	6	17%
3	HC-05	0			0	0	1	1	2	3	4	5	14%
4	HC-07	1				0	1	1	2	3	4	5	14%
5	HC-04	0					0	0	1	2	3	4	11%
6	HC-06	1						0	1	2	3	4	11%
7	HC-09	1							0	1	2	3	8%

8	HC-03	1								0	1	2	6%
9	HC-02	-									0	1	3%
												36	100%

Table 35: Human Capital indicators weighting.

Code	Description	Ranking						Weight
		E1	E2	E3	E4	E5	E6	
HC-01	Level of education	0,17	0,21	0,20	0,26	0,20	0,09	0,19
HC-02	Number of recreational facilities/events	0,03	0,07	0,16	0,05	0,15	0,04	0,08
HC-03	Number of immigrants involved in educational-training programs	0,06	0,03	0,18	0,05	0,11	0,19	0,10
HC-04	Number of internship for immigrants activated	0,11	0,09	0,18	0,05	0,11	0,16	0,12
HC-05	Number of self-employees	0,14	0,19	0,08	0,11	0,13	0,18	0,14
HC-06	Number of internship for students	0,11	0,14	0,02	0,11	0,11	0,12	0,10
HC-07	Number of people trained in IT and tourism (in specific SIA)	0,14	0,16	0,06	0,16	0,11	0,15	0,13
HC-08	Number of people involved in professional management training course (summer school and master)	0,17	0,10	0,04	0,16	0,07	0,04	0,10
HC-09	Number of publication as recommendation and guidelines provided	0,08	0,02	0,10	0,05	0,02	0,01	0,05
								1

Figure 32: Human Capital weighting summary



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Table 36: Financial Capital ranking assignment by experts (E_i).

Code	Description	Ranking					
		E1	E2	E3	E4	E5	E6
FC-01	Nights spent at tourist accommodation establishments	5	4	6	6	4	2
FC-02	Year revenues per sector/municipality (in specific SIA)	4	3	2	4	2	5
FC-03	Number of PPPs set and signed	6	5	3	3	6	6
FC-04	Unemployment rate (%)	2	1	1	5	1	4
FC-05	Number of start-ups and spin-off created/Birth of enterprises	3	2	5	1	3	1
FC-06	Number of companies supported in defining new business models and innovative processes of production	1	6	4	2	5	3

Table 37: Financial Capital score assignment by expert no.1 (E1).

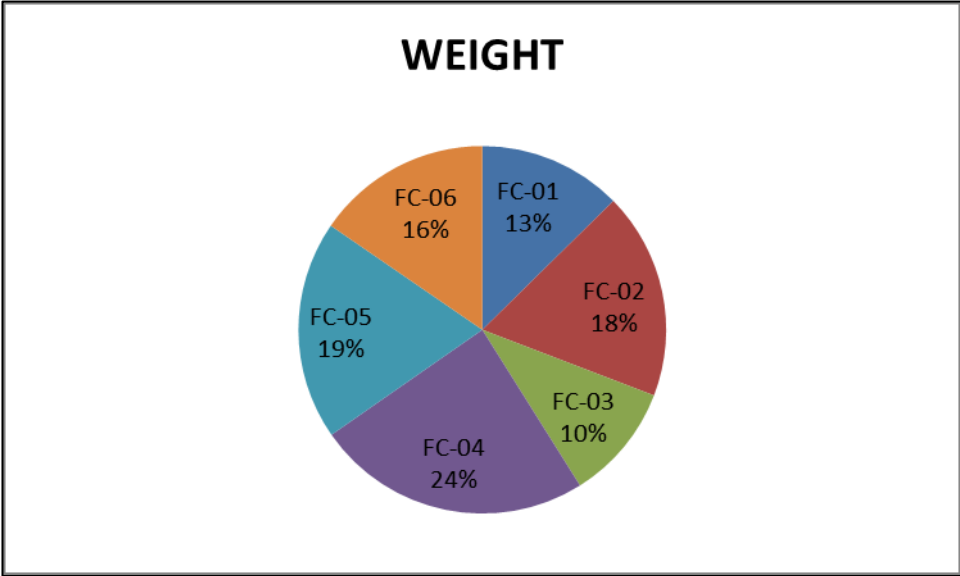
Ranking	Code	Score	FC-06	FC-04	FC-05	FC-02	FC-01	FC-03	+1	%
1	FC-06	1	0	1	1	2	2	5	6	24%
2	FC-04	0		0	0	1	1	4	5	20%
3	FC-05	1			0	1	1	4	5	20%
4	FC-02	0				0	0	3	4	16%

5	FC-01	3					0	3	4	16%
6	FC-03	-						0	1	4%
									25	100%

Table 38: Financial Capital indicators weighting.

Code	Description	Ranking						Weight
		E1	E2	E3	E4	E5	E6	
FC-01	Nights spent at tourist accommodation establishments	0,16	0,14	0,03	0,05	0,13	0,26	0,13
FC-02	Year revenues per sector/municipality (in specific SIA)	0,16	0,18	0,26	0,19	0,25	0,05	0,18
FC-03	Number of PPPs set and signed	0,04	0,09	0,18	0,19	0,06	0,05	0,10
FC-04	Unemployment rate (%)	0,20	0,32	0,31	0,10	0,38	0,16	0,24
FC-05	Number of start-ups and spin-off created/Birth of enterprises	0,20	0,23	0,10	0,24	0,13	0,26	0,19
FC-06	Number of companies supported in defining new business models and innovative processes of production	0,24	0,05	0,13	0,24	0,06	0,21	0,15
								1

Figure 33: Financial Capital weighting summary



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7. Annex II. Database Implementation

This annex shows the script for database implementation, according to the description included in previous sections of this deliverable. PostgreSQL is the database management system selected, and script is adapted to this database characteristics.

```
-- tables
-- Table: capitals
CREATE TABLE capitals (
    id serial NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    description varchar(2147483647) NOT NULL,
    CONSTRAINT capitals_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT capitals_description_key UNIQUE (description) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT capitals_pkey PRIMARY KEY (id)
);

-- Table: capitals_stats
CREATE TABLE capitals_stats (
    id serial NOT NULL,
    capital_id int4 NOT NULL,
    count int4 NULL,
    min float8 NULL,
    max float8 NULL,
    a float8 NULL,
    b float8 NULL,
    CONSTRAINT capitals_stats_pkey PRIMARY KEY (id)
);

-- Table: capitals_values
CREATE TABLE capitals_values (
    id serial NOT NULL,
    rep_rm_id int4 NOT NULL,
    capital_id int4 NOT NULL,
    value float8 NULL,
    event_id int4 NOT NULL,
    CONSTRAINT capitals_values_pkey PRIMARY KEY (id)
);

-- Table: continents
CREATE TABLE continents (
    id serial NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    name varchar(2147483647) NOT NULL,
    CONSTRAINT continents_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
```

```

        CONSTRAINT continents_name_key UNIQUE (name) NOT DEFERRABLE INITIALLY IMMEDIATE,
        CONSTRAINT continents_pkey PRIMARY KEY (id)
    );

-- Table: countries
CREATE TABLE countries (
    id serial NOT NULL,
    code varchar(2147483647) NOT NULL,
    name varchar(2147483647) NOT NULL,
    continent_id int4 NULL,
    CONSTRAINT countries_code_key UNIQUE (code) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT countries_name_key UNIQUE (name) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT countries_pkey PRIMARY KEY (id)
);

-- Table: evaluation_objectives
CREATE TABLE evaluation_objectives (
    id int4 NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    description varchar(2147483647) NOT NULL,
    CONSTRAINT evaluation_objectives_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT evaluation_objectives_description_key UNIQUE (description) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT evaluation_objectives_pkey PRIMARY KEY (id)
);

-- Table: evaluation_procedures
CREATE TABLE evaluation_procedures (
    id int4 NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    description varchar(2147483647) NOT NULL,
    CONSTRAINT evaluation_procedures_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT evaluation_procedures_description_key UNIQUE (description) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT evaluation_procedures_pkey PRIMARY KEY (id)
);

-- Table: events
CREATE TABLE events (
    id serial NOT NULL,
    description varchar(2147483647) NOT NULL,
    year int4 NOT NULL,
    month int4 NOT NULL,
    day int4 NOT NULL,
    hidden bool NULL,
    CONSTRAINT events_pkey PRIMARY KEY (id)
);

```

```

);

-- Table: kpis
CREATE TABLE kpis (
  id serial NOT NULL,
  code varchar(2147483647) NOT NULL,
  description varchar(2147483647) NOT NULL,
  unit_id int4 NULL,
  sias_id_int4(10) NULL,
  evaluation_procedure_id int4 NULL,
  capital_id int4 NOT NULL,
  weight float8 NULL,
  CONSTRAINT kpis_code_key UNIQUE (code) NOT DEFERRABLE INITIALLY IMMEDIATE,
  CONSTRAINT kpis_pkey PRIMARY KEY (id)
);

-- Table: kpis_stats
CREATE TABLE kpis_stats (
  id serial NOT NULL,
  kpi_id int4 NOT NULL,
  count int4 NULL,
  min float8 NULL,
  max float8 NULL,
  a float8 NULL,
  b float8 NULL,
  CONSTRAINT kpis_stats_pkey PRIMARY KEY (id)
);

-- Table: kpis_values
CREATE TABLE kpis_values (
  id serial NOT NULL,
  rep_rm_id int4 NOT NULL,
  kpi_id int4 NOT NULL,
  value float8 NULL,
  event_id int4 NOT NULL,
  CONSTRAINT kpis_values_pkey PRIMARY KEY (id)
);

-- Table: rep_rm_info
CREATE TABLE rep_rm_info (
  id serial NOT NULL,
  acronym varchar(2147483647) NOT NULL,
  description varchar(2147483647) NULL,
  partners varchar(2147483647) NULL,
  country_id int4 NULL,
  latitude varchar(2147483647) NULL,
  longitude varchar(2147483647) NULL,

```

```

    sia_id int4    NULL,
    type_id int4   NULL,
    CONSTRAINT rep_rm_info_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT rep_rm_info_pkey PRIMARY KEY (id)
);

-- Table: rep_rm_types
CREATE TABLE rep_rm_types (
    id serial NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    description varchar(2147483647) NOT NULL,
    CONSTRAINT rep_rm_types_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT rep_rm_types_description_key UNIQUE (description) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT rep_rm_types_pkey PRIMARY KEY (id)
);

-- Table: sias
CREATE TABLE sias (
    id serial NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    description varchar(2147483647) NOT NULL,
    CONSTRAINT sias_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT sias_description_key UNIQUE (description) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT sias_pkey PRIMARY KEY (id)
);

-- Table: units
CREATE TABLE units (
    id serial NOT NULL,
    acronym varchar(2147483647) NOT NULL,
    description varchar(2147483647) NOT NULL,
    CONSTRAINT units_acronym_key UNIQUE (acronym) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT units_description_key UNIQUE (description) NOT DEFERRABLE INITIALLY IMMEDIATE,
    CONSTRAINT units_pkey PRIMARY KEY (id)
);

-- foreign keys
-- Reference: capitals_stats_capital_id_fkey (table: capitals_stats)
ALTER TABLE capitals_stats ADD CONSTRAINT capitals_stats_capital_id_fkey
    FOREIGN KEY (capital_id)
    REFERENCES capitals (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: capitals_values_capital_id_fkey (table: capitals_values)

```

```

ALTER TABLE capitals_values ADD CONSTRAINT capitals_values_capital_id_fkey
    FOREIGN KEY (capital_id)
    REFERENCES capitals (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: capitals_values_event_id_fkey (table: capitals_values)
ALTER TABLE capitals_values ADD CONSTRAINT capitals_values_event_id_fkey
    FOREIGN KEY (event_id)
    REFERENCES events (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: capitals_values_rep_rm_id_fkey (table: capitals_values)
ALTER TABLE capitals_values ADD CONSTRAINT capitals_values_rep_rm_id_fkey
    FOREIGN KEY (rep_rm_id)
    REFERENCES rep_rm_info (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: countries_continent_id_fkey (table: countries)
ALTER TABLE countries ADD CONSTRAINT countries_continent_id_fkey
    FOREIGN KEY (continent_id)
    REFERENCES continents (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: kpis_capital_id_fkey (table: kpis)
ALTER TABLE kpis ADD CONSTRAINT kpis_capital_id_fkey
    FOREIGN KEY (capital_id)
    REFERENCES capitals (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: kpis_evaluation_procedure_id_fkey (table: kpis)
ALTER TABLE kpis ADD CONSTRAINT kpis_evaluation_procedure_id_fkey
    FOREIGN KEY (evaluation_procedure_id)
    REFERENCES evaluation_procedures (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

```

```

-- Reference: kpis_stats_kpi_id_fkey (table: kpis_stats)
ALTER TABLE kpis_stats ADD CONSTRAINT kpis_stats_kpi_id_fkey
    FOREIGN KEY (kpi_id)
    REFERENCES kpis (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: kpis_unit_id_fkey (table: kpis)
ALTER TABLE kpis ADD CONSTRAINT kpis_unit_id_fkey
    FOREIGN KEY (unit_id)
    REFERENCES units (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: kpis_values_event_id_fkey (table: kpis_values)
ALTER TABLE kpis_values ADD CONSTRAINT kpis_values_event_id_fkey
    FOREIGN KEY (event_id)
    REFERENCES events (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: kpis_values_kpi_id_fkey (table: kpis_values)
ALTER TABLE kpis_values ADD CONSTRAINT kpis_values_kpi_id_fkey
    FOREIGN KEY (kpi_id)
    REFERENCES kpis (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: kpis_values_rep_rm_id_fkey (table: kpis_values)
ALTER TABLE kpis_values ADD CONSTRAINT kpis_values_rep_rm_id_fkey
    FOREIGN KEY (rep_rm_id)
    REFERENCES rep_rm_info (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: rep_rm_info_country_id_fkey (table: rep_rm_info)
ALTER TABLE rep_rm_info ADD CONSTRAINT rep_rm_info_country_id_fkey
    FOREIGN KEY (country_id)
    REFERENCES countries (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

```



```
-- Reference: rep_rm_info_sia_id_fkey (table: rep_rm_info)
ALTER TABLE rep_rm_info ADD CONSTRAINT rep_rm_info_sia_id_fkey
    FOREIGN KEY (sia_id)
    REFERENCES sias (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;

-- Reference: rep_rm_info_type_id_fkey (table: rep_rm_info)
ALTER TABLE rep_rm_info ADD CONSTRAINT rep_rm_info_type_id_fkey
    FOREIGN KEY (type_id)
    REFERENCES rep_rm_types (id)
    NOT DEFERRABLE
    INITIALLY IMMEDIATE
;
```