

S.LI.DES

Smart strategies for sustainable tourism in Lively cultural DESTinations

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Deliverable 3.1.1.

Datahub framework

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INTRODUCTION

Many cultural cities that are big or small tourist destinations currently suffer damaging anthropic pressure on local natural and cultural heritage, especially on the most popular point of interests and during peak seasons or special events.

The concentration of visitor flows in space and time is the most shared problem among these destinations, also in cases where the total amount of visitors over a year is not so excessive if compared with the total population.

The situation is even worse in coastal cities that are also home ports or port of call, like those located along the Adriatic coasts, where cruise tourism often contributes to increase the volume of visitor flows already present in the urban territory, without generating a comparable positive impact in economic terms.

From this point of view, it is important to understand the role that tourism plays and can play within the urban environment, taking into account that cultural cities have not been created for tourism and that tourism interacts with other urban functions, which can promote or inhibit their performances reciprocally. In particular, local identity, typical cultural heritage and productions and, more generally, minor attractions, are at risk of disappearing or of being homogenised by mass tourism.

Given these aspects, there is a growing need:

- on the one hand, to support the development of sustainable tourism practices - through thorough and dynamic knowledge of visitor flows, of their characteristics and behaviour and their mobility patterns, and to strengthen the cities' competitive advantage on the market;
- on the other hand, to revitalise the urban environment and the local economy, promoting but also managing tourism and its relationships with other local activities very carefully, so as to create new job opportunities and to enhance sustainable territorial development, especially in cities/areas that are heavily dependent on tourism.

Taking appropriate decisions requires first of all that city managers and other stakeholders are adequately informed about what is going on in the city. The availability of great amount of data is crucial to have a

comprehensive view of the situation, but it is often hampered by the high fragmentation of sources and by a policy of “closed doors” or “watertight compartments”, where every city sector works separately from others.

Technology innovation can support data sharing, upload and analytics, helping cities to become “smarter”. However, as stated by Lamsfus et al. (2015), a destination is not smart because it makes intensive use of technology, but because it uses technology to have a deeper knowledge of their visitor flows and mobility within the city and employs this knowledge to empower local institutions and industries in order to create advanced policies and services for visitors.

Being aware of the value of data and data analysis for comprehensive monitoring of city tourism within the specific urban context, the partner cities of the S.LI.DES project (Venice, Ferrara, Bari, Dubrovnik and Sibenik) have agreed to plan and build a common knowledge system to support their decision-making processes and to develop adequate transnational strategies, by involving a group of technical partners (Ca’ Foscari University Venice –Dept of Management, Ciset, Turizam, CAST, Ecipa and Uciliste) who would support them in achieving these results, as an evolution and ongoing process that starts with the project.

This document presents the general Smart Destination Ecosystem methodology (one of the main outputs of WP3) and the Smart Destination Datahub (the second main outputs), describing the Datahub framework (Deliverable 3.1.1.).

After the definition of the main objectives of the S.LI.DES project (Section 2), Section 3 provides a short description of each partner city, in terms of main features, specific problems met and information requirements, as well as the potential synergies with EU/national projects the cities have already carried out or are developing in the same period.

Section 4 introduces the concept of the S.LI.DES Smart Destination Ecosystem, in terms of general vision and main structure, while Section 5 identifies the Smart Destination Datahub framework, describes its main features and functionalities, goes into detail of the definition of the dataset and related KPIs and discusses the problems encountered by cities during the data collection.

1. The S.LI.DES project: main objectives

Following the challenges of the Programme Area, the S.LI.DES project aims at supporting the creation of a “Smart Tourism Destination”, helping city managers and other stakeholders of Italian and Croatian cities involved to take informed decisions and to check/assess the results of their decisions.

There are many definitions of Smart Cities as well as of Smart Tourism Destination (see Boes et al., 2016; Jasrotia and Gangotia, 2018). In the case of urban centres that are also tourism attractions these concepts are strictly linked: “smart tourism is a fundamental part of smart cities” (Jasrotia and Gangotia, 2018: 47). According to Buhalis and Amaranggana (2015), a Smart Tourism Destination is a destination that embeds technology having as priorities: the improvement of visitors’ travel experience; the efficient gather and distribution of information; the efficient allocation of tourism resources and the distribution of the sector benefits to the local community.

Following de Lurdes Calisto and Goncalves (2017: 35), “a smart tourism destination is one that responds to the requirements of the present global and mobile elites by facilitating access to tourism and hospitality products, services, spaces and experiences through ICT-based tools and where a healthy social and cultural environment can be found through a focus on the city’s social and human capital. On the other hand, it also implements innovative and entrepreneurial businesses and fosters the interconnectedness of businesses”. Given all these aspects, the main goal of the S.LI.DES project is to develop a common cross-border methodology and strategy to:

1. analyse and assess the sustainable competitiveness of Adriatic cultural cities who are also popular tourism destinations;
2. measure, monitor and manage visitor flows and tourism mobility patterns in congested urban areas through a set of innovative data models and tools, in order to decrease human pressure to heritage sites;

preserve and valorise local identity and (tangible and intangible) typical cultural heritage, with a specific focus on “living culture” (craft activities and Culture and Creative Industries), making these activities a leverage for local economic diversification and sustainable development, which would generate new job opportunities and increased wellbeing for the local community. To achieve these objectives, the project wants to build an integrated knowledge system, supported by innovation technologies (i.e., the Smart Destination Ecosystem

developed in WP3), which should help cities:

- to be aware of the mutual relationships between the development of tourism and of other urban functions as well as of other local activities and services, and then to assess the cities' tourism and non-tourism performances from different urban perspectives (economic, social, environmental, cultural, accessibility and local mobility, etc.) and at different time scales (activity 3.1);
- to be aware of the main characteristics of visitor mobility within the urban environment, with a focus on pedestrian mobility, and monitor it over time and space, taking into account the location of Point of Interests (POIs: not only popular, but also less promoted tangible and intangible heritage), and the effects related to the organization of specific events (activity 3.2);
- within tangible and intangible heritage, to map craft activities and CCIs, which are an important expression of the local identity, and define a sort of "ranking" of these activities according to their tourism potential, in order to promote them as driver of local sustainable development and job creation (activity 3.3).

Core of the S.LI.DES Smart Destination Ecosystem is a multi-dimensional Destination Datahub (activity 3.1), which integrates in a unique repository a huge set of data on each partner city retrieved from different internal and external sources, from the analysis of mobility patterns and the mapping of craft activities, as well as by means of primary data collection. It works as a sort of business intelligent system that collect data and, through specific analytical tools, process and transform them into systematic information, trying also to identify meaningful relationships among data (KPIs).

The outputs of this system are accessible to city managers (and other stakeholders, whether agreed by local decision makers) through a Destination Dashboard (activity 3.4.), a user-friendly panel accessible via Web, which displays the city performances related to different key areas of analysis using tabular and visual reports (tables, meters, graphics, dynamic maps).

The development of specific pilot actions (WP 4) will help local decision makers, on the one side, to implement the Smart Destination Ecosystem and test its effectiveness, starting from the reference state of the art and the scenario provided by the Destination Dashboard; on the other, to use this knowledge to support concrete interventions to promote the tangible and intangible cultural assets that are

acknowledged as an important leverage to enhance the local tourism offer, revitalize the social and economic environment in historical centers as in Bari and Sibenik), reduce tourism pressure and move tourism flows towards peripheral urban areas (as in Venice or Dubrovnik), or also link the city with the nearby rural areas (as in Ferrara).

The results achieved in WP3 and WP4 will support the design of a common S.LI.DES strategy (WP5) to foster sustainability and territorial development in partner cities, but also in all EU cultural destinations, through an increased awareness of the patterns of tourism growth and its relationships with the local urban environment (mutual effects and impacts), the appropriate promotion of cultural tangible and intangible heritage and the smart management of visitor flows. The dynamic decision support system will guide decision makers in the definition of innovative tourism policies to valorize cultural assets in a sustainable way.

2. A short profile of the partner cities: characteristics, data requirements and synergies with other projects

Before going into detail of the S.LI.DES Ecosystem and the Datahub, it is important to describe briefly the context where the project applies. Herewith a short presentation of each partner city, highlighting the relevance of the project for its territory in terms of challenges and opportunities addressed, the coherence with policies and other initiatives taken at local level (i.e., how it can contribute to their implementation) and the synergies with past or current EU and other projects or initiatives the project makes use of.

2.1. Venice

The site 'Venice and its Lagoon' has been inscribed on the UNESCO World Heritage List in 1987 in UNESCO's World Heritage List for the unique and singular nature of its cultural wealth, consisting of its historical, archaeological, urban, architectural and artistic heritage and of exceptional traditions, integrated into an environmental, natural and landscape context that is unique in the world. The Venice Lagoon, one of the oldest and most complex examples of the relationships between human activities and the forces of nature, stratified in centuries of history. It is precisely this exceptional historical identity that has transformed Venice

into one of the international capitals of tourism.

Tourism in Venice is in fact one of main economic resources and it represents a continuous source of cultural exchange, an opportunity for economic growth and an important social resource for the development of the community. The Municipality of Venice, with its 260.520 inhabitants, experiences around 28 million visitors (tourists and same-day visitors) per year, according to the last estimates produced by DAEST- Ca' Foscary University Venice. But the historical center of Venice, which is the main destination of most visitors, only recorded less than 53,000 inhabitants. This implies a dramatic tourist pressure on this area. In the last few years, the tourist phenomenon has completely exploded in terms of mass tourism and day-tripper tourism, calling for a renewed integrated strategy for the management of such a complex resource.

The participation to the S.LI.DES project and the creation of city Smart Destination Ecosystem can support the development of an innovative strategy based on an in-depth knowledge of the tourism phenomenon in various aspects. Firstly, to know the role that tourism plays within the local urban environment, from different tourism and non-tourism perspectives. Secondly, to monitor the volume of visitor flows in different time periods (days, hours during the day, etc.): managing means having reliable information about their number and being able to constantly monitor the access in order to understand if a numerical threshold in specific periods should be introduced. Thirdly, to profile the day trippers and of the overnight tourists, in order to convey in the correct and most targeted way, the variety of the tourist offer of the territory, in order to preserve and valorise local identity and (tangible and intangible) typical cultural heritage, with a specific focus on “living culture” (craft activities and Culture and Creative Industries).

To this aim, since the end of January and the beginning of February 2020, the experimental installation of a network of pedestrian flow detection tools (sensors, cameras and WiFi hotspots) was carried out in 34 sites that fall along the main intercept of pedestrian flows in Venice. The S.LI.DES project will contribute to this experiment, with the acquisition of real-time data, and subsequent analysis, in order to have predictive models of influx in certain areas of the City for the purpose of effective territorial management of flows, as well as to guarantee greater protection of the City. The data, when the system is tested and enters into operation, will be acquired by the Smart Control Room, the integrated system for the control and management of mobility, set up by the City of Venice and within the National Operative Programme for

Metropolitan cities financed by ERDF funds. The information will be processed by a dedicated software: not only data will say how many pedestrian visitors are present at a given moment, but they also allow to predict at what time a critical threshold will be reached and, if necessary, divert visitor flows to another area, in so as not to clog or block pedestrian traffic. The system will also make it possible to intercept the data of the telephone cells and to know the origin of the people, in absolute respect for privacy. In the analysis phase, therefore, we will have the opportunity to understand where visitors come from, how long they stay in the city, distinguish tourists from commuters.

So, the S.LI.DES project integrates well with other EU projects and investments the city is carrying out. In addition to the Smart Control Room, the city is currently carrying out an URBACT III project (Tourism-friendly Cities - Local community & tourists together for urban sustainability), which aims at exploring how tourism can be made sustainable in medium-sized cities, reducing the negative impact on neighbourhoods and areas interested by different types of tourism and its related aspects through integrated and inclusive strategies keeping a balance between the needs of the local community, in terms of quality of life and of services available, and the promotion of sustainable urban development at environmental, social and economic level. Another project is included in the Interreg Central Europe Programme (SlowFood) and is aimed at improving the capacity of public and private actors to safeguard, enhance and promote the gastronomic cultural heritage as an engine of economic and environmental development of the territory. As part of the project, the City of Venice organized, in close collaboration with the main institutions and associations in the area, the festival "SAOR" – to celebrate and enhance the Venetian gastronomic cultural heritage.

2.2. Ferrara

Ferrara lies upon the PO plain in the north of Italy, it is situated 50 km north-northeast of Bologna, on the Po di Volano, a branch channel of the mainstream of the Po River, located 5 km north.

The first modern city and one of the culturally most important Italian Renaissance city states, Ferrara was one of the European capitals of culture, arts, politics, gastronomy, in addition to being a reference point for artists, poets and minstrels. Under the Este domination Ferrara experienced its golden age, hosting the most important contemporary artistic and literary figures and playing a key role in many fields. The city took

shape between the end of the fifteenth century and the beginning of the sixteenth based on a totally new urban design concept by Biagio Rossetti. It ranges from the original medieval core of the city to the spacious Renaissance buildings, the maximum expression of the Este revolution, where wonderful palaces were built as homes for the Lords, still intact and capable of narrating their stories: above all, Palazzo dei Diamanti, Palazzo Schifanoia and the small Marfisa d'Este Palace. UNESCO, the United Nations Education, Scientific and Cultural Organisation, included the territory around Ferrara in its lists on two separate occasions. The historic centre of Ferrara was conferred this honour in 1995, being denominated a "City of the Renaissance". In 1999, the listing was extended to include the area of the Po Delta and the "delizie" court residences.

In 2018 Ferrara recorded about 255,000 tourism arrivals and about 476,000 overnight stays over a population of 86,000 inhabitants, which highlights a lower tourism pressure in comparison to other partner cities, like Venice or Dubrovnik. But same-day visitors have also to be taken into account, whose number can be huge during special events (e.g. Buskers festival at the end of August) or in occasion of important art exhibitions at Palazzo dei Diamanti. The visitors' flows tend to concentrate within the ancient walls, and particularly in the central historical area.

Given all these elements, the relevance of the S.LI.DES. project for the city of Ferrara concerns mainly three aspects:

- The opportunity to set up a permanent multidimensional data repository of the city (economic, tourist, cultural, social, environmental, etc.), which aggregates data coming from different local sources and help to monitor tourism and non-tourism performances;
- The possibility to use innovative technologies and simulation models aimed at understanding the needs and movements of visitors and tourists. Through new tools and the development of an appropriate mobility model, the main objectives are the quantification of visitor flows, the analysis of main routes and the visitors' travelling modes, the reconstruction of realized routes and the deduction of the method of arrival of tourist flows;
- The promotion and requalification of the city's tangible and intangible heritage. In fact, the project aims to enhance the local tourism offer, to revitalize the social and economic development in historical center and to transform the cultural assets in valuable resources.

Regarding the second aspect, the project exploited, in a tourist perspective, the data collection and the digitization work carried out by the Municipality of Ferrara but also the activities of CitiEnGov project, aimed to integrate all data into a single information system.

As for the third aspect, the project is developing and following up on an important past activity of the

Municipality of Ferrara, aimed at enhancing the historical shops in Ferrara and discovering the historical identities which characterize the city in view of enhancing the touristic offer. This action could also identify a city tour through its historical shops and knowledge of products which have defined the history of the city. About that, the S.LI.DES. project makes use of other EU projects involving SIPRO, as for example ADRION 5 SENSES, which, through experimental itineraries on the 5 senses within the territory, aims to promote the knowledge of its cultural and natural heritage and to support new experiences of experiential tourism.

2.3. Bari

Bari is Puglia's regional capital and plays a fundamental role in connection with other Mediterranean countries thanks to the strategic role historically played by its port and currently played by its airport and international trade fair Fiera del Levante. Stretching along the Adriatic Sea, Bari boasts Italy's longest seafront, studded with majestic palaces typical of the elegant Murat district and narrow alleys typical of the suggestive historical centre. These captivating characteristics make Bari one of the favourite destinations in Puglia, as data of the last years have confirmed. First in Puglia for number of arrivals in 2019 (487.732), in the same year Bari was second only to Vieste in terms of presences (916.937). In the last 5 years, Tourism in Puglia has had an increasing bearing on the regional GDP, reaching a value of 75 million of euro in 2019. The S.LI.DES project represents an important opportunity to support Bari as a cultural destination. The creation of a Smart Destination Ecosystem helps city managers to analyse the multilevel performances of the city and to monitor and manage visitor flows, especially in peak season, also with the presence of cruise tourism. Thanks to the project, the Municipality of Bari will also adopt smart cross-border strategies aimed at developing the cultural elements that make its destination unique and will respond to the challenge of preserving the local cultural heritage at risk. At the same time, the improved cultural heritage will act as a catalyst for a more sustainable territorial development and a more balanced tourism in terms of seasonally adjustment.

S.LI.DES perfectly fits the frame of innovative initiatives taken by the Municipality of Bari in this field, such as the integrated metropolitan system of fruition (BARI GUEST CARD), which offers visitors a smart telematic system promoting cultural itineraries, arranging reception with local operators and making the local cultural

resources fully available. Also, the city has been making investments in innovative plans in the touristic field, for example the creation and the promotion of the official city brand - “Bari Never Ends” – aimed at giving to Bari a fresh and unique visual identity.

Finally, in addition to the local initiatives, S.LI.DES is in synergy with other European cooperation projects the Municipality of Bari is involved in, for example “Creative Camps”, funded by Interreg V-A Greece-Italy 2014/2020. The objective of the project is to develop innovation between agro-food and creative companies in Puglia and Greece, sustaining the local development and strengthening the cultural heritage, in line with the aims of SLIDES. Another relevant past project is ATRIUM PLUS, funded by Interreg V-A Italy-Croatia 2014/2020: the touristic valorisation of the cultural heritage left by the Fascist regimes in Bari became a local attractive element and an innovative cultural tourist product.

2.4. Dubrovnik

Dubrovnik is a city on the Adriatic Sea in southern Croatia. It is one of the most prominent tourist destinations in the Mediterranean Sea, a seaport and the center of Dubrovnik-Neretva County. Its total population is 42,615 (census 2011). In 1979, the city of Dubrovnik joined the UNESCO list of World Heritage sites. The prosperity of the city was historically based on maritime trade; as the capital of the maritime Republic of Ragusa, it achieved a high level of development, particularly during the 15th and 16th centuries, as it became notable for its wealth and skilled diplomacy. Thanks to its historical sites, infrastructure and views over the Adriatic, Dubrovnik has grown into a top European tourist destination in recent years. It also gained its popularity amongst Hollywood movie industry, as it became one of the most wanted filming locations in this part of Europe (hosting The Game of Thrones serials, Robin Hood movie, etc.)

The growing popularity over time has also brought an uncontrolled rise in crowds. Dubrovnik’s Old Town and cobblestoned streets have found themselves overwhelmed by tourists, concentrated in the locations of greatest interest.

Due to the new challenges facing Dubrovnik, the first phase of the Tourism Management Strategy in the City of Dubrovnik was adopted in 2018, and it resulted in a draft Management Plan for the Protected Monumental Entity of the City of Dubrovnik, all with the aim of sustainability in managing public areas,

traffic, city infrastructure and city resources in general.

The main objectives of the S.LI.DES. project fit very well into the Respect the City initiative, a multidisciplinary strategic destination management project with an action plan. It comprehends a set measures and activities focused on Dubrovnik as the leader in sustainable and responsible tourism in the Mediterranean. Aside from RTC, Dubrovnik was also involved in different transnational projects aimed at sustainable tourism management.

Through the WiFi4EU initiative, high-quality free internet access was provided for citizens and visitors via Wi-Fi access points in Dubrovnik. Furthermore, a number of access points were installed in the City center within AlterECO project (Interreg Med programme), collecting data from mobile devices going through their range. The data collected via access points served as an indicator of the WiFi demand at the historical core, predictive model of the number of visitors, as well the predictive model of *Dubrovnik Card* users. Through these two projects, a network infrastructure has been created in the City through which data on movement can be collected. Within the synergy between WiFi4EU, AlterECO and S.LI.DES. project, the existing network of access points will be upgraded and the number of WiFi sensors integrated. This will provide the City with the possibility to manage visitor flows more efficiently, moving them towards less crowded areas also by promoting the value of the local craft production.

Another interesting synergy is with the HERIT DATA project (Interreg Med programme), which was aimed at reducing negative impact of mass tourism on cultural heritage sites, cities and monuments. The aim was achieved by collecting data from Dubrovnik people counter system, a tool that collects information about the actual number of people within Dubrovnik historic core as well as their behavior in different parts of the day. The visitor counting system consists of six counting cameras placed on all entrances and exits of the historic core. Data collected from the cameras is updated every 15 minutes and it will be streamed to platform developed within HERIT DATA project.

2.5. Sibenik

Sibenik is an administrative, cultural and economic centre of Sibenisko kninska county located in the central part of Croatia Adriatic coast. The County has approximately 99.663 inhabitants according to Eurostat data from 2019 and Sibenik has approximately 35.000 citizens according to the Census from 2011. Previously known

as an industrial town, in the past 30 years the focus of city economy is mostly on tourism and hospitality services thanks to its good climate, plenty of historical and cultural monuments, natural beauties in the surrounding area and favorable location in between two airports (Zadar and Split). Dating back to 11th century, Sibenik is today known for its two UNESCO World heritage sites (St. James Cathedral and St. Nicholas fortress) as well as a gateway for National park Krka and National Park Kornati.

In the past 10 years, the municipality of Sibenik and its various stakeholders are very active in implementing EU funded projects, many of which focus on diversification of the tourist offer (HERA cultural routes, Adriatic IPA Programme 2007-2013), improvement of infrastructure (UrbEco, LIFE project; INTERMODAL, Adriatic IPA Programme 2007-2013), valorization and preservation of nature (The Unknown Krka: Hidden Treasures of the Upper and Middle Courses of the Krka River, Visitors Management Center of the Krka National Park, co-financed by the Operative Programme Competitiveness and Cohesion 2014 – 2020.), etc.

The implementation of the S.LI.DES project carried out by the Sibenik Tourist Board as partner comes at the right moment as an important mean of preventing the seasonal overcrowding and emphasizing the importance of maintaining the local trade and crafts alive and vibrant. Various local stakeholders work on preservation of local traditions, both tangible and intangible and the S.LI.DES project will contribute to support all those various existing practices, as well as to encourage the development of new experiences for tourists. Bike routes, cultural and historical routes, gastronomy and various events contribute to the overall positive experience of Sibenik as travel destination. Various new initiatives by local enthusiasts and entrepreneurs contribute to create the mix of experiences among which tourists can find the best fit for their needs. Two fortresses (Barone and St. Micheal) offer numerous programs ranging from concerts by acclaimed music artists, theatre and dance performances, open air cinema and other events which are well received both by locals and tourists.

Accommodation varies from 4 star hotels, resorts, camps, hostels, private apartments and rooms with huge variety of options among which all type of guests can find their fit. Sibenik is also a hub for charter boats and increasingly offering sailing experiences alongside the other numerous marinas in the County. Sibenik as a city focuses on tourism and sustainable growth, which is in line with the S.LI.DES project, whose aim is to make the city a smart tourist destination in which all resources are going to be used in wise, complementary and sustainable manner. The S.LI.DES project has obtained the full support of the Mayor and local

administration for its implementation. With the creation of the Smart Destination Ecosystem and the Destination Dashboard the city envisions the opportunity to gather and maintain all key data on city performance, which can be useful for various stakeholders to deal with current issues as well as preventing unwanted developments. This because, as many other seasonal tourist destination, Sibenik risks to become overcrowded in the peak of summer season, taking also into account cruise tourism.

City of Sibenik is currently finalizing huge infrastructure improvement of roads, parking lots and internal organization of historical centre. All these actions combined with the purchase of cameras for safety measures by the City and of cameras for monitoring daily visitor flows, through the S.LI.DES project, can considerably contribute to future smarter management of tourist flows in the historical centre and improved tourist experience of destination.

3. The S.LI.DES Smart Destination Ecosystem: general vision and main structure

Following the Smart City and the Smart Tourism Destination concepts, the main goal of the S.LI.DES project is to develop a Smart Destination Ecosystem for Adriatic cultural destinations.

3.1. The general vision

The Smart Destination Ecosystem aims at being an integrated knowledge system, supported by innovation technologies, which helps partner cities and other cultural destinations located along the Adriatic coast:

- analysing and monitoring their tourism and non-tourism performances over time;
- measuring and managing visitor flows, through the monitoring of local mobility patterns;
- strengthening their competitive advantages through the promotion of local identity and tangible & intangible ‘typical’ heritage;
- enhancing the quality of life for the resident community and the quality of visitor experience for tourists;
- ensuring local competitiveness and long-term sustainable development (“sustainable competitiveness”)

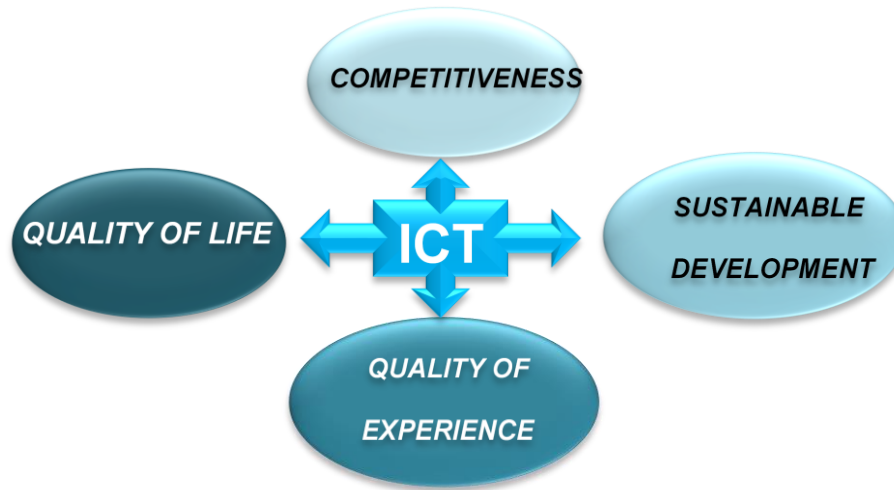


Figure 1. ICT as a driver of development

This vision derives from the acknowledgement of the complexity that characterizes a city who is also a popular cultural tourism destination. Unlike seaside or mountain resorts, which usually develop around a primary resource (e.g., beautiful sea and beaches, a typical panoramic view), cities are not created for tourism. “Tourism activities interact with other urban functions as part of a system of overlapping flows and relationships. Besides, cities are places in motion, nodes of dynamic networks of different physical and virtual ‘mobilities’ (tourists, residents, businesses, capitals, investment, culture, knowledge, etc.) (Castells, 2000), which constantly reshape the urban space, the organization of tourism practices and the city image and brand” (Minghetti, Montaguti, 2010, p.171) (see Figure 2.). Tourism is a component of this complex system of tourism and non-tourism mobilities.

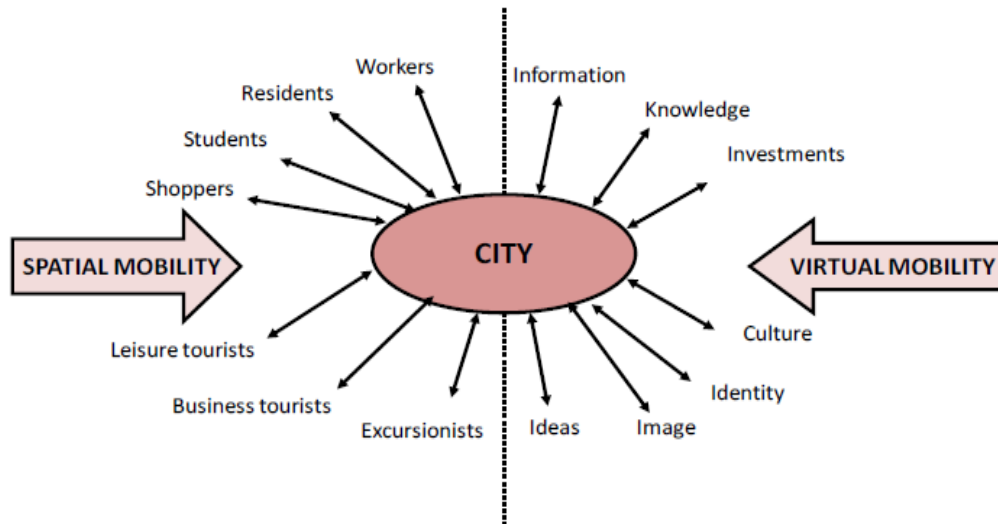


Figure 2.¹ City's complexity

Not only the tourism potential and the performance of a city depends on the attractiveness of core resources (historic, cultural, etc.) and the quality of tourism-related facilities (hotels, restaurants, transports, etc.), but also on how the city develops in the other urban functions and becomes attractive from different perspectives (e.g., economic potential, international presence, capacity to attract innovative productions, cultural liveliness). This means to take into account the evolution of both tourism and non-tourism related 'mobilities' (economic, social, cultural, environmental, etc.) and their mutual relationships (Minghetti, Montaguti, 2010a and 2010b).

In this context, the main issue is how to achieve 'sustainable competitiveness', by combining the valorization of the tourism potential with an appropriate use of the city, to the benefit of all communities involved: residents, visitors and other city users.

Given all these elements, the adoption of a multidimensional approach is needed, in order to analyze and monitor city sustainable competitiveness dynamically, and to address appropriate policies and actions.

¹ Source: Minghetti and Montaguti, 2010.

3.2. The Ecosystem main structure: the components

The S.LI.DES smart Destination Ecosystem is formed by four main building blocks (components), corresponding to the activities carried out in WP3. Namely:

- 1) The Smart Destination Datahub (activity 3.1.)
- 2) The destination mobility models, with a focus on pedestrian mobility (activity 3.2.)
- 3) The mapping of tangible and intangible cultural heritage, with a focus on craft activities (activity 3.3.)
- 4) The Destination dashboard (activity 3.4.)

The first three blocks are strictly connected. The design of the mobility models requires the use of some economic, social, tourism and mobility data included in the Datahub (e.g., on local population, on the evolution of tourism flows and their distribution by mode of transport). At the same time, the results of the analysis related to mobility models provide additional information on local mobility patterns (in particular pedestrian mobility) to be added to the Datahub.

In the same way, the data collected through the mapping of tangible and intangible cultural heritage, and in particular on the number, evolution and typology of craft activities and CCIs, contribute to populate the related section of the city Datahub.

The Destination Dashboard is transversal to all blocks, in that it translates the outputs of previous activities into user-friendly knowledge for city managers. The panel layout displays the city performances on different aspects using tabular and visual tools (graphics, dynamic maps).

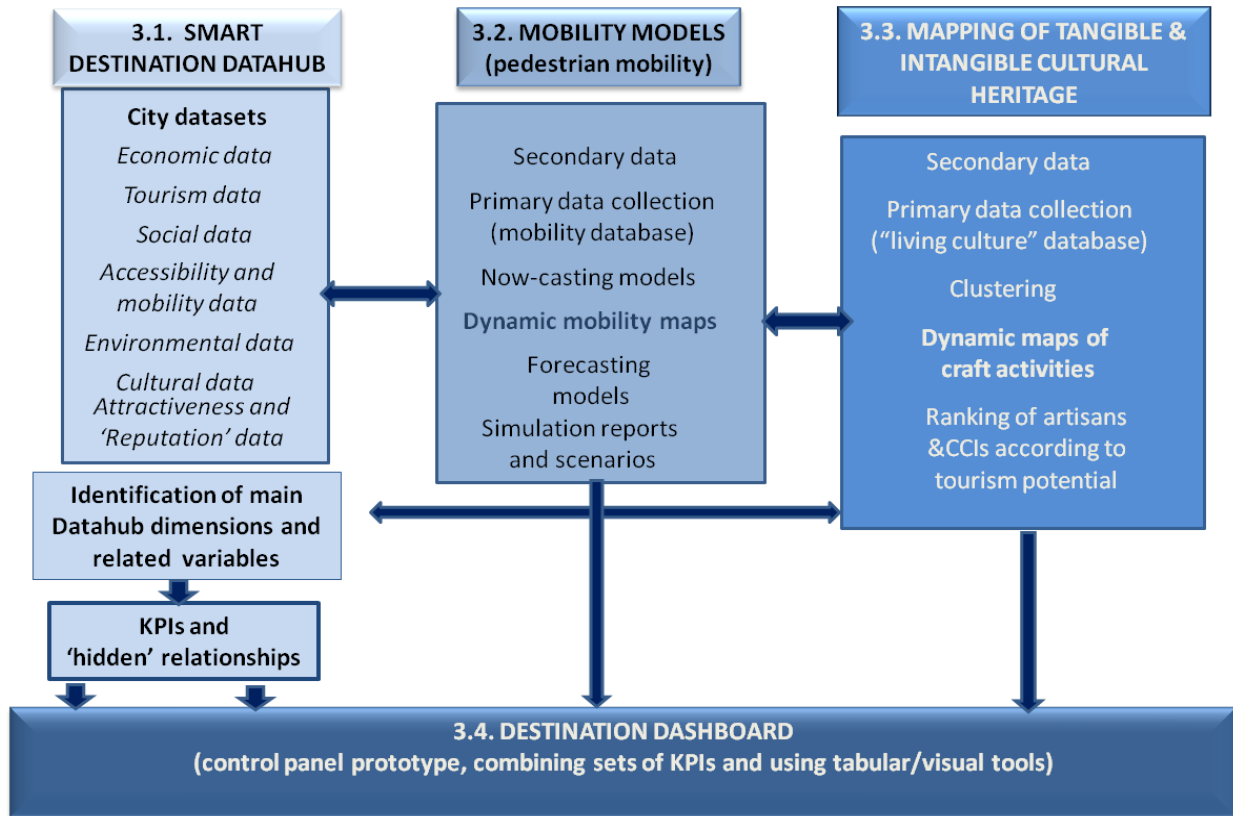


Figure 3. An overview of a Work package 3

In detail, the Ecosystem - in particular, the Datahub and the mobility models and the related analytical tools - aims at supporting four main applications:

1. Time series analysis: analysis of a single phenomenon or of a number of phenomena and their evolution over time, and analysis of the relationship between two or more phenomena and their evolution over time, through the integration of different data sources, in order to identify possible proxy relations among data. This kind of analysis points out the correlation between the time evolution of different phenomena and their causal-effect relationships. For example, the correlation between the evolution of waste production and the evolution of tourist flows in a specific time span and in a given area; the comparison between the evolution

of tourism flows provided by the local tourist office in a stated time period and the evolution of city searches on Google Trends in general and under the item “travel” in the same period or in a previous period.

2. “What’s happening?” Analysis of the present situation in each city, from different perspectives, in a specific time span or in real time. This application enables, for example, to outline a simultaneous picture of the city from different perspectives (economic, social, etc.), and of the role of tourism in this context. Through specific indicators and proxies, the Datahub (and the Dashboard) allows city managers to have a synthetic profile of the city in a screenshot and, unlike traditional research reports, to monitor their evolution over time. Concerning visitors’ accessibility and mobility, the application enables to analyze and monitor them during a day or another time span, both on foot and on urban transport, and to provide a dynamic mapping of their evolution within the urban territory.

3. Now-casting, forecasting and customized simulations As mentioned in the example of Application 1, the cross analysis of data on tourist flows and of searches on Google Trends can support the development of appropriate simulations, which can help city managers to assess how many city “lookers” can become city visitors in the specific time span, and also what they are interested in (e.g. hotels and other accommodation, cultural heritage, specific attractions, restaurants), taking into account the most used search queries and the queries that have recorded the highest growth in the period analysed. Regarding specifically tourism mobility flows and patterns, the mobility models provide short time forecasting of the tourist flows in the whole area, starting from real-time data sources (empirical observations) when available, which support the design of possible realistic scenarios (what happens if...) concerning the evolution of mobility in different conditions and also to study the effects of changes in the governance of mobility at local level, as a consequence of specific decisions taken by policymakers.

4. Analysis of impacts: this application enables to assess the economic and environmental impacts of tourism in the city, according to different indicators: e.g. the level of tourism specialization of the local economy and of the business environment; the share of waste production generated by tourists on total production per inhabitant; the share of water consumption and energy consumption generated by tourists

on total consumption per inhabitant; the concentration of visitor flows and then the level of anthropic pressure in fragile contexts.

4. The S.LI.DES Smart Destination Datahub

4.1. Main goals and the general vision

As mentioned before, the core of the Smart Destination Ecosystem is a multi-dimensional **Destination Datahub**. Its scope is to integrate, in a unique repository, a set of data on each partner city (economic, social, tourist, accessibility and mobility, environmental, etc.), which can be available as open data or actually scattered in a number of different territorial sources (local/county/national datasets/databases) - managed by public or private bodies -, but also those that can be retrieved from external sources (e.g. offline and online datasets, or mobile phone data), as well as the data that can be obtained through primary data collection, using specific devices (e.g. video-cameras, beacons, etc.) or direct surveys.

According to the Open Data Guide (Dietrich et al. 2012, p. 6), open data distinguish themselves from other data in that they can be freely taken by anyone, and whose main characteristics are as follows: availability and access; re-use and redistribution; universal participation and machine readability.

The original project idea, briefly described in the AF, states that the Datahub includes static data, dynamic data and real-time data, and operates as a business intelligence system. This means that it should automatically upload data from different internal and external sources, according to the different time span stated in the planning phase (annually, monthly, daily, etc.) and, through specific analytical tools, processes and transforms them into systematic information. In particular, not only these tools are planned to calculate pre-defined Key Performance Indicators (KPIs) from structured statistical data, but also to look for meaningful relationships among data coming from different sources (structured and semi-structured data).

At city level, the repository firstly includes the data stored in:

- Municipality departments;
- Other public offices (e.g., local tourist office);
- Public companies controlled by the Municipality (e.g., water companies);
- Private companies located in the city (e.g., airports).

The system can also include city-related data, such as those:

- stored in county/regional or national datasets/databases (e.g., the regional or national statistics offices in Italy, the county or national statistics office in Croatia);
- retrieved from external private sources (e.g., transport data, mobile phone data);
- collected in the city through primary data collection (e.g., data on visitors' mobility patterns retrieved by using video-cameras, beacons or other devices; data on visitor profile or visitor satisfaction collected through field surveys).

During the development of the project, it was decided to further enhance the system following a “Big Data perspective” and then to retrieve a set of data on partner cities also from external online sources. In particular, from the most important search engine (Google Trends) and from one of the major international tourism platforms (Tripadvisor). The data from Google Trends were available for free, while those from Tripadvisor were accessible through an annual license contract. The agreement with Tripadvisor, signed by the LP, was not foreseen in the AF and thus represent a change to it, but all partners acknowledged and shared the importance to integrate these data in order to add value to the Datahub and to support the development of the mobility models and the dynamic mapping of tangible and intangible heritage.

Table 1 summarizes the main typologies of data sources according to type of ownership (public vs. private) and territorial scale and gives some examples.

Type of sources/ Territorial scale	Public sources	Private sources

Local level	<ul style="list-style-type: none"> • Municipality departments • Other public offices • Public companies controlled by Municipality 	<ul style="list-style-type: none"> • Private companies
Regional/county level	<ul style="list-style-type: none"> • Regional/county bureau of statistics • Chambers of Commerce 	<ul style="list-style-type: none"> • Transport companies (e.g., airports)
Country level	<ul style="list-style-type: none"> • National bureau of statistics (e.g., ISTAT in Italy) 	<ul style="list-style-type: none"> • Transport companies (e.g., railways) • Mobile companies
International level	-	<ul style="list-style-type: none"> • Search engines (Google), Online platforms (Tripadvisor)

Table 1. The main typologies of data sources

4.2. The data inventory: the approaches adopted

The approach adopted to build the Datahub combines a top-down and a bottom-down approach. Following the top-down approach, the S.LI.DES technical partners have defined the general framework of the Datahub, starting from a thorough inventory of the existing city indicator systems developed at local, national and international level, with a focus on those created to assess city sustainability, city “smartness” and the role of cultural and creative sectors in the urban environment.

The basic idea was to capitalize on existing knowledge and use indicators mainly derived from existing indicator frameworks. New indicators were created only if no existing indicator was fit for measuring the desired effect.

The data inventory was divided into three main steps:

1. Review of academic literature on the development of city/destination system of analysis to assess its competitiveness/sustainability, with a focus on those based on a set of indicators;
2. Investigation of general cities indicator systems related to smart cities, sustainable cities and cultural

cities;

3. (If available) Check of existing indicator systems in partner cities and/or data sources already developed by cities in other EU and non-EU projects.

The literature reviewed includes studies and models as well as analyses and indicator systems produced or promoted by international/national public and private bodies (World Bank, WTTC, WEF, UNWTO, UNESCO, European Commission, etc.), covering different urban aspects or focusing on specific topics (e.g., environment, culture, innovation). Some of these systems had already been tested on specific cities/destinations, so it was possible to assess pros and cons of the methodology applied (see Appendix A for a list of scholar and businesses references).

The scope was to have a thorough overview of the ‘state of the art’ in this field, from which to draw on knowledge about different approaches/methods and indicators and then to design an appropriate SLIDES destination Datahub. Indicators are a key tool for driving science-based urban planning and management and support city policies and strategies, from different perspectives.

As a result of the investigation, more than 200 type of data/indicators were found, divided into the general categories characterizing the city profile (economic, social, environmental, transport, accessibility, culture, tourism, etc.) (see Appendix B).

This investigation led to identify the main dimensions/key areas of analysis of the Smart Destination Datahub. The identification takes inspiration from the work carried out by Cohen (2011) on the Smart City Wheel, which defines six dimensions of “Smartness”, namely: Smart Governance, Smart Environment, Smart Mobility, Smart Economy, Smart People and Smart Living.

The process implemented was as follows:

- reorganise the different categories into 5 main dimensions/key areas of analysis, according to a revised version of the Cohen’s smart wheel (Smart Economy, Smart people/society, Smart environment, Smart accessibility and mobility and Smart living: see Section 5.3.), following the project objectives and the need to have a city multi-dimensional perspective, according to what discussed in Section 2. Smart Governance was not included in our framework. Most data regarding the tourism

phenomenon (demand, supply and economic value), as well as craft activities and CCIs, were included in the Economic dimension, so as to highlight the value they have for partner cities. But it was also acknowledged that they are transversal to all dimensions, since they have important social, cultural, environmental and mobility impacts;

- for each dimension/key area, identify the aspects considered as most significant to be analyzed, the variables/indicators to be built (pre-defined indicators) and the related raw data to be collected. As mentioned at the beginning, the knowledge system was also built-in order to check the presence of other 'hidden' relationships among data, through the application of appropriate data analytics techniques.

The top-down approach was then matched with a bottom-up approach.

The five partner cities or the partners representing them were asked to check the technical partners' proposal, to express the cities' information requirements about the Datahub and, once agreed on the general framework, to act as "data collection hub" at local level. Their tasks were to:

- identify the data available and the main data sources, according to the agreed Datahub framework;
- investigate projects/initiatives already developed at local level (existing data and/or indicator systems and dashboards);
- involve main local stakeholders and data owners, in order to ensure a regular data feed.

Regarding the last point, a roadmap for the creation of LGSs (Local Group of Stakeholders) was produced by the LP and delivered to cities. The document suggests in more detail the need of stakeholders' involvement in the building of the Datahub as well as in the development of the other activities included in WP3 as in WP4 and gives indications for building and coordinating the group.

4.3. The Datahub framework: main dimensions/areas of analysis and the type of indicators/variables

4.3.1. The key areas of analysis

Following the process described in the previous section, the Figure 4 shows the main dimensions of the

S.LI.DES Datahub, which represent an equal number of key areas of analysis to check and monitor the performance of an urban Smart Tourism Destination.

As anticipated, in the initial design of the Datahub, the data and variables related to tourism aspects and to craft activities and CCIs were included in the Smart Economy area, so as to highlight the value they have for partner cities. However, in the S.LI.DES dashboard, the organization of the key areas of analysis was completely revised in order to enhance its role as knowledge and user-friendly tool for city managers. In particular, separate sections were created for tourism and culture-related aspects (tangible and intangible assets, including crafts). For further analysis and discussion, see Deliverable 3.4.1.

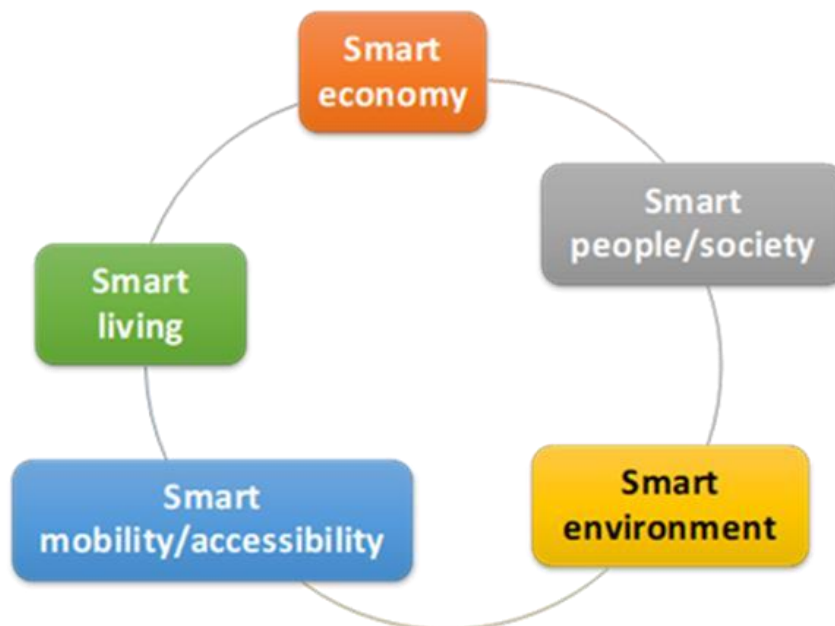


Figure 4. The main dimensions of the S.LI.DES Datahub

Focusing on each dimension, the “*Smart Economy*” area lists the variables/indicators and related raw data that measure the wealth of the city and its capacity to be an innovative “economic engine” and the role of tourism and crafts in this context. Variables like the level of diversification and of innovation/specialization of the

economy, the evolution of new entrepreneurship have been identified as significant, as well as the performances of tourism, from the demand and supply side, the importance of tourism for the local economy and the business structure and the role and variety of the craft sector.

The “*Smart people/society*” area groups the variables/indicators and related raw data that are considered significant in order to analyze the characteristics and evolution of the local community, as support to the smart evolution of the city. For example, the incidence of Millennial/GenZ population, the presence of high - level human capital, the level of “openness to the world”.

The “*Smart Environment area*” lists the variables/indicators and related raw data that assess the city’s natural conditions, but also the consumption of natural resources (water, etc.), the production of waste and the impacts of tourism on those aspects.

The “*Smart Accessibility and Mobility area*” group the variables/indicators and related raw data that describe the state of national/international accessibility and of local mobility, and the current and potential amount of traffic flows by mode of transport.

Finally, the “*Smart Living area*” list a set of indicators identified as significant to measure the quality of life and the “pulse” of the city in different areas, with a focus on culture (both in terms of facilities and of users’ participation and attractiveness), as well as the “popularity” of the city brand.

4.3.2. The typology of indicators

Considering the type of indicators, the focus adopted is on Key Performance Indicators (KPIs), i.e., those that help measuring the performance of a cultural urban destination from the ‘sustainable competitiveness’ perspective. These indicators can be used to monitor the evolution of the destination as a whole, towards an even Smart and Sustainable Tourism Destination. But they can also be implemented to assess the impact of single projects and then how they have contributed to achieve the objectives defined as city level.

What is important to highlight from the very beginning is that the data for all indicators are not available immediately in all cities. A city that engages in evolving towards a Smart tourism destination starts a process. The building of a Smart Destination Ecosystem methodology supports this process, but the city needs to develop it continuously, and then to create further indicators and update those already in use, finetuning the data collection mechanisms.

The indicators used are basically quantitative indicators (i.e., they are expressed in numbers). Within the broad category of KPIs, it is possible to distinguish between:

- **Input indicators:** they refer to the “resources” needed for the implementation of an activity or an intervention, and measure the quantity, quality and timeliness or “resources” (e.g., the availability of real time traffic data);
- **Process indicators:** they measure the efficiency, or the productivity of the process carried out to develop the activity;
- **Output indicators:** they measure the product of the activity;
- **Outcome indicators:** they refer to the results generated by the project outputs and are related to the “reason why” an activity has been carried out (social results);
- **Impact indicators:** indicators that measure the quantity and quality of long-term results generated by programme outputs (e.g., measurable change in quality of life, reduced energy use, reduced production of waste).

The S.LI.DES Datahub includes input indicators (e.g., those used to build the mobility models), output indicators and impact indicators.

Another important aspect concerns the structure of the indicators. Some KPIs are simple indicators (e.g., expressed in absolute values). Others are not available as ready-calculated, but they consist of an elaboration of basic raw data (time series) uploaded in the Datahub (e.g., expressed as annual % change or % share) or of a combination of different raw data, i.e., of different time series.

According to the CIVITAS framework (van Rooyen and Nesterova, 2013), the general criteria followed in selecting the indicators and the related raw data were as follows:

- **Relevance:** the set of indicators should have a significant importance for the evaluation process;
- **Availability:** the data for building the indicators should be easily available;
- **Measurability:** the indicators should be capable of being measured as objectively as possible;
- **Reliability:** the definition of the indicators should be clear and not open for different interpretations;
- **Familiarity:** the indicators should be easy to understand for stakeholders involved in data collection as well as for final users.

However, given the territorial level analyzed (municipality), many problems arose during the data collection process, especially concerning the availability of data. See Section 5.5. for a discussion.

4.4. The Datahub structure: the final set of variables/indicators and the raw data

For each key area of analysis included in the Datahub, the following subsections detail the indicators considered as significant to measure it. Each table includes the title of the indicator, the measurement unit, a short description and the raw data that need to be collected to build it.

4.4.1. Smart Economy

These indicators measure the wealth of the city and its capacity to be an innovative “economic engine” (local income, employment, level of diversification and innovation of the local economy, new entrepreneurship, etc.), and the role of tourism and crafts in this context. Herewith, the tourism indicators (demand, supply and economic impacts) and those related to craft activities and CCIs are described in separate tables.

General economic indicators

GENERAL ECONOMIC INDICATORS

Indicator	Indicator unit	Description	Raw data
Economic wealth of the population	Euro	GDP per capita or Average household income or Personal income before taxes	GDP per capita or Average household income or Personal income before taxes
Diversification of the economy	% values	% share of total city GDP generated by the first 3 local economic sectors	City total GDP
			City GDP by economic sector
City employment	% values	Employment rate	Employment rate (or No. of total people employed/Total population)
Level of innovation/specialization in high knowledge intensity sectors	% values	% share of people employed in high knowledge intensity sectors on total employees	No. of people employed in high knowledge intensity sectors (NACE Rev 2 codes-2 digit level: 53, 58, 60-63, 72, 50, 51, 68, 69-71, 73-74, 77-78, 80-82)

			No. of total people employed
New entrepreneurship	% values	% share of newly registered enterprises on total active enterprises	No. of newly registered enterprises
			No. of total active enterprises
Self-entrepreneurship	% values	% share of self-employed persons on total no. of employed in the city	No. of self-employed persons
			No. of total people employed
International presence	% values	% share of exports on total revenue generated by local enterprises	Total exports generated by local enterprises
			Total revenues generated by local enterprises

Tourism indicators

The tourism indicators help checking:

- *the evolution and dynamics of tourism demand and markets* (i.e. the attractiveness of the city in terms of characteristics and trends of tourism flows, level of market internationalisation and diversification, seasonality, no. and weight of same-day visitors, etc.);
- the structure and evolution of tourism supply, including accommodation on boats;
- *the tourism economic performance and the specialization of the local business sector*, i.e., the contribution of tourism to the local economy, the % share of businesses in accommodation, catering and intermediation, the level of tourism employment.

TOURISM INDICATORS - DEMAND			
Indicator	Indicator unit	Description	Raw data

Evolution of total arrivals	abs. values and % values	Number and annual % var. of total tourism arrivals in the city	Total tourism arrivals in the city
Evolution of total overnight stays	abs. values and % values	Number and annual % var. of total tourism overnight stays in the city	Total tourism overnight stays in the city
Evolution of international arrivals	abs. values and % values	Number and annual % var. of international arrivals in the city	Total international tourism arrivals in the city
Evolution of international overnight stays	abs. values and % values	Number and annual % var. of intl. overnight stays in the city	Total international tourism overnight stays in the city
Evolution of domestic arrivals	abs. values and % values	Number and annual % var. of total tourism arrivals in the city	Total domestic tourism arrivals in the city
Evolution of domestic overnight stays	abs. values and % values	Number and annual % var. of total tourism overnight stays in the city	Total domestic tourism overnight stays in the city
Level of internationalization of the city tourism market	% values	% share of international tourism arrivals on total arrivals	Total international tourism arrivals
			Total tourism arrivals

Level of concentration/distribution of intl. tourism demand	% values	% share of international tourism arrivals from the main 3-5 countries of origin	Sum of international arrivals from 3-5 countries
			Total international tourism arrivals
Level of concentration/distribution of domestic tourism demand	% values	% share of domestic tourism arrivals from the main 3-5 regions/counties of origin	Sum of domestic arrivals from 3-5 regions/counties
			Total domestic tourism arrivals
Seasonal concentration of international tourism arrivals	% values	% share of international tourism arrivals in high season	International arrivals by month
			Total international arrivals
Seasonal concentration of domestic tourism arrivals	% values	% share of domestic tourism arrivals in high season	Domestic arrivals by month
			Total domestic arrivals
Same-day visitors	abs. values	Volume of same-day visitors	No. of same-day visitors
Importance of same-day visitors vs. overnight tourism		Ratio calculated comparing the no. of same day-visitors and the no. of total overnight tourists on specific time period	No. of same-day visitors
			No. of total overnight tourists
No. of passengers on cruises (only for cities on the coast)	abs. values	No. of passengers on cruises (as home port and port of call: only for cities on the coast)	No. of passengers on cruises (as home port and port of call: only for cities on the coast)
No. of charter guests' nights (only for cities on the coast)	abs. values	No. of tourists/visitors lodging in a charter boat	No. of charter guests' nights (only for cities on the coast)
Guest profile of the tourist/visitor	various units (quantitative and qualitative)	Information about the tourist/visitor collected through specific surveys managed locally	Socio-demographic characteristics, purpose of travel, means of transport, type of accommodation, travel group, etc.

TOURISM INDICATORS- SUPPLY			
Indicator	Indicator unit	Description	Raw data
Evolution of hotel accommodation supply- establishments	abs. values and % values	Number and annual % var. of hotel establishments	No. of hotel establishments
Evolution of hotel accommodation supply- bedplaces	abs. values and % values	Number and annual % var. of hotel bedplaces	No. of hotel bedplaces
Evolution of non-hotel accommodation supply - establishments	abs. values and % values	Number and annual % var. of non-hotel establishments (b&b, short rental apartments, campsites, etc.)	No. of non-hotel establishments (registered data)
Evolution of non-hotel accommodation supply- bedplaces	abs. values and % values	Number and annual % var. of non-hotel bedplaces (b&b, short rental apartments, campsites, etc.)	No. of non- hotel bedplaces (registered data)
Evolution of marinas supply (only for cities on the coast)	abs. values and % values	Number and annual % var. of marinas to host boats (only for cities on the coast)	No. of marinas (only for cities on the coast)
Evolution of boat moorings supply (only for cities on the coast)	abs. values and % values	Number and annual % var. of boat moorings to host boats (only for cities on the coast)	No. of boat moorings (only for cities on the coast)
Evolution of berths supply (only for cities on the coast)	abs. values and % values	Number and annual % var. of berths to host boats (only for cities on the coast)	No. of berths (only for cities on the coast)

TOURISM INDICATORS - ECONOMIC IMPACTS			
Indicator	Indicator unit	Description	Raw data
Tourists' expenditure capacity	Euro	Tourists' average daily per capita expenditure	Total tourism expenditure
			Total no. of tourism overnight stays
Contribution of tourism to the local economy	% values	% share of total city GDP generated by tourism activities	Tourism GDP/turnover
			Total GDP/turnover
Level of tourism specialization of local entrepreneurship	% values	% share of local businesses in hospitality, restaurants&catering and intermediation on total enterprises	No. of businesses in hospitality, catering& restaurant and intermediation
			No. of total businesses
Tourism employment	% values	Direct tourism employment as % share on total city employment	No. people employed in tourism
			No. of total people employed
Seasonal tourism employment	% values	Seasonal tourism employment as % share on total direct tourism employment	No. of seasonal workers
			No. people employed in tourism

Craft and CCI activities

As for craft and CCI activities, the indicators measure the size of the phenomenon, in terms of no. of enterprises and % share of craft&CCI enterprises on total enterprises, its economic impact and the employment generated.

Indicator	Indicator unit	Description	Raw data
Craft enterprises and Culture&Creative Industries (CCI)	abs. values	The presence of craft enterprises and CCI at municipality level	No. of craft enterprises and CCI
Variety of the craft and CCI business sector	abs. values	The presence of craft enterprises and CCI by typology (glass, pottery, food, etc.).	No. of craft enterprises and CCI by typology (e.g. glass, pottery, etc.)
Contribution of the craft and CCI sector to the local economy	% values	% share of total city GDP generated by craft and CCI activities	Craft GDP or turnover
			Total GDP or turnover
Level of craft specialization of local entrepreneurship	% values	% share of craft enterprises and CCI on total enterprises	No. of craft enterprises and and CCI
			No. of total businesses
Craft & CCI employment	% values	Direct craft and CCI employment as % share on total city employment	No. people employed in craft and CCI
			No. of total people employed

4.4.2. Smart Society

These indicators assess the characteristics and evolution of the local community, as support to the smart evolution of the city, and the attention to cultural/educational aspects (i.e., educational supply and demand, high level human capital, etc.).

Indicator	Indicator unit	Description	Raw data
Evolution of city population	% values	% var. of total population in the city in a stated time period	Total population in the city
Importance of Millennial and GenZ population over city population	% values	% share of people in the these age ranges over total population	Total population the the age ranges
			Total population in the city
High level education supply	abs.values	No. of universities and institutions of higher education in the city	No. of universities and institutions of higher education in the city
High level education demand	abs. values	No. of students enrolled in university studies in the city	No. of students enrolled in university studies in the city
High level human capital	% values	% share of resident population with a high level degree (MA, BA, PhD, etc)	Population with a high-level degree
			Total population in the city
Openness to the world	% values	% share of residents that is foreign-born	No. of residents that are foreign born
			Total residents in the city

Employment in arts, culture and entertainment activities	% values	% people employed in art, culture and entertainment activities	No. of people employed in art and culture (NACE Rev 2 codes 2-digit level: 90-91)
			No. of total people employed
Employment in ICT sector	% values	% people employed in ICT sector	No. of people employed in ICT services (NACE Rev 2 codes 2-digit level: 62-63)
			No. of total people employed

4.4.3. Smart Environment

These indicators help assessing the importance given to green, the consumption of natural resources (water, etc.), the production of waste and the impacts of tourism on those aspects, as well as the level of local pollution, and to monitor weather evolution.

Indicator	Indicator unit	Description	Raw data
Incidence of green spaces	% values	% share of green area on total city area (include parks and grassy areas)	Total green areas
			Total city area
Waste production	abs. values	Total waste production in the city	Total waste production (in tonnes or Kilos)
Impact of tourism on waste production (estimate)	% values	% share of waste production generated by tourism on total waste production	Total waste production (in tonnes or Kilos)
			Total population
			Total tourism overnight stays
Water consumption	abs. values	Total water consumption in the city	Total water consumption (in m3), by typology of users
Impact of tourism on water consumption (estimate)	% values	% share of water consumption attributable to tourism on total water consumption	Total water consumption (in mmc3)
			Total population
			Total tourism overnight stays
Energy consumption	abs. values	Total energy consumption in the city	Total energy consumption (Kwh), by typology of users
			% share of energy

Impact of tourism on energy consumption (estimate)	% values	consumption attributable to tourism on total energy consumption	Total population
			Total tourism overnight stays
Water pollution	abs. values	Level of pollution in sea water per 100 ml	Level of pollution in sea water per 100 ml
Air pollution	abs. values	No. of days per year/months exceeding standards	No. of days per year/months exceeding standards
Weather data	Various indicator units	Data on temperatures, wind, etc. in day/month	Average daily temperatures per day/month, no. days with wind per month, etc.
Weather forecasts	various indicator units	Data on actual weather situation and weather forecasts	Data on actual weather situation and weather forecasts

4.4.4. Smart Accessibility and Mobility

These indicators describe the state of national/international accessibility and of local mobility by mode of transport, and the current and potential amount of traffic flows, which means an increase or decrease of visitor flows. They have also been used as input indicators to build the mobility models (Activity 3.2.).

Indicator	Indicator unit	Description	Raw data
Air accessibility and traffic	absolute values	Average no. of direct flights to the city airport from different cities/destinations (scheduled and charter)	Data on total flight arrivals to city airport(s) from different origin airports, per season, month, time slot, country of origin, no. of movements
	absolute values	Total number of passengers arriving to the city airport from different origins (national and international)	Data on .no. of passengers arriving to the city airport from different origin airports per season, date, day of the week and time slot (seasonal time schedules)
Road accessibility and traffic	Km per 100 square km	Road density in the city land area (the total road network includes motorways, highways, and main or national roads, secondary or regional roads, and all other roads)	Km of road per 100 square km of land area (the total road network includes motorways, highways, and main or national roads, secondary or regional roads, and all other roads)
	abs. values	Data on traffic flows (no. of vehicles, motorvehicles in a specific time period)	No. of passing vehicles and motorcycles in a specific time period
Rail accessibility	abs. values	Average hourly no. of arrivals (between 06:00 and 20:00) of fast direct trains to the city, from other cities/greater cities	Data on direct train arrivals (with a focus on high-speed connections) to the city railway station from other cities per day, month and year

Boat accessibility	abs. values	Average no. of direct ferry connections per day, to partner cities from different cities/destinations	Data on direct ferry connection to the city port from other cities per hour, day, month and year
	abs. values	No. of cruise calls by day and time slot (seasonal time schedules)	Data on cruise connections to the city port from other cities per hour, day, month and year
Public transports	abs. values	No. of lines and seats offered	No. of line and of km* seats offered in total and by lines (annual data)
	abs. values	No. of passengers carried	No. of passengers by tickets sold, etc. or indirect measures (no. of bus travels* seats offered) (annual data)
Parking areas	abs. values	No. of parking areas and of parking spaces for cars and buses	No. of parking areas and of parking spaces for cars and buses
Pedestrian mobility	Various indicator units	Data on pedestrian flows in high frequency area and in specific time period	Data on pedestrian flows in high frequency area and in specific time period

4.4.5. Smart Living

These indicators measure the quality of life in the city and the tourism pressure, the “pulse” of the city in different areas, with a focus on cultural aspects (both in terms of facilities and of users’ participation and attractiveness), as well as the “popularity” of the city brand.

Indicator	Indicator unit	Description	Raw data
Cultural supply - museums and galleries	abs. values	The supply of museums and galleries in the city compared to the no. of inhabitants	No. of museums and galleries
			Total population
Cultural supply-theatres	abs. values	The supply of theatres compared to the no. of inhabitants	No. of theatres
			Total population
Cultural supply- cinemas	abs. values	The supply of cinemas compared to the no. of inhabitants	No. of cinemas (cinema halls)
			Total population
Cultural supply - events	abs. values	The supply of events offered by the city over a year	No. of events organized by typology
Cultural demand - museum attendante	abs. values	The amount of visitors in museums and galleries compared to the no. of inhabitants	No. of visitors in museums and galleries
			Total population
Cultural demand- theatre attendance	abs. values	The audience of theatres compared to the no. of inhabitants	No. of audience of theatres
			Total population
Cultural supply- cinema attendance	abs. values	The audience of cinemas compared to the no. of inhabitants	No. of audience of cinemas
			Total population
Cultural supply- events attendance	abs. values	The audience of events organized by the city over a year	No. of audience to events
			No. of tourists/visitors

Tourism pressure (1)	Ratio	Ratio of no. of tourists/visitors compared to no. of inhabitants in a specified time period	No. of total population
Tourism pressure(2)	Ratio	Ratio of overnight stays spent by tourists in the city (presence) on total population in a specified time period	No. of overnight stays in registered accommodation
			No. of total population
Popularity of the city brand in the home country	abs. values	Comparison between the average value of researches on Google Trends for the city (using the name of the municipality) related to the items "travel" "flights" and "hotels" and the average value of total researches (all items) for the city in the 12 months, in the country (Italy or Croatia)	Trends of researches of the city on the item "travel" "flights" "hotels" in Italy/Croatia
			Trends of researches of the city on all items in Italy/Croatia
Popularity of the city brand all over the world	abs. values	Comparison between the average value of researches on Google Trends for the city (using the name of the municipality) related to the item "travel" "flights" "hotels" and the average value of total researches (all items) for the city in the last 12 months, all over the world	Trends of researches of the city on the item "travel" "flights" "hotels" all over the world
			Trends of researches of the city on all items all over the world
Ranking of cultural		Ranking of the cultural Points Of Interest (POIs) in the city (historical buildings, monuments,	List of cultural POIs in the city, in total and by category

activities according to visitors' perception	Abs. values	churches, locations, etc.) according to the no. of related reviews (Tripadvisor data)	Total no. of reviews collected for each POI
Cultural vibrancy (in terms of visitors' participation/attendance)	% values	Average no. of reviews posted per POI	Total no. of reviews related to the cultural POIs
			Total no. of cultural POIs
Cultural vibrancy (in terms of facilities-infrastructure offered)	% values	The concentration of reviews in a limited number of POIs	No. of reviews related to the Top5 POIs
			Total no. of reviews
	% values	The 'long tail': the consistence of POIs with less than X reviews	No. of POIs with less than X reviews
			Total no. of POIs

4.5. The data collection process: focus on the retrieval of external online sources

Regarding the last key area of analysis, as already mentioned in Section 5.1., during the development of the project it was decided to further enhance the system following a "Big Data perspective" and then to integrate the set of data on partner cities also with data provided by external online sources, in particular by the most important search engine (Google Trends) and from one of the major international tourism platforms (Tripadvisor).

4.5.1. Google Trends

The data retrieved from Google Trends are available for free and help analyzing how much a "city brand" is searched at international and national level, in general and with a focus on tourism. In detail, they give information regarding:

- the average value of monthly searches related to the city (using the name of the municipality as

keyword) made on the platform and related to the item "travel" and the sub-items "flights" and "hotels" made in the defined time period, in the country and abroad (international) (2 time series);

- the average value of monthly searches related to the city (using the name of the municipality as keyword) related to all items in the same time period, in the country and abroad (international) (2 time series).

It has to be taken into account that the value provided by Google Trends for the period under study is not the number of absolute research made on the city: search interests are indexed and normalized (values 0-100). Considering, for example, the total searches made on the city by people residing in the same country where the city is located, the first step is to calculate its relative frequency by comparing the total number of city searches to the total number of searches made by residents in the same time period. The result obtained is then normalized (values 0-100) by dividing this frequency for the search made by residents that records the highest interest, i.e., the highest frequency.

Anyway, the index represents a good proxy to assess the "popularity" of the city, in general and related to tourism, and to assess how it changes over time according, for example, to specific events, to the launch of a promotional campaign, etc.

In addition, if correlated with data on tourism arrivals and overnights stays, provided by local tourist offices, they can provide interesting insights on the relationships between «lookers» and «bookers», i.e., between people who search for information about the city on the Web to plan a holiday and those who have already spent a stay there, which can be very useful for predictive purposes.

4.5.2. TripAdvisor data

As mentioned before, TripAdvisor is the world's largest travel platform, available in 49 markets and 28 languages. According to its profile, it helps 463 million travelers each month, who publish more than 860 million reviews and opinions of 8.7 million accommodations, restaurants, attractions, airlines and cruises. Its clients are both tourists – who collect information for free to plan their travel and to share opinions about their experiences- and tourist properties, who pay to promote their activities and that, through it, can take control of their listings, respond to reviews and monitor their performances. In 2019 it also opened to tourist destinations, offering a sponsor opportunity for tourism organizations through a newly revamped destination

search page.

This means that the information collected about tourists' profile and opinions, as well as on the evolution of POI (Point of Interest) as identified by visitors, are usually provided to their professional clients.

In the case of the SLIDES project, TripAdvisor agreed to provide a set of information to partner cities through a one-year license contract signed by the Lead Partner.

The agreement was not foreseen in the AF and thus represent a change to it, but all partners acknowledged and shared the importance to integrate these data in order to add value to the Datahub.

Scope of the data purchase was to enhance all activities included in WP3. In detail:

- To have an updated list of the main Point Of Interests (POIs) in the city (cultural and other attractions, shopping, activities, etc.), according to the visitors' perspective (what they consider worth visiting and suggest other peers to visit or not, through the reviews posted on the platform), i.e. what the city is popular/appreciated for) (Activity 3.1.);
- To have information on the geographical location of those POIs and on their potential attractiveness, useful to design the structure of the mobility models in each city and to estimate the visitor flows in the area (Activity 3.2.);
- Since some artisans open to the public are included in the list of POIs (e.g., as specialty shops), to check how many are present for each city and collect information useful to build the ranking according to their tourism potential and the related dynamic map (Activity 3.3.).

Regarding activity 3.1., the data retrieved from TripAdvisor give the updated list of Point of Interests (POIs) present in the city from the visitors' point of view, which is usually more complete than that retrieved from the supply side (i.e., by local administrators or other stakeholders), and can be considered a good proxy to express the "cultural vibrancy" of the city. Usually, the more the POI is popular the more the reviews published on the platform.

The POIs are classified by type of attraction (art museum, historic site, architectural building, etc.) and the platform also provides a set of information (Location ID, name, address, latitude & longitude) useful to locate them on a city map. So, they have also been used as important reference to design the mobility patterns of visitors in the city (Activity 3.2. The mobility models) and the dynamic mapping of craft activities

(Activity 3.3.).

The data retrievable from the TripAdvisor platform are as follows:

- Property name of the POI (e.g., St. Mark Square);
- Location ID;
- Attraction type, groups, group categories and subcategories;
- Complete address (street, city area, city, province, region, state);
- Geo coordinates;
- Count of the related reviews by vote (from 1 to 5);
- Count of the related pictures taken;
- The profile of the travellers for whom the POIs can be attractive (family, friends, couples, etc.);
- TripAdvisor ranking of the POI («#20 on 200 things to do in the city»);
- If the POI has received the Certificate of Excellence.

A 1-year license agreement was signed on 3rd March 2020 by the LP to have access to the data described just above for all partner cities.

Currently, it is not possible to get a time series of the reviews, nor of the pictures, according to their upload date. Likely, it is not possible to distinguish the no. of reviews posted according to the language of the reviewer (i.e., language of the country in which the city is located vs. other language).

4.6. The data collection process and the problems encountered

Concerning the population of the Datahub carried out by partner cities, once the final list of variables/indicators and related raw data was drawn and shared among all partners, the collection process started.

During this process, the commitment to develop the Datahub following this list faced a number of problems that arose in each city, concerning both territorial and external sources. Namely:

- high data dispersal in several (internal and external) databases;

- difficulties (in some cases) in identifying the data holder/owner;
- low data availability and accessibility;
- lack of open data and no possibility of automatic data upload;
- unsuitable of data format;
- different data structure and organisation;
- different levels of territorial disaggregation;
- limited data timing and length of time series;
- differences in measurement modes;
- difficulties in data purchase from private sources.

Herewith a short description of the topics. The discussion of these problems is also relevant with a view to the future update of the Datahub, after the end of the project.

4.6.1. The dispersion of data sources, data owners and accessibility

The first problem, common to both Italian and Croatian cities, was the high data dispersion at municipality level among offices/departments responsible of different aspects (economy, tourism, environment, etc.). This means that often each office has its proper database, data organisation and data format. In addition, cities have different nominations and divisions for their internal departments and also different outsourcing policies, so in some cases it was difficult to identify who was the data owner or whether the data was accessible or not. Furthermore, some data are also managed by public companies: for example, some cities have outsourced their functions such as waste, water and electricity management to external organisations, although controlled by public administration. Another issue concerns the data owned by private companies (e.g., airports) or by functionally independent public bodies representing private enterprises (e.g., the Chambers of Commerce in Italy).

4.6.2. Inventory of cities' open data and other open data sources

Regarding the data upload, in spite of the actions taken also at local level for the transparency of Public Administrations, it has to be highlighted that very few data are available as open data, and for the Datahub use are basically spatial data (coordinates and geometries related to maps). Data are open if they are: available and in a readable form; published with a licence that allows re-use and redistribution; published with equal terms for every user. Open data are easily accessible through an API (Application Programming Interface), which allows an automatic data upload.

The lack of this opportunity means that most data to populate the Datahub have been collected through the use of tabular supports (see the next section) and upload manually into the database.

However, open data relevant for the S.LI.DES project and its partner cities are not limited to open data portals available at city level. They can also be managed at regional/county or national level (e.g. the regional or national Statistics Office). Unfortunately, in Italy very few data at municipality level are available on the ISTAT (National Statistics Office) open data portal. In Croatia the situation is similar. The tourism information system eVisitor created by the Croatian National Tourist Board would be the unique system accessible via API, but the procedure needs a special access permission. So, also at this level, most data

have to be uploaded using tabular supports.

4.6.3. Unsuitable data formats

Concerning the data format, as mentioned just above, no data were provided as open data.

Some data were initially provided in a format that was not machine-readable (.pdf) and have to be transformed. Most data were provided in Excel format (.xls or .xlsx), which can be read programmatically.

Almost no data were provided in .csv format.

As for geographical data, they were provided in shapefile format, which is a geospatial vector data format for geographic information system (GIS) software.

4.6.4. Different data structure and organisation

Another issue concerns the structure and the organisation of the data provided in the tables. Given the variable analysed, they should be as much homogeneous as possible for all cities, in order to set up a shared algorithm to extract the data. Instead, city data sources often adopt different procedures, so it is difficult to implement a common algorithm. An example is the timetable of the airport in Venice, Bari and Dubrovnik: the airport companies use different data systems and, being equal the information required, it has been provided with different outputs, both in terms of data included and of the number of tables in which the data were collected.

4.6.5. Level of territorial disaggregation and time series

Regarding the level of territorial disaggregation, in some cities there are data available for both the historical centre of the city and the whole municipality (e.g., in Venice); other data are available only for the whole municipality or the whole metropolitan area. This means that the information is not comparable.

In Croatia, in particular, some data (especially economic, but also cultural data) are available at county level or even at state level, but not at municipality level. In Italy the problem mainly applies to economic data.

Another important issue is the length of time series and the update interval. According to the variable analysed, cities were asked to send data files providing annual or monthly figures at least for the period

2010-2018. For some variables, especially those not referred to the tourism sector, they have difficulties in obtaining complete time series or in having the most update data. No data were available for a short time interval, even for tourism (e.g., week or day).

4.6.6. Differences in measurement mode

Another aspect to take into account is the differences in the method used by local data sources to measure a variable and also in the unit of measure, which affect the comparability of data and then the building of indicators.

For example, in Croatia, where available, the wealth of the city population can be assessed using the GDP per capita. In Italy, the only data available at municipality level is the personal income before taxes.

This heterogeneity can be higher for data provided by private companies, like transport companies (e.g., airports, port authorities) and utilities. For example, public transport companies can provide the number of passengers carried or give an estimate using the no. of bus travels x seats offered.

4.6.7. Difficulties in data purchase from private sources

The last issue concerns the difficulties in opening a dialogue with private platforms like TripAdvisor, that are used to deal with tourist properties - who pay to promote their activities through it -, and not with cities or tourism destinations in general. The difficulties concern both the drafting of the contract (because they apply the same standard formula arranged for properties) and the selection of data to be uploaded for the partner cities.

4.7. The state of the art of data collection in partner cities and the data sources

The collection process was closed at the end of March 2020.

Appendix C describes, for each section of the Datahub, the state of the art of the data collection in each partner cities at this date, and then the raw data that have been collected and uploaded into the common repository to build the KPIs and test the correlations. In the case of composite indicators that use two raw

data, one of which has already been described for other indicators, only the state of collection for the additional raw data has been displayed.

Herewith a summary of the situation, according to the five key areas/dimensions of the Datahub (Smart Economy, Smart People/Society, Smart Environment, Smart Accessibility and Mobility and Smart Living). For these areas, the Figure 5 highlight the average collection rate of the raw data required.

KEY AREAS/DIMENSIONS	Average collection rate of raw data (YES)
SMART ECONOMY	
General indicators	44%
Tourism indicators - demand	82%
Tourism indicators- supply	74%
Tourism indicators – economic impacts	40%
Craft & CCI indicators	0%

Figure 5. Average collection rate of raw data (Smart Economy)

As for the Smart Economy area, the best results in data collection have been achieved by partner cities in the subsection related to tourism demand and supply: respectively, 82% and 74% of data collected. The situation changes if we consider the economic impacts of tourism and, more in general, data related to the economic profile of the city: about 40-44% of required data collected.

No data were received regarding craft activities and CCIs, that should be provided by the local Chamber of Commerce. Here the issue is to select the activities that is meaningful to be included here. Furthermore, in Croatia, these data are available at county level only.

As for the other key areas, the best redemption rate in data collection was recorded by the Smart Society area (about 62% of raw data collected by cities), while the worst in the Smart Living area. Concerning the last area, the average collection rate only refers to data collected by cities, not to information retrieved from

Google Trends or TripAdvisor, which are included in this area and available for all cities.

KEY AREAS/DIMENSIONS	Average collection rate of raw data (YES)
SMART PEOPLE/SOCIETY	62%
SMART ENVIRONMENT	48%
SMART ACCESSIBILITY AND MOBILITY	38%
SMART LIVING (*)	15%

Figure 6. Average collection rate of raw data (Smart People/Society, Smart Environment, Smart Accessibility and Mobility, Smart Living)

The rising awareness of local stakeholders about the importance of being a “smart tourism destination” and of building a city knowledge system should help to enhance the data collection process in the future, as well as the sign of formal agreements for data provision and information exchange with data owners. The last aspect is particularly important to ensure the development and maintenance of the Datahub, also after the project. For this purpose, the LP designed a Roadmap to support the creation of LGS (Local Group of Stakeholders) by partner cities.

However, given all these elements and taking into account: the innovativeness of the project for both Italian and Croatian municipalities; the general lack of open data for an automatic upload and update of information; the intrinsic nature of the central repository and the “Big Data perspective” adopted by the project, the common purpose shared by S.LI.DES partners is that the population of the Datahub is an open and ongoing process, that will continue beyond the deadline for Activity 3.1., throughout the project.

The effort has been focused on starting from a common set of data among those included in the final list, which are available in all cities (e.g., tourism data), and then enlarge them as and when other data are retrieved from different sources.

References

- Boes, K., Buhalis, D., Inversini, A., 2016, Smart tourism destinations: ecosystems for tourism destination competitiveness", *International Journal of Tourism Cities*, Vol. 2(2), pp.108 – 124
- Buhalis, D., Amaranggana, A., 2015, Smart Tourism Destinations Enhancing Tourism Experience through Personalisation of Services, in Tussyadiah, I., and Inversini, A., (eds), *ENTER 2015 Proceedings*, Lugano, Springer-Verlag, Wien, ISBN:9783319143422, pp.377-390
- Castells M., (2000), *The Rise of The Network Society: The Information Age: Economy, Society and Culture*, Volume 1, Wiley.
- Cohen B. (2011), The Smart City Wheel URL: https://www.researchgate.net/figure/The-Smart-city-wheel-by-Boyd-Cohen_fig3_317269039
- de Lurdes Calisto, M., & Gonçalves, A. (2017). What is Smart Tourism Destination | IGI Global. Retrieved January 21, 2019, URL: <https://www.igi-global.com/chapter/smart-citizens-wise-decisions/176254>
- Dietrich et al. (2012), *Open Data Handbook Documentation*, Technical Report, URL: https://www.researchgate.net/publication/275712868_Open_Data_Handbook_Documentation
- Jasrotia A., Gangotia A. (2018), Smart cities to smart tourism destinations: A review paper, *Journal of Tourism Intelligence and Smartness*, 1(1), pp. 47-56.
- Lamsfus C., Martín D., Alzua-Sorzabal A., Torres-Manzanera E. (2015) Smart Tourism Destinations: An Extended Conception of Smart Cities Focusing on Human Mobility. In: Tussyadiah I., Inversini A. (eds) *Information and Communication Technologies in Tourism 2015*. Springer
- Minghetti V., Montaguti F. (2010a) Cities to Play: Outlining Competitive Profiles for European Cities. In: Mazanec J.A., Wöber K.W. (eds) *Analysing International City Tourism*. Springer, Vienna
- Minghetti V., Montaguti F. (2010b), Assessing Istanbul competitiveness: A multidimensional approach, *International Journal of Culture, Tourism and Hospitality Research*, 4(3), pp. 228-240, August.
- van Rooyen T., Nesterova N. (2013), Applied framework for evaluation in CIVITAS PLUS II http://civitas.eu/sites/default/files/civitas_wiki_d4_10_evaluation_framework.pdf

Appendices

Appendix A – List of scholar and business references

Appendix B – Review of the system of indicators

Appendix C- Smart Destination Datahub: the state of the art of data collection by city