Report outlining the SRT framework

Smart CulTour

Smart Cultural Tourism as a Driver of Sustainable Development of European Regions

Deliverable

D4.2

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Abstract

The SmartCulTour project aims "to propose and validate innovative, community-led interventions directed at sustainable cultural tourism development contributing to the EU regions' resilience and inclusiveness". Among several priorities, objective number two strives to "establish an improved indicator framework for cultural tourism impacts on sustainability and resilience and link these to an improved Tourism Area Life Cycle (TALC) model ".

Within the work package (WP) 4 tasks dedicated to the fulfilment of this objective were outlined. This Report reflects on Task 4.2., i.e. the Identification of relationships between cultural tourism development and destination's sustainability, resilience and the TALC model, and Task 4.3. on Developing the SRT framework. To deliver our conclusions, using the framework of indicators delivered in Report D4.1., the data collection process was performed by six project partners on the level of 35 Local Administrative Units (LAU) belonging to the six Living Labs. In both sustainability and resilience models, the dynamic panel data method was employed, with the regression analysis additionally applied in the sustainability model to deal with the static indicators.

The obtained research results shed light on the nexus between cultural tourism development and destinations sustainability and resilience. Additionally, the TALC model demonstrated all LLs were in the stage of demand dependence, tending to reach the saturation stage unless restructuring policies and new products such as cultural tourism are introduced.

The Report contains four sections, including the Introduction; the Empirical Analysis section – outlining the data collection process, methods, analysis and main conclusions following each part of the analysis; the TALC modelling section delivering a theoretical foundation for the TALC modelling together with its empirical verification; Conclusion and Reference sections. At the end of the Report, an Annex contains tables and figures to describe the attained results.

Contents

01 Introduction

The main objective of the SmartCulTour project financed by the EC Horizon 2020 Research and Innovation Framework Programme is to propose and validate innovative, community-led interventions directed at sustainable cultural tourism development contributing to the EU regions' (especially peripheral ones) resilience and inclusiveness. With that regard, the project focuses on (1) development of new and/or upgrading of the definitions of previously mentioned key concepts; (2) identification and testing of a framework of sustainability and resilience indicators (SRT Framework) and a Decision Support System (DSS) for measuring and monitoring cultural tourism and its impacts; (3) testing and presenting innovative and creative tools for stakeholder engagement in sustainable cultural tourism development.

Given the primary goal of this project, several objectives have been outlined, including the objective No. 2 striving to "establish an improved indicator framework for cultural tourism impacts on sustainability and resilience and link these to an improved Tourism Area Life Cycle (TALC) model".

To accomplish this objective and thus contribute to the overall project's goal fulfilment, within WP4, several tasks have been outlined, including:

- Task 4.1. Identification of the indicators related to the basic concepts
- Task 4.2. Identification of relationships between cultural tourism destination's sustainability and/or resilience indicators and the TALC model
- Task 4.3. Developing the SRT framework

This report targets two tasks, i.e. task 4.2. and task 4.3. Task 4.2. aims to explore, using different methods such as multicriteria methods, advanced econometric and statistical methods, system dynamics, etc., complex relationship between the most relevant cultural tourism development indicators and both, sustainability and resilience indicators, taking into consideration destinations' position in TALC. The foundation of the analysis are frameworks of indicators related to cultural tourism development, sustainability and resilience of cultural tourism destinations extensively explained in Report D 4.1 (Petrić et al. 2020). The empirical analysis is performed based on data collected for six case studies, i.e. six Living Labs involving more than thirty micro destinations, i.e. Local Administrative Units (LAUs), ending up with an SRT framework of indicators, as required by the Task 4.3.

02 The Empirical Analysis of Sustainability and Resilience Models

2.1. Data

2.1.1. Data collection process and sources

Following the identification of key indicators related to the basic concepts of sustainability, resilience and cultural tourism (Deliverable 4.1[1]), the next step was to build and empirically validate a framework for measuring the influence of cultural tourism development on sustainability and resilience of cultural destinations taking into account the tourism area life cycle (TALC).

The first stage of the process involved the outlining of a sample to validate the SRT framework. Living Labs-LL proposed by the project partners differ significantly in terms of the territory they cover, administrative units they belong to (municipality, province, city and metropolitan area) and size (Figure 1). Therefore, it was a mutual decision to consider the Local Administrative Unit - LAU[2], as a reference point. LAUs are compatible with and make building blocks of the NUTS (Nomenclature of Territorial Statistics). Each partner has collected the data for up to seven LAUs (when there were more than 7). The exception was the case of Finland, where the LL covers just one municipality. The list with all the selected LAUs across the project partners' LL is displayed in Table 1.

Table 1. List of LAUs

LAU	NUTS 2 region (code), Country	Partner / LL
Ainsa	Aragón (ES24), Spain	**Partner:** Mediterranean Agronomic Institute of Zaragoza / International Centre for Advanced Mediterranean Agronomic Studies (IAMZ-CIHEAM) **LL name:** Huesca province
Barbastro		
Benasque		
Graus		
Huesca		
Jaca		
Sariñena		
Rotterdam	Zuid-Holland (NL33), The Netherlands	**Partner:** Breda University of Applied Sciences **LL name:** The Rotterdam Metropolitan Region
Delft		
Dordrecht		
Molenlanden		
Barendrecht		
Ridderkerk		
Zwijndrecht		
Utsjoki	Pohjois- ja Itä-Suomi	**Partner:** University of Lapland

[1] Petrić, L., Mandić, A., Pivčević, S., Škrabić Perić, B., Hell, M., Šimundić, B., Muštra, V., Mikulić, D., & Grgić, J. (2020). Report on the most appropriate indicators related to the basic concepts. Deliverable 4.1 of the Horizon 2020 project SmartCulTour (GA number 870708), published on the project web site on September 2020: http://www.smartcultour.eu/deliverables/

[2] https://ec.europa.eu/eurostat/web/nuts/local-administrative-units#:~:text=To%20meet%20the%20demand%20for,communes%20of%20the%20European%20Union.

	(FI1D), Finland	**LL name:** Utsjoki municipality
Vicenza Caldogno Pojana Maggiore Grumolo delle Abbadesse Lonigo Montagnana	Veneto (ITH3), Italy	**Partner:** Ca'Foscari Università di Venezia **LL name:** Vicenza region
Split Trogir Kaštela Solin Sinj Dugopolje Klis	Jadranska Hrvatska (HR03), Croatia	**Partner:** University of Split, Faculty of Economics, Business and Tourism **LL name:** City of Split metropolitan area
Puurs-Sint-Amands Bornem Willebroek	Prov. Antwerpen (BE21), Belgium	**Partner:** KU Leuven **LL name:** The Scheldeland region
Dendermonde Berlare Aalst Denderleeuw	Prov. Oost-Vlaanderen (BE23), Belgium	

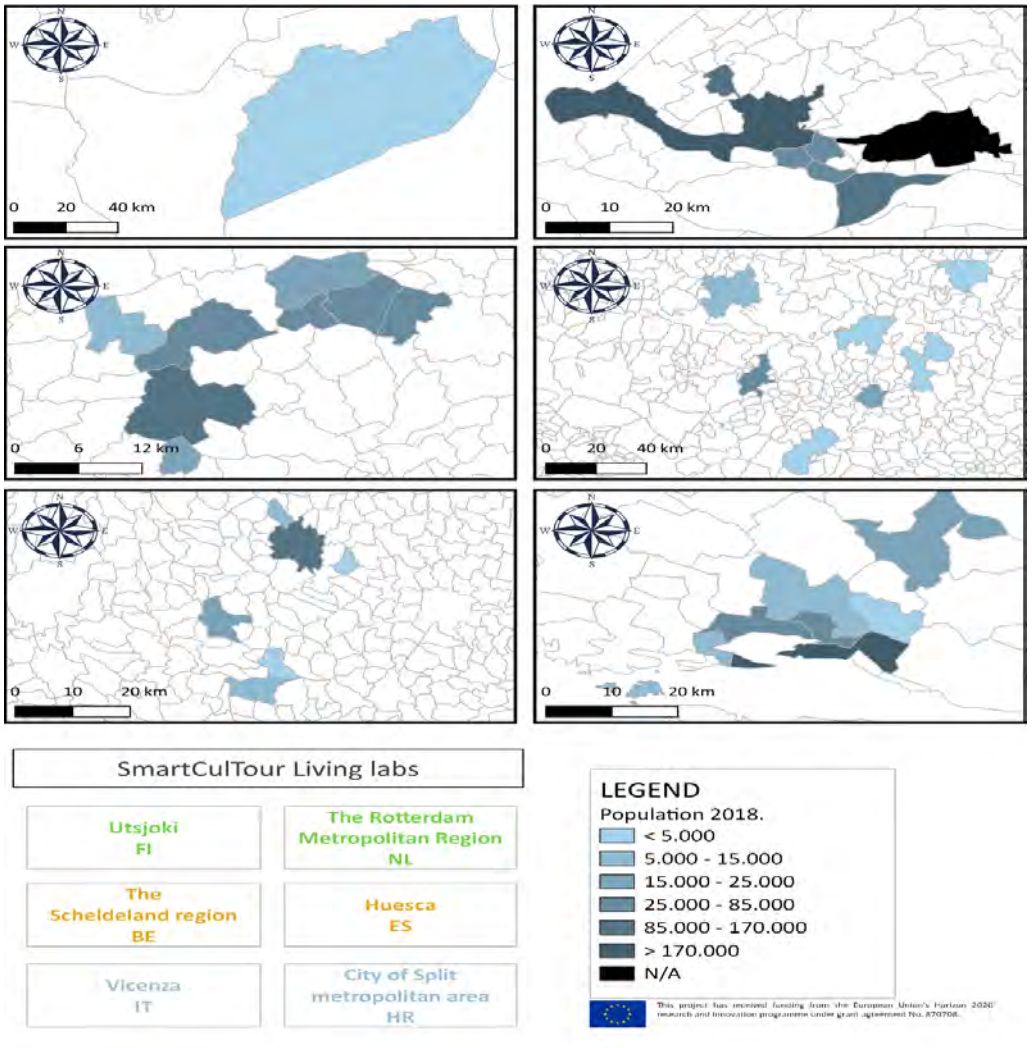

Fig 1. Population across the LAUs

The data collected referring to critical concepts involved quantitative and qualitative data obtained from national and regional official statistical agencies and the respective LAUs. The qualitative LAU-level data regarding policies and strategic documents required an in-depth analysis by each partner. The data for several LL/LAU indicators required the collection of resident and visitor sentiments, which was particularly challenging due to the COVID-19 pandemic. Therefore, instead of a face-to-face visitor survey, the project partner agreed to use TripAdvisor ratings as proxies, to represent the tourist perspective. Resident surveys were conducted via online questionnaires, with the questions measuring residents' perception on a 7-point Likert scale being translated to each partner's language, along with the Information sheet for anonymous resident surveys. Due to low return rates in certain living labs, external firms were engaged by some partners to get more responses, using Computer Assisted Telephone Interviewing (CATI) and/or online panels.

Considering that the SRT framework contains observations about different territorial cross-sections across time, the time variable made the data collection process additionally demanding. The partners were expected to collect data for each LAU between 2007 and 2019 (or 2020, where possible), except for resident surveys and visitor satisfaction indicators that refer to just one year. Since the last global economic/financial crises started in 2007, this year was chosen as the starting point of the analysis, especially concerning its relevance for resilience indicators. Following extensive consultations and several rounds of data collection, the decision was made to omit the indicators with less than 60% of the observations. Tables A1-A3 in Annex display the indicators retained for further analysis with associated data sources.

2.1.2. Summary of the critical problems related to the data collection process

Below we deliver the conclusions reflecting the experiences of project partners and their opinion obtained via questionnaire regarding the data collection process.

The main conclusions:

- There is an evident lack of LAU level data for many relevant indicators; at the same time, these data are vital when studying sustainability and resilience at the destination level. Thus, we jointly recommend establishing a data collection system at the LAU level that will foster future analysis and improve policy responses and ultimately build sustainable and resilient destinations. Similar conclusions could be drawn for several relevant indicators on the NUTS 2 level.
- Data for most of the indicators presented in the SRT framework originated from national sources, including those at the municipal level, making this framework an innovative and effective solution to evaluate the causes and consequences of sustainability and resilience on a cultural tourism destination scale.
- The partners reported low satisfaction with the EUROSTAT databases, particularly regarding the data relevant to evaluating urban and rural European tourism destinations' sustainability and resilience. Particularly challenging was to collect the data for qualitative indicators referring to social and cultural aspects of sustainability. Simultaneously, socio-cultural pressures are vital in the studies discussing current challenges faced by urban European destinations, including crowding, social protests and unrests, tourism and tourist-phobia, solastalgia, expansion of P2P accommodation and many others. The partners concluded how EUROSTAT enables country comparisons across Europe particularly related to quite broad indicators; however, it fails to enable the monitoring and comparison at the lower, particularly LAU level. It was a mutual conclusion that, for example, the data on relevant governance institutions' existence, policies or regulations (qualitative data) should be collected by EUROSTAT and available in one place.

- The partners also report the need to improve the national statistics concerning sustainability and resilience of (cultural) tourism development. However, we consider that the debate over the monitoring of tourism development should be prioritised and stimulated by supranational and regional organizations, such as the EU, as well as by Intergovernmental orgnizations and UN specialized agencies, such as UNESCO and UNWTO.
- Although most of the data were collected through open sources, some partners indicated that data (in several cases "raw)" for some relevant indicators could be obtained only at a request from institutions in charge (particularly those in charge of collecting data for cultural and tourism indicators). In most cases, these data were free of charge; however, some partner reported payment of a fee for downloading of data.
- The lack of data for each year in time-series diminishes the ability to apply sophisticated data analyses' methods. All partners indicated this problem on both NUTS 2 and LAU level data. The partners also reported methodological inconsistencies in collecting data for a more extended period. This was particularly the case with data referring to public sources' indicators as the municipal or national budgets, public cultural institutions and chambers of commerce.
- A particular challenge was to collect resident-related data. Most of the partners have introduced an online survey. However, some partners engaged an external agency that performed a survey by Computer Assisted Telephone Interviewing (CATI) due to the low return rates. The problem with data collection via surveys was stressed by four out of six partners as most challenging primarily due to the COVID-19 pandemic, a short period for collecting data and the residents' reluctance to participate, particulary in municipalities where tourism development is currently small-scale. The inclusion of municipalities from the start of the project enabled some partners to use the municipalities' communication channels to approach residents, leading to better response rates and stakeholder engagement.
- Particular recommendations on how to improve the SRT framework to enable its usability and application in cultural tourism destinations across the European Union:
    - Introduce specialist evaluation for indicators at the LAU level;
    - The objective data (from regular statistical databases) should have higher representation;
    - The framework should be filled using regional proxies instead of the LAU level data that are being missed;
    - Increase simplicity of model and data collection process. Complex models do not enable implementation as they are too data-heavy and challenging to communicate.

2.1.3. Recommendations regarding databases' availability and data collection process enhancement

This report involves primary and secondary data sources, including surveys, reports, yearbooks, and Internet databases originating from various sources such as EUROSTAT and national and local public sources. Considering the complexity of the approach, below, we outline several recommendations to foster future data collection:

- There is a need to identify common ground for data collection to enable comparison among destinations. The first step would be the common understanding of definitions, concepts and units of measurement.

- Concepts used, as well as units of measurement, should be transparent and displayed. This requirement is essential regarding time-series data. Namely, it is often the case that measurement units are changed along the period due to the changes in data collection or processing methodology.
- From the perspective of the critical concepts used in this project, a range of data should be available at NUTS 2 and NUTS 3 levels and at the LAU level considering this level "feeds" upper levels with information.
- Attention should be given to collecting the LAU level data on the most straightforward indicators, for example, visitor numbers, overnights, population, that can be used to create more complex indicators, such as those of tourist intensity.
- This report's challenge was finding databases that went back 10+ years. Along with that, we have noted that several indicators (for example, within the environmental pillar of sustainability), which were often used in studies addressing tourism development sustainability, were hard to discuss in the specific context of cultural tourism. For example, water consumption is often used as an indicator of destination sustainability; however, the data usually refers to general water consumption, and rarely consumption related to tourism.
- The qualitative and quantitative data on niche tourism types, such as cultural tourism are lacking. Consequently, it is challenging to analyse and discuss cultural tourism's sustainability or resilience outside the overall destination realm. Within this Report, we established the framework of indicators to evaluate cultural tourism's development and influence on constituting pillars of destination sustainability and resilience. We strongly encourage the adaptation of this approach on the EU level to monitor cultural tourism development.
- Regarding the proposed indicators related to the existence of particular laws, policies and institutions (currently discussed as dummy variables: existing or not), we suggest future studies to evaluate their efficiency.
- Resident and visitors surveys are challenging to collect due to a lack of common methodology and longitudinal commitment. Given this, and knowing how important their opinions are, an idea of standardized surveys at the EU level should be considered and recommended to each member state to be used at the local level regularly, concerning perceptions of the residents on (cultural) tourism impacts as well as of (culturally motivated) visitors on their satisfaction with the cultural tourism assets, and alike.
- We acknowledge the ever-growing trend of big data use and its potential to evaluate cultural tourism sustainability and resilience; however, such data are expensive. This limits destinations primarily to rely on such data in cases when they could be vital, e.g. addressing overcrowding in the historical centre or urban centres. Simultaneously, the financial reasons limit the number of tourism-related studies relying on big data to address emerging issues, end evaluating the potential of such data sources to address over-tourism related challenges.

2.1.4. Building composite indicators using multicriteria methods

Composite indices are recognized as a useful tool in both sustainability analysis (Blancas et al., 2015; Blancas et al., 2016; Pérez et al., 2013) and cultural sector analysis (Montalto et al., 2019; Vecco & Srakar, 2018), especially in researching its contribution to tourism or overall development. They enable simple comparison of units with regards to multiple criteria on a different scale. Constructing the composite index requires three steps: **normalization, weighting and aggregation** (El Gibari et al., 2019).

Considering that our datasets consist of numerical and categorical variables, with the numerical variables presented in different measurement units, it is first necessary to normalize data to construct a composite index. The normalization aims to transform differing units of measurement into a single common scale. In this way, comparison among indicators is enabled together with their inclusion in the aggregate score (Pollesch & Dale, 2016).

In this report, we apply the Linear max-min method, which uses each attribute's distance relative to the minimum and maximum values of the benefit and cost criteria (Jafaryeganeh et al., 2020). Benefit criteria are those whose values are to be maximized, while cost criteria values intend to be minimized. Normalized values range from 0 to 1.

The benefit criteria equation can be written as follows:

$$r_{ij} = \frac{x_{ij} - x_j^{\min}}{x_j^{\max} - x_j^{\min}}; i = 1,\ldots,n;\ j = 1,\ldots,m, \tag{1}$$

while for the cost criteria

$$r_{ij} = \frac{x_j^{\max} - x_{ij}}{x_j^{\max} - x_j^{\min}}, i = 1,\ldots,n;\ j = 1,\ldots,m, \tag{2}$$

where x_{ij} is the value of the i-the unit for j-the criterion, $x_j^{\max}$ is the maximum value of the j-th criterion, while $x_j^{\min}$ is the minimum value of the j-th criterion. Finally, r_{ij} is the normalized value of i-th unit for j-th criterion.

Using this type of normalization, all criteria become benefit criteria. A higher value means a better value.

Weighting is the next step in building a composite index. In Deliverable 4.1., the Satty method was explained in detail, as it was used for both the sustainability indices' weighting and for cultural tourism indices' weighting.

The final step is aggregation, for which purpose the simple additive weighting (SAW) method is performed. Based on El Gibari et al.'s (2019) extensive literature review, it is evident that this method is widely used for constructing sustainability indices because it is very transparent and easy to understand by non-experts (Šaparauskas & Turskis, 2006).

Index for each unit can be calculated from equation

$$Index_i = \frac{\sum_{j=1}^{m} w_j r_{ij}}{\sum_{j=1}^{m} w_j}, i = 1,\ldots n;\ j = 1,\ldots,m. \tag{3}$$

where w_j is the weight of criterion j obtained by the AHP Satty method, r_{ij} is the normalized value of *i*-th unit for *j*-th criterion, *n* is the number of units, while *m* is the number of criteria.

2.1.5. Sustainable tourism indicators and indices

Sustainability indicators and indices for panel analysis

Four indices of sustainability (Environmental, Economic, Social and Cultural) were constructed to keep an appropriate number of observations (Table 2). Based on the weights originally calculated in Report D4.1 using the Satty method, the second and third level weights for the retained indicators (for which data were available) were recalculated.

It should be noted that in Table 2 variables used to calculate indices in both panel data and regression analyses are presented.

Table 2. Indicators used to create sustainability indices

Variable/measure	Panel		Regression	
	Weight	MIN/MAX	Weight	MIN/MAX
Environmental sustainability indicators				
Completed impact assessment of environmental, social and cultural aspects of tourism (in terms of evaluating a tourism plan) (YES/NO)	0.349365	MAX	0.219491	MAX
Municipal expenses in environment per 1000 inhabitants	-	-	0.121058	MAX
Construction density per unit area (municipality)	0.116455	MIN	0.066699	MIN
The volume of waste generated	0.277140	MIN	0.252690	MIN
CO2 emissions per inhabitant (national level)	0.161070	MIN	0.166089	MIN
Daily number of tourists per 1 km^2	0.063980	MAX	0.067920	MAX
Accessibility of tourist attractions by public transport (YES/NO) (prevailing answer)	0.031990	MAX	0.033960	MAX
Perceptions by the local population concerning environmental damage caused by tourism (7-point Likert scale)	-	-	0.072093	MAX
Economic sustainability indicators				
Average length of stay	0.166667	MAX	0.167901	MAX
Total number of tourist arrivals	0.083333	MAX	0.083951	MAX
Existence of up to date tourism plans and policies (YES/NO)	0.375000	MAX	0.294444	MAX
Existence of land use planning, including tourism (YES/NO)	0.375000	MAX	0.294444	MAX
Global satisfaction level of tourists (destination) (TripAdvisor 5-point scale rating)	-	-	0.159259	MAX
Social sustainability indicators				
Perception of the local population regarding whether the life quality increases due to the tourism (7-point Likert scale)	-	-	0.176190	MAX
Perception of the local population regarding whether the tourists have an undesirable effect in the region life style (7-point Likert scale)	-	-	0.140476	MAX
Perception of the local population regarding whether improved public services are results of tourism (7-point Likert scale)	-	-	0.111905	MAX
Ratio of tourists to locals	0.500000	MAX	0.071429	MAX
Tourist intensity (ratio of nights spent at tourist accommodation establishments relative to the total permanent resident population of the area)	0.500000	MAX	0.071429	MAX
Degree of stakeholder participation in the planning process(Low/medium/high, measured on a 7-point Likert scale)	-	-	0.428571	MAX
Cultural sustainability indicators				
Evidence of active participation of communities, groups and individuals in cultural policies and the definition of administrative measures integrating heritage (both tangible and intangible) and its safeguarding (YES/NO)	0.666667	MAX	0.444444	MAX

Variable/measure	Panel		Regression	
	Weight	MIN/MAX	Weight	MIN/MAX
Expenditure on the cultural heritage of municipalities (includes tangible and intangible and contemporary cultural activities)	0.333333	MAX	0.222222	MAX
Percentage of the population that is very satisfied with cultural facilities in a destination (7-point Likert scale)	-	-	0.111111	MAX
Perceptions by the local population concerning the stimulation of local crafts and culture due to tourism (7-point Likert scale)	-	-	0.222222	MAX

2.1.6. Resilience indicator

The elaboration of the body of literature on resilience and tourism, with the presentation of possible resilience indicator(s), which would be suitable to verify impacts of culture, and cultural tourism on overall destination's resilience, is provided in deliverable D4.1. A framework of tourism impacts is usually considered in the destination where tourism development occurs, and tourists encounter the local people and their environment (Sharpley and Telfer, 2015). Hence, tourism impacts occur within wider social, political and economic contexts, thus affecting the overall destination's development (Romão, 2019) and resilience (Romão et al., 2016, Romão, 2020). In the SmartCulTour context, we analyse the effects of cultural tourism on the destination's resilience.

Following Strickland-Munro's (2017) framework (see Figure 3 in Deliverable 4.1.), in this paragraph, we shortly present the resilience framework applied to develop the SmartCulTour resilience model.

Table 3. Summarized dimensions of SmartCulTour destination's resilience and resilience indicator and adoption of Strickland-Munro's (2017) approach

Focal questions and stages	SmartCulTour resilience model specification	
Stage 1 **Resilience of what?**	destination/Living Lab area; Local Administrative Unit	
Stage 2 **Resilience to what?**	economic shock: crisis 2008	
Stage 3 **Resilience of what?**	labour market in LAUs (LLs)	**Employment level** (relative change during pre-shock, shock and post-shock period)
Stage 4 **Developing a model of resilience of a SmartCulTour Destiantion(s)**	period	years: 2008-2019
	methodological approach	Panel data analysis
	independent variables	control variables + cultural tourism indicators

Table 3 summarizes the stages in the process of defining the SmartCulTour resilience model. Thereby, it gives a "brief" overview of the indicators defined and later modelled in the panel analysis of destination (regional) resilience and its determinants. The elaboration of the model and independent variables is given in subchapter 2.2.2**.** Thus, this paragraph elaborates on dependent variable used to proxy the resilience of a region.

The focus of the literature on regional resilience phenomena has been driven by great volatility and uncertainty, recently experienced on a global level. This phenomenon has been extensively studied at various territorial levels in Europe, ranging from NUTS 2 and NUTS 3 level to lower administration levels such as municipalities and local labour systems (for more detail see: Giannakis and Bruggeman, 2019). The recent crisis reinforced the importance of analyzing the impacts of external shocks on the tourism industry and the related implications on economic systems Gössling et al. (2020). The lack of empirical research illuminating the role of special types of tourism on the resilience of specific European touristic destinations lead to ineffective resilience-building solutions (see Deliverable 4.1). The research of Romão (2020), who analysed the economic impact of tourism on regional resilience, represents the rare exception.

Concerning data limitations faced through the data collection process, Romão's (2020) modified resilience indicator is implemented in the SRT model. It takes into account **employment change** since employment more effectively reflects the social impacts of shock with a longer lag than output (e.g. Lagravinese, 2015;

Faggian et al., 2018). More precisely, our **resilience indicator** is calculated by considering the employment level in each analyzed year minus the employment level in 2008 for the region under study.

2.1.7. Cultural tourism indicators and indices

The empirical analysis investigating the impacts of cultural tourism on sustainability and resilience performed in this Report is among the first of this kind. Considering the complexity of the concepts used in this research (elaborated in detail in Report D4.1.), the datasets and the methodology to perform the analysis, it wasn't possible to create a single index to capture all relevant indicators. Therefore, we had to construct several indices. For this purpose, FEBT's experts used the Satty scale to evaluate the importance of paired cultural tourism indicators on the three hierarchy levels. On Level 1, there were four broad categories of cultural tourism indicators (i.e. Spatial, Prosperity and livelihood, Knowledge and Inclusion & participation); on Level 2 the categories were further divided into several subgroups, while Level 3 encompassed individual indicators. To avoid recalculation of the weights, only indicators for which data was available are evaluated. The Analytical Hierarchy Structure (AHP) analysis of cultural tourism indicators on three levels enabled the construction of more sub-indices.

Finally, aiming to keep as much information about cultural tourism as possible, indices based on the third hierarchy level are constructed[3]. In addition, for three groups of indicators, i.e. Government expenditure, Knowledge and Inclusion & Participation data wasn't available except for just one indicator, thus preventing from constructing the index (Table 4).

In Table 4 we presented indicators used to create cultural tourism indices for both panel data and regression analysis (the former being applied in both, sustainability and resilience model analyses, and the latter being applied in only sustainability model analysis).

[3] To calculate the index value, data for all indicators contained by the index has to be available. If a value for just one indicator at LAU i in period t is missing, the value of the index for LAU i in period t can't be calculated. Therefore we decided to construct more indicators.

Table 4. Indicators used to create cultural tourism indicators/indices

Variable/measure	Panel		Regression	
	Weight	MIN/MAX	Weight	MIN/MAX
Spatial indicators				
Presence of cultural resources				
Number of monuments in national lists	0.250000	MAX	0.250000	MAX
Number of intangible cultural heritage in national lists	0.250000	MAX	0.250000	MAX
Number of World Heritage Sites	0.250000	MAX	0.250000	MAX
Number of elements inscribed on the UNESCO Intangible Cultural Heritage Lists	0.250000	MAX	0.250000	MAX
Availability of cultural infrastructure index				
Number of museums per 1,000 inhabitants	0.538961	MAX	0.538961	MAX
Number of theatres per 1,000 inhabitants	0.297258	MAX	0.297258	MAX
Number of public libraries per 1,000 inhabitants	0.163781	MAX	0.163781	MAX
Prosperity and livelihood indicators				
Cultural (tourism) business				
Number of cultural (and creative) enterprises*	1.000000	MAX	1.000000	MAX
Employment				
Number of cultural jobs per 1,000 population*	-	-	1.000000	MAX
Cultural governance (institutional framework)				
Evidence of a Ministry of Culture or a Culture secretariat with ministerial/directorial status at the State/national level (YES/NO)	0.230769	MAX	0.230769	MAX
Evidence of a local authority responsible for culture at local level (YES/NO)	0.230769	MAX	0.230769	MAX
Evidence of a culture based regulatory framework (YES/NO) (at least the Law on cultural heritage/culture)	0.230769	MAX	0.230769	MAX
Examples of initiatives designed through inter-ministerial cooperation to enhance culture's impacts in other areas (tourism, education, communication, ICT, trade, international affairs, employment), such as regulatory frameworks, sector specific laws, etc. (YES/NO)	0.230769	MAX	0.230769	MAX
Evidence for the use of Destination Management Organisation(s) to manage the impact of tourism on cultural values (YES/NO)	0.076923	MAX	0.076923	MAX
Cultural governance (policies)				
Evidence of cultural management plan or alike strategic document (YES/NO)	0.259855	MAX	0.259855	MAX
Specific measures to support job creation in the culture and creative sectors (YES/NO)	0.259855	MAX	0.259855	MAX
Specific measures to encourage the formalization and growth of micro/small and medium-sized cultural enterprises (YES/NO)	0.259855	MAX	0.259855	MAX
Specific policy measures regulating public assistance and subsidies for the cultural sector (YES/NO)	0.138261	MAX	0.138261	MAX

Variable/measure	Panel		Regression	
	Weight	MIN/MAX	Weight	MIN/MAX
Specific policy measures dealing with the tax status of culture (tax exemptions and incentives designed to benefit the culture sector specifically, such as reduced VAT on books) (YES/NO)	0.082174	MAX	0.082174	MAX
Government expenditure				
General government expenditure on culture per capita (in €)*	1.000000	MAX	1.000000	MAX
Cultural (tourism) governance				
Coordination, cooperation and collaboration among Public Tourism Administrations (PTAs) at different levels of government (regarding cultural tourism) (YES/NO)	0.250000	MAX	0.250000	MAX
Establishment of cooperative and collaborative public - private relations (regarding cultural tourism, like sectoral associations of enterprenuers and chambers of commerce) (YES/NO)	0.250000	MAX	0.250000	MAX
Cooperation and collaboration by public administrations with other nongovernmental actors and networks of actors (regarding cultural tourism)	0.250000	MAX	0.250000	MAX
Evidence of cultural tourism strategic documents (local) (YES/NO)	0.250000	MAX	0.250000	MAX
Inclusion & Participation				
Satisfaction with cultural facilities				
Percentage of tourists that is very satisfied with cultural facilities in a destination (TripAdvisor 5-point scale rating)*	-	-	1.000000	MAX
Social cohesion				
Degree of positive assessment of gender equality (subjective output) (7-point Likert scale)*	-	-	1.000000	MAX
**Standalone indicator (was not used for index calculation)*				

In Table 4 specific cultural tourism variables have been given a value (MIN/MAX) indicating their impact on a destination's sustainability and resilience.

After the analysis is finished, the results must be interpreted, keeping in mind that they significantly differ concerning each Living Lab's development contexts. Generally, the higher the value of an index, the higher its potential to affect the destination's sustainability and resilience.

The index concerning the 'Presence of cultural resources' includes different indicators referring to cultural (tangible and intangible) heritage as the main attractor to a destination and a driver for cultural tourism development. Cultural heritage generates not just flows of visitors and users but also financial benefits for a community, stemming from its economic valorisation. This index comprises four components, each having 25% of the total value (see Table 4).

'Availability of cultural infrastructure' index deals with the different types of cultural infrastructure, i.e. museums, theatres and public libraries, assessing their contribution to the local community cultural development, as well as fostering inclusion and participation. This dimension also serves as an attractor for visitors and consequently a driver of cultural tourism development. The index comprises three components, each one having a different weight. Hence, the museums as the most important representatives of cultural infrastructure were attributed a weight of 0.538961 while theatres were attributed 0.2972583 and public libraries that are contributing more to the local cohesion than to the attractiveness of a destination were attributed 0.1637807 (Table 4).

The index of 'Cultural governance (institutional framework)' deals with the institutional mechanisms to support the cultural sector and to create a favourable environment for cultural activities. A specific value has been assigned to each of the components in consideration of their respective impact. 'Evidence for the use of DMO to manage the impact of tourism on cultural values' is assigned lower importance (0.076923) than the other four indicators (Evidence of a Ministry of Culture, Evidence of a local authority responsible for culture at a local level, Evidence of a culture based regulatory framework and Examples of initiatives designed through inter-ministerial cooperation), that were all assigned the same weight (0.230769). Namely, the experts estimated that a proper macro institutional framework affects even local DMO activities to manage impacts of tourism, which is why they gave it higher weight.

Finally, the 'Cultural (tourism) governance' index shows to what extent tourism-related public institutions at different levels coordinate their activities and to what extent they cooperate and collaborate with public institutions from culture and other associated sectors at different levels. This index comprises four components (see Table 4), each assigned 25% of the total score.

The above results could not be compared to the results of the previous studies elaborated in the D4.1 report, considering that a limited number of studies relied on the AHP methodology to discuss the weights attached to the cultural indicators.

Due to the limitations of existing cultural tourism statistics and/or the data (un)availability for some Living Labs, it was not possible to construct appropriate composite indicators in dimensions of 'Knowledge' and 'Inclusion and Participation'. However, these standalone indicators were used in sustainability model regression analysis (see Table 4) .

2.2. Models and methodology

2.2.1. Sustainability model

Sustainability panel model

In 1995 Craik, asked if there were cultural limits to tourism, suggested that changes and consequences of tourism on the culture of destinations and tourist culture should be central to debates about sustainable tourism development. However, more than 20 years after, the lack of studies addressing the nexus between sustainability and cultural tourism development is more than evident. The majority of studies addressing the sustainability of tourism development using different frameworks of indicators (extensively elaborated in Deliverable 4.1) discuss three elements that constitute sustainability environment, economy and society. A burgeoning research community is currently arguing for a missing fourth pillar, i.e. the pillar of cultural sustainability (Skrede & Berg, 2019), as it would allow urban development that lens toward the vital sustainability principle. Such attitudes are also supported within the Framework for Action on Cultural Heritage, highlighting the potential of heritage to enhance social capital, boost economic growth and secure environmental sustainability[4].

Culture and heritage became a significant area of growth in the special interest tourism market (Crespi-Vallbona & Smith, 2020). Heritage tourism has also been advocated as an essential mechanism for stimulating economic growth, as the adverse influences of traditional mass tourism become evident (Timothy & Timothy, 2014). Paradoxically, tourism consumption is blamed as one of the greatest threats to heritage, leading to the deconstruction of heritage and place from social and cultural to purely economic experiences, and the devaluation and often destruction of cultural assets (Loulanskia & Loulanski, 2011). To reverse this relationship between heritage and tourism from unsustainable to symbiotic, there is a need to revisit the two sides' current priority status within policies (Loulanskia & Loulanski, 2011). The foundation of the potential paradigm shift could include the empirical analysis of the interrelation between these two phenomena, i.e. cultural tourism and sustainable development.

Cultural tourism development and four pillars of sustainability

The inseparable link between the cultural offer and tourism development has long been recognised, and the relationship between the two has always been seen as complex (Matteucci & Von Zumbucsh, 2020). Much of the scholarly and policy attention has been directed to the potential for cultural projects and activities to attract tourism, revitalise urban areas and decrease social exclusion (Hall & Page, 2009). Although it has been idyllically called symbiotic (UNWTO, 2001), the perils of negative impacts of tourism on culture have also been recognised (United Nations World Tourism Organization, 2018). These may negatively affect the mere cultural resources tourism is based upon, especially heritage (Silva & Henriques, 2021). Thus, critical observers ask what the cultural polices are prioritising - heritage preservation', 'development', or 'the environment' (Haigh, 2020). This debate is highly important in light of balancing the relationship between tourism, sustainable planning and heritage conservation (Fyall et al. 2006, as cited in Canale et al., 2019).

However, in terms of the impact of cultural industries on the **economic domain of tourism sustainability**, the general agreement is that the effect is positive, i.e. that richer cultural offer will lead to higher tourism attractiveness, numbers and economic benefits for destinations (González Santa-Cruz & López-Guzmán, 2017; Jiménez-Naranjo et al., 2016). In empirical terms, however, the analysis of the impacts is mostly

[4] https://ec.europa.eu/culture/cultural-heritage/cultural-heritage-eu-policies/sustainability-and-cultural-heritage

focused on one aspect of cultural offer – World Heritage Sites (WHS) and, to a lesser extent, cultural events (Jiménez-Naranjo et al., 2016). The former have empirically tested the impact of WHS listing on tourism demand (Canale et al., 2019; Castillo-Manzano et al., 2020), regional tourism and domestic tourism revenues (Gao & Su, 2019), performance (Cuccia et al., 2016) and seasonality (Cuccia & Rizzo, 2011) of tourism destinations as well as potential damage resulting from tourism demand (Groizard & Santana-Gallego, 2018). Thus, cultural heritage's effects in fostering tourism remain a vibrant topic in regional and local planning and development policies. In our empirical analysis, we take the analysis further by including several forms of cultural resources and offer. We explore the link among these multifaceted cultural offer elements and the tourism economic sustainability index devised in Report D4.1.

Biological and cultural diversity have developed over time through mutual adaptation between humans and the **environment**. Therefore, rather than existing in separate and parallel realms, they interact with and affect one another in complex ways in a co-evolutionary process.[5] Culture enables sustainability through the intrinsic links between cultural diversity and biodiversity through its influence on consumption patterns and contribution to sustainable environmental management practices resulting from local and traditional knowledge (Liu, 2014). The conclusions drawn from the UNESCO Hangzhou international congress (2014) on culture as an enabler of environmental sustainability revealed multilevel connections between these two rather distinctive phenomena and that nexus between culture and nature should be discussed regarding ecosystem services, climate change, and green economy.[6]

The adaptation of the ecosystem approach to natural resource management inaugurated the concept of cultural ecosystem services (MEA, 2005). Often described as aesthetic, artistic, educational or spiritual, cultural ecosystem services enable the understanding of the ecosystem in terms of life-enriching and life-affirming contributions to human well-being and represent one salient example of the way culture is more generally embraced as an essential variable in the work of environmental managers and planners (Dickinson & Hobbs, 2017; Fish et al., 2016). A recent report by the 2030 Goal Campaign, “Culture in the implementation of the 2030 Agenda” [7]. This is not surprising as studies (Filimonau et al., 2018; Park et al., 2007) showed that culture is expected to influence how people utilise their natural resources and environments by shaping their attitudes and perceptions. Thus, if people are more culturally conscious of environmental conditions, higher environmental sustainability can be maintained. Finally, the UNESCO report "From Green Economies to Green Societies", outlining a new way forward through developing an inclusive green society and economy, points out culture as one of five priority areas. The Report reveals how new approaches will only work if they match the context, and so the local culture must be built into development from the start[8].

Communities have an essential role in developing sustainable tourism, as they are "the cultural agents and the social group through and in which tourism is delivered" (Cheung & Li, 2019); thus, understanding the **social impacts** of tourism is a priority. Last decade, unsustainable tourism became an immense threat for many urban destinations. Tourism growth has been identified as the leading cause of an excess of, among others, sociological capacity thresholds (Peeters et al., 2018). Consequently, questioning growth itself as the basis of sustainable tourism and resilient communities has now become part of sustainable tourism discourse (Fletcher et al., 2019). For example, (Smith et al., 2019) report on residents’ resistance in Budapest as a response to growing pressures induced by excessive tourism development. Lalicic (2019) introduced the term

[5] http://www.unesco.org/new/en/natural-sciences/ioc-oceans/focus-areas/rio-20-ocean/context/from-rio-to-rio-20/
[6] http://www.unesco.org/new/en/culture/themes/culture-and-development/hangzhou-congress/culture-an-enabler-for-environmental-sustainability/
[7] https://ficdc.org/wp-content/uploads/2019/09/culture2030goal.pdf
[8] https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=666&menu=1515

"solastalgia" to describe residents' simultaneous pride and anger, as they whiteness how the city is being degraded due to excessive tourism development. Calvi & Moretti (2020) discuss the case of Barcelona that has seen a synergic social movement growing and promoting tourism degrowth, gradually evolving into an international social movement.

"Understanding the social impacts of tourism on communities is important for governments at all levels so that action can be taken to reduce the likelihood of a community backlash against tourists and tourism development"(Deery et al., 2012, p.64). The studies have demonstrated that the attitudes, consent, and behaviour of the local communities are volatile and related to the scale of tourism development and the perception of the impacts and distribution of tourism development benefits (Mandić, 2021; Seraphin et al., 2019). Thus, as they respond to mass tourism, residents behave like victims in some cases and sometimes as vandals or peaceful activists (Seraphine et al. 2019).

As stated earlier, based on the discussions and calls from within the research community (Hawkes, 2001; Nurse, 2007; Skrede & Berg, 2019; Soini & Birkeland, 2014; Soini & Dessein, 2016), we have taken a broader view of sustainability and included **cultural sustainability** as the fourth pillar in our analysis. Althought culture is usually analyzed within the social sustainability pillar (Vallance, Perkins, & Dixon, 2011), it seems reasonable to question such a simplified approach and to give "cultural" dimension a stand-alone status. Culture has a very broad meaning ranging from way of life, networks, high-culture and arts to creative industries (Soini & Dessein, 2016; Throsby, 2010)., thus its inclusion brings additional challenges to the already ambiguous and vague notion of sustainability (Holden, Linnerud, & Banister, 2014). However, Skrede (2016) argues that culture is often taken for granted, i.e. treated as an independent variable in search for what culture can do for society (instrumentalist view) as opposed to preserving the cultural resources *per se*. Thus, we follow the reasoning of Soini & Birkeland (2014) that "heritage and cultural vitality story lines can be seen most clearly as a fourth, cultural pillar of sustainability parallel to ecological, social, and economic sustainability" (p. 220). Through a discourse analysis of relevant literature they find strong evidence for the importance of conserving and preserving cultural capital for the next generations as well as that need to take cultural aspects in account when discussing sustainable development. As further elaborated in Dessein, Soini, Fairclough, & Horlings (2015) and Soini & Dessein (2016), viewing culture as one of the four pillars of sustainability (or "in" sustainability to use the original author phrasing), is one of the three possible conceptualizations of the two phenomena. In this view, the culture is viewed from multiple perspectives and seen as capital, being an achievement in development, having an intrinsic (not instrumental!) value, complementing the society and being addressed by the cultural policies in hierchical governance (Soini & Dessein, 2016, p. 4). These findings are further corroborated by conclusions that cultural heritage issues have not received as much attention and weight as environmental, social and economic sustainability (UNESCO, 2018)[9], especially in urban development strategies (Skrede & Berg, 2019). Vieving these arguments through the lenses of the SmartCulTour project goals, the fourth, cultural pillar of sustainability is included in the analysis.

Based on the above elaboration, in the panel model, the expected signs of variables are dominatly positive (Table 5). The exception are cultural businesses and resources impact on social and environmental sustainability as the impact might be negative due to overcrowding and overtourism issues they might cause (Adie et al., 2020; Jover & Díaz-Parra, 2020; Koens et. al, 2018; Peeters et al., 2018; Smith et al., 2019; Lalicic, 2019). It must be noted that due to the small number of observations expected signs for only the remaining variables are presented.

[9] https://unesdoc.unesco.org/ark:/48223/pf0000264687

To preclude the omitted variable bias, not only the effect of the cultural offer on tourism sustainability but also other long-run drivers of sustainability previously identified in the theoretical and empirical literature as well as their expected impact/sign are included in the analysis (Gunter et al., 2017). The control variables in the model thus are GDP per capita, population, Worldwide Governance Indicators (WGI) estimate at national level and tertiary level education as a proxy for human capital formation (Liu et al., 2017; Zadeh Bazargani & Kiliç, 2021). Based on previous studies, all are expected to have positive sign.

Table 5. Sustainability panel model with expected signs

Variable	Abbreviation	Expected sign Dependent variables (Sustainability indices)		
		Environmental sustainability index	Economic sustainability index	Social sustainability index
		EnvSus_INDEX	**EcoSus_INDEX**	**SocSus_INDEX**
Control variables				
GDP per capita (NUTS2 level)	GDPpc	+	+	+
Population (local level)	POP	+	+	+
Governance (national level)	WGI	+	+	+
Education (NUTS2 level)	EDU	+	+	+
Cultural tourism indices and variables				
Cultural (tourism) businesses	CulENT	+	+/-	+/-
Presence of cultural resources	CulRes_INDEX	+	+/-	+/-
Availability of cultural infrastructure	CulInf_INDEX	+	+/-	+/-
Cultural governance (institutional framework)	CulGovInst_INDEX	+	+	+
Cultural governance (policies and financial framework)	CulGovPol_INDEX	+	+	+
Cultural (tourism) governance	CulGovTour_INDEX	+	+	+
General government expenditure on culture per capita	CulGovEXPpc	+	+	+

Ultimately, due to data unavailability, it was not possible to run the panel analysis for cultural sustainability. Instead, regression based on data for 2019 (or the closest to it) was applied. We stress the pivotal nature of the analysis on local level covering several countries, especially since recent studies have reported on inadequacy of regional level policy solutions in dealing with tourism sustainability (Pivčević et al., 2020).

With regard to the above presented basic variables, the sustainability model can be written:

$$Sustainability_{it} = \mu + \gamma \cdot Sustainability_{i,t-1} + \cdot \beta_1 GDPpc_{it} + \beta_2 POP_{it} + \beta_3 \cdot WGI_{it} + \\ + \beta_4 \cdot EDU_{it} + \alpha_i + \varepsilon_{it}; \qquad i = 1,...,N; t = 1,...,T; \tag{4}$$

where $Sustainability_{it} = \{EnvSus\_INDEX_{it}, EcoSus\_INDEX_{it}, Soc\_INDEX_{it}\}$ is the value of one of the environmental or economic index in the LAU i in the period t, $GDPpc_{it}$ is the value of GDP per capita in

the NUTS2 region of LAU I in the period t, POP_{it} is the number of population in the i-th LAU in the period t, WGI_{it} the value of institutional quality for the country of LAU I in time period t, EDU_{it} is the percentage of tertiary education in the NUTS2 region of LAU in the period t, in the period t. $\beta_1 - \beta_5$ are parameters to estimate.

In the next step, the model is extended with cultural tourism variable and it can be written as follows:

$$Sustainability_{it} = \mu + \gamma \cdot Sustainability_{i,t-1} + \cdot \beta_1 GDPpc_{it} + \beta_2 POP_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EDU_{it} + \\ + \beta_5 \cdot CUL_{it} + \alpha_i + \varepsilon_{it}; \qquad i = 1,...,N; t = 1,...,T; \tag{5}$$

The cultural tourism variable included in equation 5 is presented by following indices:

$$CUL_{it} = \begin{Bmatrix} CulENT_{it}, CulRes\_INDEX_{it}, CulInf\_INDEX_{it}, CulGovIns\_INDEX_{it}, CulGovPol\_INDEX_{it}, \\ CulGovTour\_INDEX_{it}, CulGovEXPpc_{it} \end{Bmatrix}$$

i is value of one of cultural variable or index of LAU *i* in the period t and β_5 is an additional parameter to estimate. The pairwise correlation matrix is presented to notify possible problem of multicolinearity. A high correlation coefficient of 0.9408 is found between POP and CulENT. To ensure that the high correlation coefficient doesn't affect the CulENT result, the model specification including CultEnt is estimated with all control variables and without the Pop variable. Results for CulENT remained the same in both considered model. Somewhat higher correlation is obtained between WGI and EDU (0.711), between cultural indicators CulGovTour_INDEX and CulGovIns_INDEX, and CulGovTour_INDEX and CulGovPol_INDEX. Higher correlation between cultural tourism indicators are expected. Therefore, each model specifications contains only one cultural tourism variable.

Table 6. Correlation matrix (sustainability panel model – all variables)

	SocSus_INDEX	EnvSus_INDEX	EcoSus_INDEX	POP	GDPpc	WGI	EDU	CulENT	CulRes_INDEX	CulInf_INDEX	CulGovInst_INDEX	CulGovPol_INDEX	CulGovTour_INDEX	CulGovEXPpc
SocSus_INDEX	1.0000													
EnvSus_INDEX	0.2735*	1.0000												
EcoSus_INDEX	0.4820*	0.1713*	1.0000											
POP	-0.0724	0.1658*	0.1613*	1.0000										
GDPpc	-0.3785*	-0.3501*	-0.0952	0.2147*	1.0000									
WGI	-0.3219*	-0.3347*	-0.0558	0.3006*	0.7063*	1.0000								
EDU	-0.1742*	-0.4717*	-0.2458*	0.1075*	0.4552*	0.7166*	1.0000							
CulENT	-0.0589	0.2444*	0.1208	0.9408*	0.2537*	0.3198*	0.1466*	1.0000						
CulRes_INDEX	0.2366*	0.0115	0.1605*	0.2714*	-0.1959*	-0.1295*	-0.0578	0.2368*	1.0000					
CulInf_INDEX	-0.2776*	-0.0385	-0.3992*	-0.3036*	0.1831*	0.3789*	0.3444*	-0.0725	0.0701	1.0000				
CulGovInst_INDEX	-0.3189*	-0.5224*	0.2242*	0.1085*	0.5260*	0.3563*	0.1540*	0.1293*	-0.0085	0.0643	1.0000			
CulGovPol_INDEX	-0.1920*	-0.6645*	-0.2048*	0.0583	0.2833*	-0.0792	0.1187*	0.1421*	0.1571*	0.1485*	0.4381*	1.0000		
CulGovTour_INDEX	-0.2330*	-0.5623*	-0.0463	-0.0527	0.5226*	0.1288*	0.1398*	0.0388	0.0111	0.1407*	0.7173*	0.7603*	1.0000	
CulGovEXPpc	-0.2672*	-0.6926*	0.1105	0.1279*	0.4334*	0.5357*	0.4617*	0.0453	-0.1057*	0.0146	0.4783*	0.2834*	0.3549*	1.0000

Note:*indicates statistical significance at 5%

Table 7. Sustainability panel model – descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Observations		
					N	n	T/T-bar
Dependent variable (sustainability indices)							
EnvSus_INDEX	0.51	0.09	0.29	0.74	162	22	7.36364
SocSus_INDEX	0.042954	0.092071	0.000248	0.7178994	230	24	9.58333
EcoSus_INDEX	0.76958	0.107427	0.404646	0.9166667	259	27	9.59259
Control variables							
GDPpc	28865.24	7614.791	14500	42700	420	35	12
POP	51484.59	106267	1212	644618	437	35	12.4857
WGI	0.987702	0.483678	0.365859	1.87299	455	35	13
EDU	29.20945	8.750112	12.2	42.8	455	35	13
Cultural indices and variables							
CulENT	246.4675	822.5376	0	5870	323	34	9.5
CulRes_INDEX	0.125985	0.106971	0.00013	0.375611	442	34	13
CulInf_INDEX	0.12456	0.179505	0	0.702742	294	32	9.1875
CulGovInst_INDEX	0.820626	0.162694	0.461539	1	455	35	13
CulGovPol_INDEX	0.894614	0.159991	0.220435	1	455	35	13
CulGovTour_INDEX	0.778022	0.240251	0.25	1	455	35	13
CulGovEXPpc	78.07655	85.40472	0	584.89	362	34	10.6471

Note: Descriptive statistics in the sustainabilty panel model presented in Table 7 refers to those variables that have been used as inputs to create indices.

Descriptive statistics referring to all variables are presented in the Annex, Table A4-A5

Sustainability cross-sectional model

Due to a small number of observations, a simple linear regression with one cultural tourism index as independent variable is estimated together with one index of sustainability. The OLS method with robust standard error is estimated.

$$Sustainability_i = \mu + \beta CUL_i + \varepsilon_i; \qquad i = 1,\ldots,N \tag{6}$$

where $Sustainability_i = \{SocSus\_INDEX_i, CulSus\_INDEX_i\}$ is the value of one of the (7)

environmental or economic indices in the LAUi; the cultural tourism variable included in equation 6 is presented by following indices and indicators:

$$CUL_i = \begin{Bmatrix} CulENT_i, CulRes\_INDEX_i, CulInf\_INDEX_i, CulGovIns\_INDEX_i, \\ CulGovPol\_INDEX_i, CulGovTour\_INDEX_i, CulGovEXPpc_i, \\ CulJOBS_i, CulSAT_i, GenEq_i \end{Bmatrix}, i \text{ i}$$

with value of one of cultural tourism variables or indices at LAU$_i$ in the period t and β parameter to estimate, μ is a constant and ε_i is an error.

Table 8. Sustainability cross-sectional model with expected signs

Variable	Abbreviation	Expected sign Dependent variables (Sustainability indices) Social sustainability index SocSus_INDEX	Cultural sustainability index CulSus_INDEX
Control variables			
GDP per capita (NUTS2 level)	GDPpc	+	+
Population (local level)	POP	+	+
Governance (national level)	WGI	+	+
Education (NUTS2 level)	EDU	+	+
Cultural tourism indices and variables			
Cultural (tourism) businesses	CulENT	+/-	+
Presence of cultural resources	CulRes_INDEX	+/-	+
Availability of cultural infrastructure	CulInf_INDEX	+/-	+
Cultural governance (institutional framework)	CulGovInst_INDEX	+	+
Cultural governance (policies and financial framework)	CulGovPol_INDEX	+	+
Cultural (tourism) governance	CulGovTour_INDEX	+	+
General government expenditure on culture per capita	CulGovEXPpc	+	+

Table 9. Sustainability OLS regression model – descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Environmental sustainability					
EnvSus_INDEX	20	0.515717	0.087746	0.261428	0.601492
EcoSus_INDEX	25	0.734198	0.061569	0.591988	0.904678
SocSus_INDEX	24	0.531146	0.176741	0.13042	0.859848
CulSuS_INDEX	34	0.66188	0.086169	0.462082	0.946039
Cultural indices and variables					
CulRes_INDEX	34	0.148094	0.118396	0.001422	0.375611
CulInf_INDEX	32	0.106235	0.164277	0	0.702742
CulENT	34	263.9118	1003.662	0	5870
CulJOBS	26	4.988785	5.636451	0	20.63237
CulGovInst_INDEX	35	0.87033	0.134239	0.692308	1
CulGovPol_INDEX	35	0.918029	0.13464	0.601884	1
CulGovTour_INDEX	35	0.85	0.150977	0.5	1
CulSAT	35	4.231671	0.285366	3.463235	4.760563
GenEq	35	5.255283	0.818494	3.692308	6.371428

Note: Descriptive statistics in the sustainabilty OLS regression model presented in Table 9 refers to those variables that have been used as inputs to create indices.

Descriptive statistics referring to all variables are presented in the Annex, Table A6-A7

2.2.2. Resilience model

In this chapter, we explain independent variables (control and cultural) included in the SmartCulTour resilience model. The expected signs regarding their impacts on resilience in our model are given in Table 10.

Since the concept of resilience is stemming from different disciplines, the empirical literature highlighted numerous potential factors in shaping regional reactions to external shocks. It recognizes the degree of public sector shelter (Fratesi & Rodríguez-Pose, 2016), human capital endowment (e.g. Di Caro, 2017; Annoni et al., 2019), the level of urbanization (Giannakis & Bruggeman, 2019) and quality of government (e.g. Ezcurra & Rios, 2019; Rio & Gianmoena, 2020). Those variables present **control variables** in our SmartCulTour resilience model.

The concept of "sheltered regions" have been promoted by Rodríguez-Pose and Fratesi (2007) and implies **higher public sector presence in protection** from significant and immediate layoffs at the beginning of the crisis, but also as a key factor of regions' limited capacity in taking advantage of high growth periods (Fratesi & Rodríguez-Pose, 2016). Hence, we perceive the presence of "sheltered effect" by including revenues of local government (expenditures and revenues) per capita as a control variable.[10]

Various researchers recognize **human capital** as a vital factor associated with better resistance to economic shocks (Crescenzi et al, 2016; Di Caro, 2017; Annoni et al., 2019). In the first place, higher human capital endowment favours regional ability to absorb or generate new knowledge in a period of crisis and therefore makes a regional economy more resilient. The share of people aged 15-64 with tertiary educational attainment (ISCED 5–8) in the total population represents the endowment of human capital in the region.

The focus of the literature regarding urban areas has been motivated by the dominant presumption from urban economics that larger, more **populated areas** can lose less (or create more) jobs during and after the crisis (e.g. Fratesi & Rodríguez-Pose, 2016). Conversely, Dijkstra et al. (2015) found that intermediate and rural regions closer to cities achieved higher output and labour productivity growth rates than urban areas in Europe. Finally, Giannakis & Bruggeman (2019) provide empirical evidence of the vastly heterogeneous resilience among urban and rural European regions. Thus, to control the potential agglomeration effects, an indicator of the population is included in our specification.

Besides the above-elaborated regional factors, the literature underlines the importance of national patterns, with institutions playing an important role in the resilience of a region. The **government quality** can minimize the frequency and intensity of a crisis (OECD, 2017), and increase regional resilience by improving policy responses, in particular those influencing efficiency of public investments (Crescenzi et al, 2016). In addition, quality of government can reinforce resilience capacity by strengthening contract enforcement, minimizing barriers of entry and decreasing privileges of established firms consequently improving resource allocation (OECD, 2017). Yet, literature points out that lower institutional quality may also decrease exposure to external shocks. This means that the lower level of government quality may discourage trade and financial flows (Rodríguez-Pose & Cols, 2017; Alvarez et al, 2018) and thus, decrease the risk of translating the externals shocks into greater regional disturbances (Rios & Gianmoena, 2020). Considering impact of government quality goes beyond regional administrative level (e.g. Ezcurra & Rios, 2019), in this research we use the World Bank's 'World Governance Indicators' - WGI (Kaufmann et al., 2010), as a proxy for quality of

[10] It is important to note that this variable partially replaces frequently used control variable in the regional resilience models, which depicts the level of economic development of the region under study such as GDP p.c. or which depict regional economic output such as GVA p.c. at regional level (see Romão, 2020). Therefore, we could not depict the broader scope of development levels of regions under study.

governance.

In addition, we have included the **tourism dynamics** in SmartCulTour resilience model as control variable. In a comprehensive literature review conducted by Brida et al. (2014), in which approximately 100 peer-reviewed papers on tourism-led growth hypothesis (TLGH) were analyzed, it was concluded that, with a few exceptions, the empirical findings mostly imply that tourism supports economic growth. TLGH has been the subject of research for a long time, but lately, authors have started to investigate the role of tourism in regional economic resilience (Romão et al., 2016, Mazzola et al., 2019). The first empirical assessment of the interrelations between tourism dynamics, sectoral specialization, and regional economic performance was performed by Romão (2020), revealing that tourism demand has a positive impact on regional growth and resilience. Although a previous study (Milio, 2014) concluded that regions more specialized in tourism and construction activities have revealed lower level of resilience after the 2008 international crisis, the positive effects of tourism are mostly related to the creation of high value added jobs (Romão & Neuts, 2017). Hence, when considering the policy orientation, it should not be towards the increase in tourism demand if it is not supported (followed) by high-value-added sectors in service provisions and incorporation of knowledge, rather than massive and low-cost labour-intensive services (Romão, 2020). To depict tourism dynamics in our model, we use the indicator of tourism arrivals (per habitant) in the regions under study as a proxy variable.

Since the main aim of our model is to depict the effects of cultural tourism on destination's resilience, **cultural tourism indicators** are presented through developed cultural tourism indices explained in previous paragraphs. Due to the limited empirical research regarding the link between cultural tourism and regional resilience, our empirical work presents the novelty to this field of literature. In the following text, we explain the relation between cultural tourism and economic development of a destination, and where applicable (possible) we refer to the studies analyzing the impacts of cultural tourism on resilience. In general, according to Celini and Cuccia (2019) the peculiar structure of the cultural industries, characterized by self-employers, small and micro enterprises, and a high rate of turnover of cultural enterprises, along with the cross-fertilizing role of cultural activities, provide an explanation for the capacity of this sector to contribute to regional resilience. We have tried to capture those issues in the cultural tourism indicators' framework elaborated in Report D4.1.

Economic impacts generated by **cultural resources** are mostly related to increased value of production for local heritage sites and employment and revenues of companies involved in tourism or other activities related to their use (ESPON, 2019). In addition, the regional endowment in cultural resources often relates to regional tourism attractiveness (Martin, 2014). However, the study conducted by Romão and Nijkamp (2018) identified negative correlation between abundance of cultural resources and rates of economic growth in European regions. Bille and Shulze (2006) argue that the concentration of protected heritage assets in space could have large economic potential for development depending on **the kind of cultural goods that attract visitors the most and the circumstances under which they generate the development**. To depict the effects of cultural resources on resilience in the resilience model we use the already elaborated CulRes_INDEX.

To analyse the impact of **particular cultural institutions** on resilience we use the CulInf_INDEX. According to UNESCO (2016), cultural institutions have great potential to raise the public awareness on the value of cultural and natural heritage and of the residents' responsibility to contribute to their conservation and dissemination. Finally, in the contemporary age of the knowledge-based economy, according to OECD/ICOM (2018) museums can induce local economic development by supporting creative economic activities (e.g. design and innovation) for the benefit of local and international enterprises and entrepreneurs. Therefore, museums become not only one of many actors in local development, but are seen as a driver of the local

development (OECD/ICOM, 2018). They are actually recognized as agents and drivers of social and economic change as they generate knowledge for and about society, and are a place for social interaction and dialogue, and a source of creativity and innovation for the local economy (OECD/ICOM, 2018). Nevertheless, the only presence of certain infrastructure hardly produces the positive impacts on development or resilience, while the factors of institutional framework and policy regulation have the same importance as will be further elaborated. Since there are no empirical studies regarding the effects of this kind of an indicator on resilience, we can presume either positive or negative effects of this indicator based on the conclusions of Plaza (2008), who stressed that the impact of a museum on the development of a city leans on the efficiency of tourism and the overall economy, complementary to other business sectors in order to balance the seasonal employment turnovers and offset the negative effects of the price increase.

Kourtit and Nijkamp (2018), and Kurtit et al. (2013) confirmed positive correlation between local cultural heritage and the **presence of the creative industry** at the municipality level. In the new business environment that has evolved as a result of rapid technological change, creativity is seen as a key resource through which firms can maintain a competitive edge (Throsby, 2006). In addition, Cellini and Cuccia (2019: 13) have found that *"positive and significant correlation coefficient does emerge between the percentage of cultural firms, and the regional resilience indicator referred to employment".* Finally, the presence of a resource, regardless how important it may be in the cultural sense, does not inevitably mean that it will yield significant development results if there is no convenient economic environment (Plaza, 2008). Therefore, we have included the CulBus_INDEX as an independent variable in our model, to indicate whether the presence of enterprises in creative and cultural industries impact the resilience of our regions under study.

In addition, most of the studies analysing effects of the cultural heritage on tourism attractiveness of an observed region argue that the principal role should be placed towards **regulatory concepts and policies relating cultural development and cultural tourism**. Small companies working within the cultural or creative area can use the network and cluster advantages arising from highly developed cultural institutions in a local area (Bille & Shulze, 2006: 1068). In explanation of cultural destructuralization processes, Lazaretti (2008: 97) identified "the existence of at least three basic elements: the presence of high culture places (identified through resources), the economic enhancement of cultural resources (through clusters of economic, non-economic and **institutional actors**) and localization of resources and actors (territorial proximity)." In addition, Sacco and Crociata (2013) emphasise that the **cultural policies** should not be viewed as a regulatory package that supersedes a specific aspect of **local governance**, but to move towards a more **strategically integrated perspective** where the cultural dimension becomes increasingly interdependent with other policy dimensions (following Mercer, 2006), thus covering regenerative and progressive approach to cultural policy. Celini and Cuccia (2019) state that progressive and regenerative cultural policies are more effective than the educational – often paternalistic – policies, and culture is more important as a cross-fertilizing factor in regional communities, rather than a simple attractor for activities in specific spots. New forms of **public intervention to enhance economic resilience** are generally viewed as necessary (Bristow & Healy, 2015) and inclusion of resilience thinking into the development the plans is new essential element in planning processes (Cohrane, 2017). To depict all of these issues regarding policies and institutional framework of culture in a destination we have used these proxies: CulGovInst_INDEX, CulGovPol_INDEX, CulGovTour_INDEX and CulGovExp_PC.

Table 10. Resilience model: control and cultural tourism variables and expected signs

Variable	Abbreviation	Expected sign
Control variables		
Expenditures of local government in € per capita (local)	EXPpc	+
Revenues of local government in € per capita (local)	REVpc	+
Population (local)	POP	+
Governance (national level)	WGI	+
Education (NUTS2 level)	EDU	+
Tourit arrivals per capita (local)	TOURpc	+
Cultural tourism variables		
Cultural (tourism) businesses	CulENT	+
Presence of cultural resources	CulRes_INDEX	+/-
Availability of cultural infrastructure	CulInf_INDEX	+/-
Cultural governance (institutional framework)	CulGovInst_INDEX	+
Cultural governance (policies and financial framework)	CulGovPol_INDEX	+
(Cultural) tourism governance	CulGovTour_INDEX	+
General government expenditure on culture per capita	CulGovEXPpc	+

Based on the explained control variables basic model of resilience will be presented by two versions (8) and (9) of the same model. They can be written:

$$RES_{it} = \mu + \gamma \cdot RES_{i,t-1} + \cdot \beta_1 EXPpc_{it} + \beta_2 Pop_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EduTet_{it} + \alpha_i + \varepsilon_{it}; \quad (8)$$
$$i = 1,\ldots,N; t = 1,\ldots,T;$$

where RES_{it} is indicator of resilience in the LAU *i* the period *t*, $EXPpc_{it}$ is value of expenditures of local government of LAU *i* in the period *t*, POP_{it} is number of population in the *i*-th LAU in the period *t*, WGI_{it} is value of institutional quality for country of LAU i in time period t, EDU_{it} is percentage of population aged 25-64 with tertiary education in the NUTS2 region of LAU *i* in the period *t*, in the period *t*. $\beta_1 - \beta_4$ are parameters to estimate.

$$RES_{it} = \mu + \gamma \cdot RES_{i,t-1} + \cdot \beta_1 REVpc_{it} + \beta_2 POP_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EDU_{it} + \alpha_i + \varepsilon_{it}; \quad (9)$$
$$i = 1,\ldots,N; t = 1,\ldots,T;$$

In the next step both versions of the model will be extended in equations (10) and (11), by one cultural tourism variable or index, written as:

$$RES_{it} = \mu + \gamma \cdot RES_{i,t-1} + \cdot \beta_1 EXPpc_{it} + \beta_2 POP_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EDU_{it} + \quad (10)$$
$$\beta_5 \cdot CUL_{it} + \alpha_i + \varepsilon_{it}; \quad i = 1,\ldots,N; t = 1,\ldots,T;$$

$$RES_{it} = \mu + \gamma \cdot RES_{i,t-1} + \cdot \beta_1 REVpc_{it} + \beta_2 POP_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EDU_{it} + \quad (11)$$
$$+\beta_5 \cdot CUL_{it} + \alpha_i + \varepsilon_{it}; \quad i = 1,\ldots,N; t = 1,\ldots,T;$$

To additionally investigate the relationship between resilience and tourism, the resilience model is additionally extended by tourism indicator Tour_PC in (12)- (13):

$$RES_{it} = \mu + \gamma \cdot RES_{i,t-1} + \cdot \beta_1 EXPpc_{it} + \beta_2 POP_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EDU_{it} + \beta_6 \cdot TOURpc_{it} + \beta_5 \cdot CUL_{it} + \alpha_i + \varepsilon_{it}; \quad i = 1,...,N; t = 1,...,T; \tag{12}$$

$$RES_{it} = \mu + \gamma \cdot RES_{i,t-1} + \cdot \beta_1 REVpc_{it} + \beta_2 Pop_{it} + \beta_3 \cdot WGI_{it} + \beta_4 \cdot EDU_{it} + \beta_6 \cdot TOURpc_{it} + \beta_5 \cdot CUL_{it} + \alpha_i + \varepsilon_{it}; \quad i = 1,...,N; t = 1,...,T; \tag{13}$$

Table 11. Correlation matrix (resilience model – all variables)

	RES	EXPpc	REVpc	POP	WGI	EDU	TOURpc	CulENT	CulRes_INDEX	CulInf_INDEX	CulGovInst_INDEX	CulGovPol_INDEX	CulGovTour_INDEX	CulGovEXPpc
RES	1.0000													
EXPpc	0.3302*	1.0000												
REVpc	0.4445*	0.9905*	1.0000											
POP	0.3888*	0.1932*	0.2753*	1.0000										
WGI	0.1751*	0.5864*	0.5415*	0.3006*	1.0000									
EDU	0.2328*	0.3469*	0.3516*	0.1075*	0.7166*	1.0000								
TOURpc	0.0250	0.0156	0.0899	-0.1488*	-0.1746*	0.1237*	1.0000							
CulEnt	0.5250*	0.4484*	0.4419*	0.9408*	0.3198*	0.1466*	-0.0847	1.0000						
CulRes_INDEX	0.0401	-0.0406	-0.0336	0.2714*	-0.1295*	-0.0578	0.0717	0.2368*	1.0000					
CulInf_INDEX	0.0213	0.6402*	0.4599*	-0.3036*	0.3789*	0.3444*	0.8079*	-0.0725	0.0701	1.0000				
CulGovInst_INDEX	0.1294*	0.2316*	0.2057*	0.1085*	0.3563*	0.1540*	-0.3507*	0.1293*	-0.0085	0.0643	1.0000			
CulGovPol_INDEX	0.1717*	-0.1091	-0.0705	0.0583	-0.0792	0.1187*	0.1110	0.1421*	0.1571*	0.1485*	0.4381*	1.0000		
CulGovTour_INDEX	0.1732*	0.0060	0.0234	-0.0527	0.1288*	0.1398*	-0.0390	0.0388	0.0111	0.1407*	0.7173*	0.7603*	1.0000	
CulGovEXPpc	0.1584*	0.2504*	0.2394*	0.1279*	0.5357*	0.4617*	-0.1776*	0.0453	-0.1057*	0.0146	0.4783*	0.2834*	0.3549*	1.0000

Note:*indicates statistical significance at 5%

Table 12. Resilience panel model - descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Observations		
					N	n	T/T-bar
RES	185.359	3297.542	-7824	34000	234	22	10.6364
EXPpc	1519.855	1690.424	253.3094	10317.46	313	35	8.94286
REVpc	1401.57	1358.707	247.0152	9900.99	330	35	9.42857
POP	51484.59	106267	1212	644618	437	35	12.4857
WGI	0.987702	0.483678	0.365859	1.87299	455	35	13
EDU	29.20945	8.750112	12.2	42.8	455	35	13
TOURpc	3.24233	6.52625	0.006639	37.93139	261	29	9

In the correlation matrix (Table 11), high correlation between Exp_PC and Rev_PC with correlation coefficient 0.9905 is evident. Therefore, these two indicators are considered in the deferent model specifications. The first basic model contains Exp_PC as a control variable, while the second basic model contains Rev_PC. Additionally, a high correlation coefficient 0.9408 is obtained between Pop and CulEnt. To ensure that the high correlation coefficient doesn't impact the CultEnt result, a model specification which includes CultEnt is estimated with all control variables and without the Pop variable. Results for CulEnt remained the same in both models. A somewhat higher correlation is obtained between WGI and Edu_Tet (0.711) and Tour_PC and CulInf_INDEX (0.8079). To ensure that possible problems of multicolinearity do not endanger the results, several model specifications are considered. Half of the model specifications do not contain Tour_PC variable while the other half of model specifications do contain the variable. Additionally, correlation coefficients are somewhat higher between different cultural tourism indicators. This result is expected and these variables are included separately in the different model specifications.

2.2.3. Dynamic panel data and linear regression

The dynamic nature of sustainability and resilience is proved by the SRT model formulation presented in equations (1)-(5) and (8)-(13). Precisely, the current value of sustainability indices and resilience depends on its value from the previous period (Mazzola et al, 2019; Romao, 2020). Therefore, aiming to estimate their values, a dynamic panel data estimator needs to be applied. Considering the number of cross-sections (LAU in this case) and periods, a dynamic panel data estimator for this specific dataset is used.

By including lagged dependent variables of sustainability and resilience into the model, standard estimators such as Least Squares Dummy Variables (LSDV) and Generalized Least Squares (GLS) became biased due to the correlation between lagged dependent variable and cross-section specific part of the error term α_i.

Most of the researches use two GMM estimators, i.e. a differenced GMM estimator (Arellano & Bond, 1991) and system GMM introduced by Arellano and Bover (1995), and upgraded by Blundell and Bond (1998). Both estimators are proposed for data sets with many cross-sections and a small number of periods. However, Soto (2009) has confirmed in a simulation study the appropriateness of their properties for the smaller number of cross-sections, conditioned by the usage of a minimal number of instruments.

Both the difference GMM and system GMM estimators use instrumental variables to remove the correlation between lagged dependent variable and α_i. Difference GMM estimates equations in first differences while system GMM simultaneously estimates equations in level and equations in first differences. Regardless of better properties of the system GMM in simulation studies (Blundell & Bond, 1998, 2000; Bun & Sarafidis, 2013; Soto, 2009), in this research a differenced GMM estimator is employed. The reason for such a choice is a relatively small number of cross-sections.

In case we apply the system GMM, a minimal number of instruments will exceed the number of cross-sections. By applying difference GMM we can keep the number of instruments below the number of cross-sections in the most model specifications. On the other hand, if we use too many instruments, estimation bias can be higher than estimation that neglected the endogeneity problem. Additionally, for a case with many instruments, the Sargan test for endogeneity doesn't give realistic results (Roodman, 2009a; 2009b). To avoid both elaborated problems, differenced GMM is applied. To remove correlation only the second lag of the dependent variable $Sustainability_{i,t-2}$ and $RES_{i,t-2}$ is used for the instrument. Aiming at relaxing the assumption of error term independence and at achieving robustness to heteroscedasticity, the two-step system GMM estimator is applied. Windmeijer (2005) corrected underestimated standard errors of estimators and made it concurrent to the one-step estimator.

Considering that resident survey data, as well as data for some other qualtitative indicators are available for just one year, some sustainability models will be estimated with the Ordinary Least Squares (OLS) method for cross sectional data. To prevent possible problems of heteroscedasticity, robust standard errors are used.

2.3. Empirical results and discussion on Sustainability and Resilience models

2.3.1. Results of Sustainability model

According to equation (4) and equation (5), for estimating the impacts of cultural tourism on environmental sustainability, eight estimation models have been executed, i.e. one basic model that is presented by equation (4) and seven models stemming from equation (5).

Table 13. Environmental sustainability panel model

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.EnvSus_INDEX	0.429***	0.393***	0.354***	0.428***	0.298***	0.435***	0.432***	0.413***
	(0.0225)	(0.0353)	(0.0311)	(0.0344)	(0.0335)	(0.0337)	(0.0254)	(0.0265)
GDPpc	-0.00000100**	-0.00000211***	-0.00000182***	-0.000000862*	-0.00000136***	-0.00000109**	-0.000000929**	-0.000000901**
	(0.000000416)	(0.000000508)	(0.000000309)	(0.000000456)	(0.000000412)	(0.000000490)	(0.000000421)	(0.000000440)
POP	-0.000000381	0.00000326**	0.000000161	-0.00000148**	0.000000295	-0.000000264	-0.000000397	-4.81e-09
	(0.000000800)	(0.00000151)	(0.000000660)	(0.000000683)	(0.00000124)	(0.00000109)	(0.00000106)	(0.000000858)
WGI	0.0468***	0.0357***	0.0162***	0.0416***	0.0345***	0.0463***	0.0423***	0.0444***
	(0.00523)	(0.00749)	(0.00466)	(0.00728)	(0.00679)	(0.00763)	(0.00665)	(0.00848)
EDU	0.00182***	0.00157***	0.00149***	0.00180***	0.00147***	0.00182***	0.00178***	0.00176***
	(0.000140)	(0.000197)	(0.000148)	(0.000164)	(0.000106)	(0.000161)	(0.000120)	(0.000124)
CulENT		0.000466***						
		(0.000164)						
CulRes_INDEX			0.0655***					
			(0.00279)					
CulInf_INDEX				-0.196***				
				(0.0443)				
CulGovInst_INDEX					0.0385***			
					(0.00175)			
CulGovPol_INDEX						0.00249		
						(0.00836)		
CulGovTour_INDEX							-0.000722	
							(0.00204)	
CulGovEXPpc								-0.00000575
								(0.00000404)
_cons	0.233***	0.150***	0.294***	0.291***	0.272***	0.225***	0.236***	0.229***
	(0.0310)	(0.0225)	(0.0225)	(0.0358)	(0.0394)	(0.0453)	(0.0341)	(0.0301)
Number of observations	119	119	119	118	119	119	119	116
Number of groups	14	14	14	14	14	14	14	14
Number of instruments	15	16	16	16	16	16	16	16
Sargan test (p-value)	0.1269	0.1504	0.1308	0.1277	0.1347	0.1286	0.1284	0.1307
AB2 test (p-value)	0.1257	0.1095	0.0624	0.1337	0.0312	0.1279	0.1147	0.1337

Notes: [a]Standard errors in parentheses, *, **,*** indicates significance at 10%, 5% and 1%*

In line with Table 13, it can be concluded that all models but model (5) satisfied diagnostic tests. In all models' specifications (1)-(8) p-value of the Sargan test is higher than 0.05 indicate there is no problem of endogeneity in any model specification. Additionally, the p-value of the AB2 test of second-order autocorrelation of differenced residuals is also higher than 0.05 in models (1)-(4) and (6)-(8). Second-order autocorrelation of differenced residuals ensures no autocorrelation of the first order of residuals in levels for those models. Model (5) proves the existence of the autocorrelation problem.

Lagged dependent variable EnvSus INDEX is positive, less than one and statistically significant in all model specifications. These results confirm the dynamics of the dependent variable and additionally prove that the use of dynamic panel data was justified. However, the number of instruments, being more than the number of cross-sections, doesn't follow Roodman's recommendations (2009), suggesting the number of instruments being less than the number of cross-sections. Hence, we tried to adhere as closely as possible to the recommendations of Roodman by limiting the instruments to the absolutely necessary ones, which proved to be a good decision judging by the results of the Sargan that proved that the quality of estimation is not significantly endangered.

Variable 'GDP-PC' has a negative sign and is statistically significant in most model specifications. Variable 'Population' exhibites both, positive and a negative signs but is not statistically significant in most of the model specifications. 'Institutional quality indicator - WGI' proves positive and statistically significant in all model specifications apart from model (3). Finally, 'Tertiary education' indicates a positive and statistically significant impact. Based on all model specifications, it is evident that the impact of control variables is robust to the inclusion of different cultural tourism variables and indices in the environmental sustainability model.

In the model specifications (2)-(8), different cultural tourism indicators and indices are included in the model of sustainability. The analysis indicates a positive and statistically significant influence of the variables CulEnt, CulRes_INDEX, CulGovInst_INDEX on environmental sustainability, while variable CulInf_INDEX affects environmental sustainability in a negative and statistically significant way. Finally, the analysis has shown a negative and statistically non-significant influence of the variables CulGovTour_INDEX and CulGovExp_PC on environmental sustainability, while the variable CulGovPOL_INDEX indicated a positive and statistically non-significant impact.

Table 13 outlines the Environmental sustainability panel model, which analyses how cultural tourism development affects the tourism destination's environmental sustainability. This pivotal analysis, which is among the first to quantify the interrelation between these two complementary but distinctive phenomena, suggests that the link between cultural tourism and environmental sustainability is complicated. The results referring to the control variables suggest a negative and significant influence of the GDP per capita and population in most model specifications, which is in line with studies discussing a trade-off between economic and population growth and environmental quality (Dang & Serajuddin, 2020; Rehman et al., 2021). Institutional quality indicator (WGI) and tertiary education have a positive and statistically significant influence in most of the model specifications, reinforcing the need for effective institutions (Mavragani et al., 2016) and education (Freidenfelds et al., 2018) to act to reduce the adverse impacts on environments. Model specifications suggest that the influence of control variables is robust to the inclusion of different cultural variables and indices in the sustainability model. The analysis reveals the positive influence of the number of cultural businesses, cultural resources index and cultural governance index on tourism destination environmental sustainability. Simultaneously, the model has demonstrated the adverse effects of cultural infrastructure index and culture government expenditure per capita on this pillar of sustainability.

Cultural resources (including cultural heritage - tangible and intangible as well as contemporary creative and cultural expressions) and governance (strategic planning at different levels) are the foundation for the development of creative industries (cultural businesses), which are among major drivers of social inclusiveness and enabler of sustainable development. Tourism destinations are dependent on healthy and preserved environments, and cultural resources as their constituent element require effective governance, i.e. conservation and interpretation models to guide heritage use and fruition while ensuring sustainability

at the destination level (Keitumetse, 2014). Sustainability and innovation are central principles underpinning underpinning the European Framework for Action on Cultural Heritage (2019). Within the second pillar, "Cultural Heritage for a Sustainable Europe", this document particularly focuses on the improvement of cultural (tourism) governance to promote Europe's natural heritage and environmental sustainability as a factor of competitiveness and inclusive growth. Additional support for this interpretation comes from Ben Mahjoub & Amara (2020), as their recent study of impacts of cultural governance on environmental sustainability demonstrated positive effects. Finally, cultural businesses – an integrated part of the creative economy, contribute to resolving issues on sustainable urban development (Štreimikienė & Kačerauskas, 2020), which was a significant aspect of the proposed environmental sustainability model (for example, the indicator of construction density within destination).

The adverse influence of cultural infrastructure on tourism destinations' environmental sustainability partially contradicts the previously discussed interrelation between culture and environmental sustainability. From one side, one would expect a positive interrelation between constructs, as cultural infrastructure (Duxbury et al. 2016) is the foundation of sustainable and inclusive development (UNESCO, 2016). However, this model mainly focused on the environmental aspect of destinations sustainability. Thus, despite initially contradictory, in reality, these findings provide additional argument to consider culture both as a constituent and enabler of overall sustainability and a sustainability pillar in itself. An alternative explanation would be that higher values of cultural infrastructure index, in this case suggesting more museums and theatres in the tourism destination, could relate to higher cultural tourism intensity and density (more tourists and overnights), reflecting on the deterioration of environmental pillar of sustainability (crowding, emissions, waste generated).

Table 14. Economic sustainability panel model

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.EcoSus_INDEX	0.159***	-0.321***	0.0480	0.127***	0.496***	0.149***	0.0123	0.255***
	(0.0318)[a]	(0.0323)	(0.0369)	(0.0485)	(0.0325)	(0.0318)	(0.0185)	(0.0284)
GDPpc	-0.00000135	-0.000000651	-0.00000150	-0.00000687***	-0.00000114	-0.00000153	-0.00000138	-0.00000145
	(0.00000114)	(0.000000675)	(0.00000113)	(0.00000152)	(0.000000963)	(0.00000119)	(0.00000123)	(0.00000134)
POP	0.000000369	-0.00000174**	0.000000491	-0.00000511*	0.000000182	0.000000427	0.000000415	-0.000000143
	(0.000000782)	(0.000000793)	(0.000000644)	(0.00000308)	(0.000000695)	(0.000000741)	(0.000000879)	(0.00000149)
WGI	-0.0137	0.0538**	-0.00463	-0.0968***	-0.0336	-0.0116	-0.00407	-0.0216
	(0.0233)	(0.0217)	(0.0179)	(0.0152)	(0.0313)	(0.0243)	(0.0210)	(0.0193)
EDU	0.00108***	0.00115***	0.000948***	0.00283***	0.000908**	0.00110***	0.000937	0.000924*
	(0.000380)	(0.000216)	(0.000360)	(0.000785)	(0.000425)	(0.000358)	(0.000608)	(0.000515)
CulENT		0.0000557***						
		(0.0000152)						
CulRes_INDEX			0.0526**					
			(0.0253)					
CulInf_INDEX				-0.206				
				(0.385)				
CulGovInst_INDEX					-0.0103*			
					(0.00619)			
CulGovPol_INDEX						0.0206*		
						(0.0113)		
CulGovTour_INDEX							-0.00378	
							(0.0111)	
CulGovEXPpc								0.0000259
								(0.0000477)
_cons	0.668***	1.069***	0.729***	1.173***	0.442***	0.656***	0.782***	0.650***
	(0.0465)	(0.0669)	(0.0463)	(0.109)	(0.0384)	(0.0441)	(0.0538)	(0.0755)
Number of observations	183	145	183	117	183	183	183	149
Number of groups	26	21	26	15	26	26	26	26
Number of instruments	15	16	16	16	16	16	16	16
Sargan test (p-value)	0.7962	0.4912	0.8052	0.3623	0.7783	0.7966	0.8109	0.8405
AB2 test (p-value)	0.9482	0.7518	0.9261	0.8616	0.7310	0.9830	0.9211	0.9030

Notes: [a]Standard errors in parentheses, *, **,*** indicates significance at 10%, 5% and 1%*

Given the results presented in Table 14, it can be concluded that all models satisfied diagnostic tests. In all model specifications (1)-(8), the p-value of the Sargan test is higher than 0.05, indicating there is no problem of endogeneity in any model specifications. Additionally, the p-value of the AB2 test of the second-order autocorrelation of differenced residuals is also higher than 0.05. Second-order autocorrelation of differenced residuals ensures no autocorrelation of the first order of residuals in levels.

The lagged dependent variable EcoSus_INDEX is positive, less than one and statistically significant in most model specifications but models (2) and (3). These results confirm the dynamics of the dependent variable and additionally prove dynamic panel data use was justified. In all model specifications apart from model (4), the number of instruments is less than the number of cross-sections.

Variable 'GDP_PC has a negative sign and is not statistically significant in most model specifications. Variable 'Pop' is not statistically significant in most model specifications. 'Institutional quality indicator WGI' proves a negative sign and is not statistically significant impact in any other model specifications apart from models (2) and (4). Finally, 'tertiary education' has a positive and statistically significant impact. Based on all model specifications, it is evident that the impact of control variables is robust to the inclusion of different cultural tourism variables and indices in the model of economic sustainability.

In the model specifications (2)-(8), different cultural tourism indicators and indices are included in the model of economic sustainability. The analysis has shown a positive and statistically significant influence of the variables CuLEnt, CulRes_INDEX, CulGovPol_INDEX on economic sustainability while variable CulGovInst_INDEX affects environmental sustainability in a negative and statistically significant way. Finally, the analysis indicated a negative and statistically non-significant impact of both CulInf_INDEX and CulGovTour_INDEX on economic sustainability.

The results indicate a positive and statistically significant correlation between two cultural offer indicators and the economic dimension of tourism sustainability. These two indicators are (1) the number of cultural businesses/enterprises and (2) the cultural resources index. The latter comprises the tangible and intangible elements inscribed on World Heritage Lists and national ones. On the other hand, the economic sustainability index is composed of two demand-side indicators (tourism arrivals and length of stay) and two indicators related to supply-side regulation (existence of up to date tourism plans/policies and the existence of land use planning). Thus, these results align with the existing theoretical stance and provide empirical evidence that attractive and abundant cultural attractions stimulate tourism activity and related economic impacts (Castillo-Manzano et al., 2020; Lozano-Oyola et al., 2012). To be pinpointed and critically viewed is the finding on the importance of abundant heritage as a tourism driver. Namely, Gravari-Barbas, (2018) warns that heritage production and tourism are in a vicious cycle of co-production: heritage development encourages tourism, which in turn contributes to heritage development, which then again fuels tourism, and so forth. She goes on to conclude that today the cycle functions are in a frantic rhythm. Thus, although being encouraging in terms of economic impacts, this finding needs to be looked at in the wider context of the overall sustainability, i.e. inclusive of social, environmental and especially the cultural dimension of sustainability.

Table 15. Social sustainability panel model

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.SocSus_INDEX	0.195***	0.201***	0.138***	0.207***	0.153***	0.197***	0.252***	0.201***
	(0.00150)	(0.00127)	(0.00356)	(0.00323)	(0.00185)	(0.00193)	(0.00169)	(0.00151)
GDPpc	-0.00000589***	-0.0000100***	-0.00000695***	-0.00000974***	-0.00000611***	-0.00000544***	-0.00000302***	-0.00000534***
	(0.00000122)	(0.000000548)	(0.00000152)	(0.00000134)	(0.00000167)	(0.00000132)	(0.000000928)	(0.00000138)
Pop	-0.00000240**	-0.00000106	-0.00000159***	-0.00000386	-0.00000236**	-0.00000207**	-0.00000349***	-0.00000393**
	(0.000000995)	(0.00000210)	(0.000000444)	(0.00000390)	(0.000000962)	(0.000000930)	(0.000000932)	(0.00000154)
WGI	0.0320***	0.0758***	-0.0580***	0.0613***	0.00580	0.0320***	0.0242***	0.0535***
	(0.00639)	(0.00431)	(0.0222)	(0.00931)	(0.0101)	(0.00549)	(0.00563)	(0.00973)
EDU	0.00179***	0.00280***	-0.000974***	0.00277***	0.000554**	0.00168***	0.00458***	0.00209***
	(0.000227)	(0.000154)	(0.000221)	(0.000249)	(0.000224)	(0.000279)	(0.000393)	(0.000197)
CulENT		0.0000259						
		(0.0000397)						
CulRes_INDEX			0.346***					
			(0.0330)					
CulInf_INDEX				-0.464***				
				(0.169)				
CulGovInst_INDEX					0.108***			
					(0.00574)			
CulGovPol_INDEX						-0.000793		
						(0.0178)		
CulGovTour_INDEX							-0.104***	
							(0.00293)	
CulGovEXPpc								0.0000799***
								(0.0000164)
_cons	0.263***	0.220*	0.335***	0.339**	0.252***	0.242***	0.257***	0.278***
	(0.0359)	(0.122)	(0.0565)	(0.171)	(0.0279)	(0.0304)	(0.0352)	(0.0440)
Number of observations	164	129	164	98	164	164	164	130
Number of groups	23	18	23	12	23	23	23	23
Number of instruments	15	16	16	16	16	16	16	16
Sargan test (p-value)	0.0523	0.0777	0.0699	0.4928	0.0459	0.0530	0.0584	0.1289
AB2 test (p-value)	0.3015	0.3003	0.2920	0.2988	0.3050	0.3011	0.2999	0.3066

Notes: [a]Standard errors in parentheses, *, **,*** indicates significance at 10%,5% and 1%*

In line with Table 15, it can be concluded that all models but model (5) satisfied diagnostic tests. The p-value of the Sargan test is higher than 0.05 in models (1)-(4) and (6)-(8). That indicates there is no problem of endogeneity for those models. In model (5) the value of the Sargan test is 0.045 what is slightly below 0.05. However, as other results are in line with other models, it can be concluded that the endogeneity problem is not large. The p-value of the AB2 test of the second-order autocorrelation of differenced residuals is higher than 0.05 in all model specifications. Second-order autocorrelation of differenced residuals ensures no autocorrelation of the first order of residuals in levels. The lagged dependent variable SusSus_INDEX is positive, less than one and statistically significant in all model specification. These results confirm the dynamics of the dependent variable and additionally prove dynamic panel data use was justified. In all model specifications but (4), the number of instruments is less than the number of cross-sections.

Table 15 displays the results of the social sustainability panel model. The analysis here is based on tourists' ratio to locals and tourism intensity as indicators reflecting the social sustainability of tourism development. At this stage of the analysis, these indicators were retained to reflect tourism development's social sustainability as they enabled the panel analysis. The subsequent regression analysis, involving social sustainability indicators referring to visitor and resident perception of various aspects of tourism development (displayed in Deliverable 4.1) measured on a 7-point Likert scale using an online questionnaire and telephone interviews from November to January 2021, is displayed below.

A quick glance at the control variables in Table 15 suggests a negative and significant influence of GDP per capita and population in most model specifications. Simultaneously, institutional quality (WGI) and tertiary education indicators have a positive and statistically significant influence in most models. Considering the focus of the analysis, and in the absence of comparative studies, a likely explanation of the adverse influence of GDP per capita and the population is the sample outline, involving LAUs of different types (urban and rural) and scale (municipalities of less than 1,000 inhabitants and cities of more than half a million inhabitants, e.g. Rotterdam). Developed and highly populated urban destinations are recognised and often discussed (Khomsi et al., 2020; Namberger et al., 2019; Koens et al,, 2018; Panayiotopoulos & Pisano, 2019; Seraphin et al., 2018) as victims of overtourism, with particular reference to the social influence of tourism development. Regarding the positive influence of institutional quality indictor and tertiary education, the findings reinforce the importance of human capital and effective institutions for sustainable development (Jacobs, 2004). Model specifications suggest that control variables' influence is robust to the inclusion of different cultural variables and indices in the sustainability model.

The analysis has revealed a positive and statistically significant influence of cultural resources, cultural governance (institutions), and culture government expenditure per capita on cultural tourism destinations' social sustainability (Table 15). Such results reaffirm cultural resources as a catalyst to the solution of numerous social problems within the destination (Miles, 2005). Cities enthusiastically promote cultural resources and culture-driven strategies as an advantage in a highly competitive tourism market and assign financial resources to address urban revitalisation and social exclusion (Haigh, 2020). However, as this analysis' findings confirm, cultural tourism's value focus and impacts depend on cultural governance (Richards, 2018), while cooperation between relevant institutions can inspire local community sustainable development (Liu, 2020).

Simultaneously, the models have shown the significant and negative influence of cultural infrastructure index and cultural governance (tourism) index on social sustainability within these destinations. Although cultural tourism is often used as a socially desirable filter to attract desirable tourists, the findings of this analysis confirm that growing visitor numbers can also be seen as "the thin end of the mass tourism wedge, entering to destroy the very culture that the tourists seek" (Richards, 2018). Cultural heritage and cultural tourism

development policies aim to attract a large number of tourists, and at the same time enable overcrowding, traffic and parking problems in historical centres, and ultimately resident irritation as a result of, among others, misbehaving tourists and rising costs of living (Adie et al., 2020). In reality, the same as others do, cultural tourists are competing for space with residents (Jover & Díaz-Parra, 2020) and often do not reduce seasonality (Vergori & Arima, 2020), amplifying the pressures on local communities.

Tables 17 and 18 display the results of the regression analysis. The models include all retained social sustainability indicators (Table 9), including those outlining residents' perceptions and attitudes. It has to be noted that R-square values in the presented models are relatively small, but to be to able to estimate models with more independent variables, the number of available observations would have to be bigger.

The summary of the descriptive statistics related to residents' perceptions in the six LL is presented in the Table 16 while detailed descriptive statistics across LAUs is available in the Annex, in Table A8-A11 and Figures A1-A5. Also, the mean values of the Tripadvisor ratings across the LAUs are presented in Annex , in Table 12.

The regression analysis partially confirms the findings obtained via panel analysis by emphasising the positive influence of cultural resources on tourism development social sustainability (Table 17). The negative influence of cultural governance (institutions) contradicts the previously elaborated social sustainability panel model. These apparent differences may be explained by the inclusion of six additional indicators concerning residents perception of the influence of cultural tourism development or merely reflect the failure of cultural governance institutions to foster social sustainability within the destination. In both cases, cultural tourism governance remains a critical challenge for cultural toruism destinations in one scenario (panel analysis) asking to proceed with acceptable practices focused on restricting tourism intensity in heritage destinations, and in other scenarios (regression analysis) requiring to constraint potentially adverse influences of cultural "overtourism" on local communities by resolving conflicts, educating, and empowering stakeholders to benefit from tourism.

The regression analysis (Table 18) reveals a positive and significant correlation among the cultural sustainability index and three indicators of cultural tourism - the number of cultural enterprises, the number of jobs in the cultural sector and the index of cultural reosurces. Thus, the results based on the data collected support the conclusion that the growing number of cultural resources as well as the growing number of firms and people working in the cultural sector are important building blocks of the fourth, cultural, pillar of sustainability. As the jobs in the cultural sector to the most part require educated and skilled work force, one could argue that it could be the possible explanation for this finding.

These findings fit neatly into the perspective of culture as an intrinsic value which acknowledges that "cultural assets may be valued in their own right"(Tretter, 2009, p. 113) and that the assessment of culture-led projects should pay more attention to the mere cultural benefits of such processes as opposed to measuring economic, physical or social impacts (García, 2004). On the other hand, drawing on Soini & Dessein's (2016) view of the importance of culture in sustainable development (be it culture "in, for or as sustainable development" in authors' exact phrasing), one could extend these findings and conclude that the number of cultural resources and the size of cultural sector are highly important elements in the overall sustainable development. However, further analyses are required before supporting such a broad conclusion.

Table 16. Summary of descriptive statistics on residents survey indicators

LAU	No of answers collected (LL)	Gender			Age			Education		Years living in LAU		Tourism related job		
		M	W	X	<=34	35-54	55+	At most high school degree	Higher education	0-10	>10	Yes	No	I do not know
Huesca	234	131	103	0	62	87	85	39	195	24	210	113	121	0
Rotterdam	320	185	135	0	49	71	200	187	133	63	257	24	294	2
Utsjoki	22	6	15	1	6	10	6	5	17	9	13	10	12	0
Vicenza	368	134	232	2	113	134	121	235	133	47	321	33	331	4
Split	944	346	598	0	296	350	298	491	453	84	860	361	561	22
Scheldeland	2058	960	1088	10	515	893	650	895	1163	383	1675	134	1924	0
TOTAL	**3946**	**1762**	**2171**	**13**	**1041**	**1545**	**1360**	**1852**	**2094**	**610**	**3336**	**675**	**3243**	**28**

LAU	No of answers collected (LL)	Gender			Age			Education		Years living in LAU		Tourism related job		
		M	W	X	<=34	35-54	55+	At most high school degree	Higher education	0-10	>10	Yes	No	I do not know
Huesca	234	56.0%	44.0%	0.0%	26.5%	37.2%	36.3%	16.7%	83.3%	10.3%	89.7%	48.3%	51.7%	0.0%
Rotterdam	320	57.8%	42.2%	0.0%	15.3%	22.2%	62.5%	58.4%	41.6%	19.7%	80.3%	7.5%	91.9%	0.6%
Utsjoki	22	27.3%	68.2%	4.5%	27.3%	45.5%	27.3%	22.7%	77.3%	40.9%	59.1%	45.5%	54.5%	0.0%
Vicenza	368	36.4%	63.0%	0.5%	30.7%	36.4%	32.9%	63.9%	36.1%	12.8%	87.2%	9.0%	89.9%	1.1%
Split	944	36.7%	63.3%	0.0%	31.4%	37.1%	31.6%	52.0%	48.0%	8.9%	91.1%	38.2%	59.4%	2.3%
Scheldeland	2058	46.6%	52.9%	0.5%	25.0%	43.4%	31.6%	43.5%	56.5%	18.6%	81.4%	6.5%	93.5%	0.0%
TOTAL	**3946**	**44.7%**	**55.0%**	**0.3%**	**26.4%**	**39.2%**	**34.5%**	**46.9%**	**53.1%**	**15.5%**	**84.5%**	**17.1%**	**82.2%**	**0.7%**

Table 17. Social sustainability OLS regression

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CulENT	0.00000522									
	(0.00000878)									
CulJOBS		-0.00366								
		(0.00552)								
CulRes_INDEX			0.859***							
			(0.216)							
CulInf_INDEX				-1.204						
				(1.132)						
CulGovInst_INDEX					-0.722***					
					(0.219)					
CulGovPol_INDEX						-0.0279				
						(0.292)				
CulGovTour_INDEX							-0.102			
							(0.281)			
CulGovEXPpc								-0.000602*		
								(0.000320)		
CulSAT									0.0293	
									(0.144)	
GenEq										-0.0837
										(0.119)
_cons	0.522***	0.542***	0.391***	0.614***	1.184***	0.556*	0.619**	0.577***	0.410	1.003
	(0.0404)	(0.0549)	(0.0424)	(0.0582)	(0.198)	(0.276)	(0.252)	(0.0580)	(0.611)	(0.666)
N	23	23	24	21	24	24	24	24	24	24
R^2	0.001	0.015	0.326	0.080	0.225	0.001	0.009	0.084	0.002	0.030

Notes: Standard errors in parentheses, *, **,*** indicates significance at 10%, 5% and 1%*

Table 18. Cultural sustainability OLS regression

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CulENT	0.0000515***									
	(0.00000320)									
CulJOBS		0.00930***								
		(0.00307)								
CulRes_INDEX			0.300**							
			(0.114)							
CulInf_INDEX				-0.0871						
				(0.0604)						
CulGovInst_INDEX					0.172					
					(0.107)					
CulGovPol_INDEX						-0.00138				
						(0.0849)				
CulGovTour_INDEX							0.0878			
							(0.0898)			
CulGovEXPpc								0.000250*		
								(0.000132)		
CulSAT									0.0101	
									(0.0361)	
GenEq										0.0240
										(0.0208)
_cons	0.648***	0.629***	0.617***	0.669***	0.513***	0.663***	0.587***	0.639***	0.619***	0.536***
	(0.0129)	(0.0188)	(0.0187)	(0.0124)	(0.0907)	(0.0725)	(0.0723)	(0.0185)	(0.159)	(0.105)
N	33	25	34	31	34	34	34	34	34	34
R^2	0.360	0.377	0.170	0.029	0.072	0.000	0.024	0.066	0.001	0.052

Notes: Standard errors in parentheses, *, **,*** indicates significance at 10%, 5% and 1%*

Ranking of LL-s and LAU-s regarding sustainability indices based on cross-sectional data (for the last available year)

Based on the data collected, the four sustainability indices for the last available year (2019, unless not available, in which case the closest year with the most logical data was taken into account) were generated for all LAUs in five LLs (with the exclusion of LL Utsjoki for which most of the data were not available) (Figure 2).

Before proceeding to the results, it must be noted that the results emphasise the major challenge in measuring sustainability - the lack of data. Thus, all four sustainability indices were calculated for 18 out of 35 LAUs in 3 out of 6 LLs observed. These results show that LAUs score the highest on economic sustainability (ranging from 0,5920 in Benasque to 0,9047 in Caldogno) followed by cultural sustainability ranging from 0,462081697 (Bornem) to 0,946039 (Puurs-Sint-Amands).

Social sustainability, on the other hand, turns to be the most heterogenous among the LAUs as the corresponding indices range from 0,13042 (Grumolo delle Abbadesse) up to 0,859848 (Trogir).

Finally, indices for environmental sustainability are at the lowest level ranging from 0,2614 (Huesca) to 0,6015 (Dodrecht). Data visualized in maps/figures 4-7 provide a more detailed and precise presentation of the sustainability state-of-the-art in all LAUs and reveal, as expected, certain heterogeneities among the LAUs within the same LLs.

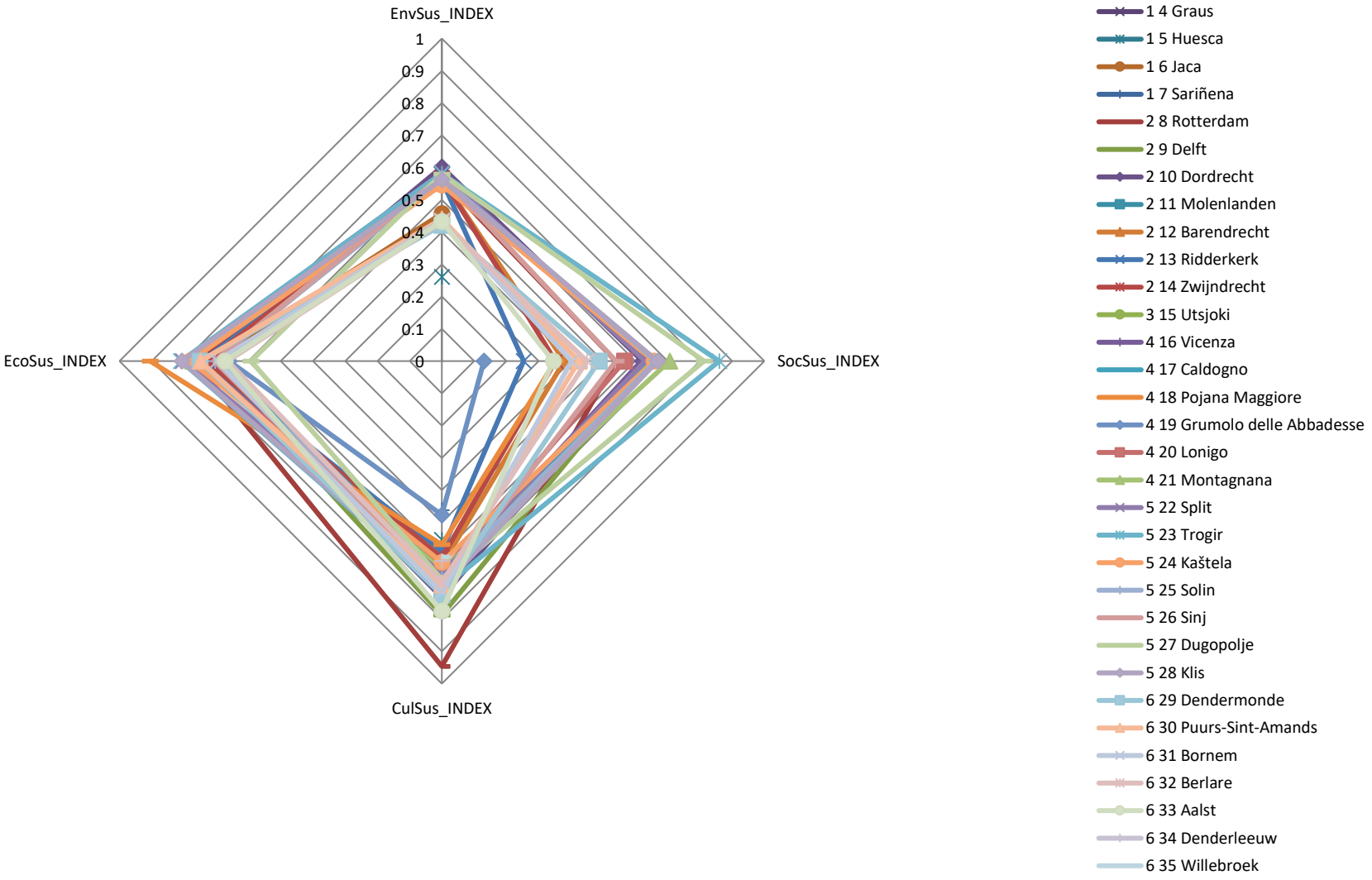

Fig 2. Sustainability indices on LAU level (the last available year)

Moving to the analysis to LL level based on the average of indices attained (Figure 3), the results paint a similar picture. Thus, LLs score highest on economic sustainability (on average 0,7342), followed by cultural (0,6619) and social (0,5311), while the lowest score is found for environmental sustainability (0,5157). In terms of the specific dimensions scores, the economic sustainability index is the highest in Vicenza (0,7491) and Split (0,7431) and the lowest in Sheldeland (0,7068). Cultural index scores the highest in Rotterdam (0,7143) and Scheldeland (0,6890); the lowest in Huesca (0,6095). On the other hand, Split registered the highest social sustainability index (0,6903) while Rotterdam (0,05732) and Split (0,5707) topped the environmental index list. Differences in sustainability dimensions are, to no surprise, found among LLs. Thus, although LL Split, Vicenza and Huesca have the same ranking of sustainability indices (with missing data for two dimensions in the latter two), Rotterdam and Scheldeland exhibit a higher environmental than social sustainability index. Furthermore, both these LLs register a slight difference between the economic and cultural sustainability indices, which are far more emphasised in Vicenza, Huesca, and, to a lesser extent, in Split. These differences are a solid base for the panel and regression analysis that follow in the subsequent section.

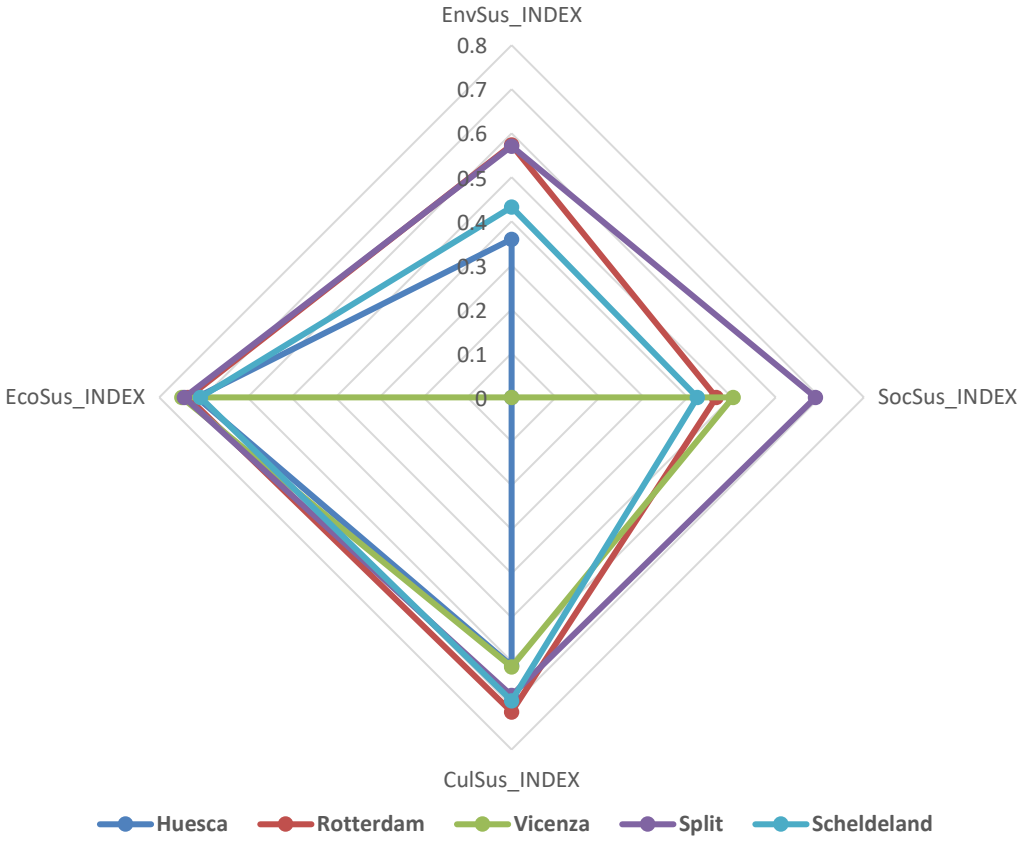

Fig 3. Sustainability indices, LL level (the last available year)

Figures 4-7 indicate four sustainability indices (Economic, Environmental, Cultural and Socila) across the observed LAUs.

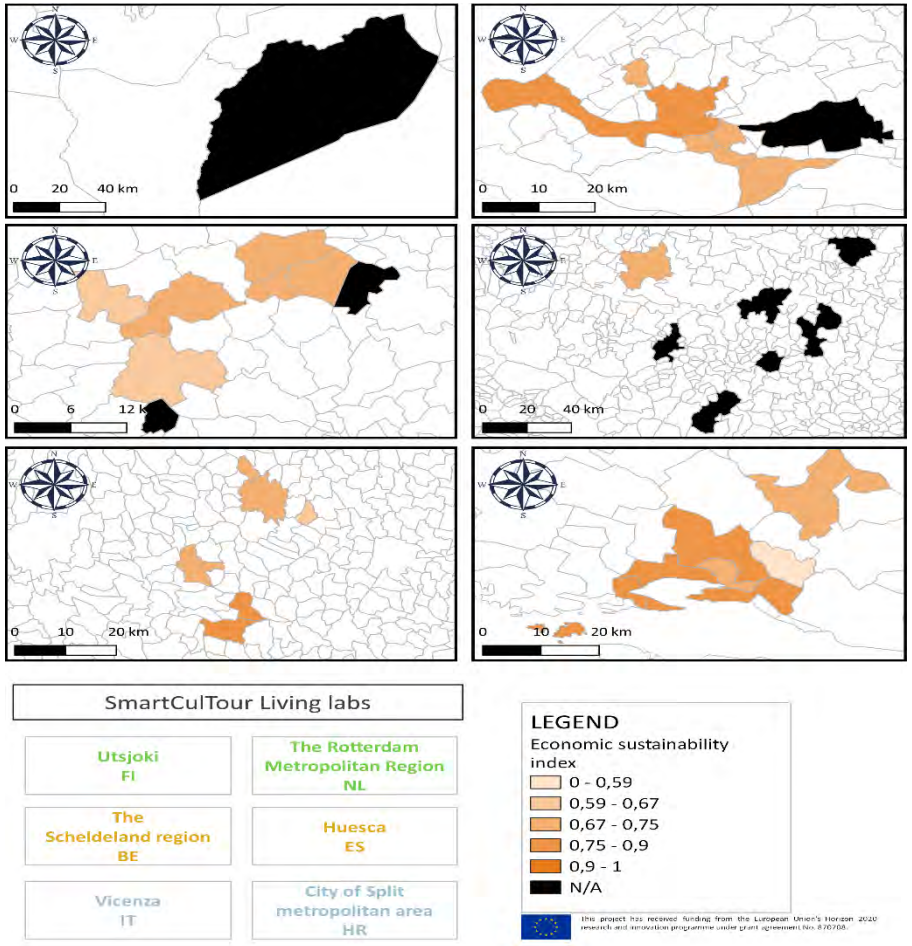

Fig 4. Economic sustainability indices across the LAUs

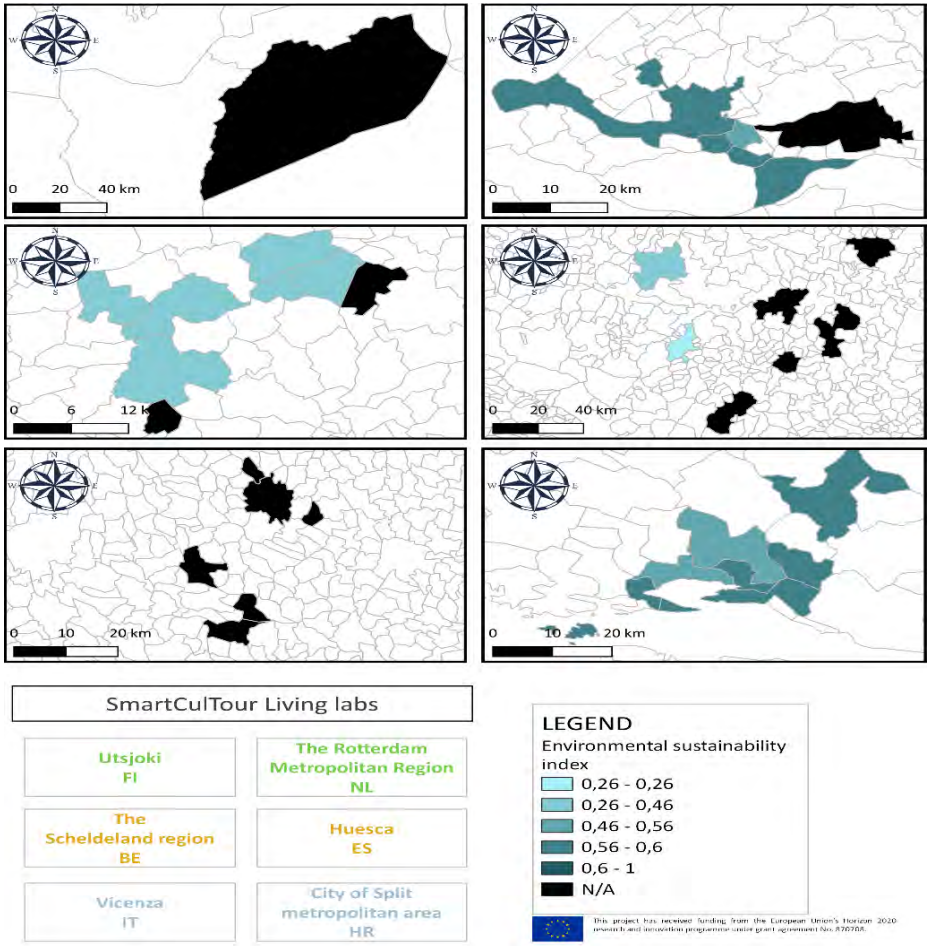

Fig 5. Environmental sustainability indices across the LAUs

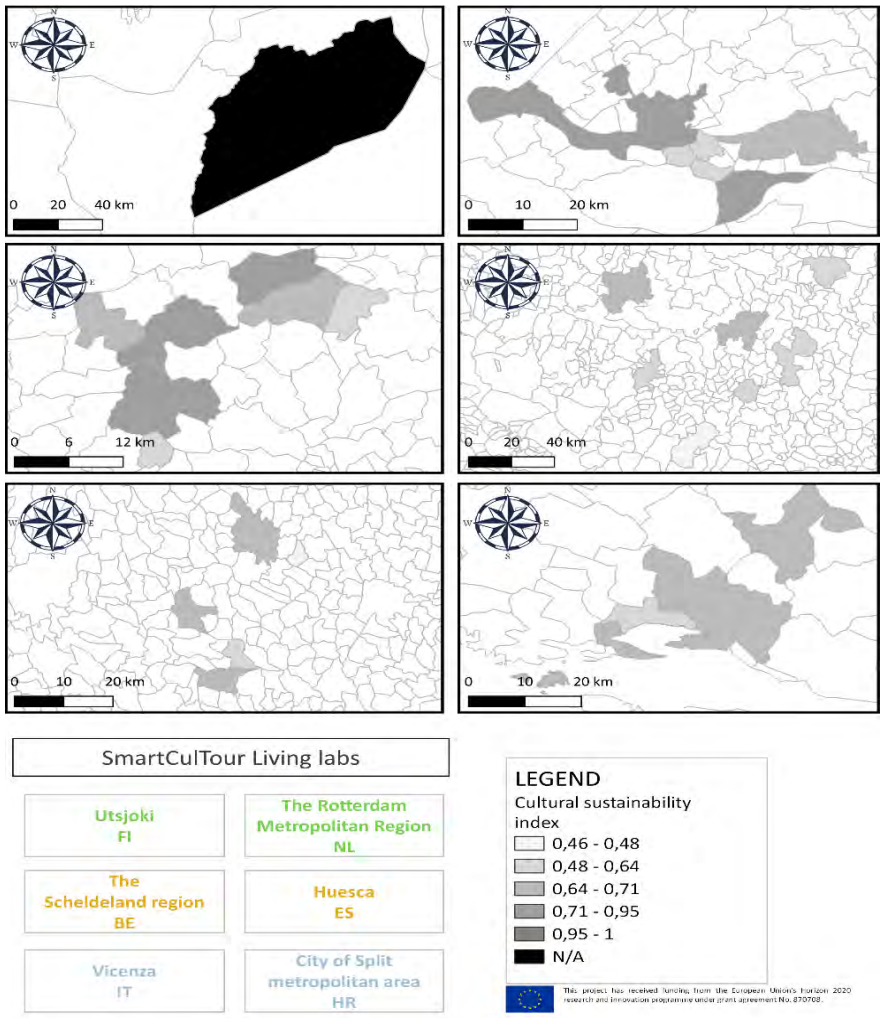

Fig 6. Cultural sustainability indices across the LAUs

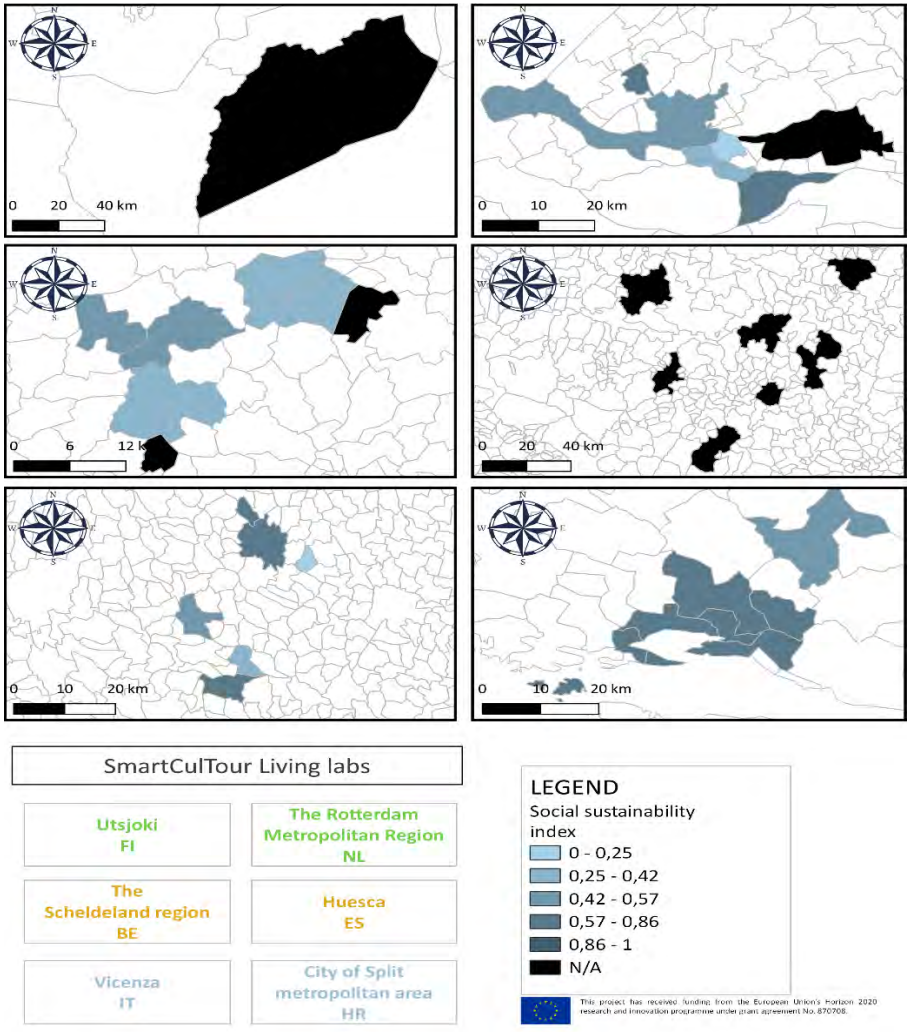

Fig 7 Social sustainability indices across the LAUs

Conclusions on sustainability models' results

Due to the contribution of tourism to economic growth, it has been advocated and supported, with little criticism and failure to take into account potential consequences that might come with incremental growth. The attention drawn to the concept of sustainable tourism inspired studies focused on evaluating the sustainability of tourism development applying different methodologies and approaches, however, mostly reflecting on the regional aspect of sustainability and thus failing to depict the state and inspire local scale policies (Petrić et al. 2020). Additionally, attention was often given to tourism in general, neglecting niche tourism's potential to affect the sustainability of tourism development or influence positive change on the local level. This gap becomes even more substantial following the European Union's (EU)[11] acknowledgement of cultural tourism as a driver and enabler of sustainable development. Under the Horizon 2020 programme, the EU allocated substantial financial resources to support projects discussing how cultural tourism development could support European regions' sustainable and resilient development. Thus, the need to evaluate the effects of cultural tourism development on four sustainability pillars, including environment, economy, society and culture, emerged.

This section of the Report attempted to evaluate the influence of cultural tourism development on the sustainability of tourism destinations, and in doing so, seeked to extend previous work in the field in three ways: (a) focusing on a local scale, (b) discussing cultural tourism specifically and (c) introducing culture as a fourth and independent pillar of sustainability. Below, we briefly outline the main lessons learned from the previously discussed analysis.

The analysis has contributed towards a better understanding of the effects of cultural tourism development by successfully evaluating its impacts on four pillars of sustainability on a local scale. We can conclude from the data that cultural resources positively affect all four pillars of sustainability. Simultaneously, the number of cultural enterprises positively affects the environmental and economic aspects of a destination's sustainability. However, cultural infrastructure seemed to negatively influence the environmental and social dimension, reflecting the need for careful spatial and tourism-development planning to grow within a destination's capacity thresholds. Cultural government institutions positively influence the environmental aspect while their effect on economic and social sustainabilility pillars are negative. This emphasises the need to integrate culture and cultural tourism planning into the broader, i.e. regional development agenda. Finally, the positive effect of government expenditure and negative impact of cultural tourism planning suggests that allocating funds for cultural tourism development is insufficient. When there is a lack of sustainable tourism development planning, uncontrolled tourism growth will most likely yield adverse impacts on local communities, something we currently witness in many urban European destinations.

The lesson we have learned is that cultural resources and enterprises can stimulate sustainable development; however, along with fiscal stimulus, cultural tourism development requires strategic planning to maximise benefits and minimise adverse impacts on communities.

The analysis has offered an alternative view of culture as a distinct dimension in the sustainable development model and reflected on the characteristics that distinguish it from the other pillars. In the context of sustainability of cultural tourism development, we advocate cultural aspects that integrate community involvement in cultural tourism planning, communities' support for cultural tourism development and development of cultural facilities. These dimensions distinguish culture from other pillars and lay the

[11] https://ec.europa.eu/culture/cultural-heritage/cultural-heritage-eu-policies/sustainable-cultural-tourism

foundation for local scale policy design and implementation.

We have learned that culture has different roles in sustainable development, appearing as both its constituent and driver. Our analysis has put forward a tentative explanation of how acknowledging culture as a pillar for itself, in a context of sustainable tourism development planning, promotes not only economic prosperity, environmental sustainability and social well-being but also conservation of cultural heritage and community involvement in cultural tourism development.

Finally, one of the most important contributions of this section is that it lays the foundation for analysing the sustainability of cultural tourism development at the local scale. We were able to document six case studies across the EU, involving more than 30 micro destinations.

However, what we have also learned is that the analysis of the sustainability of cultural tourism development on a local scale is primarily constrained by data availability, the reluctance of communities and stakeholders to participate in the survey, the lack of opportunities for the inclusion of longitudinal survey results, and the inability of public entities to provide the necessary data. Additionally, this kind of integrative analysis required a mixed method approach to collect and analyse the data, and combine different quantitative methods of data analysis and interpretation, demonstrating the complexity of the task.

2.3.2. Results of Resilience model

Based on the resilience model presented in sub-chapter 2.2.3., the obtained results are presented in Tables 19-22.

The severe and uneven territorial impacts of the global economic activity have been manifested among the LL and corresponding LAUs, units of our interest (Figures 8 and 9). The heterogeneous ability to withstand, react and recover from different economic stimuli is evident not only among different Living Labs, but also within them. These differences are especially evident during the period of the global economic crisis (Figure 8) and for the recovery period (Figure 9).

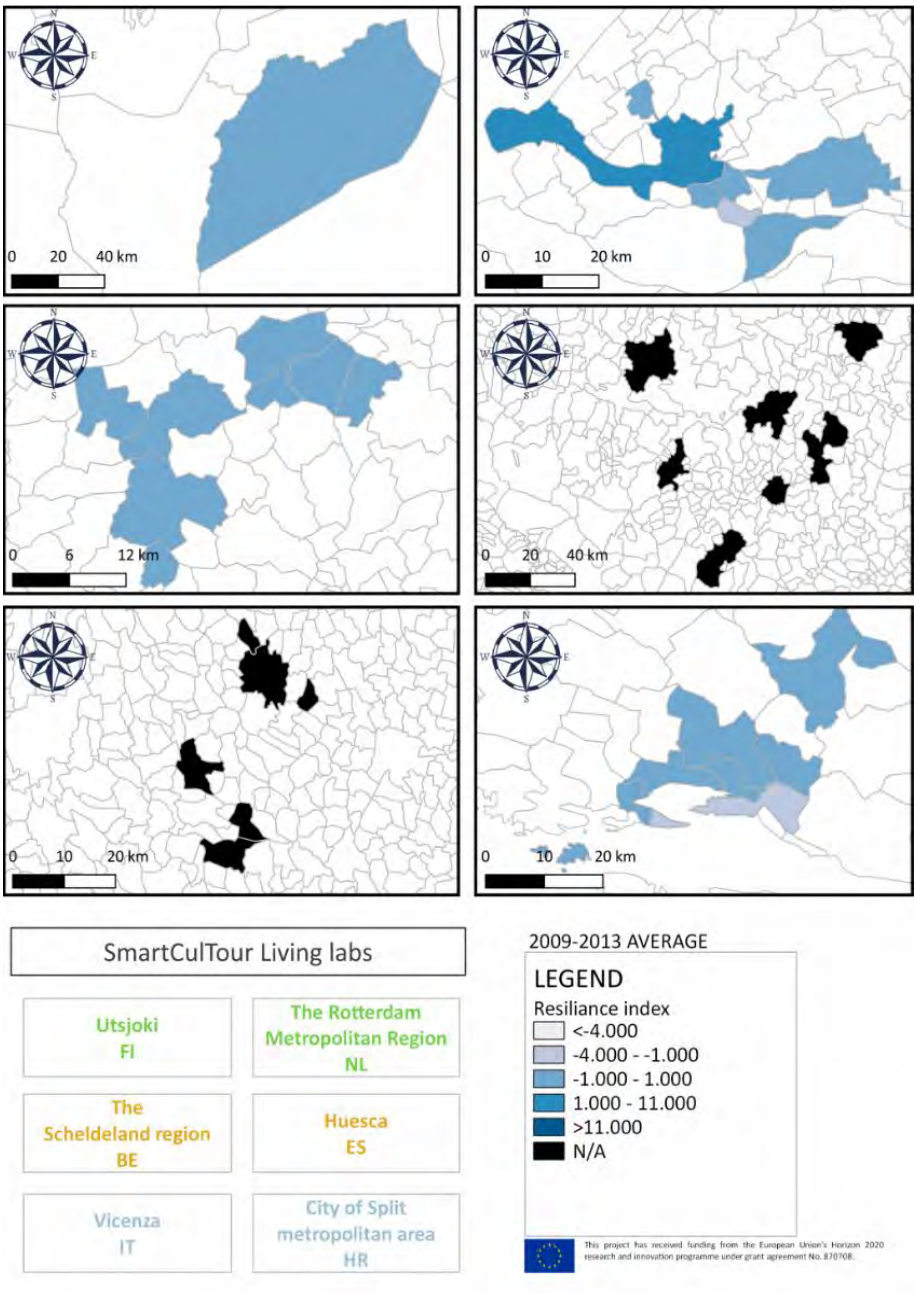

Fig 8.Resilience across LAUs in the period 2009-2013 (crisis)

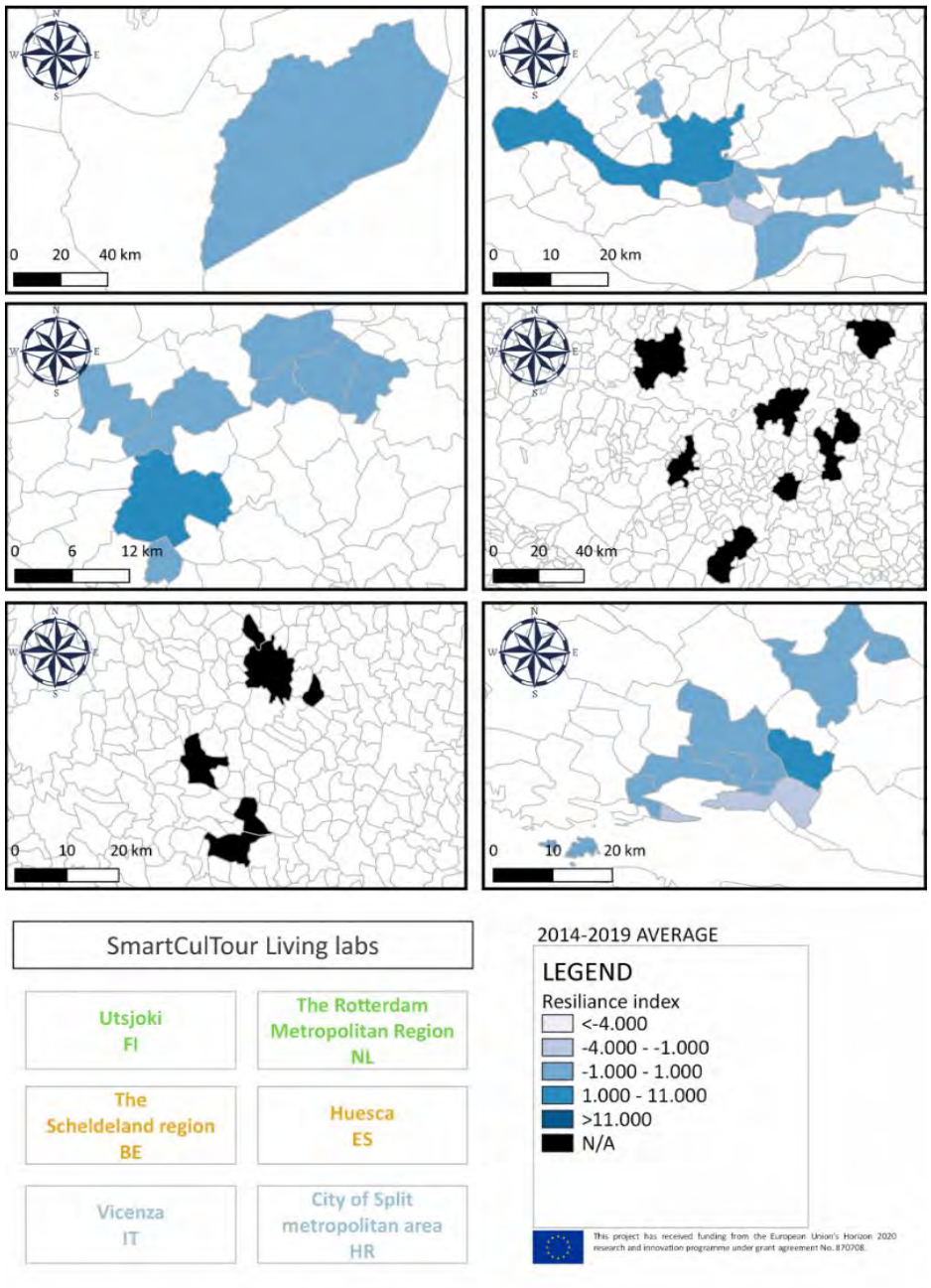

Fig 9.Resilience across LAUs in the period 2014-2019 (recovery)

The significant variances of the resilience patterns across selected Living Labs indicate differential effects of socio-economic characteristics. Due to severe variations within specific Living Labs (e.g. the Rotterdam Metropolitan Region and the City of Split metropolitan area), these characteristics are evidently not homogenous on the level of Living Lab units, and stand as a specific feature on the micro-local unit within Living Labs.

In addition, results presented in Figures 8 and 9 provide new stimuli to researchers to understand the factors behind the ability of spatial units to react efficiently and effectively during and after turbulent economic periods in order to maintain regional development and employment levels. This especially encourages analysis of different perspectives of cultural and tourism elements in the complex resilient puzzle, which is widely explained in the rest of the report, after the presentation of the resilience model results in Tables 19-22.

Table 19. Resilience panel model – option 1 (expenditure per capita without tourism per capita)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.RES	0.838***	0.557***	0.822***	0.684***	0.828***	0.810***	0.804***	0.844***
	(0.0148)	(0.0189)	(0.0140)	(0.00287)	(0.0174)	(0.0140)	(0.0190)	(0.0181)
EXPpc	-0.0646	0.0297	-0.131	0.0635	-0.0521	-0.0502	-0.0400	-0.0613
	(0.0424)	(0.0538)	(0.116)	(0.0493)	(0.0461)	(0.0394)	(0.0379)	(0.101)
POP	-0.347***	-0.127***	-0.313***	-0.364***	-0.320***	-0.250***	-0.274***	-0.353***
	(0.0175)	(0.0245)	(0.0330)	(0.0154)	(0.0290)	(0.0156)	(0.0275)	(0.0277)
WGI	84.68	860.9	207.4	719.1**	872.7**	318.5	401.5	157.2
	(379.2)	(639.6)	(445.2)	(281.4)	(420.6)	(362.2)	(435.9)	(410.3)
EDU	27.28**	34.78**	13.09	88.35***	25.50**	15.84	20.18	20.37*
	(12.85)	(13.89)	(12.73)	(4.785)	(12.99)	(14.61)	(13.26)	(12.17)
CulENT		7.347***						
		(0.945)						
CulRes_INDEX			3022.6***					
			(860.0)					
CulInf_INDEX				-12531.5***				
				(1654.0)				
CulGovInst_INDEX					-417.4**			
					(188.8)			
CulGovPol_INDEX						2435.9***		
						(517.7)		
CulGovTour_INDEX							452.8***	
							(174.6)	
CulGovEXPpc								-0.482
								(0.594)
_cons	13307.8***	1621.3	14926.2***	9514.1***	14234.2***	7804.5***	11554.9***	14067.0***
	(3833.8)	(1976.3)	(3208.3)	(900.3)	(3833.7)	(2828.9)	(2956.0)	(4036.3)
Number of observations	138	131	131	122	138	138	138	128
Number of groups	21	20	20	15	21	21	21	20
Number of instruments	14	15	15	15	15	15	15	15
Sargan test (p-value)	0.5243	0.1385	0.5150	0.1295	0.6482	0.3820	0.6434	0.5478
AB2 test (p-value)	0.3063	0.3708	0.4131	0.4433	0.2771	0.2729	0.3498	0.3854

[a]Standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

As indicated by Table 19, it can be concluded that all models satisfied diagnostic tests. In all model specifications (1)-(8), the p-value of the Sargan test is higher than 0.05, indicating no problem of endogeneity in any model specification. Additionally, the p-value of the AB2 test of second-order autocorrelation of differenced residuals is also higher than 0.05. Second-order autocorrelation of differenced residuals ensures no autocorrelation of the first order of residuals in levels.

The lagged dependent variable RES is positive, less than one and statistically significant in all models. These results confirm the dynamics of the dependent variable and additionally prove dynamic panel data use was justified. In all but one (model 4) of the model specifications, the number of instruments is less than the number of cross-sections.

Although the variable 'EXPpc' sign varies along the model specifications, it is not statistically significant throughout. The variable 'POP' has a negative sign and is statistically significant in all model specifications. 'Institutional quality indicator WGI' has a positive sign but is statistically significant only in models (4) and (5). Finally, 'EDU' has a positive sign and shows a statistically significant impact on the models (1), (2), (4) and (5). Based on all model specifications it is evident that the influence of control variables is robust to the inclusion of different cultural tourism variables and indices in the model of resilience.

In the model specifications (2)-(8), different cultural tourism indicators and indices are included in the model of resilience. Variables CulENT, CulRes_INDEX, CulGovPol_INDEX and CulGovTour_INDEX have a positive sign and are statistically significant. Variables CulInf_INDEX and CulGovInst_INDEX have a negative sign and are statistically significant. Finally, CulGovEXPpc has a negative sign and is not statistically significant.

Table 20. Resilience panel model – option 2 (revenue per capita without tourism per capita)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.RES	0.836***	0.559***	0.825***	0.675***	0.825***	0.808***	0.807***	0.839***
	(0.0125)	(0.0185)	(0.0146)	(0.00290)	(0.0167)	(0.0123)	(0.0196)	(0.0123)
REVpc	-0.0848	0.0369	-0.125**	0.219***	-0.0942	-0.0781*	-0.0548	-0.0977*
	(0.0588)	(0.0563)	(0.0635)	(0.0274)	(0.0658)	(0.0414)	(0.0449)	(0.0583)
Pop	-0.337***	-0.128***	-0.306***	-0.350***	-0.320***	-0.244***	-0.272***	-0.338***
	(0.0210)	(0.0212)	(0.0296)	(0.0145)	(0.0268)	(0.0172)	(0.0297)	(0.0220)
WGI	343.2	938.1	490.7	955.5***	1075.2**	529.9	569.1	555.9
	(396.5)	(651.2)	(373.6)	(263.6)	(442.9)	(369.2)	(424.0)	(363.7)
EDU	25.28**	33.78**	13.08	90.95***	20.63	13.18	18.42	20.82*
	(12.72)	(14.27)	(12.60)	(4.545)	(13.65)	(14.11)	(13.36)	(12.55)
CulENT		7.360***						
		(0.996)						
CulRes_INDEX			2968.0***					
			(811.5)					
CulInf_INDEX				-12482.9***				
				(1169.6)				
CulGovInst_INDEX					-385.6**			
					(168.1)			
CulGovPol_INDEX						2446.4***		
						(508.6)		
CulGovTour_INDEX							495.9***	
							(161.0)	
CulGovEXPpc								-0.525
								(0.569)
_cons	14051.6***	1471.0	14020.7***	8987.8***	15751.5***	8317.5**	11608.9***	14302.3***
	(4195.6)	(1828.6)	(3609.8)	(906.6)	(4188.2)	(3250.7)	(3549.3)	(4111.2)
Number of observations	133	131	131	117	133	133	133	128
Number of groups	21	20	20	15	21	21	21	20
Number of instruments	14	15	15	15	15	15	15	15
Sargan test (p-value)	0.6524	0.1413	0.5935	0.1785	0.6273	0.4227	0.6472	0.6548
AB2 test (p-value)	0.3412	0.3690	0.4087	0.3309	0.2846	0.2803	0.3630	0.5129

Notes:[a] Standard errors in parentheses* p < 0.1, ** p < 0.05, *** p < 0.01

As indicated in Table 20, all models satisfied the diagnostic tests. In all model specifications (1)-(8), the p-value of the Sargan test is higher than 0.05, indicating no problem of endogeneity in any model specification. Additionally, the p-value of the AB2 test of second-order autocorrelation of differenced residuals is also higher than 0.05. Second-order autocorrelation of differenced residuals ensures no autocorrelation of the first order of residuals in levels.

The lagged dependent variable RES is positive, less than one and statistically significant in all models. These results confirm the dynamics of the dependent variable and additionally prove that a dynamic panel data use was justified. In all model specifications apart from model (4), the number of instruments is less than the number of cross-sections.

The variable 'REVpc' sign varies in different models and it is statistically significant in most specifications. The variable 'POP' has a negative sign and is statistically significant in all model specifications. 'Institutional quality indicator WGI' has a positive sign but is statistically significant only in models (4) and (5). Finally, 'EDU' has a positive sign and indicates a statistically significant impact in the following models: (1), (2) and (4). Based on all model specifications it is evident that the impact of control variables is robust to the inclusion of different cultural tourism variables and indices in the model of resilience.

In the model specifications (2)-(8), different cultural tourism indicators and indices are included in the model of resilience. Variables CulENT, CulRes_INDEX, CulGovPol_INDEX and CulGovTour_INDEX have a positive sign and are statistically significant. Variables CulInf_INDEX and CulGovInst_INDEX have both negative signs and are statistically significant. Finally, CulGovEXPpc has a negative sign and is not statistically significant.

Table 21. Resilience panel model – option 3 (expenditure per capita with tourism per capita)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.RES	0.833***	0.556***	0.807***	0.635***	0.823***	0.801***	0.793***	0.838***
	(0.0131)	(0.0154)	(0.0120)	(0.0156)	(0.0138)	(0.0144)	(0.0158)	(0.0125)
EXPpc	-0.0262	0.103*	-0.0262	0.145*	-0.106	-0.0595	-0.0250	0.0373
	(0.0830)	(0.0576)	(0.0912)	(0.0780)	(0.0907)	(0.0822)	(0.0755)	(0.0850)
POP	-0.348***	-0.120***	-0.294***	-0.391***	-0.317***	-0.258***	-0.266***	-0.337***
	(0.0238)	(0.0213)	(0.0334)	(0.0676)	(0.0271)	(0.0227)	(0.0303)	(0.0249)
WGI	37.28	1003.6	437.8	-1228.4	861.9	467.3	581.5	193.6
	(679.8)	(874.8)	(663.5)	(1770.0)	(557.3)	(687.1)	(699.2)	(587.8)
EDU	31.99**	36.14**	7.754	47.21	29.34**	12.39	15.89	23.13*
	(12.84)	(14.29)	(13.15)	(29.35)	(13.77)	(18.57)	(14.42)	(12.51)
TOURpc	26.12***	46.06***	19.32***	48.73**	34.86***	27.46***	28.31***	37.39***
	(8.847)	(9.344)	(6.649)	(21.68)	(8.811)	(6.682)	(4.010)	(8.260)
CulENT		7.179***						
		(0.879)						
CulRes_INDEX			3691.5***					
			(921.2)					
CulInf_INDEX				-26111.5**				
				(12029.1)				
CulGovInst_INDEX					-345.0*			
					(186.2)			
CulGovPol_INDEX						2473.2***		
						(578.8)		
CulGovTour_INDEX							614.5***	
							(216.8)	
CulGovEXPpc								-0.506
								(0.594)
_cons	15839.0***	2142.3	17711.8***	14788.9***	17466.5***	12456.5***	14806.5***	14507.6***
	(4759.7)	(2078.3)	(4024.7)	(4139.8)	(4596.7)	(3581.0)	(3335.7)	(4148.9)
Number of observations	105	105	105	92	105	105	105	102
Number of groups	18	18	18	12	18	18	18	18
Number of instruments	15	16	16	16	16	16	16	16
Sargan test (p-value)	0.3351	0.1714	0.5858	0.7782	0.8143	0.3998	0.7206	0.5488
AB2 test (p-value)	0.3435	0.3324	0.4520	0.2446	0.3491	0.2699	0.3429	0.3999

[a]Standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

As indicated in Table 21, all models satisfied diagnostic tests. In all model specifications (1)-(8), the p-value of the Sargan test is higher than 0.05 indicate no problem of endogeneity in any model specification. Additionally, the p-value of the AB2 test of second-order autocorrelation of differenced residuals is also higher than 0.05. Second-order autocorrelation of differenced residuals ensures no autocorrelation of first-order residuals in levels.

The lagged dependent variable RES is positive, less than one and statistically significant in all models. These results confirm the dynamics of the dependent variable and additionally prove justification for dynamic panel data use. In all model specifications apart from model (4), the number of instruments is less than the number of cross-sections.

Although the sign of variable 'EXPpc' varies along with the model specifications, it is not statistically significant. Variable 'POP' has a negative sign and is statistically significant in all model specifications. 'Institutional quality indicator WGI' sign varies along with the model specifications but does not show statistical significance in any of the models. Finally, 'EDU' has a positive sign and indicates a statistically significant impact in the following models: (1), (2) and (5). Variable 'TOURpc' has a positive sign and is statistically significant in all models specifications. Based on all model specifications, it is evident that the impact of control variables is robust to the inclusion of different cultural tourism variables and indices in the model of resilience.

In the model specifications (2)-(8), different cultural tourism indicators and indices are included in the model of resilience. Variables CulENT, CulRes_INDEX, CulGovPol_INDEX and CulGovTour_INDEX have a positive sign and are statistically significant. The variable CulInf_INDEX has a negative sign and is statistically significant. Finally, CulGovInst_INDEX and CulGovEXPpc have negative signs and are not statistically significant.

Table 22. Resilience panel model – option 4 (revenue per capita with tourism per capita)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.RES	0.837***	0.559***	0.812***	0.636***	0.821***	0.805***	0.799***	0.835***
	(0.0102)	(0.0163)	(0.0129)	(0.0150)	(0.0139)	(0.0119)	(0.0170)	(0.00941)
REVpc	-0.00935	0.115*	-0.00863	0.265***	-0.0514	-0.0625	-0.00753	0.00129
	(0.0562)	(0.0593)	(0.0518)	(0.0570)	(0.0585)	(0.0472)	(0.0428)	(0.0465)
POP	-0.338***	-0.123***	-0.292***	-0.407***	-0.312***	-0.251***	-0.265***	-0.331***
	(0.0183)	(0.0182)	(0.0300)	(0.0625)	(0.0236)	(0.0168)	(0.0294)	(0.0215)
WGI	74.85	1017.3	345.6	-2269.2	1189.1**	591.2	726.1	473.8
	(538.2)	(859.2)	(616.7)	(1602.0)	(531.6)	(569.9)	(618.7)	(448.0)
EDU	35.22***	37.78***	15.55	42.43	27.92*	14.59	17.19	25.68**
	(11.98)	(14.08)	(14.49)	(29.32)	(14.31)	(15.79)	(14.56)	(12.33)
TOURpc	24.43***	37.79***	13.16**	43.62**	29.08***	23.40***	20.93***	26.87***
	(7.339)	(6.812)	(6.150)	(18.72)	(7.939)	(5.466)	(3.682)	(6.036)
CulENT		7.115***						
		(0.958)						
CulRes_INDEX			3473.7***					
			(968.3)					
CulInf_INDEX				-26961.9**				
				(11858.8)				
CulGovInst_INDEX					-499.9***			
					(179.9)			
CulGovPol_INDEX						2478.8***		
						(511.0)		
CulGovTour_INDEX							649.5***	
							(183.6)	
CulGovEXPpc								-0.237
								(0.593)
_cons	14767.8***	2141.1	16382.3***	16284.1***	17878.4***	11425.4***	13823.3***	15672.7***
	(4485.6)	(1900.0)	(4444.9)	(3864.0)	(4458.0)	(3928.6)	(4109.0)	(4070.8)
Number of observations	105	105	105	92	105	105	105	102
Number of groups	18	18	18	12	18	18	18	18
Number of instruments	15	16	16	16	16	16	16	16
Sargan test (p-value)	0.5746	0.1750	0.6662	0.7567	0.7954	0.4873	0.7249	0.6955
AB2 test (p-value)	0.3652	0.3343	0.4524	0.1717	0.3189	0.2761	0.3619	0.5536

[a]Standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

As indicated in Table 22, all models satisfied the diagnostic tests. In all model specifications (1)-(8) the p-value of the Sargan test is higher than 0.05 which indicate that there is no problem of endogeneity in any model specification. Additionally, the p-value of the AB2 test of second-order autocorrelation of differenced residuals is also higher than 0.05. Second-order autocorrelation of differenced residuals ensures no autocorrelation of the first-order residuals in levels.

The lagged dependent variable RES is positive, less than one and statistically significant in all models. These results confirm the dynamics of the dependent variable and additionally prove justification for the use of dynamic panel data. In all model specifications but (4), the number of instruments is less than the number of cross-sections.

Although the sign of variable 'REVpc' varies across models, it is not significant in most of the model specifications. Variable 'POP' has a negative sign and is statistically significant in all model specifications. 'Institutional quality indicator WGI' has a positive sign in all models but model (4), but it shows statistical significance only in model (5). Finally, 'tertiary education' has both, a positive sign and statistically significant impact on resilience in the following models: (1), (2) and (8). The variable 'TOURpc' has a positive sign and is statistically significant in all models. Based on all model specifications, it is evident that the influence of control variables is robust to the inclusion of different cultural tourism variables and indices in the model of resilience.

In the model specifications (2)-(8) different cultural indicators and indices are included in the model of resilience. Variables CulENT, CulRes_INDEX, CulGovPol_INDEX and CulGovTour_INDEX have positive signs and are statistically significant. Variables CulInf_INDEX and CulGovInst_INDEX have negative signs and they are statistically significant. Finally, CulGovEXPpc has a negative sign and is not statistically significant.

Conclusions on resilience model results

Our empirical analysis (Tables 19 and 20) modelled different socio-economic variables in the resilience model within the SRT framework to ensure that the observed link between the cultural tourism variables and resilience is not affected by some other regional characteristics. After that, in Tables 21 and 22, the tourism dynamics were included in the model as a control variable. Thus, we have confirmed the presented models' robustness (as explained in the previous chapter). Here, we provide a discussion of the results.

Since our primary focus is on cultural tourism and its effects on regional resilience, we begin with the interpretation of the effects of cultural indices, followed by tourism dynamics and additional control variables.

The results of the models presented in four tables, referring to the effects of different cultural indices on regional resilience, reveal several important issues. In all of the presented models, where revenues or expenditures of local government units are used as a control variable, and in models with and without the tourism demand as a control variable, four cultural indices, e.g. CulEnt, CulRes_INDEX, CulGovPol_INDEX and CulGovTour_INDEX are statistically significant with positive effects on regional resilience, as expected.

Figures A6-A13, representing the CulEnt, CulRes_INDEX, CulGovPol_INDEX and CulGovTour_INDEX as statistically significant indices with positive effects on regional resilience, are presented in the Annex.

Overall, this means that the development of a favourable institutional environment in the regions with cultural resources could enhance the development of cultural enterprises and entrepreneurship, fostering the region's resilience. In addition, the results reveal that, from the regional development perspective, an important issue refers to the kind of cultural goods that most attract the visitors (CulRes) and the circumstances under which they support development (CulGovPol_INDEX and CulGovTour_INDEX) (Bille & Shulze, 2006). Finally, the results revealed that the shift towards the economic orientation for a cultural policy means that the duality of economic and cultural value is valid for the cultural policy field and that this orientation could induce positive effects on regional resilience (Throsby, 2001). Since the results confirm positive impacts generated by the number of cultural enterprises (CulEnt) in the region on its resilience, those enterprises could be considered as high-value-added activities, which improve regional dynamic and resilience (ESPON, 2019). In that sense, **cultural indicators regarding the institutional framework and policies are of high importance when regional resilience is concerned.** The results on CulGovPol_INDEX suggest that regions with cultural resources and developed supporting tools (such as: management plan; specific measures to support job creation in the culture and creative sectors or to encourage the formalization and growth of micro/small and medium-sized cultural enterprises; specific policy measures regulating public assistance and subsidies for the cultural sector or dealing with the tax status of culture, i.e. tax exemptions and incentives designed to benefit the culture sector specifically, such as reduced VAT on books) work in favour of regional resilience. Moreover, coordination, cooperation and collaboration among Public Tourism Administrations (PTAs) at different levels of government (regarding cultural tourism), the establishment of the cooperative and collaborative public-private relations (regarding cultural tourism), cooperation and collaboration by public administrations with other nongovernmental actors and networks of actors (regarding cultural tourism) and evidence of cultural tourism strategic documents, add to regional resilience positively. In addition, the results indicate statistically significant and negative effects of CulInfr_INDEX on regional resilience in all analyzed models. Analyzing the economic impacts of particular cultural institutions, Plaza (2008) concluded that the impact of the museums on the development of the city depends on the efficiency of the whole economy, and not only tourism, which must be complementary to other business sectors in order to balance the seasonal employment turnovers and offset the negative effect of the price increase. The results of our study indicate that the presence of cultural infrastructure in the regions under study are still not yielding significant development results and eventually do not positively affect regional resilience.

Tables 21 and 22 include in the model an additional variable, **tourism dynamics**, presented through arrivals per resident. The results reveal that tourism demand is statistically significant, with positive effects on the regional resilience of the observed regions for every model in the tables. Thus, our study confirmed the results gained by Romao (2020) where tourism dynamics presented as overnight stays per inhabitant, also showed positive and significant impacts on regional resilience. Nonetheless, Romao (2020) and Romao and Nijkamp (2018) refer to the need for being cautious with such results when framing tourism dynamics within regional development strategies. The importance of policy regulation of economic activities in tourism services which could lead to improvement of high value-added activities and development of innovations, is accentuated (Romao and Nijkamp, 2018) rather than increasing the number of visitors.

Our results illuminate a **positive and significant role of human capital** for regional resilience. Higher levels of education reflect more opportunities in prosperous periods and is an important factor for the

economic activation of displaced workers (Nystrom, 2018). In addition, high levels of human capital endowment can also improve the possibilities for a better match on the labour market (Neffke et al., 2016) and provide more effective absorption and creation of the new knowledge and business idea, crucial for improving resilience of our spatial units (Giannakis & Bruggeman, 2017).

The mixed and mostly non-significant influence of the public sector on the local level reminds us of the ambiguous role of higher public sector presence. While relying on the public sector may mitigate negative effects at the beginning or during a crisis, it could be an obstacle for activating full economic potential during prosperous periods (Rodríguez-Pose & Fratesi, 2007; Fratesi & Rodríguez-Pose, 2016)

Results in Table 19 and 20 have challenged the view of urban and agglomerate areas as the main engines of growth and the most effective pathway to economic prosperity (Glaeser, 2011). **The significant and negative influence of a larger population reveals the importance of urban–rural dimensions for economic resilience (Giannakis & Bruggeman, 2019) and is in line with Dijkstra's et al's (2015) findings**. They highlighted lower productivity and growth rates of urban areas comparing with some less populated areas in Europe. An explanation may be in improvements in accessibility, access to nature or quality of life factors (Dijkstra et al., 2013) but also lower integration and lower exposure to external shocks among less populated areas (Dijkstra et al., 2015).

Finally, our estimates reveal that **higher quality of government is associated with greater regional resilience**, but it is not completely robust with the inclusion of different explanatory variables in the analysis. Since the role of government quality transcends and goes beyond a specific mechanism of influence (e.g. Ezcurra & Rios, 2019, Rios & Gianmoena, 2020), our findings may also reflect a specific dimension of governance considered. The government's quality may stimulate the private sector by minimizing entry barriers and decreasing established firms' privileges (OECD, 2010). Following Schumpeter (1942) and Aghion & Saint-Paul (1998) this has been especially important for periods of recession when creative destruction is likely to be at work. More precisely, the creative-destruction process may be efficient if entry barriers are low and if government regulations promote fair competition. Higher institutional quality may also restrict corruption as an important barrier not for new firms, enhancing monopoly power and rents earned by incumbent firms, but also for limiting innovation performance (e.g. Rodríguez-Pose & Di Cataldo, 2015; Ezcurra & Rios, 2019). At the same time, the overall efficiency of the judicial system, as an important driver of efficient resource reallocation, may also be an additional channel of the quality of government influence (OECD, 2017). Finally, regions with low quality of government promote the presence of persistent corruption, pervasive rent-seeking and self-serving decision-makers that lead to ineffective public policies, not cable to contribute to improving regional resilience capacity (Ezcurra & Rios, 2019).

Given the aforementioned, (cultural) tourism related conclusion that we can derive from our investigation is twofold. First, we have learned that cultural tourism enhances regional resilience and, second, tourism dynamics is an important factor of regional resilience.

More precisely, our investigation showed that the abundance of cultural resources and the presence of cultural enterprises enhances the regional ability to withstand and recover from external economic shock. In addition, the government support and measures related to cultural tourism, together with cooperation, collaboration and coordination of different stakeholders' activities, showed to be a favourable framework under which the regions' resilience is enhanced.

Furthermore, the tourism dynamics showed to positively affect regional resilience, stressing importance of tourism demand in regional resilience for the Living Labs under study. Thus, we expect

that the regions with higher tourism demand, favourable cultural policy and tourism policy frameworks (enabling its sustainable development), richness of cultural resources and existence of cultural enterprises, would perform better in terms of regional resilience when external shocks occur.

03 TALC modelling

Following the conclusions presented in Report D4.1, in this report, we conducted TALC research towards the analysis of the structure of cause-consequence links among elements of a destination (Living Lab) system aiming to describe its behavior while moving along the lifecycle curve. Applying system thinking, we first tried to explain the complexity of a destination (Living lab) as a system and its structure. Then, based on the panarchy concept we intended to contribute to the interdisciplinary understanding of resilience at the community (and other levels) by drawing attention to cross-scale relationships. Finally, to explain the logic behind the TALC model outlined in this report, we employed the system dynamics (as an aspect of systems theory) to comprehend how information feedback governs using feedback loops, delays and stocks and flows. Following the theoretical explanation on system and resilience thinking and system dynamics, a system dynamic TALC model is elaborated and applied to five Living Labs to explain their development along the observed period (2007-2019).

3.1. System and resilience thinking –the rationale behind the TALC modelling

Ever since Ludwig von Bertalanffy published his book on General System Theory (Bertalanffy, 1968), systems theory was adopted by scientists from different scientific fields as a methodology for complex phenomena research. In general, the term 'system' is associated with a “complex whole of interrelated components, whether it is biological (e.g. an ecosystem), structural (e.g. a railway system), organized ideas (e.g. the democratic system), or any other assemblage of components comprising a whole” (Cabrera et al., 2008:31). All systems consist of inputs, outputs, and feedback, and maintain a basic level of equilibrium (Radošević, 2001). As explained by Cabrera et al. (2008), opposite to thinking about systems in an informal process, systems thinking is a more formal, abstract, and structured cognitive endeavour and depends on the contextual patterns of an organisation. It emphasises the balance between the whole and its parts and takes into consideration the perspectives of multiple actors.

Systems differ regarding their complexity. Given this, there are simple, complicated or complex ones. According to Baggio (2008), simple systems are considered as linear, with predictable interactions, consisting only of a few components; they are repeatable and decomposable, while complicated systems, though may also be repeatable and decomposable, have many components, separated cause and effect over time and space.

Opposite to simple and complicated systems, complex systems do not have predictable reactions, cannot be decomposed, have nonlinear interactions, are dynamic, adaptable to the environment and produce emergent structures and behaviours (Jere Lazanski & Kljajić, 2006). Besides, a complex system possesses a structure spanning several scales or layers with a (sub)structure at every scale and involves interplay between cooperation and competition (Baranger, 2000). As pointed by Baggio

(2008: 5), complexity is the study of the structures which depend only partially on the nature of their constituents and concerns the unforeseen adaptive capacities and the emergence of new properties in systems that arise as the quantity and the quality of the connections among individuals and organisations increase.

The behaviour of complex, dynamic and non-linear systems is most widely described by the ”chaos theory" which claims that it is essentially impossible to formulate long term predictions about the behaviour of such a system (Jere Lazanski & Kljajić, 2006; Baggio, 2008). However, by adjusting both, their structure and their behaviours to external environmental changes, such systems demonstrate their ability to withstand large shocks, i.e. to be more resilient (Baggio & Sainaghi, 2013).

In this regard, it has to be investigated how a complex system, or a 'system of systems', as named by Jere Jakulin (2017) can be best managed in the face of disturbances, surprises and uncertainty. As already explained in detail in Report 4.1 resilience is the capacity of any system, be it an individual, an ecological system, a city, a destination or an economy, to deal with change and continue to develop. Concerning a social system, Cutter et al. (2010) indicate that resilience may be looked at as its capability to respond to and recuperate from catastrophes, including those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organise, change and learn in response to a threat. Given this, resilience thinking focuses on three aspects of social-ecological systems (SES): resilience as persistence, as adaptability and as transformability (Folke et al, 2010). Also, based on a thorough literature review on resilience, Ungar (2018) identifies seven conceptual clusters that reflect current thinking across discipline, being as follows: (1) resilience occurs in contexts of adversity; (2) resilience is a systemic process; (3) there are trade-offs between systems when a system experiences resilience; (4) a resilient system is open, dynamic, and complex; (5) a resilient system promotes connectivity; (6) a resilient system demonstrates experimentation and learning; and (7) a resilient system includes diversity, redundancy, and participation.

De Bruijn et al. (2017) stress that different notions to guide the development of resilience can be identified depending on the purpose, i.e. policy needed to cope with a specific problem. Hence, the first notion is that systems thinking is a core of resilience thinking. Namely, to define what resilience is aimed for and to whom it is addressed, it is necessary to be clear what kind of systems are being dealt with. The second notion of resilience is the reaction to disturbances in socio-ecological systems, whether there is actual resilience (implying change) or resistance (which means no change). Another important notion in resilience is feedback. As defined by Kefalas (2011:349), feedback is an input that represents a deviation, called error (ε) [(ε) = X−Y], between the system's goal (X) and its actual output or performance (Y), and can be either negative or positive, with the former dampening change and the latter reinforcing it. In other words, negative feedback carries a message to the system that it must reverse the cause of the error, whereas positive feedback tells the system to maximise the error, i.e. it promotes resilience (Kefalas, 2011). Biggs et al. (2012) point out that, in a rapidly changing world, managing slow variables and feedbacks is often crucial to keep social-ecological systems configured and functioning in ways that produce essential ecosystem services. In the same vein, a notion of forward-looking resilience is important to build sustainable and resilient communities that can easily deal with future disturbances. Fischer et al. (2009) stress that it is of utmost importance for complex adaptive systems thinking to be applied in management processes within socio-ecological systems. In this regard, adaptation is seen as the ability of a system and its actors to influence resilience by changing elements of the system to enable total transformation or a change in the existing system

(Walker et al, 2004; as cited in de Bruijn et al, 2017). To this end learning and experimentation makes the core of adaptive management (de Bruijn et al, 2017).

By focusing on community socio-ecological systems, resilience thinking recognizes panarchy, e.g. the nested character (one inside the other) of such systems and the challenge of connectivity across levels (Berkes & Ross, 2016). Holling & Gunderson (2002) point out that the significance of the panarchy concept is that it allows for the possibility of interactions across levels and thresholds through system feedbacks. Thus, it seems suitable for not only analysing the effects of drivers originating at various levels but also for generating insights regarding policies to enhance resilience at appropriate levels (Brondizio et al., 2009; Berkes & Ross, 2016). As indicated by Berkes & Ross (2016), the use of the panarchy concept helps contribute to the interdisciplinary understanding of resilience at the level of community, including tourist community/destination (Farrell & Twining-Ward, 2004) by drawing attention to cross-scale relationships.

3.1.1. System and resilience thinking applied to tourist destination

According to Baggio (2008), a destination can be considered a complex adaptive system, for which reason the chaos and complexity framework seems to be very appropriate to provide explanations of its dynamical behaviour. But, how exactly does the destination concept fit this framework?

First, a tourist destination (be it a community, a region or a country/state) encompasses numerous factors and activities which are interdependent and whose relationships might be highly nonlinear (Petrić, 2013). Moreover, apart from typical tourism elements, there are also elements not traditionally thought of as belonging strictly to the tourism sector, but whose importance and role in this framework is undoubtedly very high (Baggio, 2008; Petrić, 2011).

Being such a complex system, a tourist destination is very sensitive to different disturbances through environmental change as well as through social, economic and political upheaval (Bui et al, 2020). Moreover, due to its complexity (nonlinearity), one type of stress initiates a series of other stresses/impacts (butterfly effect. For example, natural disasters may lead to the health crisis, which may cause social crisis (related to crime rate growth), ultimately producing impacts of economic/financial nature.

Furthermore, a tourist destination possesses a structure spanning several scales or layers. At every scale, there is a structure as an essential aspect of a complex system, ultimately contributing to emerging behaviour. The emerging behaviour is, as stated by Barranger (2000), a phenomenon special to the scale considered, resulting from global interactions between the scale's constituents. Considering the complexity of a destination as a system, the use of the panarchy concept helps contribute to the interdisciplinary understanding of resilience at the community (and other levels) by drawing attention to cross-scale relationships. Baggio (2008) points out that global structures in a complex system may emerge when certain parameters go beyond a critical threshold, affecting the appearance of a new hierarchical level that reduces the complexity. The system then evolves, increasing its complexity up to the next self-organisation process potentially affecting the capability to show a good degree of robustness to external (or internal) shocks. The system may show to be capable to absorb the shock and to remain in a given state or regain the state unpredictably fast, which depends on the internal structure of the system and the stimulus of private or public policy decisions (Mileti, 1999, as cited in Baggio, 2008). Tourist destination as a complex adaptive system constantly

acts at the edge of the chaos (in the state of fragile equilibrium), i.e. between a chaotic state (disorganisation) and a completely ordered one (highest level of organisation), a condition that has also been named self-organised criticality (Baggio, 2008).

The state of the highest level of the organisation should imply that a destination has reached sustainability in all the three major aspects of its development, i.e. economic, social and environmental, which seems to be only a theoretical, unreachable goal (Petrić, 2013). However, a better understanding of the above-elaborated considerations may help destination managers/planners to bring appropriate policies to move the destination's sustainability (and consequently resilience) towards a higher level of organisation. According to Faulkner & Russell (1997), who introduced Chaos and Complexity Theory into tourism destination-related literature, entrepreneurs are seen as actors of chaos while planners are seen as regulators. Additionally, Russell & Faulkner (2004) explained that the stagnation stage of a destination or an 'edge-of-chaos state' can be viewed as an opportunity to achieve productive change, which will push the destination into the next more innovative cycle.

3.1.2. The elements of system dynamics

To explain the reasoning behind the Tourism Area Life Cycle (TALC) model behaviour, a few common facts on complex system dynamics are introduced. System dynamics is an aspect of systems theory as a method to understand the dynamic behavior of complex systems, or, as explained by Colye (1996), system dynamics is the time-dependent behaviour of managed systems, aimed to describe the system, and to understand how information feedback governs. The origins of system dynamics can be traced back to engineering control theory that focuses on the feedback loop control, and transient/steady response (Ogata, 1997). System dynamics took these concepts and applied them to social, managerial domains. Hence, characteristics that make system dynamics different from other approaches to studying dynamic systems is the use of feedback loops, delays and stocks and flows (Forrester, 1969). These elements help describe how even seemingly simple systems display nonlinearity (Radzicki & Taylor, 2008). System analysis uses both qualitative and quantitative analyses. The qualitative tools are mainly used to capture the model structure, including causal loop diagrams (Sterman, 2000), structure-behaviour diagram (Davidsen, 1992), and stock-flow diagram (Forrester, 1961) used in model simulation. The quantitative methodologies in system dynamics focus on feedback loop analysis aiming to design an effective policy to adjust the system behaviour.

According to the "father" of the system dynamics, Forrester (1969), the feedback loop is the technical term describing the environment around any decision point in a system. The decision leads to a course of action that changes the state of the surrounding system and gives rise to new information on which future decisions are based. A feedback loop is a closed path, representing a chain of causal-effect relationships. Forrester (1961) stated that all decisions take place in the context of feedback loops.

A time delay describes a process whose output lags behind its input. Time delays reduce the number of times one can cycle around the learning loop, slowing the ability to accumulate experience, test hypotheses, and improve (Rahmandad et al., 2009). By using time delays, it is possible to explain the movement of a destination along the TALC stages.

A fundamental task in exploring dynamic systems is to distinguish different types of behaviour. It is also a prerequisite to ultimately identify what types of feedback structures give rise to various

behaviour and why. "Structure drives behaviour" is considered a primary principle in the system dynamics paradigm (Güneralp, 2004, as cited in Huang, 2012). Although it would be of utmost importance to discover links between dominant feedback loops and shifts in loop dominance to behaviour patterns, system dynamics does not currently provide such a method for identifying dominant feedback loops. With this aim, it has traditionally used informal approaches such as experimental model exploration, model reduction, or both with their understanding of the behaviour patterns typically generated by positive and negative feedback loops (Richardson, 1991). However, they didn't seem to be very useful in identifying dominant loops because loop polarity is only loosely coupled to specific behaviour patterns. In addition, no formal and unambiguous definition of behaviour with regards to dominance has been formulated so far. Research has focused far more on the structural aspects of how feedback structures and behaviour are linked than on behavioural aspects (Richardson, 1991; 1995).

System dynamics needs an understanding of feedback loop dominance that balances structural and behavioural perspectives. The purpose of feedback loop dominance analysis is to identify feedback structures that dominate behaviour. The location of dominance must be identified more specifically than at the level of a model because different variables in a model can have very different behaviour patterns at the same time interval. Therefore, the identification of feedback loop dominance requires the specification of a single system variable for which dominance is considered important (Ford, 1999).

3.1.3. System dynamics approach to TALC modelling

Complexity of a tourist destination results from a multitude of constituents and their mutual interactions. By employing the Tourism Area Life Cycle (TALC) approach, its behaviour may be clearly described, while moving along different stages of its life cycle. However, the question arises whether the TALC model can be applied to niche product destinations, such as cultural tourism destinations. The answer to this question should be sought by applying system dynamics.

The description of the relationships between system dynamics and resilience and sustainability was already partially drawn in Report 4.1. (Petrić et.al, 2020). A deeper understanding of the logic behind feedbacks, delays, and time dimension can help explaining the destination system structure and its impacts on the expected pattern of its behaviour. In this way, the analysis is not focused solely on partial observation of one or two variables but on structured sets of variables (FBL feedback loop) characterizing basic patterns of behaviour. The structured sets of variables obtained in this way enable studying the FLBs dominance. FLB dominance can change over time because the same variables may belong to different FLBs, hence enabling the isolated observation of each of the observed subsystems and the description of the interaction between them. To adapt the general model to individual destinations descriptive statistics is applied, thus helping the model verification at a particular destination level. Such a model enables achieving a balance of the entire destination system by applying variables with different values. In the context of this research, a balanced destination system is the one that has reached sustainability and resilience.

”Step by step“ approach to development of system dynamics model proposes three evaluation tests (Pejić-Bach & Čerić, 2007). The dimensional consistency test shows the existence of errors, i.e. it checks if the units of measure of variables on both sides of the equation are the same. The extreme conditions test indicates oversights, i.e. it shows whether the structure of the model allows that the

behaviour of the model in extreme conditions matches the behaviour of the real system in the same situations. The behaviour sensibility test helps to understand the impact of each variable on the model behaviour. It focuses on detecting such parameters whose small changes cause a significant change in the model behaviour. The fewer such parameters, the higher the credibility of the model. However, the behaviour sensibility test is acceptable if the real system behaves as the modelled one. The system dynamics aims to identify the parameters which affect the system behaviour the most, and as so is the most adequate to be applied in management policies. If the behaviour sensibility test shows the model is not sensible to the changes of some parameters, they can be assessed based on the subjective judgment (Pejić-Bach & Čerić, 2007:174).

3.1.4. Model development based on casual loop diagram

Following the theoretical explanation on system and resilience thinking and system dynamics, a system dynamic TALC model will be further elaborated in detail.

A destination's attractiveness is usually expressed by tourist attendance, whether reported by visitor arrivals or overnights, or by financial indicators such as tourist receipts. In this report, considering data availability and Butler's (1980) original idea, we decided to take the number of visitors V as the reference point, with the logistic curve to explain the destination's development over time. The logistic function is applied in various scientific disciplines, such as neural networks, biomathematics, demography, economics, chemistry, medicine, mathematical psychology, probability, sociology, political science and statistics. Butler (1980) himself created the TALC model based on a logistic curve originating from Verhulst (1838), as explained by expression (1).

$$f(x) = \frac{L}{1+e^{-k(x-x_0)}} \tag{1}$$

where: L is the maximum value of the curve $f(x)$, x is the argument of the function, x_0 is the argument of sigmoid 'midpoint', k is the logistic growth rate or steepness of the curve. To align with previous research in this area, $f(x)$, which in our study represents the actual number of visitors, will be denoted by V; L is the maximum value of the number of visitors and will be denoted by M, while the variable x will represent time and will be denoted by t. Based on this, the logistic TALC function has the following form (2)

$$V(t) = \frac{M}{1+e^{-k(t-t_0)}} \tag{2}$$

There are different ways in which the function can be presented. For the sake of consistency of the units of measurement used in the model and of the methodology of system dynamics, in this study, we will use a logistic differential equation. Such a form is obtained by applying the differential calculus, as follows.

The TALC logistic curve may be represented by function (2). By deriving the function (2) we come to

$$\frac{dV(t)}{dt} = k \cdot M \cdot \frac{-e^{-k(t-t_0)}}{1+e^{-k(t-t_0)}},$$

and, after arranging it

$$\frac{dV(t)}{dt} = k \cdot \left(\frac{M}{1+e^{-k(t-t_0)}} - \frac{1}{M}\left(\frac{M}{1+e^{-k(t-t_0)}}\right)^2\right). \tag{3}$$

If (2) is contained within (3), the logistic differential equation (4) is obtained and will be further used to describe the TALC model.

$$\frac{dV(t)}{dt} = k * V(t) * \left(1 - \frac{V(t)}{M}\right). \quad (4)$$

In the system dynamics context, after being arranged, equation (4) may be written as a level equation (5)

$$V(t) = V(t_1) + \int_{t_1}^{t_2} k \cdot V(t) * \left(1 - \frac{V(t)}{M}\right) dt, \quad (5)$$

where *Vt* is the actual number of visitors (arrivals), Vt_1 is the number of visitors in time t_1; t_1 and t_2 are the starting and ending points of the observed period, *k* is the coefficient of the information spread-out rate about a destination (WoM-word-of-mouth), and *M* is a maximum number of the potential visitors (arrivals).

Based on the above, the basic TALC model structure is described by the causal loop diagram as in Figure 10.

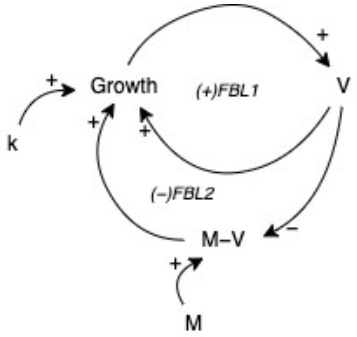

Fig 10 Casual loop diagram of the TALC model

Figure 10 describes the interaction of the variables used in the model.

Considering *V* is the number of actual visitors and *M* is the maximum expected number of visitors in a destination, *M – V* is the difference between the number of maximum and actual visitors in the previous period. As *V* increases, the difference *M-V* decreases, indicating inverse proportionality. That is why there is a minus sign next to the arrow. The difference between the actual number of visitors (V) in the previous period and the maximum number of potential visitors (M) in the following period makes the basis of Growth. The described process' operation will depend on the information spread-out rate *k*, which sublimates all elements influencing Growth.

3.2. Model improvement applied to Living Labs

Economics, business, and related fields often distinguish between quantities that are stocks and those that are flows. They differ concerning the units of measurement. A stock is measured at one specific time, and represents a quantity existing at that point in time, which may have accumulated in the past. A flow variable is measured over an interval of time. Therefore, a flow would be measured per unit of time (such as a year). Flow is roughly analogous to rate or speed in this sense. This means that level function (*V*) may be calculated in one-time period, while two-time periods are needed to calculate rate function (Growth).

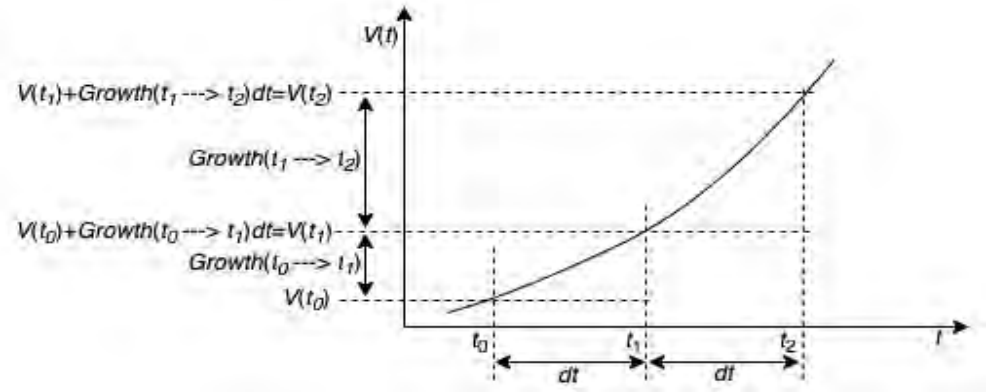

Fig 11. Basic concept of calculation

According to the structure shown in Figure 11, the number of visitors (V) is represented by a level variable. This means that all changes in visitors over time are accumulated in this variable. The annual change in *V* is observed through the variable *Growth*. In this research, the number of visitors *V* is observed in the period from 2007 to 2019. Although there are originally six Living Labs (LL) with 36 Local Administrative Units (LAUs) in total, lack of data on arrivals (visitors) limited analysis on 5 Living Labs and a total of 27 LAUs. Even the remaining LAUs were lacking some data, and they were approximated by Excel's function for creating arrays. Finally, all data are presented in Table 23, with those that have been approximated marked in red. The data from table 23 are used not just as an input for a quantitative model but also to conduct a simulation using the Powersim studio nine software package.

Table 23. Data on arrivals along the LAUs and LLs in the period from 2007-2019[12]

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BE 23-TOTAL	40727	51614	47882	46696	49077	55170	56907	75382	74473	71756	80759	88008	96358
Bornem	12020	12105	11889	12146	12543	12325	12003	13315	13700	13356	13876	13601	15660
Pu.-Si.-Am.	2638	2996	3354	3713	4071	4429	4787	5442	5395	6144	5276	6570	7418
Aalst	18759	28618	25143	23230	25405	29688	31119	48224	47814	44537	52851	58623	62628
Berlare	2838	2839	2487	2797	2606	3151	2482	2100	2862	2732	2921	3109	4020
Dendermonde	4472	5056	5009	4810	4452	5577	6516	6301	4702	4987	5835	6105	6632
ES 24-TOTAL	267090	297506	261463	280208	271409	247693	276771	288902	329622	381897	387165	407220	400611
Ainsa	3439	6356	9273	12190	15107	18024	19426	26888	25260	29692	32609	55503	35258
Benasque	70753	68201	63243	72698	67585	49759	56079	57041	59285	71142	81818	78271	79695
Huesca	77565	92458	71568	69988	66990	65409	72650	78374	90168	92857	90091	90091	90168
Jaca	115333	130491	117379	125332	121727	114501	128616	126599	154909	188206	182647	183355	195490
HR 03-TOTAL	294370	327557	306968	301086	405275	400456	503400	568271	706592	794964	1019852	1204130	1305993
Dugopolje	3000	4000	9000	10282	29676	32258	61193	46726	53960	25927	51299	49159	45779
Kaštela	28501	29987	26893	25509	54880	32670	41016	42406	50191	60364	83605	100530	114990
Klis	100	100	100	100	100	300	300	300	500	877	1909	2931	4085
Sinj	8689	9645	7649	7179	7694	7110	9035	10691	10266	9633	11317	13116	11620
Solin	2500	4000	5500	7530	14590	11118	6915	10422	14449	15693	22139	32042	41322
Split	185718	211299	176185	203539	252287	265630	318057	381227	487474	583041	720325	859224	941185
Trogir	65862	68526	81641	46947	46048	51370	66884	76499	89752	99429	129258	147128	147012
IT H3-TOTAL	183858	183119	168631	173731	192618	198268	217598	218073	236852	242609	286103	293648	303550
Caldogno	1833	2029	1742	1651	1838	2121	1131	842	842	842	842	842	842
Grumolo delle Abbadese	1769	3146	5642	3663	8396	9622	11115	11038	11748	12458	13168	13878	14588
Lonigo	7403	8013	7154	7136	6718	6949	6913	7130	7717	8304	8891	9478	10065
Montagnana	6121	6369	4636	4681	4667	3700	4055	4514	3248	1982	716	0	0
Vicenza	166732	163562	149457	156600	170999	175876	194384	194549	213297	219023	262486	270000	279871

[12] The Utsjoki Living Lab lifecycle hasn't been elaborated due to the lack of data

NL 33-TOTAL	471342	557097	642852	728607	814361	922282	953188	1065836	1148228	1243377	1354261	1469674	1445218
Barendrecht	12801	14187	15573	16959	18345	19260	20924	22601	24012	25013	28755	28106	27980
Delft	26527	29515	32503	35490	38478	40290	44185	48050	50688	52455	60653	59572	59501
Dordrecht	33779	36944	40109	43274	46439	48165	52419	56548	59602	61432	70246	68517	68513
Ridderkerk	12350	13638	14927	16215	17503	18430	19986	21473	22625	23494	27160	26702	26529
Rotterdam	373226	448964	524702	600440	676179	778000	796000	896000	969000	1058000	1141000	1261000	1237000
Zwijndrecht	12659	13848	15038	16228	17418	18137	19674	21165	22302	22982	26447	25777	25695

To present Excel sheet data (Table 23), the following function is used in a business simulation software Powersim:

GRAPHCURVE (X, X1, DX, Y(N))

The GRAPHCURVE function returns tabulated values (referred to as grid points or fixed points) for given input values. If the input value does not correspond to any of the tabulated values, GRAPHCURVE computes a value based on interpolation and/or extrapolation. X is the input value that is desirable that GRAPH finds a matching output value. X1 is the first point of the graph, and DX is the increment between the fixpoints on the curve. Y is an array containing N fix points. If X lies between the fixpoints on the tabulated graph, the output value of GRAPHCURVE is calculated by third-order polynomial interpolation. A third-order polynomial is constructed based on all fixpoints and solved for the given input value, consequently giving a smooth function. If X is less than X1 or larger than X1+(N-1)*DX (thus lying beyond the range of the given fixpoints), the output value is computed by linear extrapolation. GRAPHCURVE uses linear asymptotes constructed as lines connecting two outermost fixpoints (www.powersim.com). Figures 12-16 describe the behaviour of a GRAPHCURVE function for each Living Lab and corresponding LAUs (Table 23). Based on the GRAPHCURVE function, we calculated the annual average of the arrivals' growth rates. Since we have been observing the multi-year lifecycle of a specific tourist area, we omitted seasonality analysis. The GRAPHCURVE function is also used to validate the TALC system dynamics' model.

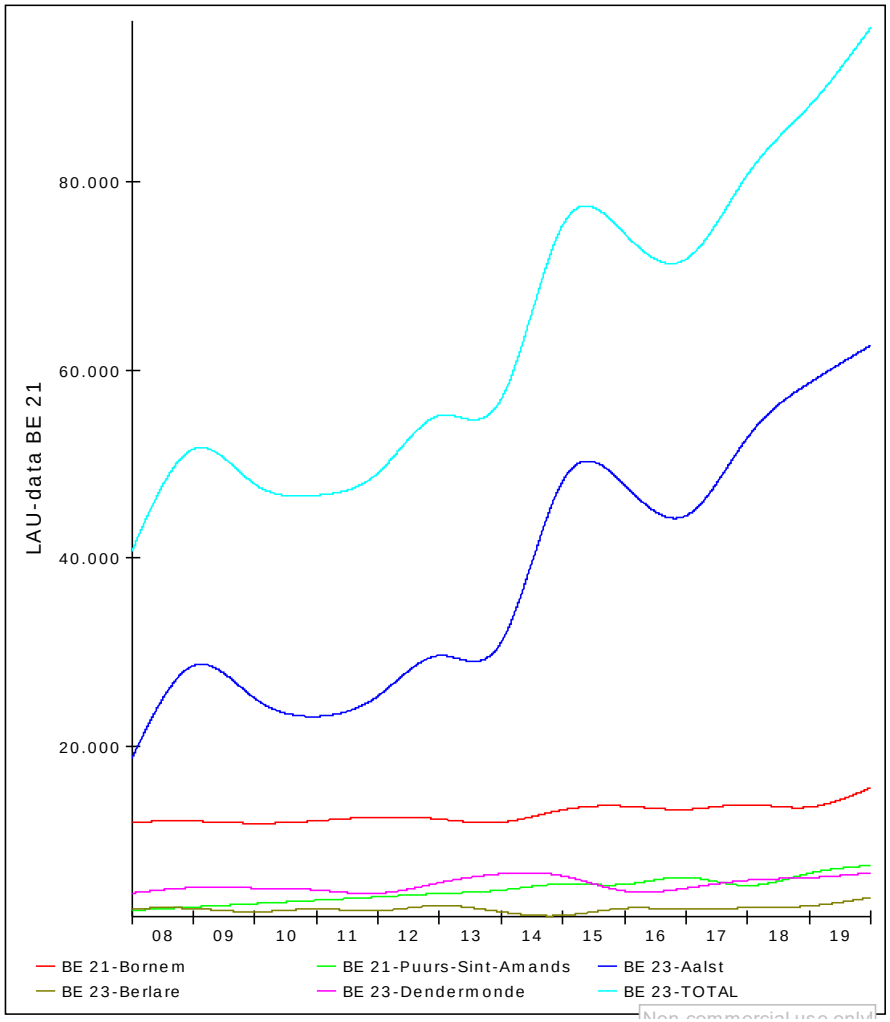

Fig 12. Behaviour of a GRAPHCURVE function for BELGIUM, Prov. Oost-Vlaanderen & Antwerpen, The Scheldeland region

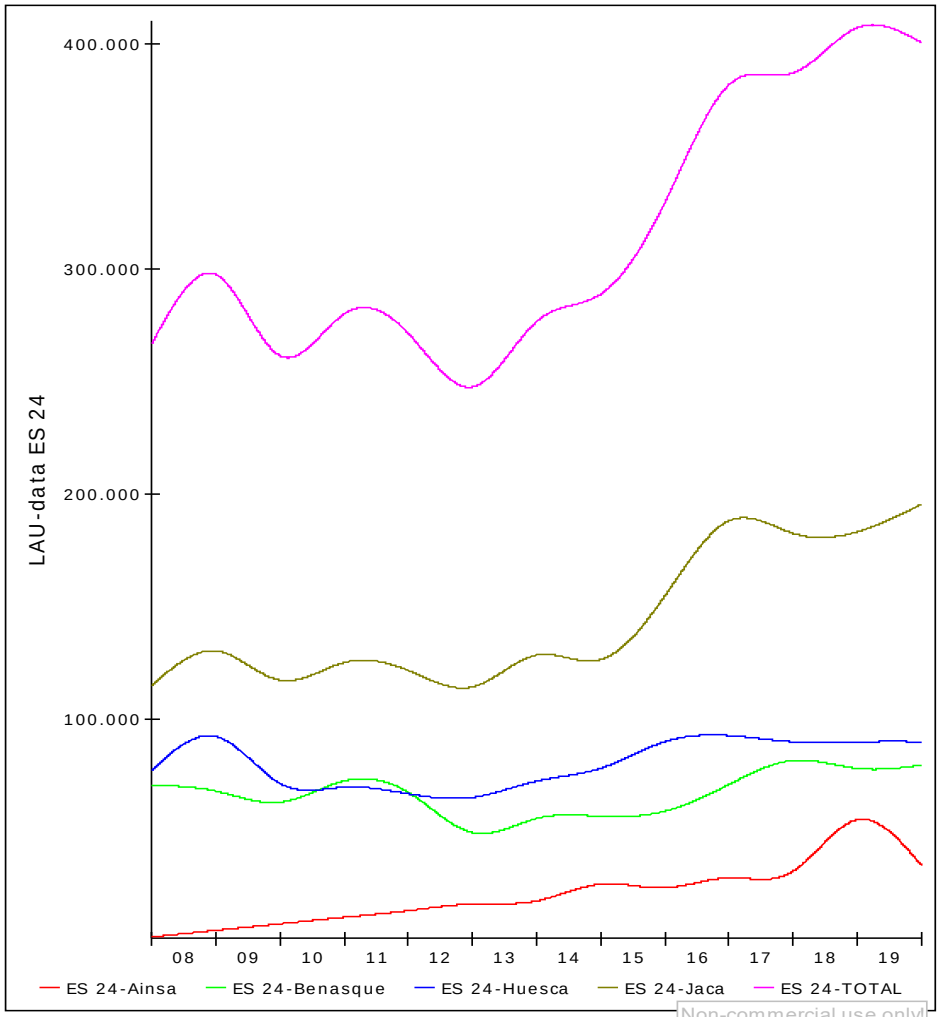

Fig 13. Behaviour of a GRAPHCURVE function for SPAIN, Aragón, Huesca

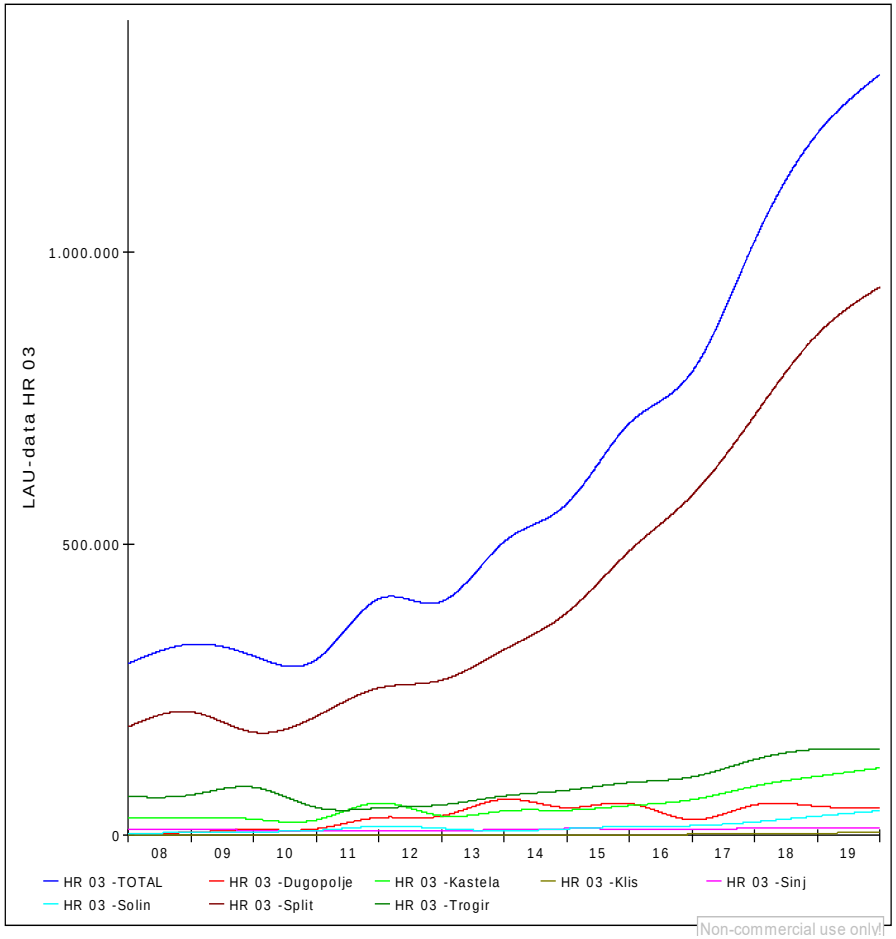

Fig 14. Behaviour of a GRAPHCURVE function for CROATIA, Jadranska Hrvatska, city of Split metropolitan area

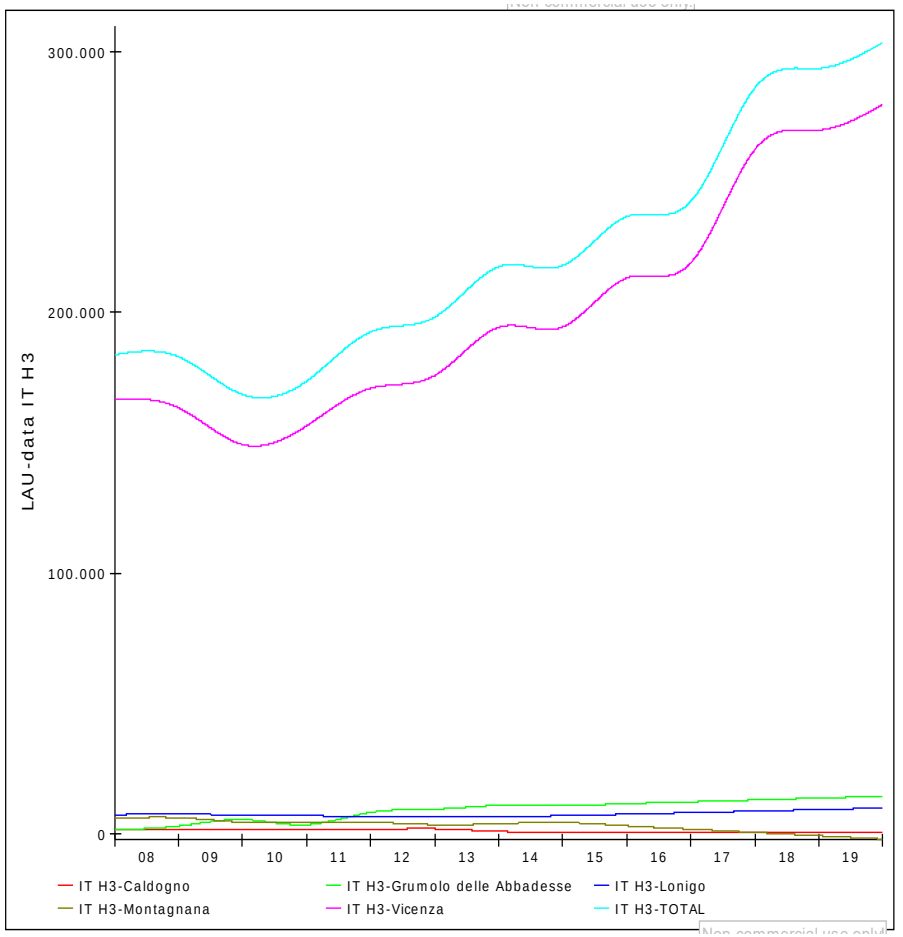

Fig 15. Behaviour of a GRAPHCURV function for ITALY, Veneto, Vicenza

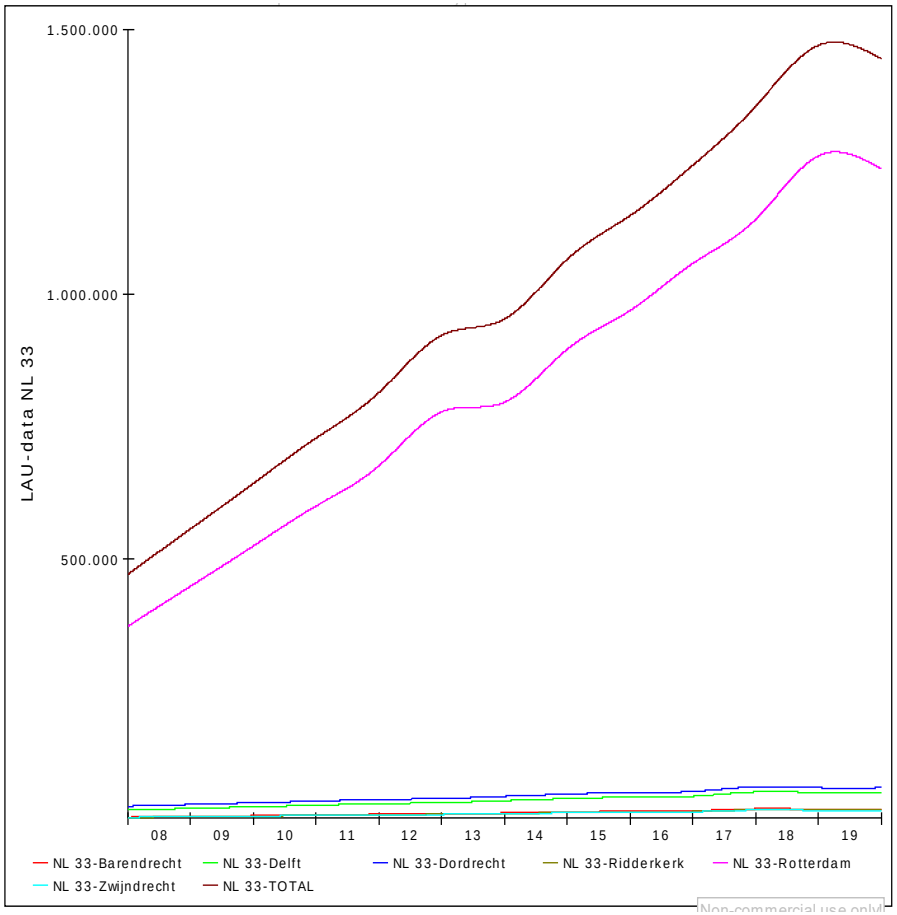

Fig 16. Behaviour of a GRAPHCURVE function for NETHERLANDS, Zuid-Holland, The Rotterdam Metropolitan Region

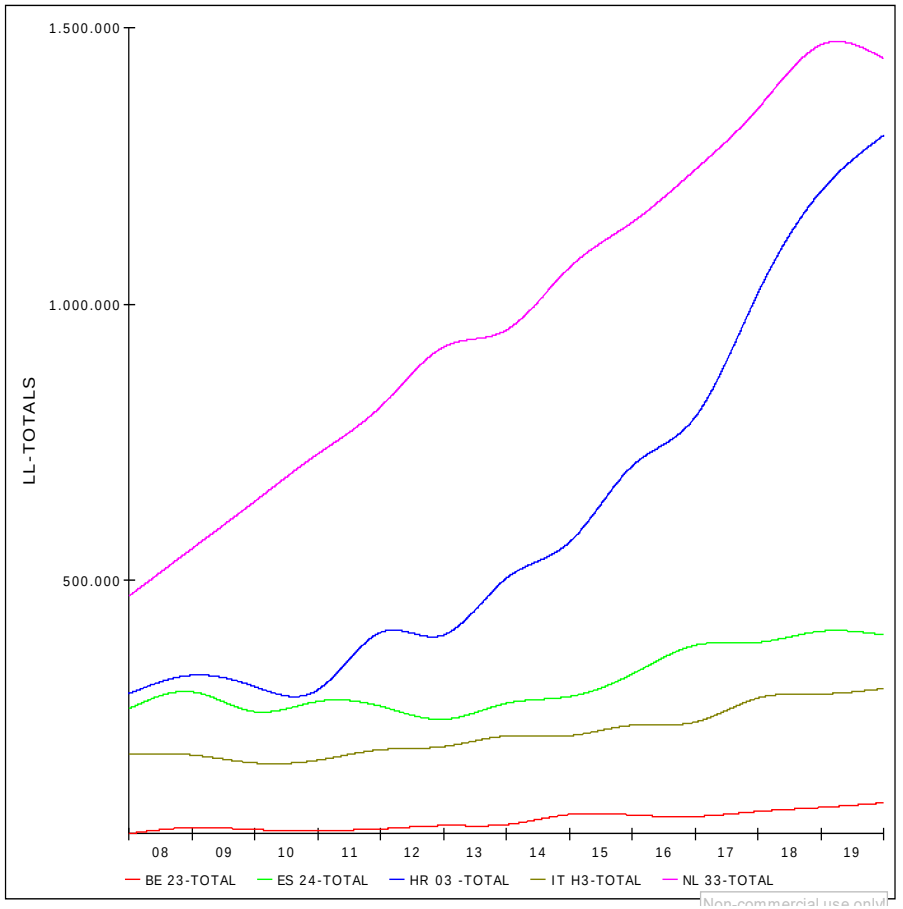

Fig 17. Behaviour of a GRAPHCURVE function for all Living Labs

As can be seen in Figures 12-16, in the observed period (2007-2019) the number of visitors at each Living Lab and its corresponding LAUs recorded a wavy growth. Each of the waves, i.e. the sigmoid S-shape of the curve at a specific multi-year interval, can be viewed as a distinct mini-TALC. These are the destination's short-term ups and downs, which cumulatively contribute to the shape of its long-term life cycle. Precisely, based on the cumulative effects, a specific trend of the entire Living Lab (destination) development can be predicted (as shown in Figure 17).

In his seminal paper Butler (1980) dealt with 6 TALC stages while some other authors (such as Haywood, 1986; Dealbuquerque & Mcelroy, 1992; Prideaux, 2000; Romão et al., 2013) were suggesting destinations can pass less than 6 stages. In the following chapters, we propose an analytical procedure for determining the limits of different TALC stages, assuming there are three, i.e.

- the supply dominance stage,
- the demand dominance stage,
- and the restructuring stage.

3.2.1. Generic structures of the TALC behaviour

Generally speaking, the change of an object's speed depends on its acceleration and the time needed to achieve it. The larger the difference between the current and the desired values, the stronger the effort to equalize them. If we deal with the inert (sluggish) system, a small change can easily become bigger and ultimately lead to unwanted consequences (the butterfly effect). However, the type and intensity of the adverse impacts depend on a system's ability and resilience. Given this, we first have to elaborate on generic structures that characterize certain patterns of behaviour, such as (+)FBL delineating exponential growth, i.e. ability and (-)FBL delineating logarithmic growth. (-)FBL explains the observed variable tendency to reach a maximum, which leads to an overall system resistance.

By combining these two generic structures, we reach the limits of growth, being an archetype of system dynamics whose behaviour corresponds to the TALC curve behaviour. Good knowledge of the supply and demand subsystems can help to formalize this approach. Understanding how they behave, we can simulate the destination system's responses while searching for a new state of stability.

For this purpose, a DPSIR approach (Drivers-Pressures-States- Impacts-Responses) can be applied. However, as elaborated in Report D4.1., the DPSIR elements, being an integral part of the supply side (Figure 10), make essential factors of a destination system's resilience to external shocks (including a too intensive number of visitors). Accordingly, the development of a resilience simulation model based on a system-dynamic approach depends on data availability. However, the supply-side data availability and consistency over a period, is always an issue, let alone the DPSIR specificities across different destinations, which is why further research has to lean solely on the demand-side data (visitor attendance) presented by a TALC logistic curve. Such an approach was already proven in many papers, from Butler's (1980) seminal research up to the most recent ones, elaborated in Report D4.1.

Given the future research trajectory outlined in Report D4.1, it is necessary to determine time intervals when visitors' growth rate in a destination is either supply-driven or demand-driven. Looking at the structural diagram in Figure 10, it can be seen that two feedback circuits exist in the TALC logistic curve, i.e. positive (+)FBL1 and negative (-)FBL2, showing characteristic (generic) patterns of behaviour, as shown in Figures 18 and 19.

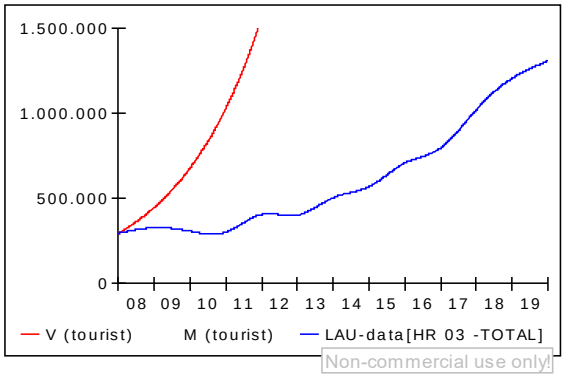

Fig 18. Exponential growth

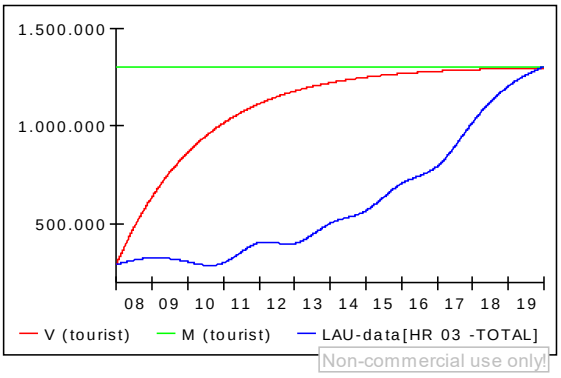

Fig 19. Goal seeking

In both, Figure 18 and Figure 19, the growth rate (*k)* is constant, and the blue curve indicates the official data on visitors for the Croatian Living Lab, consisting of 7 LAUs (expressed as HR-03-Total).

(+)FBL1 describes the structure of the exponential growth pattern (Figure 18) similar to a compound interest account, where the principal is accrued based on the interest rate. Then, in the next stage, the interest rate is added to the principal, with the procedure repeated for each subsequent period. Thus, as regards the (+)FBL1, there are no limits of growth, but instead, growth depends on the penetration coefficient *k* and the initial state of the number of visitors *V(t1).*

The number of visitors V(*t*) can grow continuously towards infinity because there are no boundaries/limits to slow the growth. This explained, it can be concluded that (+)FBL1 describes an unlimited demand market, i.e. a situation with no competitors or any other external influence. In such a case, demand would grow exponentially with the coefficient *k*, according to the structure (+)FBL1.

However, the limits of growth exist and conditioned by supply, i.e. greater demand can't be reached unless enabled by supply, which means that the maximum expected number of visitors (M) equals total supply**.** Being constant, supply may represent a constraint on expected demand with a constant penetration coefficient *k*. With this in mind, the dynamics of the maximum expected number of visitors (*M*) is determined by (-)FBL2 structure that has a pattern of goal seeker (Figure 19).

The pattern of behaviour between the two elaborated structures (+)FBL1 and (-)FBL2 is shown in Figures 20 and 21.

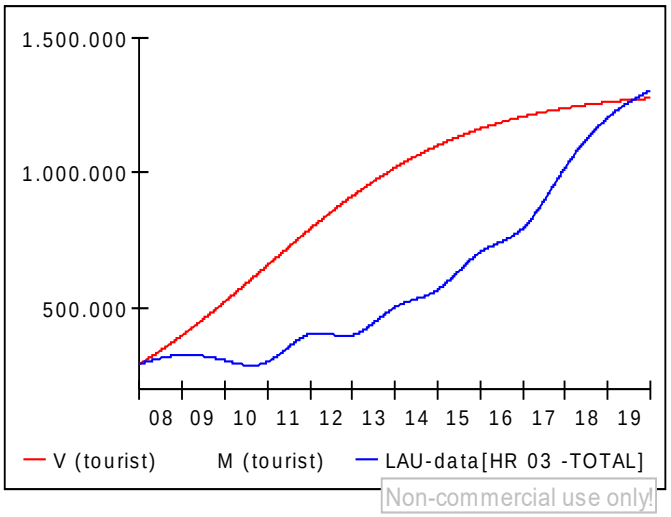

Fig 20. Pattern of behaviour of the TALC logistic curve

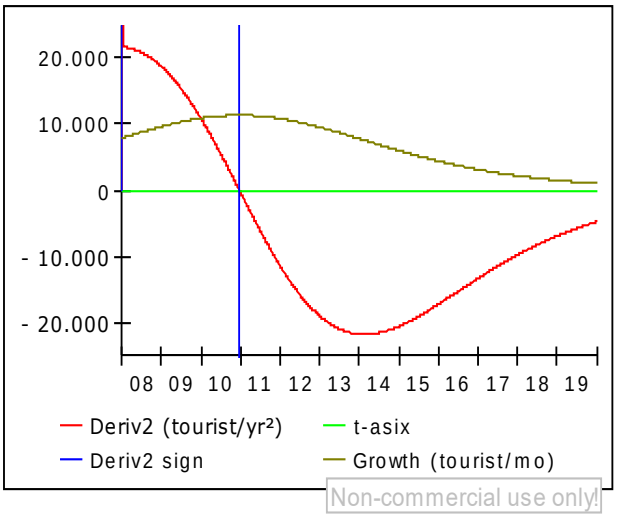

Fig 21. Graphs of the first and second derivation of the TALC logistic curve

We see that the behaviour pattern of the TALC logistic curve has a sigmoid shape. In this case, *k* and *M* are constant. The growth rate acceleration occurs until the threshold point, affecting various pressures in a destination (P in the DPSIR model). In that point, called the inflexion point, the TALC curve changes from a convex to a concave shape. From that moment onwards, suppliers start to compete by lowering prices, cutting costs, finally resulting in an overall quality decline. Eventually, demand overpowers supply. However, following the TALC model, absolute numbers of arrivals are growing but with diminishing growth rates. Further growth increases pressures (P) until reaching a saturation threshold after which, as presumed by the TALC approach, in the last stage different scenarios may occur, depending on a destination's resilience.

Reaching the point of inflexion provides a signal that unacceptable changes have been occurring in a destination. Moreover, the flow of the best fit straight line describing the acceleration/deceleration of the new arrivals' growth rate during the observed period, will enable management of the entire destination system based on the site-specific DPSIR approach.

The point of inflexion may be equated with the destination's carrying capacity, defined as the maximum number of people who can visit a tourist destination at the same time, without causing unacceptable disturbances of the physical, economic and socio-cultural environment and reduction in visitor satisfaction (UNWTO, 1981).

To determine the saturation point, i.e. the maximum of the function V (t), it is necessary to equate its first-order derivative V '(t) with zero. The inflexion point of the function V(t) is reached by equating its second-order derivative V ''(t) with zero. The value of the argument t will represent the time point at which V(t) reaches an inflexion point. The same is on the graph of the function V(t) and its first-order derivative Growth (t), and the second-order derivative Deriv2(t) (Figure 10). The simulated TALC curve has an inflexion point, i.e. Deriv2 (t)=0 in 2010, while the moment of saturation Growth(t)=0 is expected in 2021.

Precisely, the two points of time can be considered as limits of the three TALC periods:

- In the first period (stage), there is the **supply dominance,** with supply-driven innovations pushing the destination's attractiveness, eventually affecting further demand growth. In this period, supply driven development positively affects the destination, especially in terms of the socio-economic and cultural impacts. This period of growth lasts until the first point of time (t-point of inflexion).
- In the second period (stage), suppliers fiercely compete for the limited amount of resources to attract as many visitors as possible. The visitors benefit from this competition and increasingly visit a destination, thus indicating the period of **demand dominance**. Along with the growth of arrivals, many pressures are generated, indicating a destination's maturity**.** Each effort to enlarge the number of visitors in this stage ends up with an increase in resources' consumption. Such a development approach questions the very survival of a destination as a system. This period began with the inflexion point and ends up with the saturation point, which is the maximum number of visitors.
- As soon as the saturation point is achieved, the third period (stage) should start aiming at a **destination's restructuring**, which may initiate its new development cycle together with its gravitating area or a complete decline.

Following above explanation, it is necessary to approximate TALC as accurately as possible with real data. As presented in Figure 20, the approximate visitor curve *V(t*) only roughly determines the trend. The reason is that the *k*-coefficient of penetration together with the *M*-maximum expected number of visitors are constant. Following Figure 18 coefficient *k* determines the demand itself and its growth rate. Therefore, based on the idea of unlimited market, we can assume that it sublimates all elements affecting demand, thus indicating behaviour according to an exponential growth pattern. Demand constraints are caused, among

other things, by the attractiveness of supply – *M* (proxied by the maximum expected number of arrivals). Simply said, a new product in a destination can increase *M*. This scenario is visible in the graph of the HR-03 Total visitors' arrival function in Figure 14. Each end of the short-time TALC cycle resulted in a shift of the M limit, potentially initiating a new short-time TALC.

Based on the above, we can say that *M* sublimates all elements of supply. If *M* doesn't grow, the function of arrivals will eventually behave according to the target search pattern as in Figure 18. However, if the new supply is created to fight market saturation, the variable *M* growth will behave in accordance with the TALC curve behaviour. An extreme case of a structure when practically all supply was defined at the beginning of the observed period is presented by the graph *V(t)* for the Living Lab NL-33, as shown in Figure 16.

Based on the aforementioned we can conclude that *k* and *M* should be viewed as time-dependent variables.

By doing so, the structure of the TALC presented in Figure 10 may be supplemented by the structure presented in Figure 22.

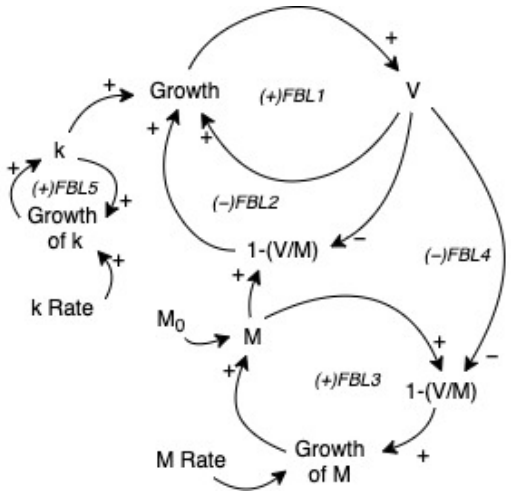

Fig 22. Casual loop diagram of the TALC model in context of supply-demand dynamics

Dependence of the number of visitors *V* on variables *k* and *M* can be explained by the scenario analysis presented in Figure 23.

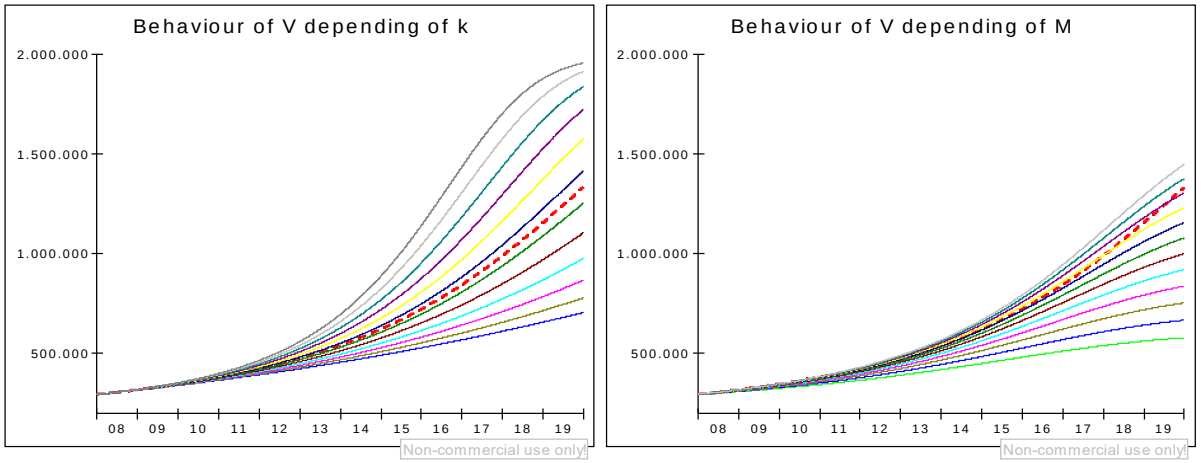

Fig 23. Dependence of the number of visitors *V* on variables *k* and *M*

As presented on the left side of the Figure 22, an increase of the penetration coefficient *k* (with a constant *M*) affects the demand growth rate. It doesn't increase the supply. Namely, lower positioned graphs have

lower values of coefficient *k* and react more slowly to supply use. While tending to reach the supply, the top positioned graph slows down the growth of arrivals. On the right side of the Figure 23, the situation with *M* is reversed. Higher values of *M* (with a constant *k*) allow for an increase in the number of arrivals. Since *M* is easily reached with a given *k*, the number of arrivals with a small value of *M* (the lowest positioned graph) has a sigmoid shape. However, a high value of *M* takes longer to reach the supply as the number of visitors grows exponentially.

After the TALC curve crosses the inflexion point with different pressures evidenced, it is necessary to consider introducing cultural tourism as a new destination product (to increase *M*). In the previous chapter, we have shown how to extend the observation of dynamics to a deeper level than the TALC logistic curve. The dynamization of *k(t)* as a representative of demand, and *M(t)* as a representative of supply, will enable the observation of the relationship between supply and demand over time through *V(t*), which characterizes the life cycle of the destination.

3.2.2.Scenario analysis based on TALC system dynamics model

To develop a quantitative model following the previously described structure (Figure 22), the Powersim simulation modelling software package was used. Powersim as well as system dynamics recognizes four basic types of parameters:

- State variables which accumulate change. It takes one moment to read them. These variables remember values and are denoted by the rectangle symbol (in Figure 24 these are k, M, SumSTDError and V-simulation Data).
- Rate variables indicate change, i.e. speed (first-order derivative). It takes two time moments to calculate their values. They are marked with a picture of the valve and flow. A bubble at the beginning and/or end indicates the source and abyss of the stream. Input/output presents a parameter for state variables. In Figure 24 these are Growth k, Growth M, Growth V, STDError…
- Auxiliary variables are used to clarify calculations and flow within the model. Linking them to/from rate variables enables a partial calculus.
- Constants are permanent identifiers throughout the simulation period. They are denoted by a rhombus (in Figure 24, k-rate, M-rate, M0, id-LAU-whose value in the model is selected based on the radio-button and the variable).

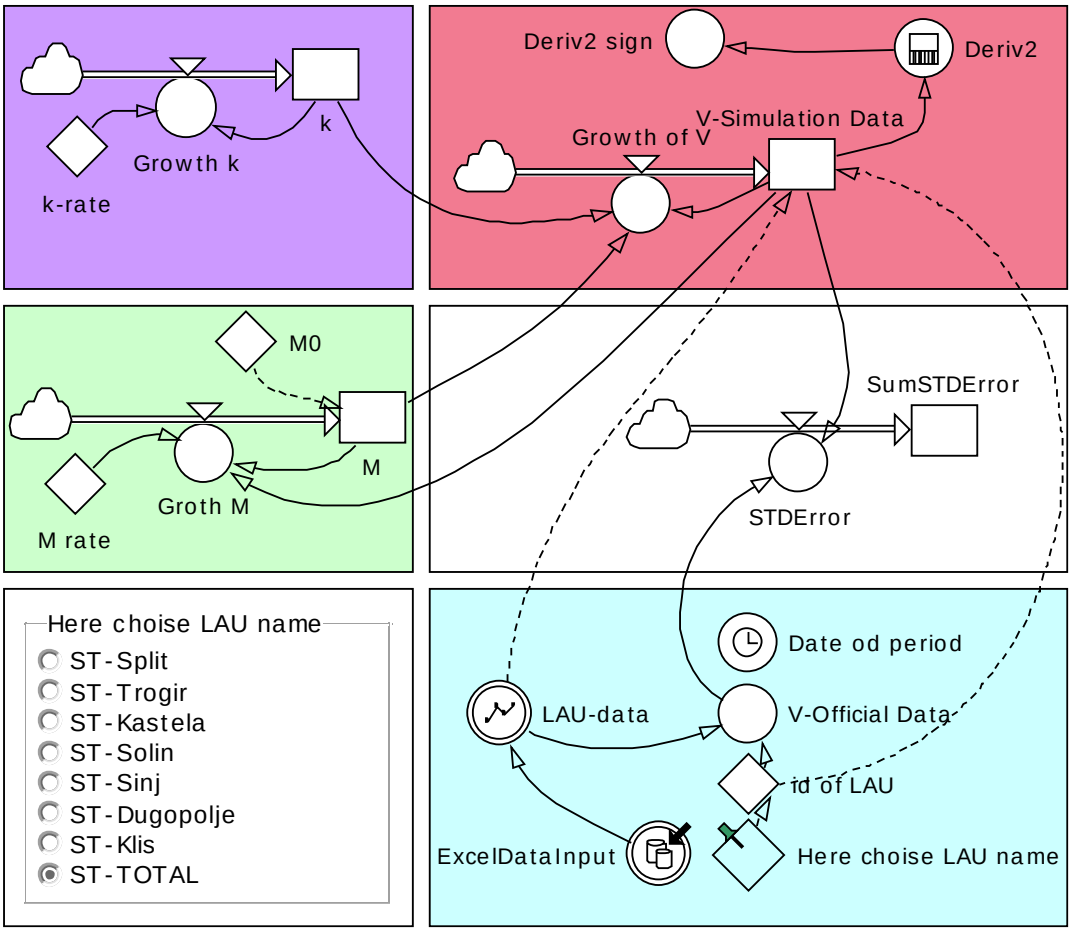

Fig 24. Flow diagram of the HR 03- LL TALC model simulation presented by Powersim symbols

Figure 14 represents graphs of approximated visitor arrival functions for each of the LAUs based on time series data in the period 2007 to 2019. The next step is, based on the simulation model shown in Figure 24, (which is leaning on the structure described in Figure 22), to show graphs of the visitor arrivals' trends. The input variables of the model are k-rate, M-rate, and M0. Using the optimization tool in Powersim, the optimal values of the mentioned input variables were determined to minimize the sum of standard derivatives at each time point, i.e. the minimum (SumSTDError). Simply put, the optimization task is to determine the optimal values of the input variables so that the graph of the simulated number of arrivals deviates as little as possible from the graph of the approximate function based on time series data collected from the real system.

3.2.3. Simulation results across Living Labs

The results for each of the Labs are presented in two parts, i.e. the first one delineating TALC based on the number of visitor arrivals and the second one describing the properties of the TALC curve (1st and 2nd order derivative) which indicates what stage a destination is in with regards to the lifecycle.

Figure 25 contains the following graphs:

- V-simulation data (red colour graph) - a graph representing the number of arrivals by year, as simulated by the above-elaborated model, representing the trend of the observed period;
- V-Offical Data (light green colour graph) – a graph representing the number of arrivals per year, based on the interpolated data;
- Maximum expected number of visitors (M) equals total supply.

Figure 26 contains the following graphs:

- Growth of V (dark green) - the first-order derivative of the V-simulation function
- Derivative2 (red graph) - the second-order derivative of the V-simulation function
- Derivative2 sign (blue graph) - a sign of the second-order derivative indicating moment when a destination passes from one stage to another,
- t-asix (light green graph) - drawn to enable monitoring of the first and second-order derivative functions flow.

The simulated visitor arrival curves (V-simulation data) have a sigmoid shape corresponding to the theoretical TALC curve. Observed differences across Living Labs can be explained by different dynamics of their supply (offer) development proxied by the maximum expected number of visitors (M).

Given the above, the models are presented as follows.

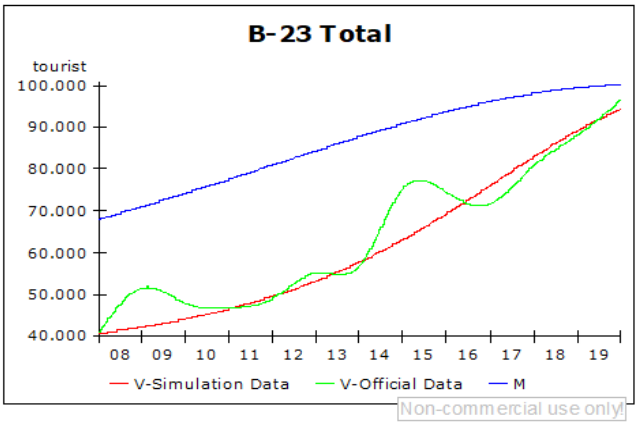

Fig 25. TALC and supply curve of B-23

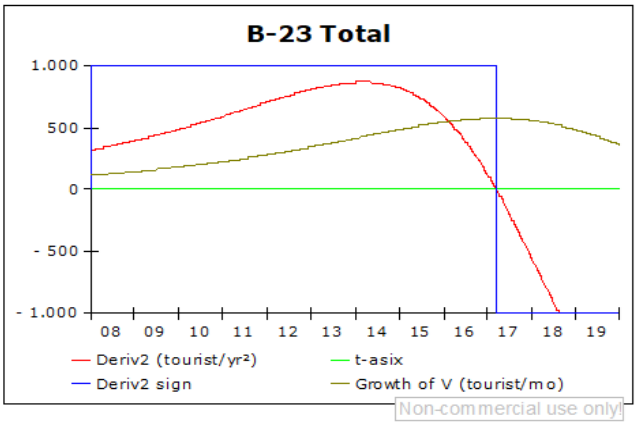

Fig 26. Properties of B-23 TALC curve

Within the observed period (2007-2019), the Living Lab B-23, (BELGIUM / Prov. Oost-Vlaanderen / The Scheldeland region / Denderleeuw, Willebroek) has hosted approximately 30,000 more visitors as a result of its supply expansion. It has passed through the first (growth) stage, or the supply dominance stage and in 2017 reached its carrying capacity threshold, after which has entered the second (of the three elaborated) TALC stage, i.e. the the demand dominance stage. As shown in Figure 24, the supply (M) curve has a slight S-shape indicating the region's involvement with tourism. Figure 26 indicates that the maximum acceleration of the visitors' growth rates (Deriv2) was achieved in 2014, with the maximum number of arrivals reached in 2017 (Deriv 2. = 0), after which it began to decline. Parallel to this, the curve representing the number of visitors (V) became concave, tending to reach the threshold indicating the maximum number of visitors.

However, when interpreting TALC behaviour, one has to keep in mind the LL- specific circumstances. Special attention should be paid to the fact that each Living Lab consists of several LAUs, each one differing from another, not just in quantity and quality of resources, but in every other way, which means that each one can be in a different lifecycle stage. In addition, despite not so intense tourism development in most of the peripheral/rural LAUs (compared to urban destinations), it is exactly their smallness, remoteness and overall fragility that can affect them reaching their carrying capacity threshold sooner than urban destinations and with fewer tourists. Given this, the logic lying behind the obtained results may be explained only by knowing specific framework given LL and each particular LAU operate in, which is one of the tasks associated with the WP6 package referring to the Living Lab activities.

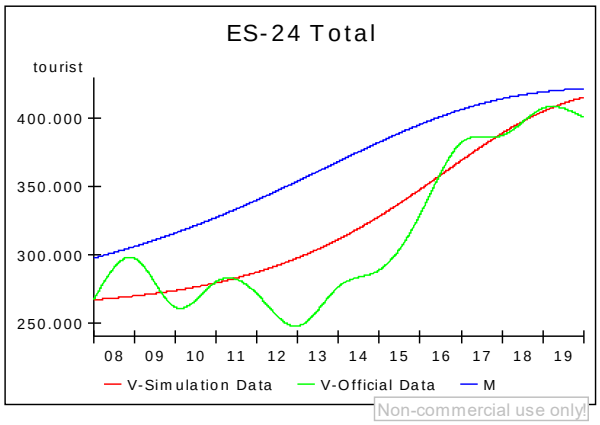

Fig 27. TALC and supply curve of ES-24

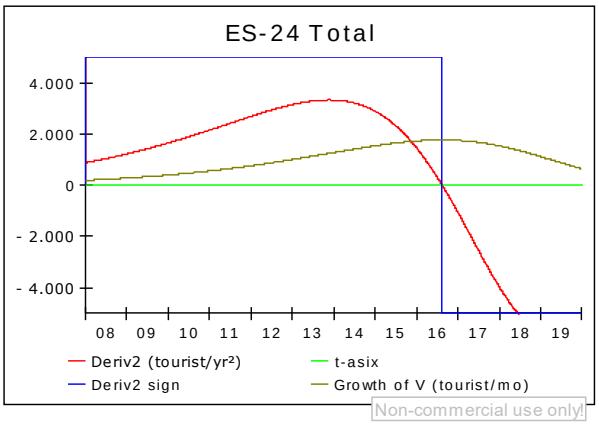

Fig 28.Properties of ES-24 TALC curve

In 2019, due to the enhanced supply (offer), the LL -ES24 (SPAIN / Aragón / Huesca / Ainsa, Barbastro, Benasque, Graus, Huesca, Jaca, Sariñena) has increased the number of visitors by approximately 100,000 compared to 2007. The fastest acceleration of the growth rate was achieved in 2014 (Figure 27), after which it began to decline. It has reached its carrying capacity threshold (associated with the given supply structure) in 2016 (Figure 28) and has entered the second lifecycle stage, i.e. the demand dominance stage.

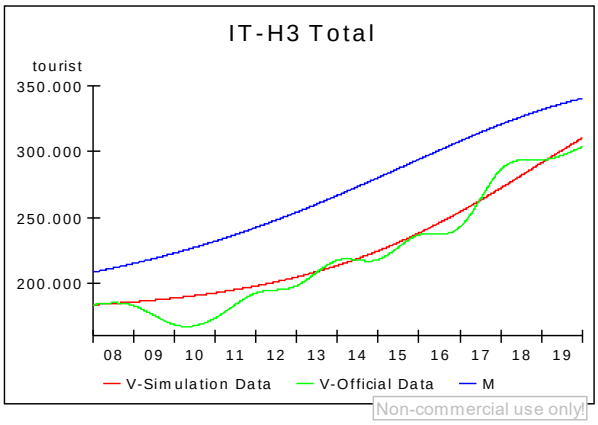

Fig 29. TALC and supply curve of IT-H3

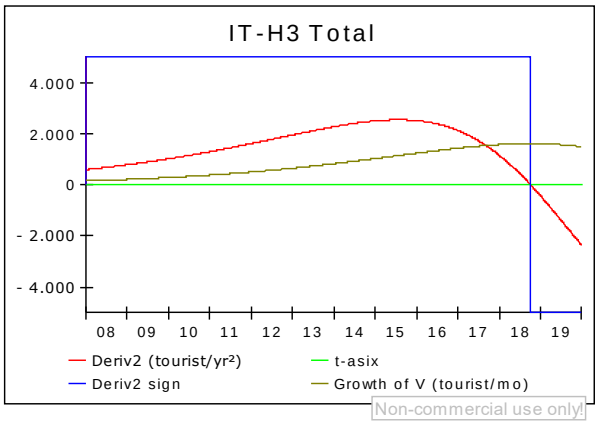

Fig 30. Properties of IT-H3 TALC curve

In the observed period, the number of visitors in the LL IT-H3 (ITALY/ Veneto / Vicenza / Vicenza, Caldogno, Pojana Maggiore, Grumolo delle Abbadesse, Lonigo, Montagnana) has increased by approximately 120,000 visitors. However, it has grown at a lower rate than in Belgium and Spain. Hence, maximum acceleration of the growth rate was achieved in 2015 (Figure 29), and the maximum number of visitors was reached in 2018 (Figure 30), designating point when LL has entered into the second TALC stage, with a diminishing number of visitors along the remaining period.

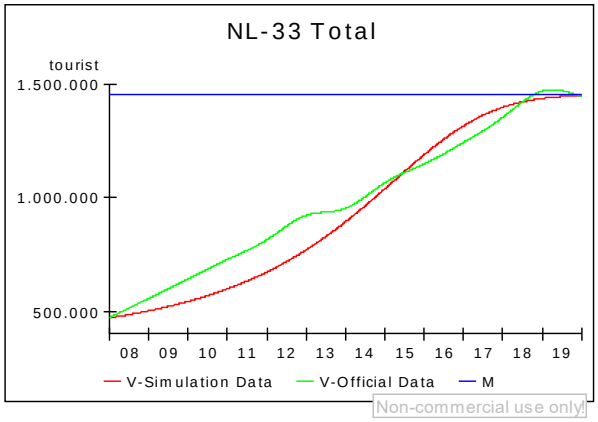

Fig 31. TALC and supply curve of NL-33

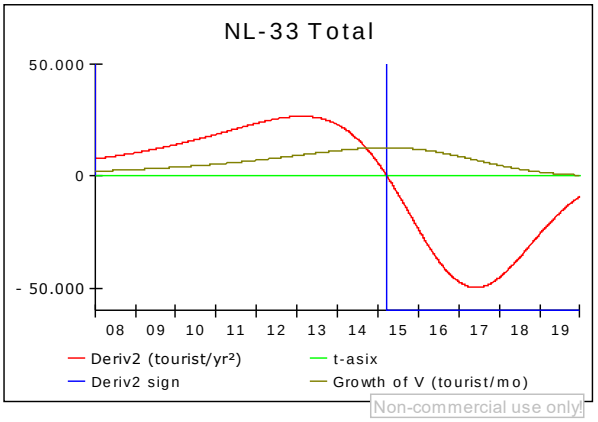

Fig 32. Properties of NL-33 TALC curve

The LL NL-33 (NETHERLANDS/ Zuid-Holland/ The Rotterdam Metropolitan Region/ Rotterdam, Delft, Dordrecht, Molenlanden, Barendrecht, Ridderkerk, Zwijndrecht) has reached the end of the second TALC stage already in 2015 (Figure 31), primarily due to the role of the city of Rotterdam (as presented in Table 23 and Figure 16). Currently, the acceleration growth rate tends to zero, which means that the number of visitors will be the same each year. The second-order derivative graph (Deriv2) shown by the red line (Figure 32) indicates that the acceleration of the visitors' growth rate has changed its direction and is not declining steeply anymore. Both the first and the second-order derivative graphs tend to zero, which means that a destination (LL) approaches the third stage of its lifecycle. After reaching this stage, it will have to decide on which of the following three opportunities should choose:

- either to initiate a new lifecycle by expanding/enhancing offer (M), or
- to remain in the stability state (the same number of arrivals each year), or
- to reduce the number of arrivals.

This particular Living Lab differs from the others concerning its supply M that remains almost constant along the observed years. This indicates that during the observed period it hasn't significantly enhanced its supply.

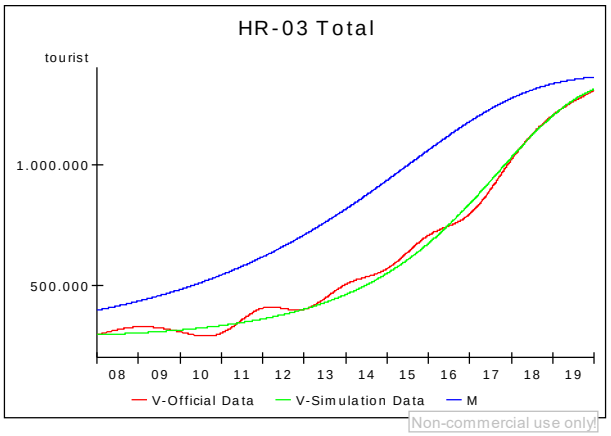

Fig 33. TALC and supply curve of HR-03

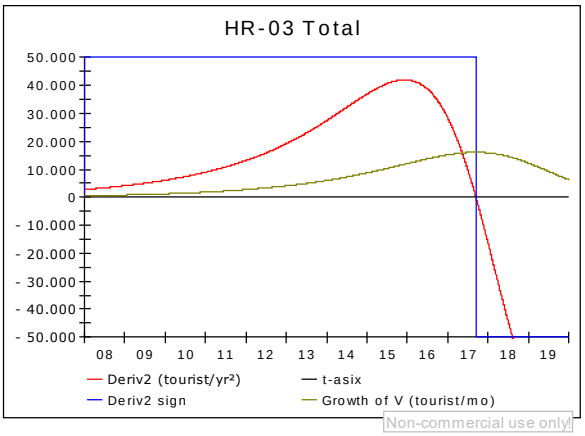

Fig 34. Properties of HR-03 TALC curve

The LL HR-03 (CROATIA/ Jadranska Hrvatska/ City of Split metropolitan area/Split, Trogir, Dugopolje, Solin, Klis, Kaštela, Sinj) consists of seven municipalities, out of which four coastal ones (with two inscribed on the World Geritage List) currently register significant tourist flows. Three rural municipalities have recently got involved more intensively with the tourism business. However, despite the newcomers, the whole of the Split metropolitan LL has reached its carrying capacity in 2017 (Figure 33) and is currently in its second lifecycle stage (the demand dominance). The sudden take-off in terms of the number of visitors (V) resulting from the

enhancement of its supply attractiveness (M) happened in the period from 2013 to 2016, when it also reaches the maximum acceleration of the visitor growth rate (Deriv2). The maximum number of visitors is reached in 2017 (Figure 34), meaning that it was just one-year distance between reaching the maximum acceleration of the visitor growth rate and the maximum number of arrivals.

By declining along the second stage of its lifecycle, the visitor number growth tends to reach its predefined supply M. The LL HR-03 has the steepest decline of the growth rate compared to other LLs, which means the fastest deceleration of the number of visitors. Worth noting is that HR-03 LL has accomplished the most significant advancement of its supply in the observed period, delineated by 920,000 arrivals.

Conclusions on TALC analysis' results

Given the presented TALC model, the following conclusions and lessons can be outlined.

The system thinking applied in this research helped us understand the complexity of a destination as a system and its structure. Moreover, the system dynamics applied in this research to modelling tourist destination (area) life cycle (TALC) contributed to understanding its behaviour and the ways information feedback governs using feedback loops, delays and stocks and flows.

What we have also learned is that a destination may experience wavy growth, with each wave having the sigmoid S-shape of the curve for a specific multi-year interval (representing a distinct mini-TALC). These short-term ups and downs cumulatively contribute to the shape of its long-term life cycle.

Compared to the original Butler's (1980) TALC model suggesting six lifecycle stages, this research offers a model with three lifecycle stages, i.e. the supply dominance stage, the demand dominance stage, and the restructuring stage. The first stage is characterised by the constant growth of both supply and resulting demand. However, following the TALC model, absolute numbers of arrivals are growing (although with diminishing growth rates) until the point of inflexion.

What we have learnt is that the point of inflexion means that unacceptable changes occurred resulting in carrying capacity violations. Further growth increases pressures until reaching a saturation threshold after which, as presumed by the TALC approach, in the last stage different scenarios can occur, depending on a destination's resilience.

The dynamisation of the penetration coefficient k(t) as a representative of demand, and M(t) as a representative of supply, being a novel approach in simulating the TALC model, enables the observation of the relationship between supply and demand over time using V(t) (number of visitors).

Apart from the theoretical contributions, the conceptual model has been tested and verified on 5 specific cases. The analysis revealed (Table 24) all observed Living Labs reached the second lifecycle stage, with one entered as early as in 2015 and one in 2018.

Table 24. The comparative presentation of the LLs' lifecycle stages

The name of the Living Lab	The year when maximum acceleration of the visitor growth rate was reached	The year when the maximum growth rate of arrivals is reached (carrying capacities threshold)	Lifecycle stage
BE -23; BELGIUM, Prov. Oost-Vlaanderen & Antwerpen, The Scheldeland region	2014	2017	The second lifecycle stage- the stage of demand dominance

ES 24: SPAIN, Aragón, Huesca	2014	2016	The second lifecycle stage- the stage of demand dominance
HR-03; CROATIA, City of Split metropolitan area	2016	2017	The second lifecycle stage- the stage of demand dominance
IT H3; ITALY, Veneto, Vicenza	2015	2018	The second lifecycle stage- the stage of demand dominance
NL 33; NETHERLANDS, Zuid-Holland, The Rotterdam Metropolitan Region	2015	2015	The end of the second lifecycle stage

However, when interpreting the TALC behaviour, it must be borne in mind that the duration of a lifecycle stage may significantly differ across the destinations (Living Labs), as are the policies used to prevent stagnation or to restructure the supply to become more sustainable and resilient.

Despite being in the same lifecycle stage, the future outcomes in the observed Living Labs, resulting from applied policies and measures are expected to differ significantly, thus proving the rule of the thumb that 'the same policy doesn't fit all'.

Given the methodological considerations and obtained results, future research may focus on:

- introducing the third-order derivative into the TALC model, implying the moment in which the second-order derivative reaches its maximum. However, it has to be carefully considered given the inertia of a large destination system on one side and the fast changes in small destination systems on the other side, hence questioning its applicability. Namely, large systems react slowly to changes, especially to small changes characterized by the third-order derivative. On the other hand, small systems are too volatile, which brings their credibility into question. In other words, the changes of the third-order derivative characteristics can be temporary and can lead to wrong decisions. Nevertheless, investigating the applicability of the third-order derivative can enable splitting the three TALC stages into more;
- Also, by using models described in this Report, we can explore the impact of cultural tourism on TALC within each LL. After designing its Terms of Reference, partners working together in each of the LLs can set specific policies to increase, or adjust or decrease the supply (eventually ending up by the adjusted M - maximum expected number of visitors). Based on these results, more detailed simulation scenarios can be developed.
- Given the general lack of data referring to cultural tourism, and the inability to use the same set of indicators across all Living Labs, the DPSIR as a common approach to a TALC model was not applied, though indicated in Report D4.1. Future research can focus on the further development of a DPSIR-based TALC model and its validation on an individual Living Lab case.

04 Conclusion

Within this Report we explore the relationship between cultural tourism development and destinations' sustainability and resilience, taking into consideration destinations' position in the TALC. The foundation of the analysis are frameworks of indicators related to cultural tourism development, sustainability and resilience of cultural tourism destinations extensively explained in Report D 4.1 (Petrić et al. 2020). The empirical analysis was performed based on data collected for six case studies, i.e. six Living Labs involving more than thirty micro destinations, i.e. LAUs. Within this analysis, we particularly discussed culture as the fourth pillar of sustainable tourism development and aimed to assess cultural tourism development impacts on a local scale, among others, by inaugurating indicators reflecting visitor and resident attitudes.

To analyse cultural tourism development's influence on cultural tourism destinations' sustainability, we employed both dynamic panel data and regression analysis. With no intent to recurrently explain what has already been described in more details in the previous chapters, we only want to stress the most important contributions.

The research has shown that cultural resources (CulRes_INDEX, represented by an index comprising four indicators) positively affect all four sustainability pillars. Simultaneously, the number of cultural and creative enterprises positively affects the environmental and economic dimensions of a destination's sustainability. Cultural infrastructure (CulInfr_INDEX, indicated by an index encompassing three indicators) negatively influences environmental and social aspect of sustainability, reflecting the need for careful spatial and tourism-development planning to grow within a destination's capacity thresholds. Cultural governance institutions (CulGov_INDEX, encompassing five indicators) positively influence environmental sustainability while their effect on economic and social sustainability pillars are negative. This emphasises the need to integrate culture and cultural tourism planning into the broader, i.e. regional development agenda.

Finally, the positive effect of government expenditure (GovExp_INDEX, represented by just one indicator) and negative of cultural tourism governance (CulTourGov_INDEX, indicated by an index including four indicators) suggests that allocating funds for cultural tourism development is insufficient unless there is effective cultural tourism governance enabling the efficient framework to properly plan development of cultural tourism towards sustainability.

The regression analysis that includes all retained social sustainability indicators, including those outlining residents' perceptions and Tripadvisor data on visitor perceptions, partially confirmed the findings obtained via panel analysis by emphasising the positive influence of cultural resources on tourism social sustainability. The negative influence of cultural governance (institutions) contradicts the previously elaborated social sustainability panel model, which can be explained by the inclusion of six additional indicators concerning residents' perception of the influence of cultural tourism development or merely reflect the failure of cultural governance institutions to foster social sustainability within the destination. In both cases, cultural tourism governance remains a critical challenge for cultural tourism destinations in one scenario (panel analysis) asking to proceed with acceptable practices focused on restricting tourism intensity in heritage destinations, and in other scenarios (regression analysis) requiring to constraint potentially adverse influence of cultural "overtourism" on local communities by resolving conflicts, educating, and empowering to benefit from tourism.

Following the results obtained regarding the sustainability of cultural tourism development, we have learned that culture has different roles in sustainable development, appearing as both its constituent and driver. Our analysis has put forward a tentative conclusion of how acknowledging culture as a pillar for itself, in a context of sustainable tourism development planning, promotes not only economic prosperity, environmental sustainability and social well-being but also conservation of cultural heritage and community involvement in cultural tourism development. To promote the above goals, it is essential to focus on future research on the sustainability of cultural tourism development at a local scale. However, as already stressed, to broadly apply such an approach, there is a need to improve databases and more intensively strive to get different stakeholders into the same line of thinking to get more deeply involved with reaching sustainability goals.

The resilience model focused on recognising cultural tourism contribution to a destination's resilience based on already existing resilience indicators.

The results of the resilience model analysis referring to the effects of different cultural indices on regional resilience reveal several important issues. In all of the presented models, where revenues or expenditures of local government units are used as a control variable, and in both, models with and without tourism demand as a control variable, four cultural indices, e.g. cultural enterprises (CulEnt_INDEX comprising of only one indicator), cultural resources (CulRes_INDEX, comprising of four indicators), cultural governance policy (CulGovPol_INDEX, comprising of five indicators) and cultural tourism governance (CulGovTour_INDEX, comprising of four indicators) are statistically significant with positive effects on regional resilience.

Overall, this means that the development of a favourable institutional environment in the regions with cultural resources could enhance the development of cultural enterprises and entrepreneurship, fostering the region's resilience. Besides, results reveal that, from the regional development perspective, an important issue refers to the type of cultural goods that attract the visitors (CulRes_INDEX) and the circumstances under which they generate the development (CulGovPol_INDEX and CulGovTour_INDEX). The results on CulGovPol_INDEX are very important as they suggest that regions with cultural resources and developed policy support work in favour of regional resilience. Moreover, the importance of CulGovTour_INDEX, as an index representing a synergy between the cultural and tourism sector add to regional resilience positively. Finally, the results revealed the shift towards the economic orientation for a cultural policy could induce positive effects on regional resilience. Opposite to the expectations, the analysis revealed negative effects of cultural infrastructure (CulInfr_INDEX, consisting of 3 indicators) on regional resilience in all analysed models. However, in discussing such a result, one should keep in mind not just specificities of the units under analysis, with many of them situated in either rural or peripheral areas, with hardly any cultural infrastructure. Also, it is important to understand that cultural infrastructure solely doesn't have the strength to generate development unless complemented by other business sectors (in particular tourism and creative industries).

The inclusion of several control variables into resilience models gave different results, with tourism dynamics presented through arrivals per resident, human capital and higher quality of government (though not completely robust with the inclusion of different explanatory variables in the analysis) associated with greater regional resilience. This is especially true with the tourist arrivals, however, conditioned by the need of respecting a destination's carrying capacity on one side, and of introducing high value-added activities and innovations in the cultural tourism offer. By proving a positive relationship between certain regional characteristics and regional resilience, the empirical evidence laid down has provided a broader perspective in understanding the role of cultural tourism indices and tourism demand presented earlier.

Given the aforementioned, it can be concluded that the CulRes_INDEX is without a doubt the most important index in affecting both, sustainability and resilience of destinations under analysis, thus addressing the fundamental relevance of cultural resources from the cultural tourism policy standpoint. Considering that

CulEnt_INDEX, CulGovPol_INDEX and CulGovTour_INDEX are shown statistically significant with positive effects on regional resilience, and with diverging impacts on sustainability, elaboration of the obtained results requires understanding of the broader regional development framework.

Given the requirement to connect the results concerning the impacts of cultural tourism on sustainability and resilience with the destination's life cycle stage (TALC), in the third chapter of this report, based on available data on tourist arrivals we have modelled the movement of both Living Labs (LL) and its individual Local Administrative Units (LAUs) along the life cycle curve. The analysis indicated that all of the observed Living Labs have reached the second stage of their lifecycles, designated as 'the demand dominance stage'. This stage was preceded by a 'supply dominance stage', with tourism businesses growing at high rates the same as visitor numbers, up to the point of inflexion. At this point, further resource deterioration is expected together with the price reduction to attract even more tourists, thus closing the cause-consequence vicious circle. This process ends up with a destination's maturity, e.g. the saturation point. As soon as the saturation point is achieved, the third period (stage) should start aiming at a destination's overall restructuring. It is not only that the observed LLs (destinations) have entered the demand dominance stage in different years depending on site-specific circumstances, but it may be expected that its duration will depend on each LL's (cultural) tourism policies and measures. Following the results of the sustainability-resilience analyses, different measures can be employed, ranging from those associated with the cultural resources' preservation, enhancement and governance to those aimed at fostering cultural and creative enterprises' development that may add value to cultural resources. Finally, there is a whole set of measures focusing on both cultural and tourism governance, pursuing synergies between two complementary sectors of activities. With this aim, within the activities of the WP6 dealing with the Living Labs, each LL should propose a set of specific policy measures and tools aiming to become more resilient and sustainable by employing cultural tourism as a development solution. It is worth mentioning that, by belonging to the (more or less) same stage of the life cycle, the observed LLs are relatively homogenous, which enables comparison among them regarding the success of the applied policies and measures.

Literature

Adie, B. A., Falk, M., & Savioli, M. (2020). Overtourism as a perceived threat to cultural heritage in Europe. *Current Issues in Tourism*, 23(14), 1737–1741. https://doi.org/10.1080/13683500.2019.1687661

Aghion, P., & Saint-Paul, G. (1998). Virtues of bad times: Interaction between productivity growth and economic fluctuations. *Macroeconomic Dynamics*, 2, 322–344. doi:10.1017/S1365100598008025

Allen, C.R., Angeler, D.G., Garmestani, A.S., Gunderson, L.H., Holling, C.S., (2014). Panarchy: theory and application. *Ecosystems* 17, 578–589. doi:http://dx.doi.org/10.1007/s10021-013-9744-2.

Alvarez, I. C., Babero, J., Rodríguez-Pose, A., & Zofio, L. (2018). Does institutional quality matter for trade? Institutional conditions in a sectoral trade framework. *World Development*, 103, 72–87. doi: 10.1016/j.worlddev.2017.10.010

Annoni, P., Dominicis, L., & Khabirpour, N. (2019). Location matters: A spatial econometric analysis of regional resilience in the European Union. *Growth and Change*. doi:10.1111/grow.12311

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, 58(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Baggio, R. (2008). Symptoms of Complexity in a Tourism System. *Tourism Analysis*, 13(1), 1–20. doi:10.3727/108354208784548797

Baranger, M. (2000). Chaos, Complexity, and Entropy - A Physics Talk for Non-Physicists, Center for Theoretical Physics, Laboratory for Nuclear Science and Department of Physics Massachusetts Institute of Technology, Cambridge and New England Complex Systems Institute. Available at: http://grex.cyberspace.org/~jayk/ChaosComplexityAndEntropy.pdf

Bellandi, M., & Santini, E. (2017). Resilience and the role of arts and culture-based activities in mature industrial districts. *European Planning Studies*,25, 88–106. doi:10.1080/09654313.2016.1268096

Ben Mahjoub, L., & Amara, I. (2020). The impact of cultural factors on shareholder governance and environmental sustainability: an international context. *World Journal of Science, Technology and Sustainable Development,* 17(4), 367–385. https://doi.org/10.1108/wjstsd-06-2020-0060

Berkes, F., Ross, H., 2016. Panarchy and community resilience: sustainability science and policy implications. *Environmental Science and Policy,* 61, 185–193. doi:http://dx.doi.org/10.1016/j.envsci.2016.04.004.

Bertalanffy, L. (1968). General System Theory: Foundations, Development, Applications, George Braziller, New York.

Biggs, R., Schlüter, M., Biggs, D., Bohensky, E. L., BurnSilver, S., Cundill, G., West, P. C. (2012). Toward principles for enhancing the resilience of ecosystem services. *Annual Review of Environment and Resources*, 37(1), 421–448. https://doi.org/10.1146/annurev-environ-051211-12383

Bille, T., Schulze, G. (2006). Culture in Urban and Regional Development. In Ginsburg, V.A., Throsby, D. (Ed.) Handbook of the Economics of Art and Culture. Volume 1, Elsevier, Amsterdam, 1052-1099.

Blancas, F. J., Lozano-Oyola, M., González, M., Caballero, R. (2016). Sustainable tourism composite indicators: a dynamic evaluation to manage changes in sustainability. *Journal of Sustainable Tourism*, 24(10), 1403–1424. https://doi.org/10.1080/09669582.2015.1122014

Blancas, Francisco Javier, Lozano-Oyola, M., González, M. (2015). A European sustainable tourism labels proposal using a composite indicator. *Environmental Impact Assessment Review*, 54, 39–54. https://doi.org/10.1016/j.eiar.2015.05.001

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Blundell, R., & Bond, S. (2000). GMM Estimation with persistent panel data: An application to production functions. *Econometric Reviews*. 19(3), 321–340. https://doi.org/10.1080/07474930008800475

Brida, J.G., Cortes-Jimenez, I. & Pulina, M. (2014): Has the tourism-led growth hypothesis been validated? A literature review. *Current Issues in Tourism*, doi: 10.1080/13683500.2013.868414.

Brondizio, E.S., Ostrom, E., & Young, O.R., (2009). Connectivity and the governance of multilevel social-ecological systems: the role of social capital. *Annual Review on Environmental Resources*. 34, 253–278. doi:http://dx.doi.org/10.1146/annurev. environ.020708.100707.

Bui, H.L., Jones, T.E., Weaver, D.B., & Le, A. (2020). The adaptive resilience of living cultural heritage in a tourism destination, *Journal of Sustainable Tourism*, 28:7, 1022-1040, DOI: 10.1080/09669582.2020.1717503

Bun, M. J., & Sarafidis, V. (2013). Dynamic panel data models (1 No. 13; Discussion Paper). Universiteit van Amsterdam, Dept. of Econometrics.

Cabrera, D., Colosi, L., & Lobdell, C. (2008). Systems thinking. Evaluation and Program Planning, 31(3), 299–310. doi:10.1016/j.evalprogplan.2007.12.001

Canale, R. R., De Simone, E., Di Maio, A., & Parenti, B. (2019). UNESCO World Heritage sites and tourism attractiveness: The case of Italian provinces. *Land Use Policy,* 85(February), 114–120. https://doi.org/10.1016/j.landusepol.2019.03.037

Calvi, L., & Moretti, S. (2020). Future of cultural tourism for urban and regional destinations. Deliverable D2.2 of the Horizon 2020 project SmartCulTour (GA number 870708), published on the project web site on October, 2020: http://www.smartcultour.eu/deliverables/

Cellini, R. & Cuccia, T. (2019): Do behaviours in cultural markets affect economic resilience? An analysis of Italian regions. *European Planning Studies*, doi: 10.1080/09654313.2019.1568397.

Cellini, R. & Cuccia, T. (2019): Do behaviours in cultural markets affect economic resilience? An analysis of Italian regions, *European Planning Studies*, doi: 10.1080/09654313.2019.1568397

Cheung, K. S., & Li, L. H. (2019). Understanding visitor–resident relations in overtourism: developing resilience for sustainable tourism. *Journal of Sustainable Tourism*, 27(8), 1197–1216. https://doi.org/10.1080/09669582.2019.1606815

Cinti, T. (2008). Cultural clusters and districts: the state of the art. In Cooke, P., Lazzeretti, L. (Ed.) Creative Cities, Cultural Clusters and Local Economic Development, Edward Elgar, Cheltenham, UK; Northampton, USA, 70-92.

Coyle, G. (1996). System Dynamics Modelling: A Practical Approach, Springer-Science+Business Media, B.Y.

Craik, J. (1995). Are there cultural limits to tourism? *Journal of Sustainable Tourism*, 3(2), 87–98. https://doi.org/10.1080/09669589509510713

Crescenzi, R., Luca,D., & Milio,S.(2016).The geography of the economic crisis in Europe: National macroeconomic conditions, regional structural factors and short-term economic performance. *Cambridge Journal of Regions, Economy and Society*,9(1),13–32. doi: 10.1093/cjres/rsv031

Crespi-Vallbona, M., & Smith, S. G. (2020). Managing Sociocultural Sustainability in Public Heritage Spaces. *Tourism Planning and Development,* 17(6), 636–654. https://doi.org/10.1080/21568316.2019.1683885

Cutter, S.L., Burton, C.G., Emrich, C. T. (2010). Disaster Resilience Indicators for Benchmarking Baseline Conditions. *Journal of Homeland Security and Emergency Management*, 7(1) doi:10.2202/1547-7355.1732

Dang, H. A. H., & Serajuddin, U. (2020). Tracking the sustainable development goals: Emerging measurement challenges and further reflections. World Development, 127, 104570. https://doi.org/10.1016/j.worlddev.2019.05.024

Davidsen, P. 1992. The structure±behavior diagram: understanding the relationship between structure and behavior in complex dynamic systems. In Proceedings of System Dynamics Conference 1992, ed. J. A. M. Vennis. Utrecht: The Systems Dynamics Society, 127-140

De Bruijn, K., Buurman, J., Mens, M., Dahm, R., & Klijn, F. (2017). Resilience in practice: Five principles to enable societies to cope with extreme weather events. *Environmental Science & Policy*, 70, 21–30. doi:10.1016/j.envsci.2017.02.001

Dealbuquerque, K., Mcelroy, J. L. (1992). Caribbean small-island tourism styles and sustainable strategies, *Environmental Management*, 16(5), 619-632. https://doi.org/10.1007/BF02589017

Deery, M., Jago, L., & Fredline, L. (2012). Rethinking social impacts of tourism research: A new research agenda. Tourism Management, 33(1), 64–73. https://doi.org/10.1016/j.tourman.2011.01.026

Dessein, J., Soini, K., Fairclough, G., & Horlings, L. (2015). Culture in, for and as Sustainable Development. Conclusions from the COST Action IS1007 Investigating Cultural Sustainability. In J. Dessein, K. Soini, G. Fairclough, & L. Horlings (Eds.), Culture in, for and as Sustainable Development. Retrieved from http://www.culturalsustainability.eu/

Di Caro, P. (2017). Testing and explaining economic resilience with an application to Italian regions. Papers in Regional Science, 96(1), 93–113. doi:10.1111/pirs.12168

Dickinson, D. C., & Hobbs, R. J. (2017). Cultural ecosystem services: Characteristics, challenges and lessons for urban green space research. *Ecosystem Services*, 25, 179–194. https://doi.org/10.1016/j.ecoser.2017.04.014

Dijkstra, L., Garcilazo, E., & McCann, P. (2013). The economic performance of European cities and city regions: Myths and realities. *European Planning Studies*, 21, 334–354. doi:10.1080/09654313.2012.716245

Dijkstra, L., Garcilazo, E., & McCann, P. (2015). The effects of the global financial crisis on European regions and cities. *Journal of Economic Geography*,15, 935–949.doi:10.1093/jeg/lbv032

El Gibari, S., Gómez, T., & Ruiz, F. (2019). Building composite indicators using multicriteria methods: A review. *Journal of Business Economics*, 89(1), 1–24. https://doi.org/10.1007/s11573-018-0902-z

ESPON (2019). The Material Cultural Heritage as Strategic Territorial Development Resource: Mapping Impacts Through a Set of Common European Socio-economic Indicators. Scientific Annex Available at https://www.espon.eu/sites/default/files/attachments/HERITAGE_Scientific%20Annex.pdf (Accessed: 25 February 2019)

Ezcurra, R., & Rios, V. (2019). Quality of government and regional resilience in the European Union. Evidence from the Great Recession. *Papers in Regional Science*. doi:10.1111/pirs.12417

Faggian, A., Gemmiti, R., Jaquet, T., & Santini, I. (2018). Regional economic resilience: The experience of the Italian local labor systems. *Annals of Regional Science*, 60(2), 393–410. doi:10. 1007/s00168-017-0822-9

Farrell, B. H., Twining-Ward, L. (2004). Reconceptualising tourism. *Annals of Tourism Research*, 1(2), 274–295. doi:10.1016/j.annals.2003.12.002

Filimonau, V., Matute, J., Mika, M., & Faracik, R. (2018). National culture as a driver of pro-environmental attitudes and behavioural intentions in tourism. *Journal of Sustainable Tourism*, 26(10), 1804–1825. https://doi.org/10.1080/09669582.2018.1511722

Fish, R., Church, A., & Winter, M. (2016). Conceptualising cultural ecosystem services: A novel framework for research and critical engagement. *Ecosystem Services*, 21(September), 208–217. https://doi.org/10.1016/j.ecoser.2016.09.002

Fletcher, R., Murray Mas, I., Blanco-Romero, A., & Blázquez-Salom, M. (2019). Tourism and degrowth: an emerging agenda for research and praxis. *Journal of Sustainable Tourism*, 27(12), 1745–1763. https://doi.org/10.1080/09669582.2019.1679822

Folke, C., Carpenter, C.R., Walker, B., Scheffer, M., Chapin, T., Rockström , J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society*, 15(4): 20. Available at: https://www.fs.fed.us/pnw/pubs/journals/pnw_2010_folke.pdf (retrieved February, 2, 2021)

Ford, F.A. (1999).Modeling the Environment: An Introduction to System Dynamics Models of Environmental Systems, Island Press. Washington, USA.

Forrester, J.W. (1961). Industrial Dynamics, The Massachusetts Institute of Technology, Cambridge, Massachusets

Forrester, J.W. (1969). Urban Dynamics, M.I.T. Press, Cambridge, Mass. xiv + 290 pp

Fratesi, U., & Rodríguez-Pose, A. (2016). The crisis and regional employment in Eu- rope: What role for shelteredeconomies? *Cambridge Journal of Regions, Economy and Society*, 9(1), 33–57.doi: 10.1093/cjres/rsv032

Freidenfelds, D., Kalnins, S. N., & Gusca, J. (2018). What does environmentally sustainable higher education institution mean? *Energy Procedia*, 147, 42–47. https://doi.org/10.1016/j.egypro.2018.07.031

García, B. (2004). Cultural policy and urban regeneration in western European cities: Lessons from experience, prospects for the future. *Local Economy*, 19(4), 312–326. https://doi.org/10.1080/0269094042000286828

Giannakis, E. & Bruggeman, A. (2017) Determinants of regional resilience to economic crisis: a European perspective. *European Planning Studies*, 25:8, 1394-1415, doi: 10.1080/09654313.2017.1319464

Giannakis, E., & Bruggeman, A. (2019). Regional disparities in economic resilience in the European Union across the urban–rural divide. *Regional Studies*, 1–14. doi:10.1080/00343404.2019.1698720.

Glaeser, E. L. (2011). Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier and happier. New York:Penguin

González Santa-Cruz, F., & López-Guzmán, T. (2017). Culture, tourism and World Heritage Sites. *Tourism Management Perspectives*, 24(August), 111–116. https://doi.org/10.1016/j.tmp.2017.08.004

Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism*. doi: 10.1080/09669582.2020.1758708s.

Gravari-Barbas, M. (2018). Tourism as a heritage producing machine. *Tourism Management Perspectives,* 25(October 2017), 173–176. https://doi.org/10.1016/j.tmp.2018.01.004

Groizard, J. L., & Santana-Gallego, M. (2018). The destruction of cultural heritage and international tourism: The case of the Arab countries. *Journal of Cultural Heritage*, 33, 285–292. https://doi.org/10.1016/j.culher.2018.06.005

Gunter, U., Ceddia, M. G., & Tröster, B. (2017). International ecotourism and economic development in Central America and the Caribbean. *Journal of Sustainable Tourism*, 25(1), 43–60. https://doi.org/10.1080/09669582.2016.1173043

Haigh, M. (2020). Cultural tourism policy in developing regions: The case of Sarawak, Malaysia. *Tourism Management,* 81(May), 104166. https://doi.org/10.1016/j.tourman.2020.104166

Hall, C. M., & Page, S. J. (2009). Progress in Tourism Management: From the geography of tourism to geographies of tourism - *A review. Tourism Management*, 30(1), 3–16. https://doi.org/10.1016/j.tourman.2008.05.014

Hawkes, J. (2001). The fourth pillar of sustainability: Culture's essential role in public planning. Common Ground Publishing Pty Ltd in Association with the Cultural Development Network (Vic), (January 2001), 69. Availabel at : http://www.culturaldevelopment.net.au/community/Downloads/HawkesJon(2001)TheFourthPillarOfSustainability.pdf (retrieved February, 10, 2021)

Haywood, K.M. (1986). Can the tourist area life-cycle be made operational? *Tourism Management* 7 (3), 154-167. https://doi.org/10.1016/0261-5177(86)90002-6

Holden, E., Linnerud, K., & Banister, D. (2014). Sustainable development: Our Common Future revisited. *Global Environmental Change,* 26(1), 130–139. https://doi.org/10.1016/j.gloenvcha.2014.04.006

Holling, C., Gunderson, L. (2002). Resilience and adaptive cycles. In L. Gunderson & C. Holling (Eds.), Panarchy: Understanding transformations in human and natural systems (pp. 25–62). Washington, DC: Island Press

Huang, J. B. (2012). Analytical and Computational Methods for Analyzing Feedback Structure in System Dynamics Models, doctoral dissertation, School of Engineering & Informatics National University of Ireland, Galway, Ireland.

Jacobs, M. (2004). Sustainable growth and development in the EU : concepts and challenges. Fairness and Futurity. *Essays on Environmental Sustainability and Social Justice*, 1997, 21–45.

Jafaryeganeh, H., Ventura, M., & Guedes Soares, C. (2020). Effect of normalization techniques in multi-criteria decision making methods for the design of ship internal layout from a Pareto optimal set. *Structural and Multidisciplinary Optimization*, 62(4), 1849–1863. https://doi.org/10.1007/s00158-020-02581-9

Jiménez-Naranjo, H. V., Coca-Pérez, J. L., Gutiérrez-Fernández, M., & Sánchez-Escobedo, M. C. (2016). Cost–benefit analysis of sport events: The case of World Paddle Tour. *European Research on Management and Business Economics*, 22(3), 131–138. https://doi.org/10.1016/j.iedee.2015.04.001

Jover, J., & Díaz-Parra, I. (2020). Who is the city for? Overtourism, lifestyle migration and social sustainability. *Tourism Geographies*, 0(0), 1–24. https://doi.org/10.1080/14616688.2020.1713878

Karplus, Y., Krakover, S. (2005). Stochastic multivariable approach to modelling tourism area life cycles. *Tourism and Hospitality Research*, 5 (3), 235-253. DOI: 10.1057/palgrave.thr.6040023

Kaufmann, D. Kraay, A. & Mastruzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. *World Bank Policy Research Working Paper* No. 5430, Available at SSRN: https://ssrn.com/abstract=1682130

Kefalas, A. G. (2011). On systems thinking and the systems approach. *World Futures*, 67(4–5), 343–371.https://doi.org/10.1080/02604027.2011.585911

Keitumetse, S. O. (2014). Cultural resources as sustainability enablers: Towards a community-based cultural heritage resources management (COBACHREM) model. *Sustainability*, 6(1), 70–85. https://doi.org/10.3390/su6010070

Khomsi, M. R., Fernandez-Aubin, L., & Rabier, L. (2020). A prospective analysis of overtourism in Montreal. *Journal of Travel and Tourism Marketing*, 37(8–9), 873–886. https://doi.org/10.1080/10548408.2020.1791782

Koens, K., Postma, A., & Papp, B. (2018). Is Overtourism Overused? Understanding the Impact of Tourism in a City Context. Sustainability, 10(12), 4384. https://doi.org/10.3390/su10124384

Kourtit, K. & Nijkamp, P. (2018). Creative actors and historical–cultural assets in urban regions, *Regional Studies*, doi: 10.1080/00343404.2018.1541077

Kourtit, K., Möhlmann, J., Nijkamp, P. and Rouwendal J. (2013). The Spatial Distribution of Creative Industries and Cultural Heritage in The Netherlands, Tinbergen Institute Discussion Paper, No. 13-195/VIII, Tinbergen Institute, Amsterdam and Rotterdam.

Lagravinese, R. (2015). Economic crisis and rising gaps north-south: Evidence from the Italian regions. Cambridge Journal of Regions, *Economy and Society*, 8(2), 331–342. doi:10.1093/cjres/rsv006

Lalicic, L. (2019). Solastalgia: An application in the overtourism context. *Annals of Tourism Research*, April. https://doi.org/10.1016/j.annals.2019.102766

Lazzareti, L. (2008). The cultural districtualization model. In Cooke, P., Lazzeretti, L. (Ed.), Creative Cities, Cultural Clusters and Local Economic Development, Edward Elgar, Cheltenham, UK; Northampton, USA, 93-120.

Liu, J., Nijkamp, P., Huang, X., & Lin, D. (2017). Urban livability and tourism development in China: Analysis of sustainable development by means of spatial panel data. *Habitat International*, 68, 99–107. https://doi.org/10.1016/j.habitatint.2017.02.005

Liu, S. T. (2020). Comparing the perspectives of municipal tourism departments and cultural departments on urban cultural-tourism development. *Journal of Destination Marketing and Management,* 16(July 2019), 100432. https://doi.org/10.1016/j.jdmm.2020.100432

Loulanskia, T., & Loulanski, V. (2011). The sustainable integration of cultural heritage and tourism: A meta-study. *Journal of Sustainable Tourism*, 19(7), 837–862. https://doi.org/10.1080/09669582.2011.553286

Mandić, A. (2021). Optimisation of tourism development in destinations : an approach used to alleviate the impacts of overtourism in the Mediterranean region. In A. Spenceley (Ed.), Handbook for Sustainable Tourism Practitioners: The Essential Toolbox (Issue 2021, pp. 347–364). Edward Elgar Publishing.

Matteucci, X.& Von Zumbusch, J. (2020). Report on Theoretical framework for cultural tourism in urban and regional destinations. Deliverable 2.1. of the Horizon 2020 project SmartCulTour (GA number 870708), published on the project web site on July, 2020: http://www.smartcultour.eu/deliverables/

Mavragani, A., Nikolaou, I. E., & Tsagarakis, K. P. (2016). Open economy, institutional quality, and environmental performance: A macroeconomic approach. *Sustainability*, 8(7), 1–13. https://doi.org/10.3390/su8070601

Mazzola, F., Pizzuto, P. & Ruggieri, G. (2019). The role of tourism in island economic growth and resilience: A panel analysis for the European Mediterranean countries (2000–2015). *Journal of Economic Studies*, 46(7), 1418-1436. doi: 10.1108/JES-04-2019-0172

Miles, M. (2005). Interruptions: Testing the rhetoric of culturally led urban development. *Urban Studies,* 42(5–6), 889–911. https://doi.org/10.1080/00420980500107375

Milio S. (2014). Impact of the Economic Crisis on Social, Economic and Territorial Cohesion of the European Union, Vol. 1. Brussels: Directorate-General for Internal Policies, Policy Department B (Structural and Cohesion Policies).

Montalto, V., Tacao Moura, C.J., Langedijk, S., Saisana, M. (2019). Culture counts: An empirical approach to measure the cultural and creative vitality of European cities. *Cities,* 89, 167–185. https://doi.org/10.1016/j.cities.2019.01.014

Musavengane, R. (2019). Using the systemic-resilience thinking approach to enhance participatory collaborative management of natural resources in tribal communities: Toward inclusive land reform-led outdoor tourism. *Journal of Outdoor Recreation and Tourism*, 25, 45–56. doi:10.1016/j.jort.2018.12.002

Namberger, P., Jackisch, S., Schmude, J., & Karl, M. (2019). Overcrowding, Overtourism and Local Level Disturbance: How Much Can Munich Handle? *Tourism Planning and Development*, 0(0), 1–21. https://doi.org/10.1080/21568316.2019.1595706

Neffke, F., Otto, A., & Hidalgo, C. (2016). The mobility of displaced workers: How the local industry mix affects job search strategies. Papers in Evolutionary Economic Geography (PEEG) No, 16.

Nurse, K. (2007). Culture as the Fourth Pillar of Sustainable Development. (June), 28–40. https://doi.org/10.14217/smalst-2007-3-en

Nyström, K. (2018). Regional resilience to displacements. *Regional Studies*, 52(1), 4–22. doi: 10.1080/00343404.2016.1262944

OECD (2010). Moving Beyond the Job Crisis Employment Outlook. Paris: OECD

OECD. (2017). OECD G20 policy paper on economic resilience and structural policies. Paris: OECD

OECD/ICOM (2018). Culture and Local Development: Maximizing the Impact. Guide for Local Goverments, Communities and Museums. Avalaible at https://icom.museum/wp-content/uploads/2019/08/ICOM-OECD-GUIDE_EN_FINAL.pdf (retrieved 25 February 2021)

Ogata, K. (1997). Modern Control Engineering Systems. 3rd Edition, Prentice Hall.

Panayiotopoulos, A., & Pisano, C. (2019). Overtourism Dystopias and Socialist Utopias: Towards an Urban Armature for Dubrovnik. *Tourism Planning and Development*, 0(0), 1–18. https://doi.org/10.1080/21568316.2019.1569123

Park, H., Russell, C., & Lee, J. (2007). National culture and environmental sustainability: A cross-national analysis. *Journal of Economics and Finance*, 31(1), 104–121. https://doi.org/10.1007/BF02751516

Peeters, P., Klijs, J., & Novelli, M. (2018). Requested by the TRAN committee Research for TRAN Committee - Overtourism : impact and possible policy responses. February 2019.

Pejić-Bach M., Čerić V.(2007) Developing System Dynamics Models with „Step by Step approach; *Journal of information and organizational sciences*, Volume 31, Number 1 (2007). Available at: https://hrcak.srce.hr/21475. (retrieved February, 4, 2021).

Pérez, V., Guerrero, F., González, M., Pérez, F., Caballero, R. (2013). Composite indicator for the assessment of sustainability: The case of Cuban nature-based tourism destinations. *Ecological Indicators*, 29, 316–324. https://doi.org/10.1016/j.ecolind.2012.12.027

Petrić, L. (2011).(Tourist destination management-Principles and practice, (Upravljanje turističkom destinacijom - načela i praksa), Faculty of Economics, Split.

Petrić, L. (2013). Has the myth of tourist destination sustainability faded? Behind the curtains of the global crises, Proceedings of the 2nd International Scientific Conference Tourism in Sourhern and Eastern Europe 2013, Faculty of Tourism and Hospitality Management, Opatija. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2289266 (retrieved February 2, 2013)

Petrić, L., Mandić, A., Pivčević, S., Škrabić Perić, B., Hell, M., Šimundić, B., Muštra, V., Mikulić, D., & Grgić, J. (2020). Report on the most appropriate indicators related to the basic concepts. Deliverable 4.1 of the Horizon 2020 project SmartCulTour (GA number 870708), published on the project web site on September 2020: http://www.smartcultour.eu/deliverables/

Plaza, B. (2008). On Some Challenges and Conditions for the Guggenheim Museum Bilbao to be an Effective Economic Re-activator, *International Journal of Urban and Regional Research,* Vol. 32 (2), 506-17. doi:10.1111/j.1468-2427.2008.00796.x

Pollesch, N. L., & Dale, V. H. (2016). Normalization in sustainability assessment: Methods and implications. *Ecological Economics*, 130, 195–208. https://doi.org/10.1016/j.ecolecon.2016.06.018

Prideaux, B. (2000). The resort development spectrum - a new approach to modelling resort development. *Tourism Management*, 21 (3), 225-240 . DOI: 10.1016/S0261-5177(99)00055-2

Radošević, D., (2001).System theory basics (Osnove teorije sustava), Nakladni zavod Matice Hrvatske, Zagreb

Radzicki, M. J., Taylor, R. A., (2008). Origin of System Dynamics: Jay W. Forrester and the History of System Dynamics, Department of Energy's Introduction to System Dynamics, U.S.

Rahmandad, H., Repenning, N., Sterman, J. (2009). Effects of feedback delay on learning. *System Dynamics Review*, 25(4), 309–338. doi:10.1002/sdr.427

Rehman, A., Ma, H., Ahmad, M., Irfan, M., Traore, O., & Chandio, A. A. (2021). Towards environmental Sustainability: Devolving the influence of carbon dioxide emission to population growth, climate change, Forestry, livestock and crops production in Pakistan. *Ecological Indicators*, 125, 107460. https://doi.org/10.1016/j.ecolind.2021.107460

Richards, G. (2018). Cultural tourism: A review of recent research and trends. *Journal of Hospitality and Tourism Management*, 36, 12–21. https://doi.org/10.1016/j.jhtm.2018.03.005

Richardson, G. P. (1991). Feedback Thought in Social Science and Systems Theory. Philadelphia, PA: University of Pennsylvania Press

Richardson, G. P. (1995). Loop polarity, loop dominance, and the concept of dominant polarity (1984). *System Dynamics Review* 11(1): 67-88.

Rios, V., & Gianmoena, L. (2020). The Link Between Quality of Government and Regional Resilience in Europe. *Journal of Policy Modeling*. doi:10.1016/j.jpolmod.2020.02.005

Rodríguez-Pose, A. & Fratesi, U. (2007) Regional business cycles and the emergence of sheltered economies in the southern periphery of Europe. *Growth and Change*, 38: 621–648. doi: 10.1111/j.1468-2257.2007.00390.x

Rodríguez-Pose, A., & Cols, G. (2017). The determinants of foreign direct investment in sub-Saharan Africa: What role for governance? *Regional Science Policy and Practice*, 9(2), 63–81. doi: 10.1111/rsp3.12093

Romão, J. (2019). Economic impacts of tourism. In D. Gursoy, & R. Nunkoo (Eds.). Routledge handbook of tourism impacts: A theoretical perspective (pp. 143–154). London: Routledge.

Romão, J. (2020). Tourism, smart specialisation, growth, and resilience. *Annals of Tourism Research*, 84, 102995. doi:10.1016/j.annals.2020.102995

Romão, J., Guerreiro, J., & Rodrigues, P. M. M. (2016). Tourism growth and regional resilience: The 'beach disease' and the consequences of the global crisis of 2007. *Tourism Economics*, 22(4), 699–714. doi: 10.1177/1354816616654243

Romao, J., Guerreiro, J.& Rodrigues, P. (2013). Regional tourism development: culture, nature, life cycle and attractiveness. *Current Issues in Tourism*. 16 (6).517-534. https://doi.org/10.1080/13683500.2012.699950

Romão, J., Neuts, B. (2017). Smart tourism, territorial capital, and sustainable regional development: experiences from Europe. *Habitat International* 68: 64-74.

Romão, J., Nijkamp, P. (2018). Impacts of innovation, productivity and specialization on tourism competitiveness – a spatial econometric analysis on European regions. *Current Issues in Tourism*. doi: 10.1080/13683500.2017.1366434.

Roodman, D. (2009). How to do xtabond: An introduction to difference and system GMM in Stata. *Stata Journal*, 9(1), 86–136.

Roodman, D. (2009). A Note on the Theme of Too Many Instruments*. *Oxford Bulletin of Economics and Statistics,* 71(1), 135–158. https://doi.org/10.1111/j.1468-0084.2008.00542.x

Russell, R., Faulkner, B. (2004). Entrepreneurship, Chaos and the Tourism Area Lifecycle', *Annals of Tourism Research*, 31(3), pp. 556–579, https://doi.org/10.1016/j.annals.2004.01.008

Russo, A.P. (2002). The vicious circle of tourism development in heritage cities. *Annals of Tourism Research* 29 (1), 165-182. DOI: 10.1016/S0160-7383(01)00029-9

Sacco, P. L., & Crociata, A. (2013). A conceptual regulatory framework for the design and evaluation of complex, participative cultural planning strategies. *International Journal of Urban and Regional Research*, 37, 1688–1706. doi:10.1111/j.1468-2427.2012.01159.x

Šaparauskas, J., & Turskis, Z. (2006). Evaluation of construction sustainability by multiple criteria methods. Ukio Technologinis Ir Ekonominis Vystymas, 12(4), 321–326. https://doi.org/10.1080/13928619.2006.9637761

Schaffernicht, M. (2010). Causal Loop Diagrams Between Structure and Behaviour: A Critical Analysis of the Relationship Between Polarity, Behaviour and Events, *Systems Research and Behavioural Science*, Wiley Online Library (wileyonlinelibrary.com) DOI:10.1002/sres.1018

Schumpeter, J. A. (1942). Capitalism, Socialism and Democracy. London: Harper & Brothers.

Seraphin, H., Ivanov, S., Dosquet, F., & Bourliataux-Lajoinie, S. (2019). Archetypes of locals in destinations victim of overtourism. *Journal of Hospitality and Tourism Management*, December, 0–1. https://doi.org/10.1016/j.jhtm.2019.12.001

Seraphin, H., Sheeran, P., & Pilato, M. (2018). Over-tourism and the fall of Venice as a destination. *Journal of Destination Marketing and Management*, 9 (September 2017), 374–376. https://doi.org/10.1016/j.jdmm.2018.01.011

Sharpley, R., & Telfer, D.J. (2015). Tourism and Development: Concepts and Issues. 2nd ed. Aspects of Tourism: 63. Channel View Publications. Bristol: UK.

Silva, H. E., & Henriques, F. M. A. (2021). The impact of tourism on the conservation and IAQ of cultural heritage: The case of the Monastery of Jerónimos (Portugal). *Building and Environment*, 190, 107536. https://doi.org/10.1016/j.buildenv.2020.107536

Skrede, J. (2016). What may culture contribute to urban sustainability? Critical reflections on the uses of culture in urban development in Oslo and beyond. *Journal of Urbanism*, 9(4), 408–425. https://doi.org/10.1080/17549175.2015.1074603

Skrede, J., & Berg, S. K. (2019). Cultural Heritage and Sustainable Development: The Case of Urban Densification. Historic Environment: *Policy and Practice*, 10(1), 83–102. https://doi.org/10.1080/17567505.2019.1558027

Smith, M. K., Sziva, I. P., & Olt, G. (2019). Overtourism and Resident Resistance in Budapest. *Tourism Planning and Development*, 0(0), 1–17. https://doi.org/10.1080/21568316.2019.1595705

Soini, K., & Birkeland, I. (2014). Exploring the scientific discourse on cultural sustainability. *Geoforum,* 51, 213–223. https://doi.org/10.1016/j.geoforum.2013.12.001

Soini, K., & Dessein, J. (2016). Culture-sustainability relation: Towards a conceptual framework. *Sustainability*, 8(2), 13–15. https://doi.org/10.3390/su8020167

Soto, M. (2009). System GMM estimation with a small sample (Working Paper No. 395). Barcelona Graduate School of Economics. http://ideas.repec.org/p/bge/wpaper/395.html

Sterman, J.D. (2002). System Dynamics: Systems Thinking and Modelling for a Complex World. Massachusetts Institute of Technology. Engineering Systems Division Working Paper Series. Available at: https://www.researchgate.net/publication/44827001_Business_Dynamics_System_Thinking_and_Modeling_for_a_Complex_World (retrieved, February 7, 2021).

Štreimikienė, D., & Kačerauskas, T. (2020). The creative economy and sustainable development: The Baltic States. *Sustainable Development*, 28(6), 1632–1641. https://doi.org/10.1002/sd.2111

Throsby, D. (2010). Convention on the protection and promotion of the diversity of cultural expressions (2005). The Impact of Uniform Laws on the Protection of Cultural Heritage and the Preservation of Cultural Heritage in the 21st Century, (January), 96–107. https://doi.org/10.1163/ej.9789004180444.I-786.6

Timothy, D. J., & Timothy, D. J. (2014). Contemporary Cultural Heritage and Tourism : Development Issues and Emerging Trends Contemporary Cultural Heritage and Tourism : Development Issues and Emerging Trends. 5187. https://doi.org/10.1179/1465518714Z.00000000052

Tretter, E. M. (2009). The cultures of capitalism: Glasgow and the monopoly of culture. *Antipode,* 41(1), 111–132. https://doi.org/10.1111/j.1467-8330.2008.00658.x

Tyrell, T. J., & Johnston, R. J. (2008). Tourism sustainability, resiliency and dynamics: Towards a more comprehensive perspective. *Tourism and Hospitality Research*, 8 (1), 14–24. doi:10.1057/thr.2008.8

UNESCO (2016). Recommendation concerning the Protection and Promotion of Museums and Collections, their Diversity and their Role in Society (Adopted by the General Conference at its 38th Session, Paris, 17 November 2015) Available at http://unesdoc.unesco.org/images/0024/002463/246331m.pdf (Accessed: 25 February 2021)

UNESCO (2018). Culture for the 2030 Agenda. Available at https://unesdoc.unesco.org/ark:/48223/pf0000264687 (retrieved February, 25, 2021)

UNESCO, (2019). Culture 2030 Indicators -Thematic indicators for culture in the 2030 Agenda for Sustainable Development. Paris: UNESCO, available at:

https://unesdoc.unesco.org/ark:/48223/pf0000371562 (retrieved June, 15,2020)

Ungar, M. (2018). Systemic resilience: principles and processes for a science of change in contexts of adversity. *Ecology and Society* 23 (4):34. https://doi.org/10.5751/ES-10385-230434

United Nations World Tourism Organization. (2018). Tourism and Culture Synergies. In Tourism and Culture Synergies.

UNWTO (1981). Report of the Secretary General of the General Programme of Work for the Period 1980-1981: Tourist markets, promotion and marketing-Saturation of tourist destinations. Available at: https://www.e-unwto.org/doi/pdf/10.18111/unwtogad.1981.1.un406362r557g40k (retrieved February, 4, 2021)

Vecco, M., Srakar, A. (2018). The unbearable sustainability of cultural heritage: An attempt to create an index of cultural heritage sustainability in conflict and war regions. *Journal of Cultural Heritage*, 33, September–October, pp. 293-302. https://doi.org/10.1016/j.culher.2018.06.009

Vergori, A. S., & Arima, S. (2020). Cultural and non-cultural tourism: Evidence from Italian experience. *Tourism Management*, 78(June 2018), 104058. https://doi.org/10.1016/j.tourman.2019.104058

Verhulst, P.F. (1838) Notice sur la loi que la population poursuit dans son accroissement"(PDF) *Correspondance Mathématique et Physique*. 10: 113–121. Available at: https://books.google.com/books?id=8GsEAAAAYAAJ, Retrieved February, 14, 2021)

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126(1), 25–51. https://doi.org/10.1016/j.jeconom.2004.02.005

Zadeh Bazargani, R. H., & Kiliç, H. (2021). Tourism competitiveness and tourism sector performance: Empirical insights from new data. *Journal of Hospitality and Tourism Management*, 46, 73–82. https://doi.org/10.1016/j.jhtm.2020.11.011

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Table A 1 Data sources - Sustainability indicators

INDICATOR		PARTNER					
		BUAS	IAMZ - CIHEAM	LAY	UNIVE	FEBTS	KU LEUEVEN
		SOURCE					
ENVIRONMENTAL	Completed impact assessment of environmental, social and cultural aspects of tourism (in terms of evaluating a tourism plan) (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	n/a	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Municipal expenses in environment per 1000 inhabitants	Statline	National official statistics reported by the municipality. Ministry of Finance	n/a	Open Bilanci	Ministry of Finance of Republic of Croatia	Agentschap Binnenlands Bestuur
	Construction density per unit area (municipality)	Statline	National official statistics reported by the municipality, Ministry of Finance	n/a	n/a	Corine Land Cover; Institute for Environmental and Nature Protection, Ministry of Economy and Sustainable Development	Provincie Oost-Vlaanderen, Provincie Antwerpen, Statistiek Vlaanderen
	The volume of waste generated	Statline	Regional official statistics	n/a	ARPAV	Pollution registry; Institute for Environmental and Nature Protection, Ministry of Economy and Sustainable Development	Openbare Vlaamse Afvalmaatschappij (OVAM)
	CO2 emissions per inhabitant (national)	Eurostat	Eurostat	Eurostat	Eurostat	Eurostat	Eurostat
	Daily number of tourists per 1 km²	Stateline	Official National Statistics - Hotel Occupancy National Survey	n/a	ISTAT	Croatian Bureau of Statistics, Statistical reports	Toerisme Vlaanderen
	Accessibility of tourist attractions by public transport (YES/NO) (prevaling answer)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources

	Perceptions by the local population concerning environmental damage caused by tourism (7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
SOCIAL	Perception of the local population regarding whether the life quality increases due to the tourism (7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
	Perception of the local population regarding whether the tourists have an undesirable effect in the region life style (7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
	Perception of the local population regarding whether improved public services are results of tourism (7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
	Ratio of tourists to locals	National statistics	National official data, regional and municipal. Data not found at LAU level	n/a	ISTAT	Croatian Bureau of Statistics, Statistical reports	STATBEL & Toerisme Vlaanderen
	Tourist intensity (ratio of nights spent at tourist accommodation establishments relative to the total permanent resident population of the area)	National statistics	n/a	n/a	STAT	Croatian Bureau of Statistics, Statistical reports	STATBEL & Toerisme Vlaanderen
	Degree of stakeholder participation in the planning process (Low/medium/high, measured on a 7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
CULTURAL	Evidence of active participation of communities, groups and individuals in cultural policies and the definition of administrative measures integrating heritage (both tangible and intangible) and its safeguarding (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Expenditure on the cultural heritage of municipalities (includes tangible and intangible and contemporary cultural activities)	Statline	National official statistics reported by the municipality. Ministry of Finance.	n/a	Open Bilanci	Ministry of Finance of Republic of Croatia	Agentschap Binnenlands Bestuur
	Percentage of the population that is very satisfied with cultural facilities in a destination (7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
	Perceptions of the local population concerning the stimulation of local crafts and culture due to tourism (7point Likert scale)	Resident survey	Resident survey	n/a	Resident survey	Resident survey	Resident survey
ECONOMIC	Average length of stay	Statline	Official National Statistics - Hotel Occupancy National Survey	n/a	ISTAT	Croatian Bureau of Statistics, Statistical reports	STATBEL & Toerisme Vlaanderen
	Total number of tourist arrivals	Statline	Official National Statistics - Hotel Occupancy National Survey	n/a	ISTAT	Croatian Bureau of Statistics, Statistical reports	STATBEL & Toerisme Vlaanderen

	Existence of up to date tourism plans and policies (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Existence of land use planning, including tourism (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Global satisfaction level of tourists (destination) (TripAdvisor 5 point scale rating)	TripAdvisor	TripAdvisor	TripAdvisor	TripAdvisor	TripAdvisor	TripAdvisor

Table A 2 Data sources and variables - Resilience model

INDICATOR	SOURCE					
	BUAS	IAMZ - CIHEAM	LAY	UNIVE	SPLIT	KU LEUEVEN
Population number	Statline	National statistics		ISTAT	Croatian Bureau of Statistics, Statistical reports	STATBEL
Total employment level	Statline	Regional statistics	Työllisyyskatsaus Marraskuu	ISTAT	Croatian Bureau of Statistics, Statistical reports	Provincie Oost-Vlaanderen, Provincie Antwerpen
Total revenues of local government in € per capita	Statline	National official statistics reported by the municipality; Ministry of Finance	Tilastokeskus	Open Bilanci	Ministry of Finance of Republic of Croatia	Provincie Oost-Vlaanderen, Provincie Antwerpen
Total expenditures of local government in € per capita	Statline	National official statistics reported by the municipality; Ministry of Finance	Utsjoen kunnan talousarvio 2020	Open Bilanci	Ministry of Finance of Republic of Croatia	Agentschap Binnenlands Bestuur
Migration (in number of persons) - International	Statline	Regional official statistics	n/a	ISTAT	Croatian Bureau of Statistics, Statistical reports	Provincie Oost-Vlaanderen, Provincie Antwerpen
Migration (in number of persons) - Between towns/municipalities of the same NUTS 3 region	Statline	Regional official statistics	Tilastokeskus	ISTAT	Croatian Bureau of Statistics, Statistical reports	Provincie Oost-Vlaanderen, Provincie Antwerpen
Population aged 15–64 with tertiary (high) educational attainment (ISCED 5–8)	Statline	n/a	Tilastokeskus	ISTAT	Croatian Bureau of Statistics, Statistical reports	STATBEL, Steunpunt Werk
GDP (PPS) per capita (NUTS 2)	Eurostat	Eurostat	Eurostat	Eurostat	Eurostat	Eurostat
Education (%), from 25 to 64 years, tertiary education (levels 5-8) (NUTS 2)	Eurostat	Eurostat	Eurostat	Eurostat	Eurostat	Eurostat
World Governance Indicators (national)	World Bank	World Bank	World Bank	World Bank	World Bank	World Bank

Tourist arrivals per capita	Statline	Official National Statistics - Hotel Occupancy National Survey	n/a	ISTAT	Croatian Bureau of Statistics, Statistical reports	STATBEL & Toerisme Vlaanderen

Table A 3 Data sources - Cultural tourism indicators

INDICATOR		SOURCE					
		BUAS	IAMZ - CIHEAM	LAY	UNIVE	SPLIT	KU LEUEVEN
SPATIAL	Number of monuments in national lists	National sources	Regional Cultural Heritage Information System	n/a	Monumenti Nazionali	Register of Cultural Property	Agentschap Onroerend Erfgoed
	Number of protected natural heritage sites in national lists	National sources	National official statistics	Own assessment based on available public (local) data sources	Monumenti Nazionali	National official statistics	Agentschap Onroerend Erfgoed
	Number of intangible cultural heritage in national lists	National sources	Regional Cultural Heritage Information System	Own assessment based on available public (local) data sources	Monumenti Nazionali	Register of Cultural Property	Departement Cultuur, Jeugd & Media
	Number of World Heritage Sites	UNESCO	Regional Cultural Heritage Information System	UNESCO	UNESCO	UNESCO	UNESCO
	Number of elements inscribed on the UNESCO Intangible Cultural Heritage Lists	UNESCO	UNESCO	UNESCO	UNESCO	UNESCO	UNESCO
	Number of museums per 1,000 inhabitants	National sources	Regional Cultural Heritage Information System	Own assessment based on available public (local) data sources	ISTAT, Vi turism	Register of museums by Museum Documentation Center	Faro - Steunpunt voor het roerend en immaterieel cultureel erfgoed
	Number of theatres per 1,000 inhabitants	National sources	Regional official statistics	Own assessment based on available public (local) data sources	Arteven Regione Veneto	Register of theaters	UitinVlaanderen
	Number of public libraries per 1,000 inhabitants	National sources	Municipality data	Own assessment based on available public (local) data sources	Bibiloteche in rete	Registry of public libraries	Departement Cultuur, Jeugd & Media
PROSPERITY AND	Number of cultural (and creative) enterprises	Statline	Regional official statistics	n/a	ISTAT	Financial Agency-FINA	Statistiek Vlaanderen
	Number of cultural jobs per 1,000 population	Statline	n/a	n/a	ISTAT	Financial Agency FINA	Statistiek Vlaanderen
	Evidence of a Ministry of Culture or a Culture secretariat with ministerial/directorial status at the State/national level (YES/NO)	Own assessment based on available	Own assessment based on available	Own assessment based on available	Own assessment based on available	Own assessment based on available	Own assessment based on available

		public (local) data sources	public (local) data sources	public (local) data sources	public (local) data sources	public (local) data sources	public (local) data sources
	Evidence of a local authority responsible for culture at local level (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Evidence of a culture based regulatory framework (YES/NO) (at least the Law on cultural heritage/culture)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Examples of initiatives designed through inter-ministerial cooperation to enhance culture's impacts in other areas (tourism, education, communication, ICT, trade, international affairs, employment), such as regulatory frameworks, sector specific laws, etc. (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Evidence for the use of Destination Management Organisation(s) to manage the impact of tourism on cultural values (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Evidence of cultural management plan or alike strategic document (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Specific measures to support job creation in the culture and creative sectors (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Specific measures to encourage the formalisation and growth of micro/small and medium-sized cultural enterprises (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Specific policy measures regulating public assistance and subsidies for the cultural sector (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Specific policy measures dealing with the tax status of culture (tax exemptions and incentives designed to benefit the culture sector specifically, such as reduced VAT on books) (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	General government expenditure on culture per capita (in €)	Statline	Regional official statistics	n/a	Open Bilanci	Ministry of Finance of Republic of Croatia	Agentschap Binnenlands Bestuur
	Coordination, cooperation and collaboration among Public Tourism Administrations (PTAs) at different levels of government (regarding cultural tourism) (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources

	Establishment of cooperative and collaborative public - private relations (regarding cultural tourism, like sectoral associations of enterprenuers and chambers of commerce) (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Cooperation and collaboration by public administrations with other nongovernmental actors and networks of actors (regarding cultural tourism)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Evidence of cultural tourism strategic documents (local) (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
INCLUSION & PARTICIPATION	Percentage of tourists that is very satisfied with cultural facilities in a destination (TripAdvisor 5point scale rating)	TripAdvisor	TripAdvisor	TripAdvisor	TripAdvisor	TripAdvisor	TripAdvisor
	Evidence of specific measures to promote active participation of communities, groups and individuals in cultural policies (YES/NO)	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources	Own assessment based on available public (local) data sources
	Degree of positive assessment of gender equality (subjective output)	Resident survey	Resident survey	Resident survey	Resident survey	Resident survey	Resident survey

Data sources across partners:

Agentschap Binnenlands Bestuur, retrieved from: https://lokaalbestuur.vlaanderen.be/bbc/data

Agentschap Binnenlands Bestuur, retrieved from: https://lokaalbestuur.vlaanderen.be/bbc/data

Agentschap Onroerend Erfgoed, retrieved from: https://inventaris.onroerenderfgoed.be/aanduidingsobjecten/zoeken?gemeente=258&aanduidingstype=1&geldig=true

ARPAV Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto, retrived from: https://www.arpa.veneto.it/temi-ambientali/rifiuti

Arteven Regione Veneto monitoring theatre spaces, retrieved from: https://www.osservatoriospettacoloveneto.it/schede.asp?tipo=teatro&provincia=VI

Bibiloteche in rete, retrieved from: https://biblioinrete.comperio.it/library/

Census 2011 België, retrieved from: https://www.census2011.be/download/downloads_nl.html

Corine Land Cover; Institute for Environmental and Nature Protection, Ministry of Economy and Sustainable Development, retrieved from: http://www.haop.hr/hr/baze-i-portali/pokrov-i-namjena-koristenja-zemljista-corine-land-cover

Croatian Bureau of Statistics, retrieved from: https://www.dzs.hr/PXWeb/Menu.aspx?px_db=Stanovni%c5%a1tvo&px_language=hr, https://www.dzs.hr/Hrv_Eng/Pokazatelji/Gradovi%20u%20statistici.xlsx , https://www.dzs.hr/Hrv/censuses/census2011/censuslogo.htm , https://www.dzs.hr/Hrv/censuses/Census2001/census.htm

Croatian Bureau of Statistics, Statistical reports, retrieved from: https://www.dzs.hr/

Croatian Civil Aviation Agency, retrieved from: https://www.ccaa.hr/novosti

Croatian State Intellectual property office, retrieved from: https://www.dziv.hr/en/

Departement Cultuur, Jeugd & Media , retrieved from: https://www.vlaanderen.be/cjm/cjm/nl/cultuur/cultureel-erfgoed/erkenningen/inventaris-vlaanderen-en-het-register-van-het-immaterieel/inventaris-vlaanderen

Departement Omgeving, retrieved from: https://omgeving.vlaanderen.be/grup

Departement Onderwijs en Vorming, retrieved from: https://www.statistiekvlaanderen.be/nl/leerlingen-en-studentenaantallen

Eurostat, retrieved from: https://ec.europa.eu/eurostat/databrowser/view/t2020_rd300/default/table?lang=en

Faro - Steunpunt voor het roerend en immaterieel cultureel erfgoed, retrieved from: https://www.vlaanderen.be/musea-in-vlaanderen-en-brussel

ISTAT, retrieved from: https://www.istat.it/

Ministry of Finance of Republic of Croatia, retrieved from: https://mfin.gov.hr/istaknute-teme/lokalna-samouprava/financijski-izvjestaji-jlp-r-s/203

Monumenti Nazionali, retrieved from: http://www.monumentinazionali.it/index.htm

Open Bilanci, retrieved from: https://openbilanci.it

Openbare Vlaamse Afvalmaatschappij (OVAM), retrieved from: https://www.ovam.be/inventarisatie-huishoudelijke-afvalstoffen

Pollution registry; Institute for Environmental and Nature Protection, Ministry of Economy and Sustainable Development, retrieved from: http://roo.azo.hr/rpt.html

Provincie Oost-Vlaanderen, Provincie Antwerpen, Statistiek Vlaanderenm, retrieved from: https://provincies.incijfers.be/dashboard/dashboard/ruimte/, https://www.statistiekvlaanderen.be/nl/monitor-lokale-bestuurskracht

Register of Cultural Property, retrieved from: https://registar.kulturnadobra.hr/

Register of museums by Museum Documentation Center, retrieved from: https://upisnik.mdc.hr/hr/

Register of public libraries, retrieved from: http://upisnik.nsk.hr/upisnik-knjiznica/

Register of theaters, retrieved from: https://min-kulture.gov.hr/istaknute-teme/ocevidnik-kazalista-16607/16607

STATBEL & Toerisme Vlaanderen, retrieved from: https://statbel.fgov.be/nl/themas/ondernemingen/horeca-toerisme-en-hotelwezen/plus https://statbel.fgov.be/nl/themas/bevolking/bevolkingsdichtheid#figures

Statistiek Vlaanderen, retrieved from: https://gemeente-stadsmonitor.vlaanderen.be/tewerkstelling-in-de-culturele-en-creatieve-sector

Statline, retrieved from: https://opendata.cbs.nl/statline/#/CBS/en/dataset/83641ENG/table?ts=1611007249934 , https://opendata.cbs.nl/statline/#/CBS/en/dataset/70262ENG/table?ts=1611050771929 , https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83452NED/table?ts=1611140269730 , https://opendata.cbs.nl/statline/#/CBS/en/dataset/83641ENG/table?ts=1611009421630 , https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82061NED/table?ts=1611058615754&fromstatweb=true

Steunpunt Werk, retrieved from: https://www.steunpuntwerk.be/node/3022

Tilastokeskus, retrieved from: http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/

Työllisyyskatsaus Marraskuu, retrieved from: www.temtyollisyyskatsaus.fi

UitinVlaanderen, retrieved from: https://www.uitinvlaanderen.be/

UNESCO IT, retrieved from: http://www.unesco.it/it/PatrimonioMondiale/Detail/108

Utsjoen kunnan talousarvio 2020, retrieved from: https://www.utsjoki.fi/wp-content/uploads/2020/02/utsjoen-kunnan-talousarvio2020saavuttettava.pdf

Vi turism, retrieved from: https://www.vitourism.it/musei/

Vlaamse Instelling voor Technologisch Onderzoek (VITO), retrieved from: http://www.burgemeestersconvenant.be/co2-inventarissen

Water Supply and Drainage Ltd. Split, retrieved from: https://www.vik-split.hr/

World Bank, WDI, retrieved from: https://databank.worldbank.org/source/world-development-indicators

Table A 4. Sustainability panel model (all sustainability variables) – descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Observations		
					N	n	T/T-bar
Environmental sustainability							
Completed impact assessment of environmental, social and cultural aspects of tourism (in terms of evaluating a tourism plan) (YES/NO)	0.20	0.40	0.00	1.00	455	35	13
Construction density per unit area (municipality)	14.55	12.42	0.25	50.50	294	27	10.8889
The volume of waste generated	74352.12	203381.40	133.42	1436861.00	355	33	10.7576
CO2 emissions per inhabitant.	0.01	0.00	0.00	0.01	420	35	12
Daily number of tourists per 1 km2	2.57	4.19	0.00	32.52	280	29	9.65517
Accessibility of tourist attractions by public transport (YES/NO) (prevailing answer)	1.00	0.00	1.00	1.00	455	35	13
EnvSus_INDEX	0.51	0.09	0.29	0.74	162	22	7.36364
Social sustainability							
Ratio of tourists to locals	3.242345	6.526229	0.007	37.931	261	29	9
Tourist intensity (ratio of nights spent at tourist accommodation establishments relative to the total permanent resident population of the area)	4.933784	13.33872	0	115.23	245	24	10.2083
SocSus_INDEX	0.042954	0.092071	0.000248	0.7178994	230	24	9.58333
Economic sustainability							
Average length of stay	2.605699	1.269559	0.462	8.62	266	28	9.5
Total number of tourist arrivals	90963.05	198619.4	29	1261000	272	29	9.37931
Existence of up to date tourism plans and policies (YES/NO)	0.878161	0.327477	0	1	435	35	12.4286
Existence of land use planning, including tourism (YES/NO)	1	0	1	1	455	35	13
EcoSus_INDEX	0.76958	0.107427	0.404646	0.9166667	259	27	9.59259
Control variables							
GDP per capita	28865.24	7614.791	14500	42700	420	35	12
Population	51484.59	106267	1212	644618	437	35	12.4857
WGI	0.987702	0.483678	0.365859	1.87299	455	35	13
Education, tertiary	29.20945	8.750112	12.2	42.8	455	35	13

Table A 5. Sustainability / Resilience panel model (all cultural variables) - descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Observations N	n	T/T-bar
Spatial indicators							
Presence of cultural resources							
Number of monuments in national lists	93.04299	206.1352	0	879	442	34	13
Number of intangible cultural heritage in national lists	73.4	325.0651	0	1931	455	35	13
Number of World Heritage Sites	0.441758	0.601406	0	2	455	35	13
Number of elements inscribed on the UNESCO Intangible Cultural Heritage Lists	0.767033	1.493971	0	6	455	35	13
CulRes_INDEX	0.125985	0.106971	0.00013	0.375611	442	34	13
Availability of cultural infrastructure							
Number of museums per 1,000 inhabitants	0.14872	0.310913	0	1.650165	341	32	10.6563
Number of theatres per 1,000 inhabitants	0.135085	0.207822	0	0.97704	389	35	11.1143
Number of public libraries per 1,000 inhabitants	0.155434	0.1906	0.02	0.825083	363	35	10.3714
CulInf_INDEX	0.12456	0.179505	0	0.702742	294	32	9.1875
Prosperity and livelihood indicators							
Cultural (tourism) business							
Number of cultural (and creative) enterprises	246.4675	822.5376	0	5870	323	34	9.5
Cultural governance (institutional framework)							
Evidence of a Ministry of Culture or a Culture secretariat with ministerial/directorial status at the State/national level (YES/NO)	1	0	1	1	455	35	13
Evidence of a local authority responsible for culture at local level (YES/NO)	0.857143	0.350312	0	1	455	35	13
Evidence of a culture based regulatory framework (YES/NO) (at least the Law on cultural heritage/culture)	0.876923	0.328887	0	1	455	35	13
Examples of initiatives designed through inter-ministerial cooperation to enhance culture's impacts in other areas (tourism, education, communication, ICT, trade, international affairs, employment), such as regulatory frameworks, sector specific laws, etc. (YES/NO)	0.707692	0.455324	0	1	455	35	13
Evidence for the use of Destination Management Organisation(s) to manage the impact of tourism on cultural values (YES/NO)	0.342857	0.475187	0	1	455	35	13
CulGovInst_INDEX	0.820626	0.162694	0.461539	1	455	35	13
Cultural governance (policies)							
Evidence of cultural management plan or alike strategic document (YES/NO)	0.740659	0.438755	0	1	455	35	13
Specific measures to support job creation in the culture and creative sectors (YES/NO)	0.984615	0.123212	0	1	455	35	13
Specific measures to encourage the formalization and growth of micro/small and medium-sized cultural enterprises (YES/NO)	0.984615	0.123212	0	1	455	35	13
Specific policy measures regulating public assistance and subsidies for the cultural sector (YES/NO)	0.8	0.40044	0	1	455	35	13

Variable	Mean	Std. Dev.	Min	Max	Observations		
					N	n	T/T-bar
Specific policy measures dealing with the tax status of culture (tax exemptions and incentives designed to benefit the culture sector specifically, such as reduced VAT on books) (YES/NO)	0.971429	0.166782	0	1	455	35	13
CulGovPol_INDEX	0.894614	0.159991	0.220435	1	455	35	13
Cultural (tourism) governance							
Coordination, cooperation and collaboration among Public Tourism Administrations (PTAs) at different levels of government (regarding cultural tourism) (YES/NO)	1	0	1	1	455	35	13
Establishment of cooperative and collaborative public - private relations (regarding cultural tourism, like sectoral associations of enterprenuers and chambers of commerce) (YES/NO)	0.679121	0.467328	0	1	455	35	13
Cooperation and collaboration by public administrations with other nongovernmental actors and networks of actors (regarding cultural tourism)	0.892308	0.310333	0	1	455	35	13
Evidence of cultural tourism strategic documents (local) (YES/NO)	0.540659	0.498893	0	1	455	35	13
CulGovTour_INDEX	0.778022	0.240251	0.25	1	455	35	13
Government expenditure							
General government expenditure on culture per capita (in €)	78.07655	85.40472	0	584.89	362	34	10.6471

Table A 6. Sustainability OLS regression model (all sustainability variables)– descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Environmental sustainability					
Completed impact assessment of environmental, social and cultural aspects of tourism (in terms of evaluating a tourism plan) (YES/NO)	35	0.2	0.40584	0	1
Municipal expenses in environment per 1000 inhabitants	33	66414.48	67004.38	0	343740
Construction density per unit area (municipality)	27	18.063	14.79683	0.281	50.249
The volume of waste generated	33	86899.58	253008.7	858.052	1436861
CO2 emissions per inhabitant	35	0.006306	0.002505	0.003	0.0096
Daily number of tourists per 1 km2	28	3.690607	6.451439	0.012	32.52
Accessibility of tourist attractions by public transport (YES/NO) (prevailing answer)	35	1	0	1	1
Perceptions by the local population concerning environmental damage caused by tourism (7point Likert scale)	35	4.366	0.62057	2.88	5.67
EnvSus_INDEX	20	0.515717	0.087746	0.261428	0.601492
Economic sustainability					
Average length of stay	27	2.521	1.25127	1.422	6.23
Total number of tourist arrivals	28	126847.5	282279.2	125	1237000
Existence of up to date tourism plans and policies (YES/NO)	30	1	0	1	1

Variable	Obs.	Mean	Std. Dev.	Min	Max
Existence of land use planning, including tourism (YES/NO)	35	1	0	1	1
Global satisfaction level of tourists (destination) (TripAdvisor 5point scale rating)	35	4.236	0.232786	3.63	4.57
EcoSus_INDEX	25	0.734198	0.061569	0.591988	0.904678
Social sustainability					
Perception of the local population regarding whether the life quality increases due to the tourism (7point Likert scale)	35	4.677429	0.560726	3.69	5.79
Perception of the local population regarding whether the tourists have an undesirable effect in the region life style (7point Likert scale)	35	4.258286	0.68239	2.7	5.44
Perception of the local population regarding whether improved public services are results of tourism (7point Likert scale)	35	4.419143	0.517996	3.31	5.49
Ratio of tourists to locals	25	2.54616	4.213273	0.029	16.019
Tourist intensity (ratio of nights spent at tourist accommodation establishments relative to the total permanent resident population of the area)	24	5.386667	9.973827	0.153	45.69
Degree of stakeholder participation in the planning process(Low/medium/high, measured on a 7point Likert scale)	35	3.734	0.558112	2.54	4.62
SocSus_INDEX	24	0.531146	0.176741	0.13042	0.859848
Cultural sustainability					
Evidence of active participation of communities, groups and individuals in cultural policies and the definition of administrative measures integrating heritage (both tangible and intangible) and its safeguarding (YES/NO)	35	1	0	1	1
Expenditure on the cultural heritage of municipalities (includes tangible and intangible and contemporary cultural activities)	34	5859505	15900000	3858	87000000
Percentage of the population that is very satisfied with cultural facilities in a destination (7point Likert scale)	35	4.634371	0.605444	3.229	5.764
Perceptions by the local population concerning the stimulation of local crafts and culture due to tourism (7point Likert scale)	35	4.362371	0.663544	2.385	5.455
CulSuS_INDEX	34	0.66188	0.086169	0.462082	0.946039

Table A 7. Sustainability OLS regression model (all cultural variables) – descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Spatial indicators					
Presence of cultural resources					
Number of monuments in national lists	34	97.70588	211.8309	0	879
Number of intangible cultural heritage in national lists	35	75.14286	329.1006	0	1931
Number of World Heritage Sites	35	0.457143	0.610827	0	2
Number of elements inscribed on the UNESCO Intangible Cultural Heritage Lists	35	1.2	2.097618	0	6
CulRes_INDEX	34	0.148094	0.118396	0.001422	0.375611
Availability of cultural infrastructure index					
Number of museums per 1,000 inhabitants	32	0.138344	0.29973	0	1.650165
Number of theatres per 1,000 inhabitants	35	0.123993	0.200211	0	0.928074
Number of public libraries per 1,000 inhabitants	35	0.146942	0.201792	0.02	0.825083
CulInf_INDEX	32	0.106235	0.164277	0	0.702742
Prosperity and livelihood indicators					
Cultural (tourism) business					
Number of cultural (and creative) enterprises	34	263.9118	1003.662	0	5870
Employment					
Number of cultural jobs per 1,000 population	26	4.988785	5.636451	0	20.63237
Cultural governance (institutional framework)					
Evidence of a Ministry of Culture or a Culture secretariat with ministerial/directorial status at the State/national level (YES/NO)	35	1	0	1	1
Evidence of a local authority responsible for culture at local level (YES/NO)	35	0.857143	0.355036	0	1
Evidence of a culture based regulatory framework (YES/NO) (at least the Law on cultural heritage/culture)	35	1	0	1	1
Examples of initiatives designed through inter-ministerial cooperation to enhance culture's impacts in other areas (tourism, education, communication, ICT, trade, international affairs, employment), such as regulatory frameworks, sector specific laws, etc. (YES/NO)	35	0.8	0.40584	0	1
Evidence for the use of Destination Management Organisation(s) to manage the impact of tourism on cultural values (YES/NO)	35	0.342857	0.481594	0	1
CulGovInst_INDEX	35	0.87033	0.134239	0.692308	1
Cultural governance (policies)					
Evidence of cultural management plan or alike strategic document (YES/NO)	35	0.8	0.40584	0	1
Specific measures to support job creation in the culture and creative sectors (YES/NO)	35	1	0	1	1
Specific measures to encourage the formalization and growth of micro/small and medium-sized cultural enterprises (YES/NO)	35	1	0	1	1
Specific policy measures regulating public assistance and subsidies for the cultural sector (YES/NO)	35	0.8	0.40584	0	1

Variable	Obs.	Mean	Std. Dev.	Min	Max
Specific policy measures dealing with the tax status of culture (tax exemptions and incentives designed to benefit the culture sector specifically, such as reduced VAT on books) (YES/NO)	35	0.971429	0.169031	0	1
CulGovPol_INDEX	35	0.918029	0.13464	0.601884	1
Government expenditure					
General government expenditure on culture per capita (in €)	34	93.16	88.97747	0.91	325.97
Cultural (tourism) governance					
Coordination, cooperation and collaboration among Public Tourism Administrations (PTAs) at different levels of government (regarding cultural tourism) (YES/NO)	35	1	0	1	1
Establishment of cooperative and collaborative public - private relations (regarding cultural tourism, like sectoral associations of enterprenuers and chambers of commerce) (YES/NO)	35	0.828571	0.382385	0	1
Cooperation and collaboration by public administrations with other nongovernmental actors and networks of actors (regarding cultural tourism)	35	1	0	1	1
Evidence of cultural tourism strategic documents (local) (YES/NO)	35	0.571429	0.502096	0	1
CulGovTour_INDEX	35	0.85	0.150977	0.5	1
Inclusion & Participation					
Satisfaction with cultural facilities					
Percentage of tourists that is very satisfied with cultural facilities in a destination (TripAdvisor 5point scale rating)	35	4.231671	0.285366	3.463235	4.760563
Social cohesion					
Degree of positive assessment of gender equality (subjective output) (7point Likert scale)	35	5.255283	0.818494	3.692308	6.371428

RESIDENTS' SURVEY QUESTIONS

Q1 Perceptions by the local population concerning environmental damage caused by tourism (7point Likert scale)
Q2 Perception of the local population regarding whether the life quality increases due to the tourism (7point Likert scale)
Q3 Perception of the local population regarding whether the tourists have an undesirable effect in the region life style (7point Likert scale)
Q4 Perception of the local population regarding whether improved public services are results of tourism (7point Likert scale)
Q5 Degree of stakeholder participation in the planning process(Low/medium/high, measured on a 7point Likert scale)
Q6 Percentage of the population that is very satisfied with cultural facilities in a destination (7point Likert scale)
Q7 Perceptions by the local population concerning the stimulation of local crafts and culture due to tourism (7point Likert scale)
Q8 Degree of positive assessment of gender equality (subjective output)

Table A 8. Mean values

LAU	No of answers collected LL	LAU	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Ainsa	234	45	3.78	5.00	3.18	3.80	3.91	4.49	5.18	3.93
Barbastro		41	3.44	4.34	2.93	3.95	3.61	5.00	3.90	3.73
Benasque		31	3.29	5.32	3.13	4.71	3.74	5.13	3.97	3.81
Graus		20	3.75	5.50	2.70	4.25	2.60	4.60	3.85	3.80
Huesca		52	4.00	4.02	4.00	4.12	2.87	4.12	3.25	3.87
Jaca		32	2.88	4.69	3.84	4.38	3.72	5.09	4.13	3.72
Sariñena		13	3.77	3.85	3.77	3.85	2.54	3.62	2.38	3.69
Rotterdam	320	55	4.64	4.45	4.62	4.45	4.02	5.76	4.71	5.95
Delft		55	4.82	4.60	4.80	4.85	4.36	5.60	5.45	5.69
Dordrecht		55	4.65	4.24	4.55	4.27	4.62	5.69	4.62	5.25
Molenland		19	4.37	4.42	4.37	4.32	4.42	5.37	4.63	4.84
Barendrecht		35	4.11	3.94	3.80	4.06	3.80	5.14	3.77	5.11
Ridderkerk		55	3.51	3.69	3.49	3.56	3.49	4.56	3.53	5.67
Zwijndrecht		46	3.98	4.11	3.80	3.93	3.63	4.37	3.93	5.26
Utsjoki	22	22	5.14	5.43	5.24	5.33	4.05	5.14	5.14	6.14
Vicenza	368	96	5.23	5.70	4.42	4.04	4.02	4.41	4.55	6.25
Caldogno		93	5.05	5.22	4.06	4.24	4.47	4.53	4.46	6.11
Pojana Maggiore		31	5.32	5.26	4.10	3.84	3.13	3.94	3.68	5.97
Grumolo delle Abbadesse		35	3.83	4.06	3.26	3.31	2.77	3.23	2.83	6.37
Lonigo		70	5.10	5.24	4.27	4.41	3.97	4.10	4.76	6.17
Montagnana		43	5.67	5.79	4.60	4.51	4.33	3.84	4.81	6.07
Split	944	185	3.96	5.01	4.77	5.03	3.88	4.54	4.40	5.74
Trogir		120	4.73	5.15	5.44	5.49	4.30	4.95	4.97	5.30
Kaštela		132	4.55	5.04	5.05	5.03	3.99	4.09	4.32	5.53
Solin		149	4.64	4.89	4.99	5.14	4.19	4.66	4.70	5.13
Sinj		139	4.78	4.73	4.91	5.04	3.74	4.81	4.84	5.29
Dugopolje		108	4.83	5.09	5.02	5.25	4.47	4.63	4.75	5.42
Klis		111	4.65	4.88	5.16	5.01	4.22	5.05	4.83	5.41
Dendermonde	2,058	343	4.55	4.59	4.60	4.64	3.59	4.74	4.95	5.69
Puurs-Sint-Amands		379	4.40	4.23	4.44	4.35	3.70	4.89	4.72	5.71
Bornem		235	4.33	4.33	4.56	4.37	3.36	5.21	4.77	5.75
Berlare		216	4.35	4.25	4.41	4.39	3.70	4.88	4.58	5.54

LAU	No of answers collected		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
	LL	LAU								
Aalst		**420**	4.28	4.26	4.47	4.45	3.13	4.60	4.77	5.60
Denderleeuw		**186**	4.20	4.28	4.23	4.27	3.02	3.67	4.41	5.74
Willebroek		**279**	4.17	4.21	4.18	4.18	3.00	3.86	4.31	5.56

Table A 9. Standard deviation

LAU	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Ainsa	1.38	1.31	0.81	0.59	0.92	0.82	1.35	0.72
Barbastro	0.74	0.88	0.69	0.67	0.86	1.00	0.80	0.63
Benasque	0.90	1.08	0.67	0.78	0.68	1.06	0.71	0.70
Graus	0.64	1.15	0.57	0.44	0.60	0.75	0.67	0.52
Huesca	0.49	0.58	0.56	0.51	0.58	0.93	0.87	0.60
Jaca	0.61	1.18	1.25	0.87	0.96	0.89	0.61	0.52
Sariñena	0.44	0.55	0.44	0.38	0.66	0.51	0.65	0.63
Rotterdam	1.02	1.29	1.25	1.24	1.68	1.02	1.08	1.28
Delft	1.38	1.41	1.31	1.13	1.61	1.01	1.07	1.70
Dordrecht	1.27	1.30	1.24	1.33	1.31	1.10	1.21	1.67
Molenland	1.07	1.26	1.12	1.00	1.30	1.42	1.16	2.03
Barendrecht	1.32	1.41	1.59	1.35	1.61	1.26	1.40	1.78
Ridderkerk	1.53	1.65	1.60	1.56	1.69	1.29	1.65	1.60
Zwijndrecht	1.16	1.58	1.24	1.45	1.76	1.29	1.27	1.77
Utsjoki	1.49	1.12	1.09	1.15	1.59	1.25	1.04	1.08
Vicenza	1.43	1.13	1.35	1.43	1.42	1.58	1.39	1.26
Caldogno	1.51	1.35	1.61	1.60	1.29	1.65	1.49	1.33
Pojana Maggiore	0.94	1.09	0.91	0.97	0.76	1.12	0.94	1.33
Grumolo delle Abbadesse	1.38	1.35	0.95	1.30	1.29	1.48	1.36	0.84
Lonigo	1.28	1.16	1.30	1.32	1.43	1.34	1.36	1.20
Montagnana	1.29	0.94	1.20	1.47	1.54	1.81	1.68	1.44
Split	1.55	1.45	1.49	1.48	1.71	1.51	1.55	1.49
Trogir	1.50	1.67	1.56	1.59	1.62	1.95	1.70	1.58
Kaštela	1.63	1.54	1.40	1.50	1.57	1.78	1.65	1.67
Solin	1.54	1.51	1.42	1.64	1.59	1.84	1.77	1.93
Sinj	1.38	1.45	1.51	1.47	1.56	1.44	1.42	1.54
Dugopolje	1.38	1.66	1.61	1.52	1.55	1.56	1.64	1.64
Klis	1.62	1.67	1.47	1.80	1.73	1.80	1.59	1.75
Dendermonde	1.15	1.08	1.12	1.07	1.46	1.39	1.15	1.68
Puurs-Sint-Amands	1.25	1.11	1.09	1.05	1.38	1.18	1.08	1.64
Bornem	1.29	1.24	1.11	1.00	1.42	1.21	1.05	1.68
Berlare	1.46	1.22	1.15	1.13	1.45	1.18	1.11	1.67
Aalst	1.07	0.96	1.05	1.02	1.37	1.33	1.08	1.75
Denderleeuw	1.24	1.15	1.21	1.24	1.44	1.46	1.30	1.63
Willebroek	1.24	1.14	1.20	1.21	1.43	1.46	1.26	1.81

Table A 10. Minimum

LAU	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Ainsa	2	3	2	3	3	3	2	3
Barbastro	2	3	2	2	2	3	2	3
Benasque	2	3	2	3	3	3	3	2
Graus	3	3	2	4	2	3	2	3
Huesca	3	3	3	3	2	2	2	2
Jaca	2	3	2	3	2	3	3	3
Sariñena	3	3	3	3	2	3	2	2

LAU	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Rotterdam	3	1	2	1	1	3	2	2
Delft	1	1	2	2	1	3	2	1
Dordrecht	1	1	2	1	2	2	1	1
Molenland	3	2	2	2	2	3	3	1
Barendrecht	1	1	1	1	1	1	1	1
Ridderkerk	1	1	1	1	1	1	1	1
Zwijndrecht	1	1	1	1	1	1	1	1
Utsjoki	3	3	3	3	1	2	4	3
Vicenza	1	3	1	1	1	1	2	2
Caldogno	1	2	1	1	2	1	1	1
Pojana Maggiore	3	4	2	2	2	2	2	3
Grumolo delle Abbadesse	2	2	2	1	1	1	1	4
Lonigo	2	3	2	1	1	1	2	3
Montagnana	1	1	1	1	1	1	1	2
Split	1	1	1	1	1	1	1	1
Trogir	1	1	1	1	1	1	1	1
Kaštela	1	1	1	1	1	1	1	1
Solin	1	1	1	1	1	1	1	1
Sinj	1	1	1	1	1	1	1	1
Dugopolje	1	1	1	1	1	1	1	1
Klis	1	1	1	1	1	1	1	1
Dendermonde	1	1	1	1	1	1	1	1
Puurs-Sint-Amands	1	1	1	1	1	1	1	1
Bornem	1	1	1	1	1	1	1	1
Berlare	1	1	1	1	1	1	1	1
Aalst	1	1	1	1	1	1	1	1
Denderleeuw	1	1	1	1	1	1	1	1
Willebroek	1	1	1	1	1	1	1	1

Table A 11. Maximum

LAU	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Ainsa	7	7	5	5	6	6	7	6
Barbastro	4	6	4	5	6	6	6	6
Benasque	5	7	4	6	5	7	6	5
Graus	5	7	4	5	4	6	5	5
Huesca	5	5	5	5	4	6	4	4
Jaca	4	7	7	7	6	7	5	5
Sariñena	4	5	4	4	4	4	4	4
Rotterdam	7	7	7	7	7	7	7	7
Delft	7	7	7	7	7	7	7	7
Dordrecht	7	7	7	7	7	7	7	7
Molenland	7	7	7	7	7	7	7	7
Barendrecht	6	6	6	7	7	7	6	7
Ridderkerk	7	7	7	7	7	7	7	7
Zwijndrecht	6	7	6	7	7	7	6	7
Utsjoki	7	7	7	7	6	7	7	7
Vicenza	7	7	7	7	7	7	7	7
Caldogno	7	7	7	7	7	7	7	7
Pojana Maggiore	7	7	6	6	4	6	6	7
Grumolo delle Abbadesse	6	7	6	6	7	7	7	7
Lonigo	7	7	7	7	7	7	7	7
Montagnana	7	7	7	7	7	7	7	7
Split	7	7	7	7	7	7	7	7
Trogir	7	7	7	7	7	7	7	7
Kaštela	7	7	7	7	7	7	7	7

LAU	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Solin	7	7	7	7	7	7	7	7
Sinj	7	7	7	7	7	7	7	7
Dugopolje	7	7	7	7	7	7	7	7
Klis	7	7	7	7	7	7	7	7
Dendermonde	7	7	7	7	7	7	7	7
Puurs-Sint-Amands	7	7	7	7	7	7	7	7
Bornem	7	7	7	7	7	7	7	7
Berlare	7	7	7	7	7	7	7	7
Aalst	7	7	7	7	7	7	7	7
Denderleeuw	7	7	7	7	7	7	7	7
Willebroek	7	7	7	7	7	7	7	7

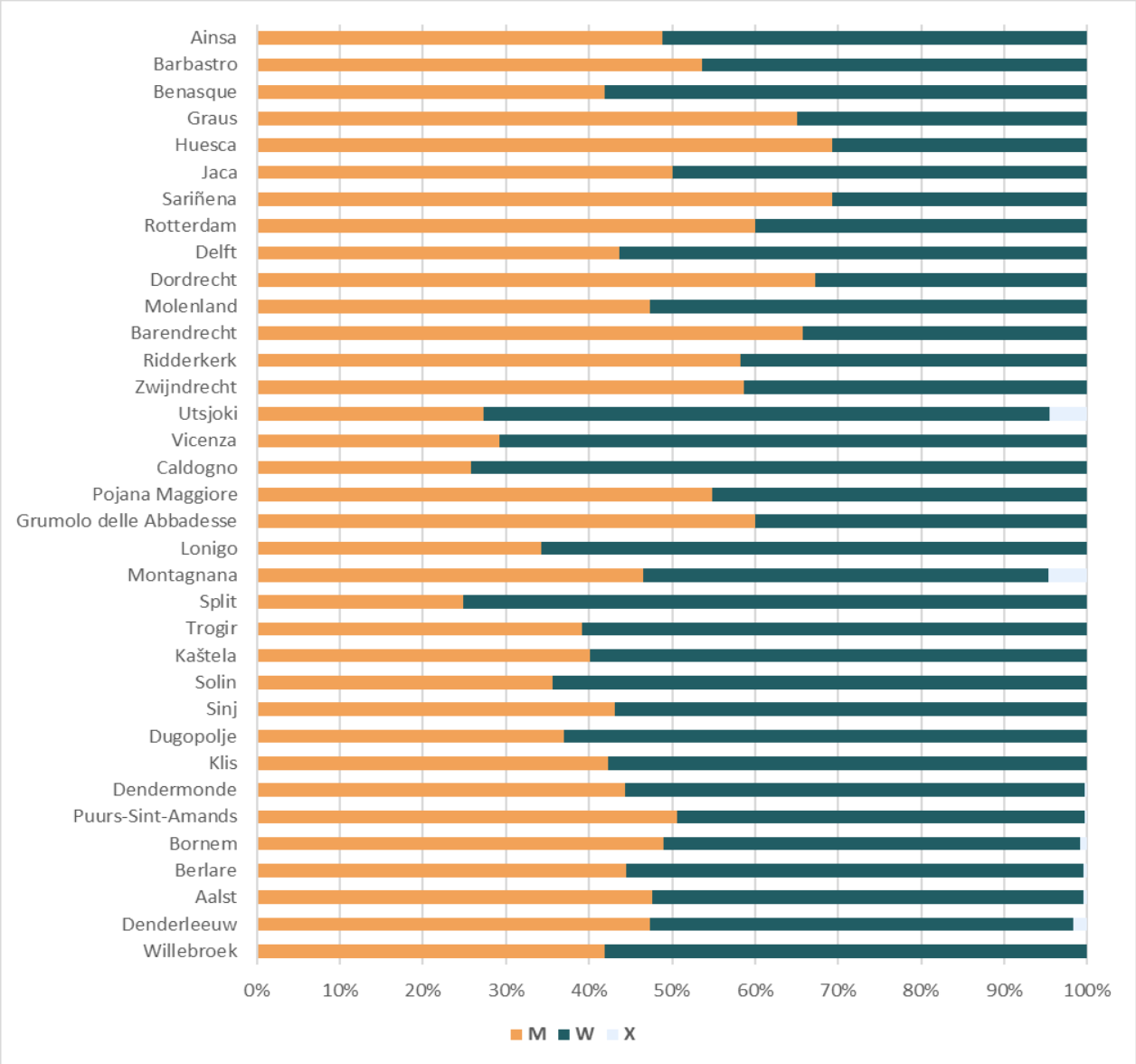

Fig A 1. Population by gender

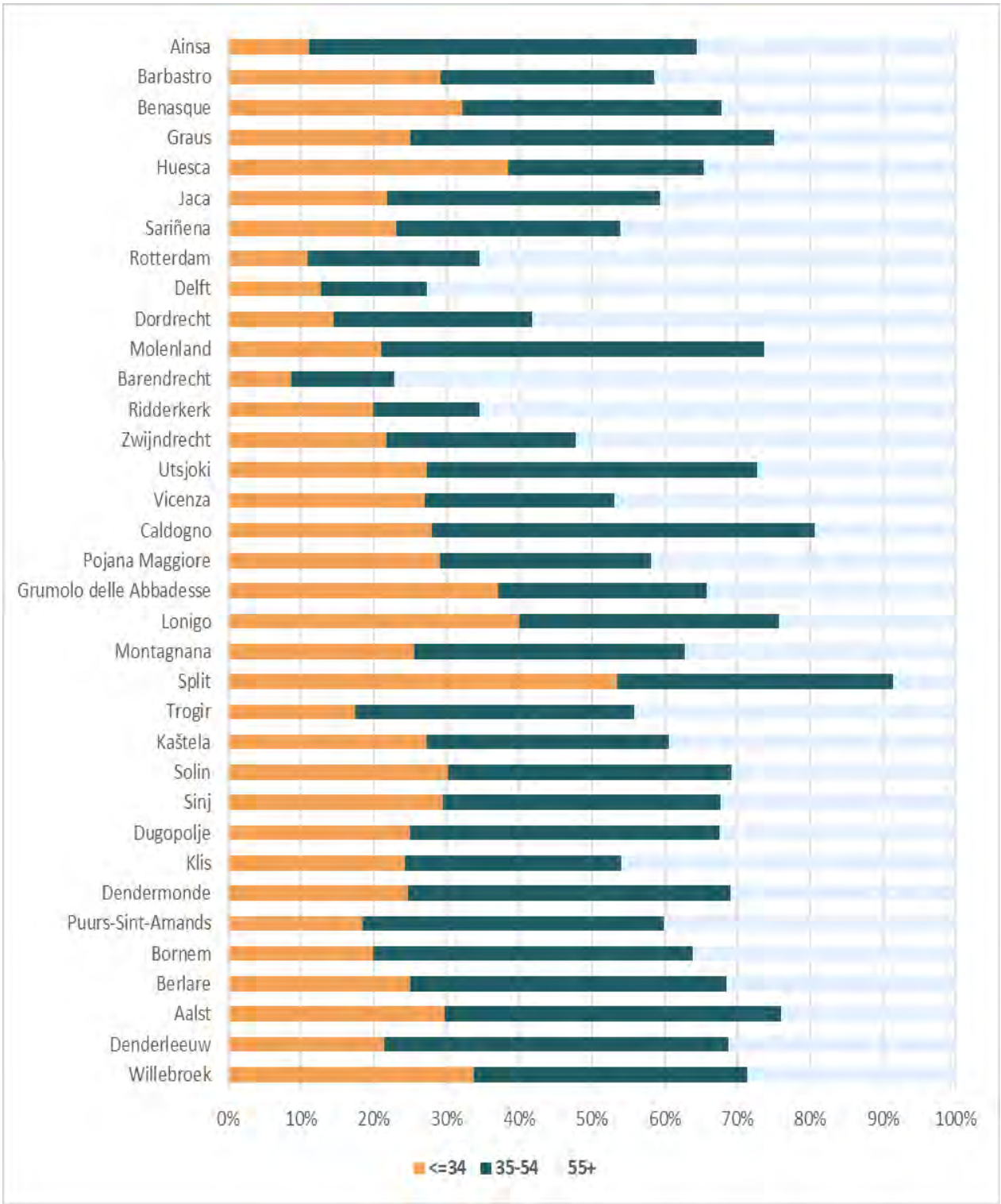

Fig A 2. Population by age

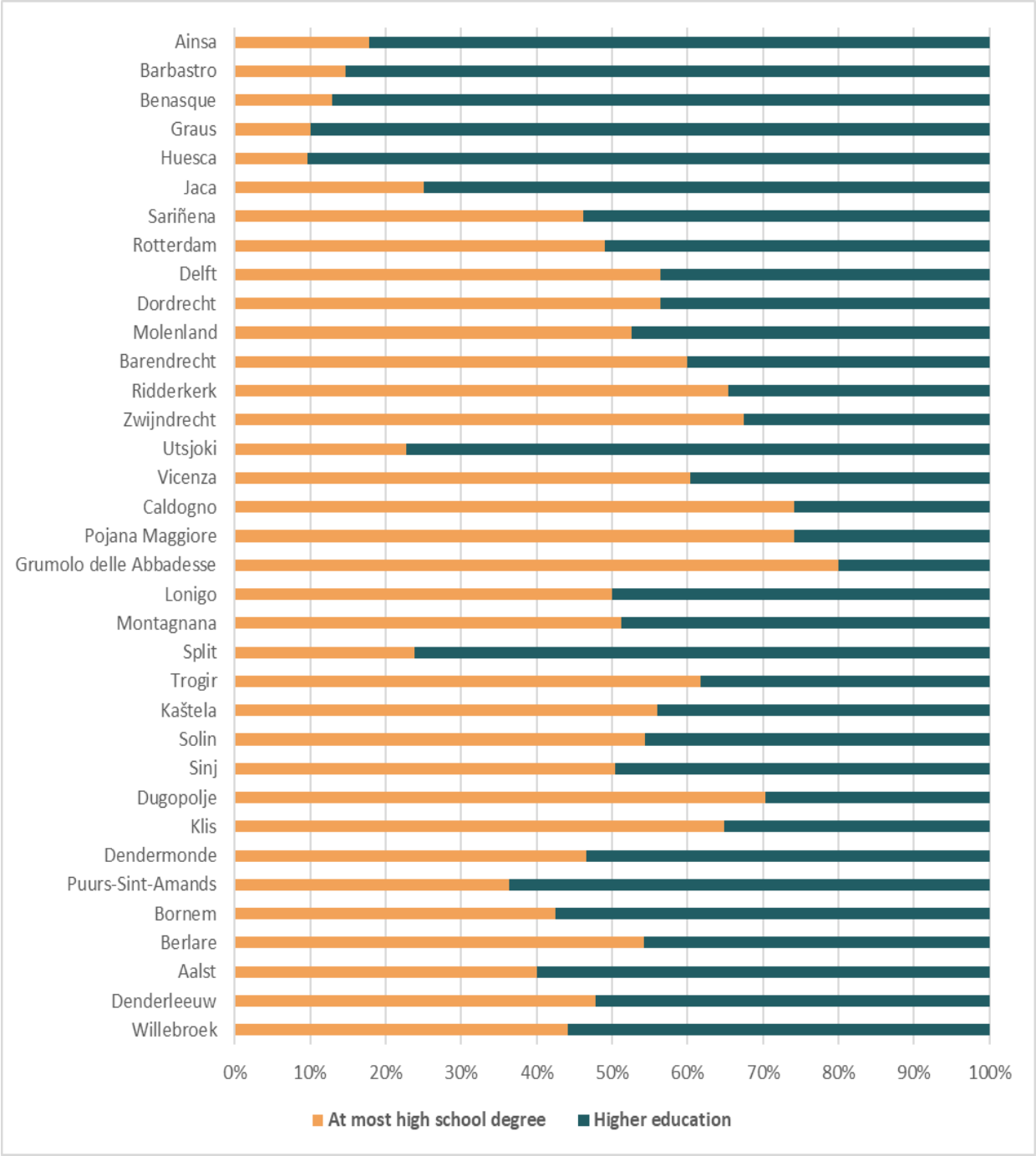

Fig A 3. The share of respondents by education

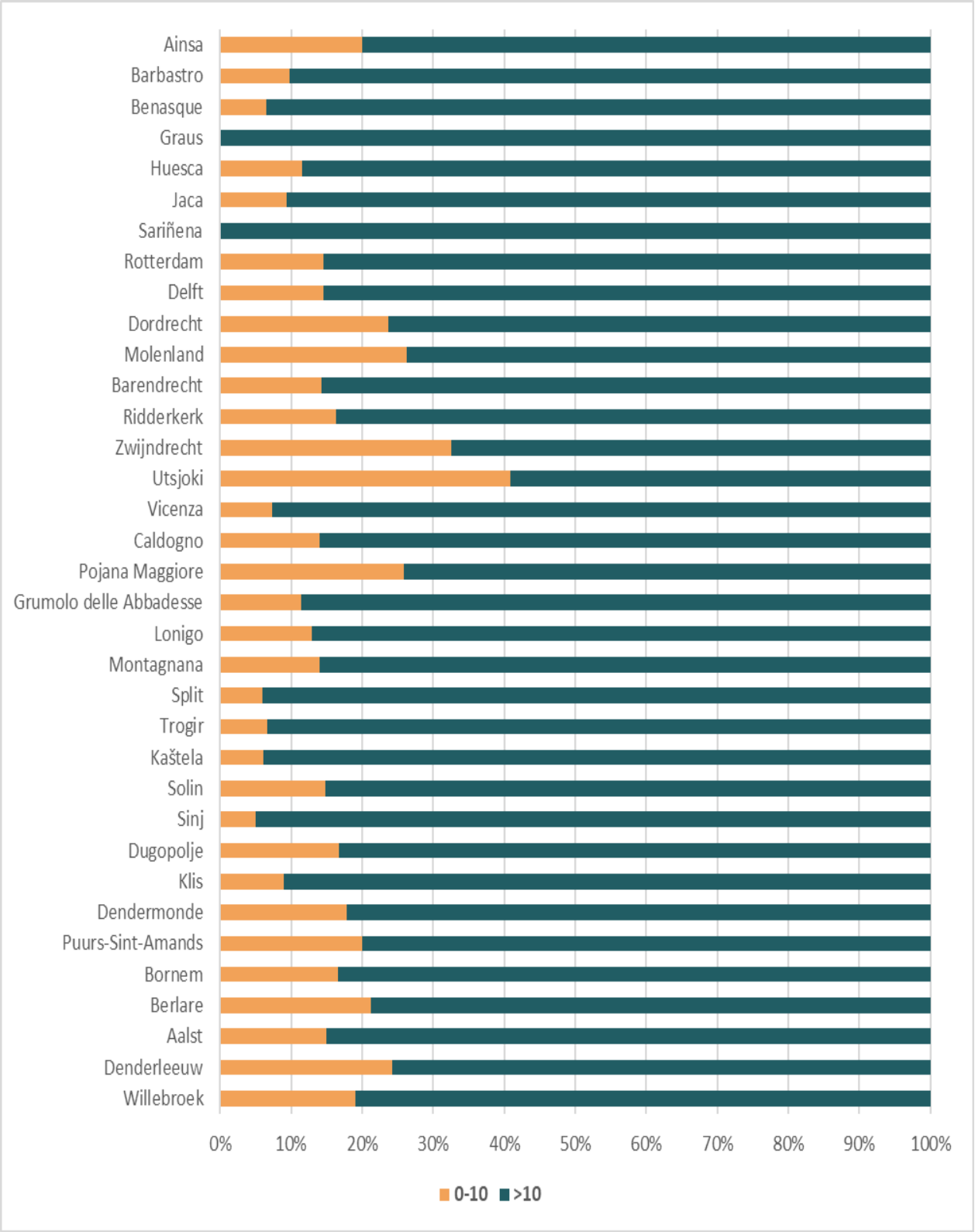

Fig A 4. The share of respondents by the nimebr ofyears living in LAU

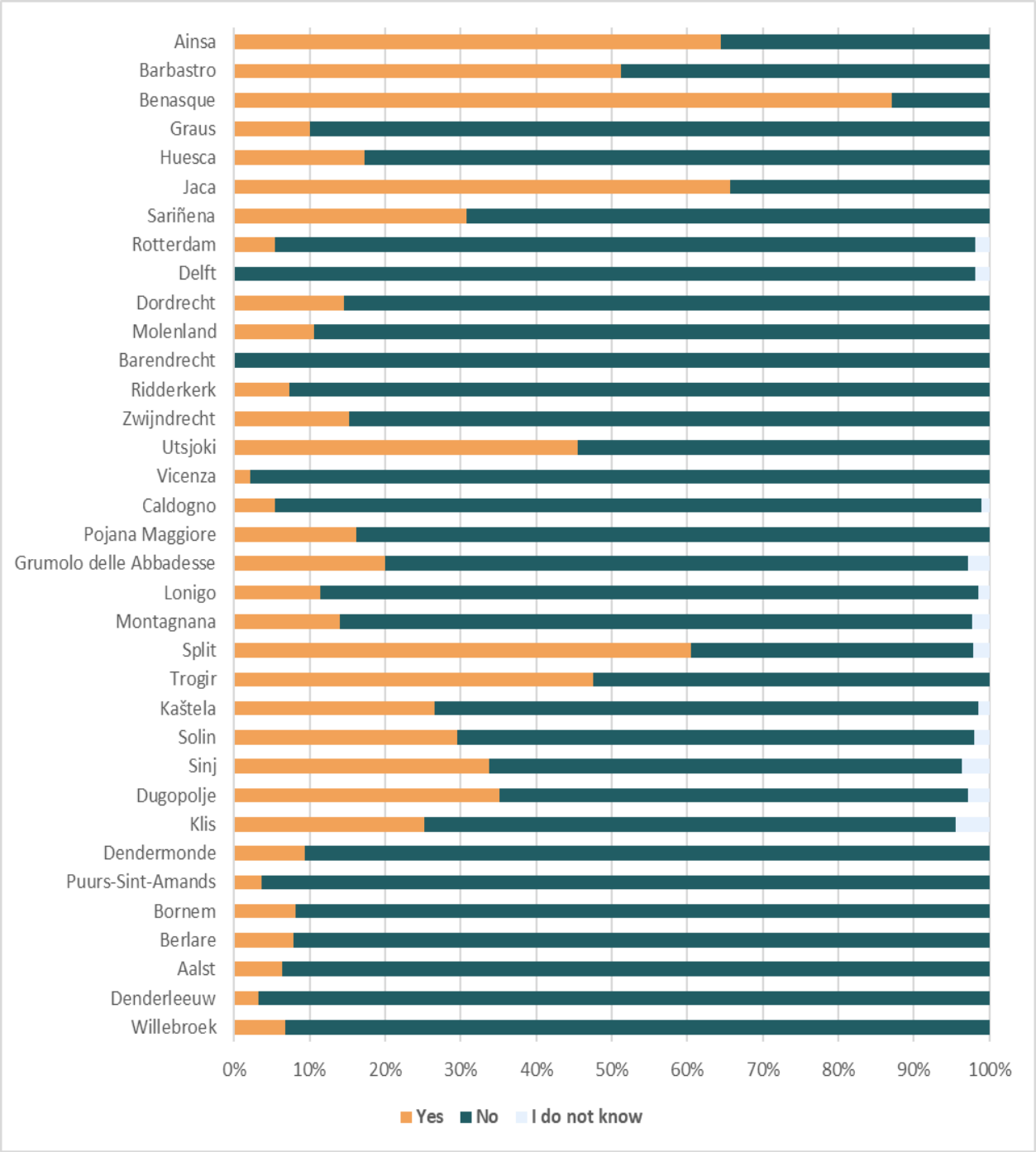

Fig A 5. The share of population whose jobs are associated with tourism

Table A 12. Tripadvisor ratings –mean values

GEO/PARTNERS	cultural satisfaction	restaurant satisfacion	accommodation satisfaction	overall satisfaction
Ainsa	4.33787	3.86838	4.77598	4.32741
Barbastro	4.47816	4.16659	4.40966	4.35147
Benasque	4.75698	4.31042	4.65584	4.57441
Graus	4.24371	3.70794	4.36161	4.10442
Huesca	4.41645	4.18482	4.00095	4.20074
Jaca	4.24550	4.13437	4.03788	4.13925
Sariñena	4.10606	3.61682		3.86144
Rotterdam	4.17730	4.13731	4.14023	4.15161
Delft	4.29470	4.32210	4.34808	4.32163
Dordrecht	4.36839	4.16284	4.48939	4.34021
Molenlanden	4.70109	4.10562		4.40335
Barendrecht	4.02500	4.08261	5.00000	4.36920
Ridderkerk	4.29545	4.11781	5.00000	4.47109
Zwijndrecht	4.00000	4.17137	5.00000	4.39046
Utsjoki	4.26471	4.80128	4.53299	4.53299
Vicenza	4.16852	3.91673	4.11717	4.06747
Caldogno	4.39063	4.04760	3.99219	4.14347
Pojana Maggiore	4.26667	4.25530	5.00000	4.50732
Grumolo delle Abbadesse	3.83333	3.98802	4.00000	3.94045
Lonigo	4.28750	4.07897	4.90566	4.42404
Montagnana	4.32604	4.28230	4.98361	4.53065
Split	4.01058	4.13558	4.51774	4.22130
Trogir	4.15785	4.17265	4.69643	4.34231
Kastela	4.43509	4.25220	3.00000	3.89576
Solin	4.06972	4.18419	4.00000	4.08464
Sinj	4.76056	4.34234	3.50000	4.20097
Dugopolje	3.50000	4.40439	3.00000	3.63480
Klis	4.00000	4.22633		4.11316
Dendermonde	4.08403	4.20177	4.84713	4.37765
Puurs-Sint-Amands	4.33333	4.16452	5.00000	4.49928
Bornem	3.98765	4.44498	4.00000	4.14421
Berlare	3.46324	4.07744		3.77034
Aalst	4.33212	3.88855	3.84963	4.02343
Denderleeuw	4.50000	4.04730	5.00000	4.51577
Willebroek	4.49027	4.15786		4.32406

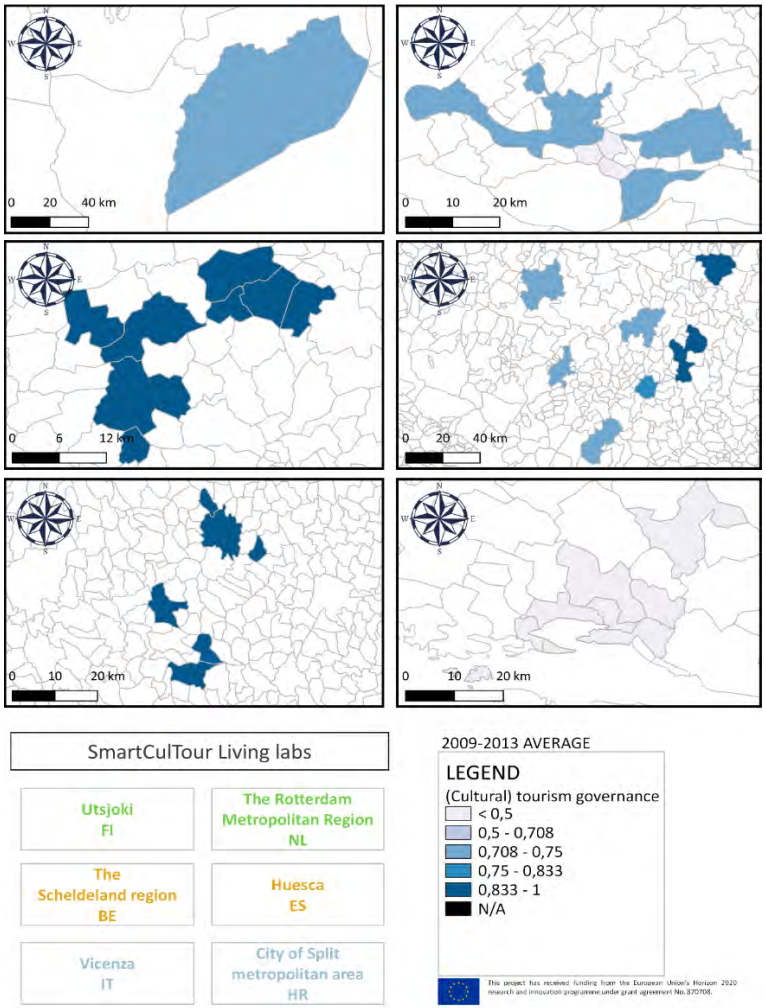

Fig A 6.Cultural tourism governance- CulGovTour_INDEX 2009-2013 (crisis)

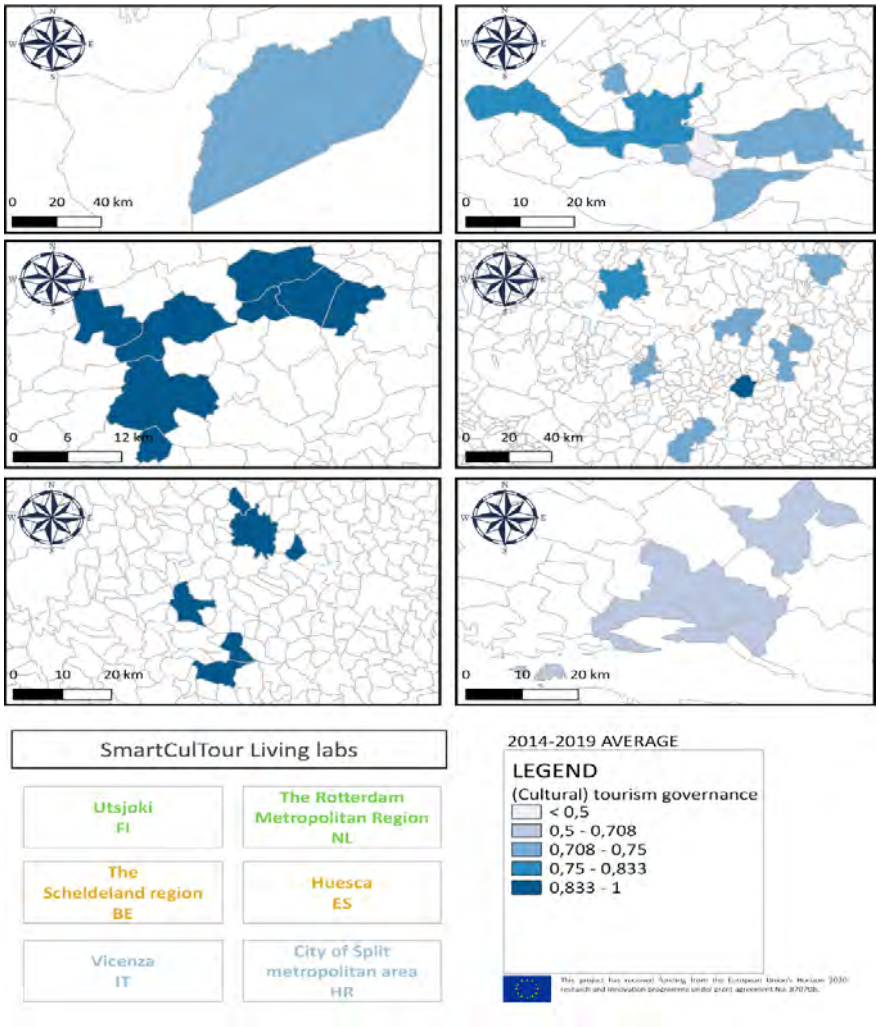

Fig A 7. Cultural tourism governance CulGovTour_INDEX 2014-2019 (recovery)

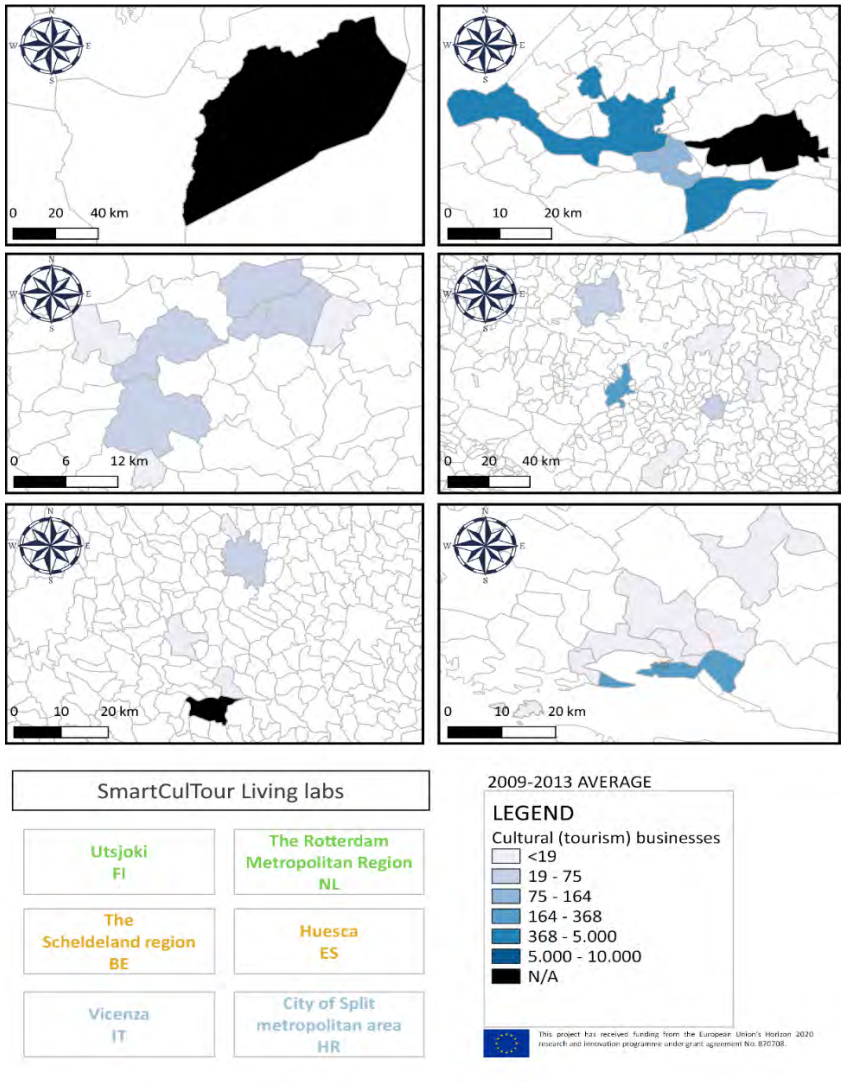

Fig A 8. Cultural (tourism) businesses CulEnt 2009-2013 (crisis)

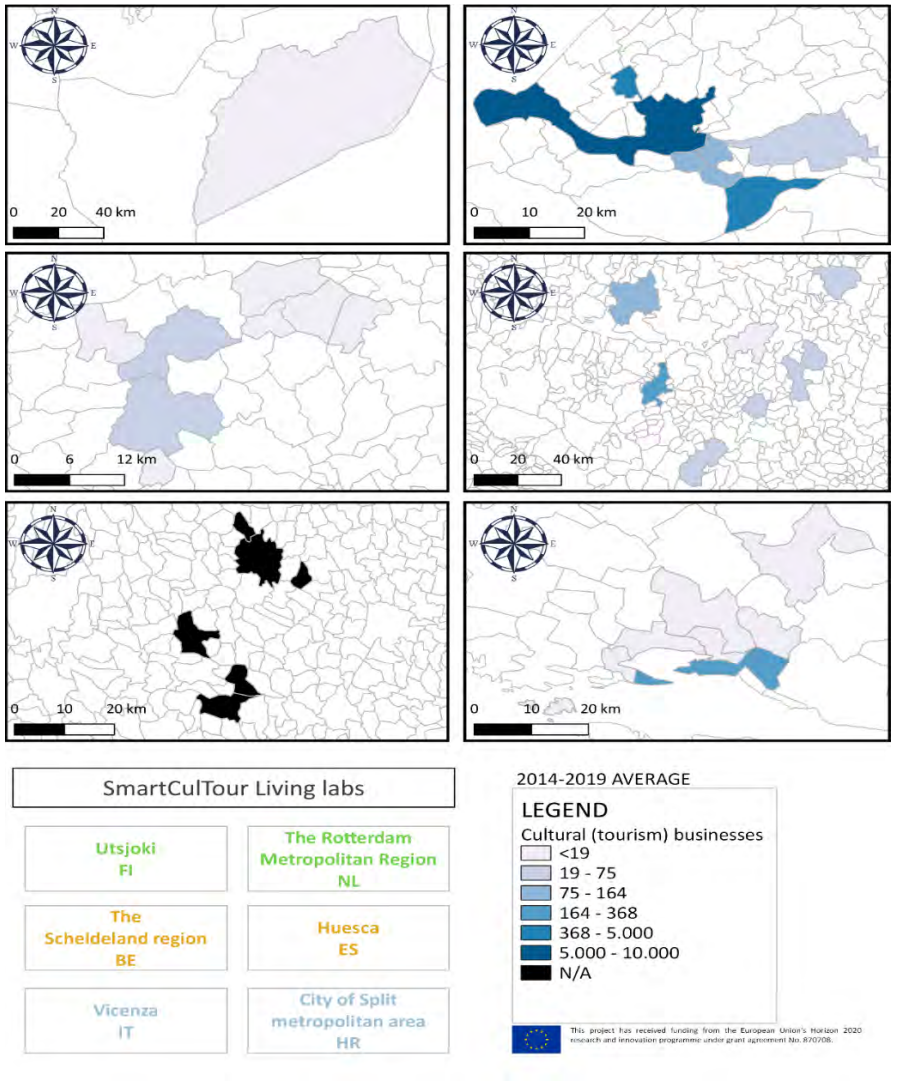

Fig A 9. Cultural (tourism) businesses CulEnt 2014-2019 (recovery)

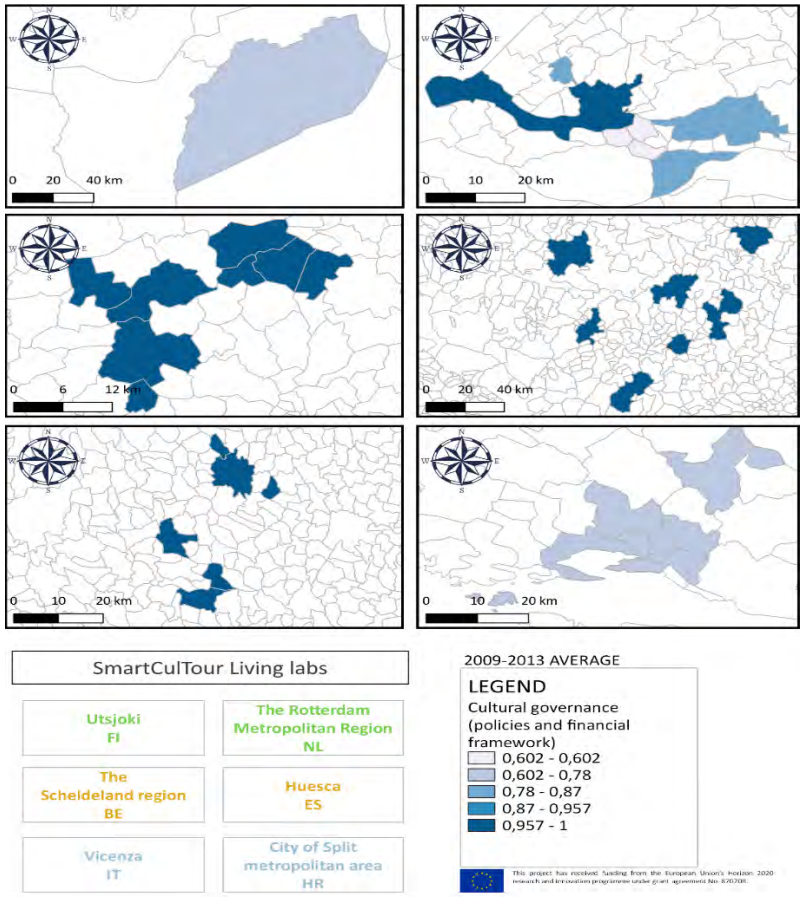

Fig A 10. Cultural governance (policies and financial framework) CulGovPol_INDEX 2009-2013 (crisis)

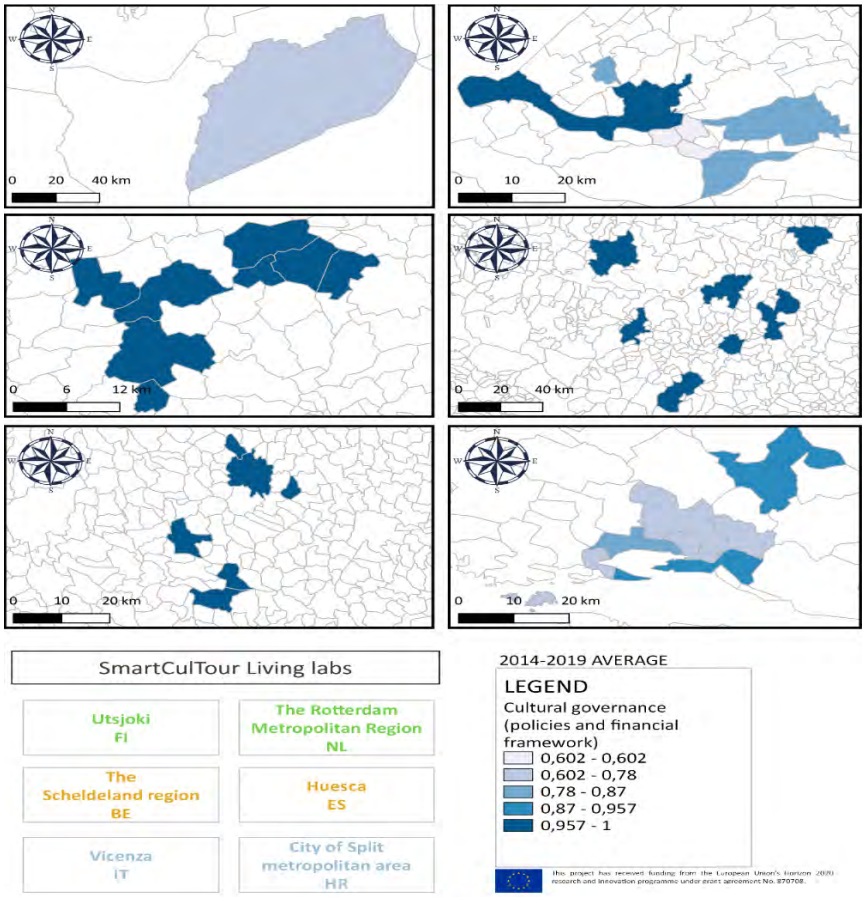

Fig A 11. Cultural governance (policies and financial framework) CulGovPol_INDEX 2014-2019 (recovery)

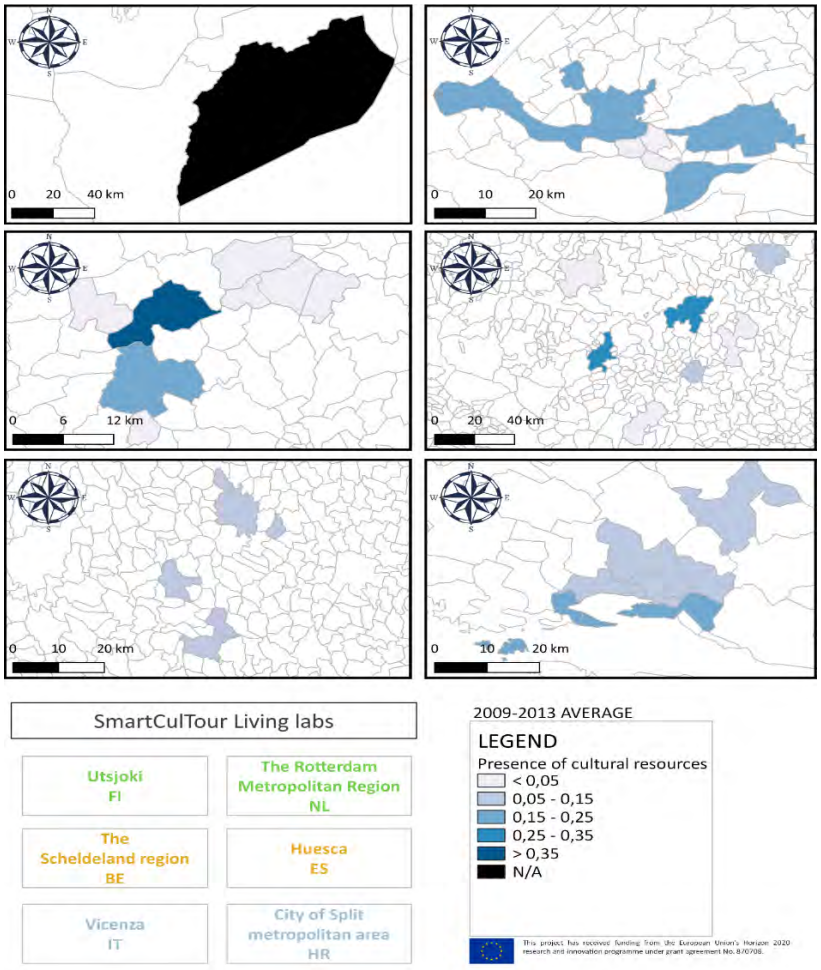

Fig A 12. Presence of cultural resources CulRes_INDEX 2009-2013 (crisis)

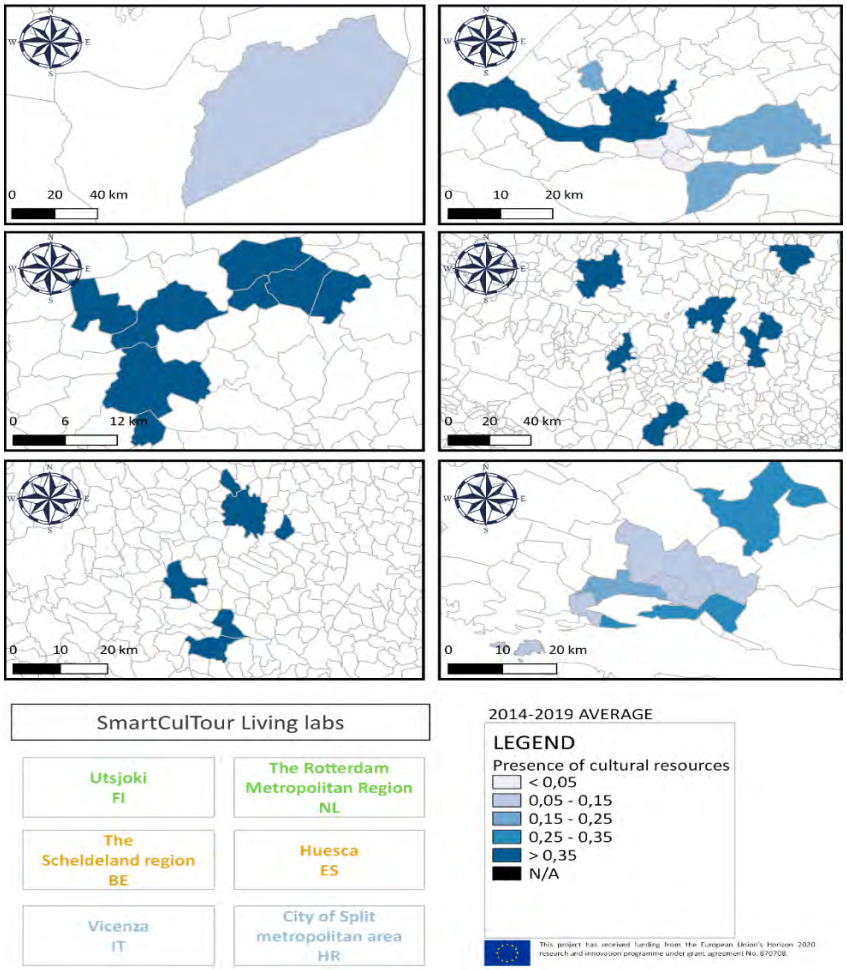

Fig A 13. Presence of cultural resources CulRes_INDEX2014-2019 (recovery)