DATES

European Data Space for Tourism

Deliverable D2.3

IDENTIFICATION OF DATA TYPOLOGY AND PRIORITY LIST OF DATASETS, POTENTIAL USE CASES AND COMMON BUILDING BLOCKS WITH OTHER DATA SPACES

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6	AMADEUS SAS	AMAD	FR
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EXECUTIVE SUMMARY

The present document represents the third DATES Work Package 2 Deliverable – *Identification of data typology and priority list of datasets, potential use cases and common building blocks with other data spaces (D2.3).*

The DATES project aims to define the tourism data sharing context analysis, the governance and business framework and the technical requirements that will be the basis for the development of the European tourism data space. Work Package 2 "Context analysis and agreed components" aims at analysing the state of EU tourism data sharing, the tourism stakeholders' data needs, priority datasets to be exchanged, and data space use cases.

The first deliverable (D2.1) focused on realizing a data sharing initiatives inventory, mapping EU data sharing initiatives already in place. The second deliverable focused on analysing the data sharing initiatives and stakeholders' insights (D2.2), pointing out stakeholders' priority needs and data shortcomings – both in terms of data types and exchange practices. According to the consultation activities, the most needed data types in the sector are data on tourist behaviour, mobility data and data on tourist flows. At the same time, evidence highlighted data issues such as incomplete data, lack of data interoperability and data not being timely updated, accompanied by workers' low data analytics skills and lack of sector's cooperation and collaboration regarding data sharing. A workshop permitted to identify the priority of the business challenges that the tourism sector players are facing regarding sustainability and accessibility, market analysis and decision making, tourists' engagement, and planning and operations.

This third and last deliverable includes the final results of the WP, namely

- A long list and a short list of developed **use cases** addressing the business challenges formerly prioritized,
- A list of **109 priority datasets** identified though the developed use cases and their association to potential data sources,
- An updated **data taxonomy** organizing the datasets under the previously identified data types,
- An overview of the **level of maturity, governance, and technical requirements of a selection of data sharing initiatives** mapped in the inventory, and
- **Building block in common** with other data spaces.

Concerning use cases results, regarding the ways in which the stakeholders will participate to data sharing, it is likely that the most needed data will be provided by HoReCA companies, public authorities, and private organizations. At the same time, it is likely that the stakeholders most interested in retrieving data from the data space will be public authorities, tourism service providers, and DMOs. Finally, the most frequently mentioned final users of the proposed use cases solutions are DMOs, HoReCa companies, and public authorities.

Regarding the governance, the interviews show that different business models are being considered, including freemium-pay-per-use models, and freemium models with charges applied based on customers' needs. Regarding the legal entity of the analysed initiatives, most of them are associations of SMEs and DMOs, non-profit associations, and research consortiums. Regarding the technical requirements, the ones adopted vary according to the nature of each initiative. However, many of them use the same formats in which data can be downloaded and use APIs for retrieving and exchanging data. The most advanced initiatives include additional features like the automatization of data harmonization, the handling of duplicate data, ETL process, scoring algorithm and the integration of different applications – chatbot, data lake and Artificial Intelligence.

Concerning the **data space building blocks** results, the most commonly used specifications for data interoperability are JSON-LD, Smart Data Models, and OpenAPI specification; the ones for data sovereignty and trust are Verifiable Credentials Data Model, DID resolution, and eIDAS; the ones for data value creation are DCAT-AP, Federated Catalogue, and IDS Information model; while the ones for governance are Onboarding & Accreditation Workflows, ONB-001 Registration and initial onboarding, ONB-002 Minimal data provider services offering.

1. Introduction

The present report presents the results of the activities carried out within Work Package 2 (WP2) *Task T2.3 Identification of potential common building blocks with other data spaces* and *Task 2.4 Identification of an agreed set of priority datasets and data themes, including potential use cases.*

The report is structured as follows:

- Chapter 1 "Introduction" provides an overview of the report objectives;
- Chapter 2 "Methodology" presents the approach used for developing the use cases for the European data space for tourism and for identifying its priority list of datasets and building blocks;
- Chapter 3 "Key findings" which showcases the results concerning the developed use cases, the priority datasets, and the common building blocks with other data spaces. The chapter will further give an overview of the data sharing initiatives that were interviewed by the Project Team in order to gain a furthered understanding of their datasets, business models, governance, and technical structures;
- Chapter 4 "Conclusions" provides an overview of the main findings, as well as an overview of the next activities that will be carried out within the scope of the DATES project.

The report further includes the following Annexes and Appendix:

- Annex I displays the questionnaire used for interviews aimed at collecting information useful for developing the use cases and the priority list of datasets;
- Annex II, the guide for the use case template that encompasses the list of challenges, list of types of data and the list of potential stakeholders impacted from which to build the use cases;
- Annex III that includes the long list of possible tourism data space use cases;
- Annex IV consists of the workshop *'Towards a Data Space for Tourism - Use Case Co-Creation'* materials for each developed use case;
- Appendix I displays the Data Space Support Centre (DSSC) Standards and specifications landscape.

1.1 Objectives of the report

The objective of this report is to present the results stemming from the identification of potential common building blocks with other data spaces, as well as the results arising from the identification of use cases for the European data space for tourism and its priority list of datasets. Accordingly, the report will showcase the Project Team's approach used to define such fundamentals, which will be pivotal for the development of a sustainable data space in the tourism sector.

2. Methodology

This Chapter shows the methodology used (i) for developing the use cases for the European data space for tourism, (ii) for identifying its priority list of datasets and (iii) building blocks (Chapter 3). The Chapter is divided in two parts: the former focuses on the data collection activities; whereas the latter focuses on the elaboration of the evidence collected.

2.1. Data collection activities

This section is divided into two parts. Paragraph 2.1.1 presents the activities the Project Team conducted to collect the evidence needed to develop the use cases for the European data space for tourism and to define its priority list of datasets. Paragraph 2.1.2 presents the activities conducted to collect the evidence needed to define the data space building blocks.

2.1.1. Use cases and priority list of datasets

To develop the use cases presented in this report (par. 4.1), the Project Team relied both on previous and *ad hoc* data collection activities. Previous data collection activities include (i) desk research, (ii) a survey, and (iii) a workshop aimed at prioritising tourism stakeholders' business challenges and related data needs; whereas, *ad hoc* data collection activities include (i) interviews (par. 2.1.1.2), and (ii) a use cases co-creation workshop (par. 2.1.1.3).

Regarding **previous data collection activities**, the following table summarises the timing and aim of each activity. A detailed description of the methodology used for developing the data sharing inventory and the survey was presented in the report accompanying the *D2.1 Data sharing initiatives inventory*, while the one for the workshop was presented in *D2.2 Analysis of gaps and overlaps.*

Table 1 - Previous data collection activities

Data collection activity	Timing	Aim of the activity
Desk research	Nov 2022 – April 2023	Deepening the team's knowledge on the topics of data use in the tourism sector; tourism stakeholders' challenges that can be solved by enhanced data sharing; the notion of data spaces and how they could enhance the use of data in the sector.
	Nov 2022 – Jan 2023	Identifying the EU and extra-EU data sharing initiatives focused on the tourism sector. These have been included in the *D2.1 Data sharing initiatives inventory*
Survey	15 Dec 2022 – 16 Jan 2023	Exploring (i) which data are needed by tourism sector stakeholders, and (ii) which data sharing initiatives in the tourism sector are known/used by sector stakeholders. The questionnaire also aimed at creating a list of

Data collection activity	Timing	Aim of the activity
		stakeholders interested in being invited in future project consultations.
Workshop	8 Feb 2023	(i) Raising awareness on the concept of data spaces and the DATES project; and (ii) setting the ground for use cases development and prioritization of the sector's data gaps, by prioritizing a series of stakeholders' business challenges and the related types of data.

Regarding the ***ad hoc* data collection activities**, the following paragraphs present a detailed description of the tasks and the methodology deployed.

2.1.1.1. Interviews

Within the first three weeks of March, a round of interviews with selected data sharing initiatives was conducted to deepen the knowledge on them, allowing to better understand their datasets, business model, governance and technical structures, and how they solve data needs/problems of the tourism ecosystem. Moreover, the interviews helped in the identification and development of a list of use cases relevant for the tourism data space that has been further explored during the workshop.

Starting from the data sharing initiatives mapped in D2.1, 35 initiatives have been selected for the interviews. Within those selected initiatives, 3 data spaces were included, such as Themis-X Tourism Data Space (a consortium of GAIA-X involving 60+ major public and private stakeholders in France), EONA-X (the European Mobility, Tourism and Travel Dataspace), Austrian Tourism Data Space, and a tourism data platform and working group, such as the GAIA-X hub in France. Overall, 26 interviews were indeed carried out by the project team.

Table 2 - Data sharing initiatives interviewed

N	Data sharing initiatives	Country
1	Austrian Tourism Data Space	Austria
2	AlpineBits Alliance	Italy
3	BayernCloud	Germany
4	Data Hub Tirol	Austria
5	Data portal Brno	Czech Republic
6	DATAestur	Spain
7	DATAtourisme	France
8	Digitize the Planet	Germany
9	EONA-X	International
10	EUHub4data	Europe
11	EU Tourism Dashboard	Europe
12	NaDiT – Swiss National Data Infrastructure for Tourism	Switzerland
13	Observatorio de Turismo Sostenible de Mallorca	Spain
14	Observatorio del Turismo en Barcelona	Spain

N	Data sharing initiatives	Country
15	Observatorio do Lisboa	Portugal
16	Open Data Germany	Germany
17	Open Data Hub South Tyrol	Italy
18	Osservatorio del Turismo Regionale Federato del Veneto	Italy
19	Osservatorio Emilia-Romagna (API ERT – EmiliaRomagna Turismo)	Italy
20	Outdoorvision	France
21	SAiNT	Germany
22	Themis-X	France
23	Tourism Digital Hub	Italy
24	Tourism of Tomorrow Lab	Spain
25	Tourism Tech Alliance	Germany, Austria and Switzerland
26	SmartData Andalusia	Spain

The selection of the initiatives to be interviewed aimed at creating a heterogeneous sample. Indeed, the Project Team selected a mix of initiatives focusing only on one data purpose and of initiatives focusing on two or more data purposes. Among the selected ones, the Project Team kept a balance between the different data sources from which the initiatives retrieve data. Finally, the geographical dimension had an important role in selecting the initiatives. The interviews tried to cover as many European countries as possible. However, the Project Team managed to interview mostly initiatives from Spain, Germany, France, and Italy, since they present the highest number of data sharing initiatives mapped in *D2.1 Data sharing initiatives inventory*. Interviews were only conducted with active initiatives.

The interviews were structured as follow:

(i) Oral interview: General section – asking general information to understand the needs and problems of the tourism ecosystem and of the initiative itself. Moreover, this section focused on general technical requirements and data governance aspects needed to develop the initiative itself.

(ii) Written interview: Specific section – exploring in depth the technical and governance requirements. Moreover, several questions were proposed to better understand the model of a data space from different points of view, namely legal, business, governance and technical.

The questionnaire is displayed in Annex I.

2.1.1.2. Co-creation workshop

The workshop entitled "Towards a Data Space for Tourism – Use Case Co-Creation" took place on the 28th of March, from 10:00 AM until 12:30 PM. The workshop was structured in two sections.

During the first section of the workshop, the project's objectives and its benefits for the tourism sector were showcased, followed by an explanation of the webinar's purpose and the topics to be explored in such.

The second section of the workshop focused on co-creating, together with a coalition of selected stakeholders of the tourism ecosystem, a set of use cases for the development of the European tourism data space. To do so, participants were split into four break-out rooms, one for each identified data purpose. Two use cases were developed for each break-out room:

Breakout room I: Increase of tourism sustainability & accessibility;

Use case I: Food inclusivity;

Use case II: Minimize tourism impact on local community.

Breakout room II: Conduct market analysis & inform decision-making;

Use case I: Smart tourism observatory;

Use case II: Mitigate crisis management.

Breakout room III: Improvement of the interaction and engagement of the tourist;

Use case I: AI-based recommender for sustainable tourism;

Use case II: Customized immersive experiences using historical data.

Breakout room IV: Improvement of planning and operations of tourism services.

Use case I: Optimisation of tourist flows in protected areas;

Use case II: Data intelligence-based marketing campaign optimization system.

The co-creation activity took place on the Mural platform, whereby participants were asked to add their answers to each presented question on sticky notes. Each break-out room was moderated by two Consortium members, an the following five main activities were carried out for each use case:

- Starting off, the data types previously identified by the project team for the use case in question were showcased, and participants were asked to point out any other data type that they considered relevant;
- Later, participants were asked which specific dataset would be needed for implementing the use case and were further asked to mention the needed level of granularity and the data source;
- Then, the stakeholder types identified by the project team were displayed, and participants were asked which is the role of each stakeholder type in the use case, hence if they are data providers, data consumers or final users of the solution. This activity was performed bearing in mind that each stakeholder might have more than one role;

- Fourthly, participants were asked which of the previously identified dataset does each stakeholder provide or consume;
- Ultimately, they were asked if there was any element missing in the presented solution, and if it could be adopted in a different context and/or for other final users.

Overall, 51 participants attended the event. It is worth mentioning that one person having competencies in data and tourism attended from each partner. Moreover, the attending stakeholders, which covered several categories ranging from destination management organizations to public authorities and travel agencies, were distributed in a way that the same proportion of each stakeholder's category was present in each break-out room.

Annex IV displays the Mural structure and answers pertaining to each developed use case, while paragraph 3.1.1 depicts the summarized findings that emerged.

2.1.1.3. Coalition validation workshop

The validation workshop – "Towards a Data Space for Tourism – 1st Coalition Validation Workshop" – took place online on Tuesday, 30th of May 2023, from 3:00 PM to 4:00 PM CEST.

This workshop is the first of the Coalition validation workshops foreseen in Task 5.4 "Validation of outputs through a Coalition of key stakeholders". The aim of the workshop was to validate results and to collect gap-filling evidence for all WP2 deliverables (including the first version of the Deliverable 2.3) and in Deliverable 4.1 "Roles and Dynamics of the Tourism industry in the EU". Therefore, it was accordingly structured in two sections, the former concerning WP2 and the latter concerning WP4. The consultation activities took place through a mix of closed questions (launched through polls) and open discussion.

To this validation workshop, as for all future Coalition validation workshops, only members of the Coalition of stakeholders were invited. The Coalition is a group of 29 stakeholders representing the EU tourism ecosystem, selected based on their experience in the sector and their competences in data. Overall, 15 members of the Coalition attended the event.

2.1.2. Data space common building blocks

To identify the common building blocks (par. 3.3), the Project Team carried out several data collection activities including (i) desk research (par. 2.1.2.1), and (ii) interviews (par. 2.1.2.2). The following paragraphs present a detailed description of the tasks and the methodology deployed.

2.1.2.1. Desk research

The first activity carried within T2.3 concerns the desk research. In particular, the Project Team relied on the data sharing initiatives inventory presented in *D2.1 Data sharing initiatives inventory*, taking into consideration only those data sharing initiatives implementing and designing a data space.

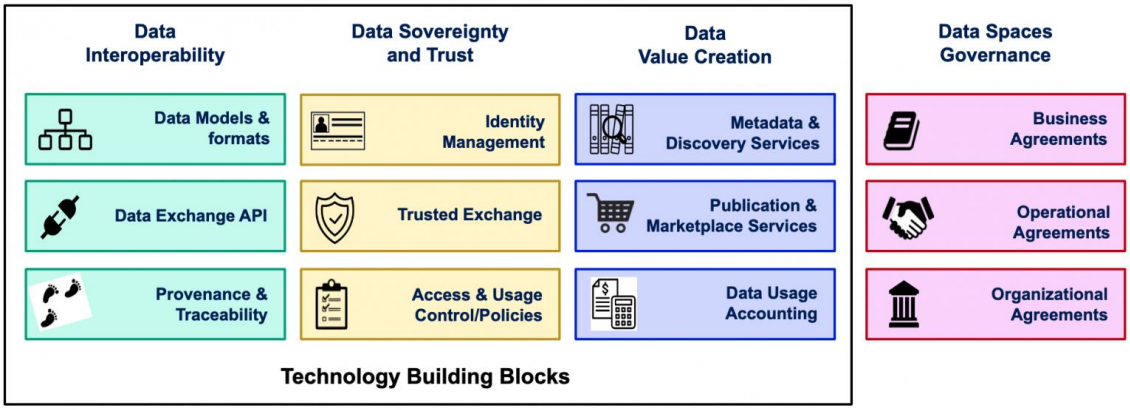
Moreover, to identify the list of specifications and technologies within each building blocks, three initiatives were taken into consideration:

- **OpenDEI**,

  OpenDEI[1] is an EU-funded project that aims to align reference architectures, open platforms and large-scale pilots in digitising European industry, focusing on four industrial domains: manufacturing, agriculture, energy and healthcare. Moreover, it aims to create common data platforms based on a unified architecture and an established standard, supporting cooperation and communication among different innovation actions and stakeholders. It addresses challenges and opportunities related to data spaces, business ecosystems, digital platforms, pilots and standards.

  The main deliverable of the OpenDEI project was the list of building blocks categorized in four pillars (Figure 1). Each pillar will be explained in paragraph 3.3.

Figure 1 - Pillars for building blocks



- **DSBA convergence**

Data Spaces Business Alliance[2] is an initiative that aims to accelerate business transformation in the data economy. It unites industry players to realize a data-driven future in which organizations and individuals can unlock the full value of their data. It also supports existing organizations and data spaces by pooling their tools, resources and expertise. It is aligned with the International Data Spaces Association (IDSA), Gaia-X, FIWARE and BDVA.

One of the important work streams within the DSBA is the convergence work stream. The latest version was published in October 2022, but it is a live document with frequent additions.

The DSBA convergence paper is a document that defines a common reference technology framework for data spaces. It is based on the technical convergence of existing architectures and

[1] OpenDEI
[2] Data Space Business Alliance

models and leverages mutual infrastructure and implementation efforts. The value added by the paper is that it aims to achieve interoperability and portability of solutions across data spaces by harmonizing technological components. It also discusses the trust anchor framework, shared catalogues and marketplaces and a policy definition language for data spaces. It provides a detailed example use case to illustrate the technical descriptions in the paper.

As part of the convergence workstream, the OpenDEI outcome was refined and updated.

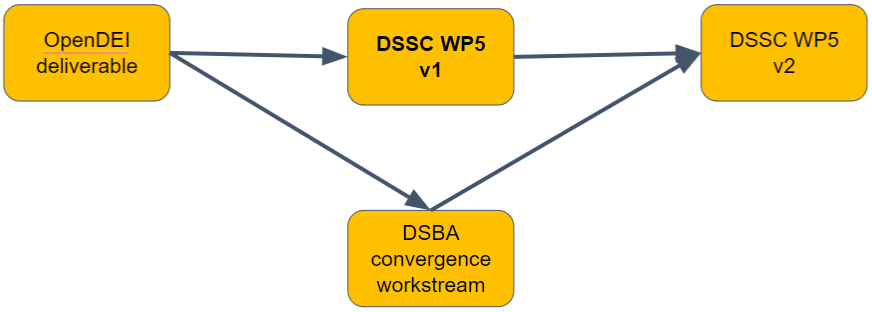
- **DSSC standards and specifications landscape**

The Data Spaces Support Centre (DSSC) is a project funded by the European Commission that aims to support the development of data spaces in Europe and beyond. Data spaces are frameworks that support data sharing within a data ecosystem and allow for the trusted and secure exchange of data assets while ensuring compliance with relevant laws and fair treatment for all involved. The Data Spaces Support Centre provides various resources and services to help organizations create or participate in data spaces, such as a starter kit, a glossary, a community of practice, a strategic stakeholder forum, liaisons and collaborations, and a support and newsletter service.

The DSSC project is organized in several work packages, and one of them, namely the WP5, has been working on refining and improving the building blocks, technologies, and specifications. As a result of that, three different lists of standards and specifications have been identified.

As Figure 2 shows, the DSBA convergence is being aligned and merged to the current version of the DSSC WP5 work to become the new DSSC WP5 list. After aligning with the DSSC WP5 team, the Project Team decided to take the current version of the DSSC WP5 standards and specifications as the basis to our work - it can be found in Appendix I. Therefore, as soon as the new version is made available, the Project Team will consider it for any next steps.

Figure 2 - Activities flow for defining standards and specifications



Finally, as part of the alignment and coordination activities across work packages, some specifications were identified by the DATES WP3 team as relevant for the project. Those specifications, mostly belonging to the tourism industry specific, were added to the spreadsheet, used for the analysis and considered for the subsequent interviews.

Figure 3 - Spreadsheet used for the analysis (Appendix I)

92	Data Interoperability	Interop: Data Models & Formats	FOAF: http://www.foaf-project.org	
93	Data Interoperability	Interop: Data Models & Formats	Tourism specific Ontology	Tourism specific Ontology (TDH Italy): https://www.minis
94	Data Interoperability	Interop: Data Models & Formats	DATA tourisme ontology	
95	Data Interoperability	Interop: Data Models & Formats	ODTA Open Data Tourism Alliance	ODTA Ontology
96	Data Sovereignty and Trust	Trust: Access & Usage Control	MYDATA	
97	Data Sovereignty and Trust	Trust: Access & Usage Control	LUCON	

2.1.2.2. Interviews

To define a list of specifications for each of the building blocks that are considered relevant for the upcoming tourism data space, three interviews were conducted. The interviewees were chosen among the multiple data sharing initiatives mapped in the *D2.1 Data sharing initiatives inventory*, based on their focus on the data space concept.

On 11th of April, the Project Team interviewed **THEMIS-X**, a project that aims to create a data-sharing space for tourism in France. It was founded in the context of the coming Paris 2024 Olympic Games and is aligned with the Gaia-X initiative. It brings together major public and private players of the tourism industry in France to build a decentralized, secure, and trusted data-sharing ecosystem that respects human-centric values. It also provides various use cases for the tourism ecosystem, such as assisting travellers, enhancing user experience, and offering B2B services. The initiative is at the design phase, so no implementation is already in place. However, most of its architecture and technical decisions have been already taken. The outcome of the interview is a list of specifications/technologies that have been chosen by the Themis-X project.

The second interview took place on the 12th of April with **EONA-X,** a project that aims to create a data-sharing space for mobility, transport and tourism in Europe. It is based on the Gaia-X initiative. EONA-X brings together various stakeholders from different sectors and domains to share their data in a secure and standardized way. It implemented a federated intermediate infrastructure, based on GAIA-X and Eclipse Dataspace Components technology. Several members of EONA-X are connected to it, offering various data sets within a catalogue, and being able to close data sharing contracts. EONA-X has already developed a prototype application of seamless travel that combines different modes of transportation and presented it to the public. It plans to finalize the data exchange platform by 2023 and implement on it a productive use case by 2024. It also collaborates with various stakeholders from different sectors and domains to explore interoperability options with them.

Moreover, since some mobility data space's use cases will be similar to those for the tourism data space and will require the same or very similar specifications and technologies within each building block, the Mobility Data Space project was taken as well.

Therefore, on the 17th of April, the Project Team interviewed the **Mobility Data Space**, a concept that refers to a framework that supports data sharing within the mobility sector and allows for the trusted and secure exchange of data assets while ensuring compliance with relevant laws and fair treatment for all involved. The mobility data space is part of the European Data Strategy and is aligned with the Gaia-X initiative. The mobility data space aims to enable innovative mobility

solutions that can improve efficiency, safety, sustainability and user experience in the transport sector.

2.2. Methodology of the analysis

This section presents the activities the Project Team conducted to analyse the evidence collected through the above-mentioned activities with the aim of developing a list of possible use cases, the priority datasets, and the common building blocks with other data spaces.

2.2.1. Use cases and priority list of datasets

To **develop the use cases** (Chapter 3 and Annex III), the Project Team relied on most of the evidence collected through the above-mentioned activities and the results presented in deliverables *D2.1 Data sharing initiatives inventory* and *D2.2 Analysis of gaps and overlaps.*

The first step of the process was drafting a long list of possible use cases. Each Consortium partner has been invited to propose use cases, based on its knowledge of the sector and of tourism-related projects focused on finding solutions based on data analytics. Moreover, the Project Team screened the data sharing initiatives inventory and analysed interview answers, to check whether use cases could stem from the data sharing initiatives already in place.

To devise the use case, the Project Team identified several dimensions: the business challenge addressed by the use case, the use case title, the use case description (focusing on the proposed solution to the challenges), the data types needed, and the stakeholders impacted by the use case, and the references (if any). Most of these dimensions were based on previous desk research[3]. Annex II represents the guide which was circulated for developing the use cases and provides definitions for each dimension.

The initial long list of use cases was then refined by erasing repetitions and merging similar use cases. Starting from this list, the activities progressed in two directions: (i) the development of eight detailed use cases and (ii) the refinement of the initial long list of use cases.

To develop the eight use cases presented in par. 3.1.1, the Project Team selected two use cases for each of the four data purposes, based on the challenges priority identified in the February workshop. These eight examples of data space application were further developed through the co-creation workshop held in April, when also datasets, stakeholders' roles and relationships were discussed.

To refine the long list of use cases presented in Annex III – Long list of use cases, the Project Team relied on its knowledge for the sector and of existing projects to deepen the explanation of the challenges addressed and the desired solution for each use case.

Moreover, the deliverable focuses also on the identification of a list of priority datasets to be shared in the data space. To develop the list, the Project Team relied on the datasets identified in the

[3] I.e. data purposes, stakeholders business challenges, data types and categories of stakeholders.

development of the eight use cases, since they have been identified as the priority data space applications. Starting from these results, the Project Team analysed the datasets taking into consideration the granularity and the data sources – defined as where the data come from.

2.2.2. Data space common building blocks

To define the common building blocks for the development of the tourism data space, the Project Team relied on the interviews conducted by T2.4 (par. 2.1.1.1) and on the interviews mentioned in paragraph 2.1.2.2. From the first round of interviews, it emerged that some of the initiatives, not only the data spaces, were using standards and specifications pertaining to the list. All relevant information was added to a spreadsheet as annotations and used for filtering the common building blocks. Moreover, during the second round of interviews, the Project Team went through the list of specifications and asked the data space whether they were using or have selected the specific specification.

The spreadsheet was structured in a way that made it easy to navigate through it: pillars, building blocks and specification short names.

Figure 4 - Spreadsheet for the analysis (Appendix I)

	A	B	C
1	Pillar	Building block	Short name
2	Data Interoperability	Interop: Data Models & Formats	JSON-LD
3	Data Interoperability	Interop: Data Models & Formats	XML
4	Data Interoperability	Interop: Data Models & Formats	OGC standards
5	Data Interoperability	Interop: Data Models & Formats	-
6	Data Interoperability	Interop: Data Models & Formats	ODATA
7	Data Interoperability	Interop: Data Models & Formats	-
8	Data Interoperability	Interop: Data Models & Formats	SDM
9	Data Interoperability	Interop: Data Models & Formats	-
10	Data Interoperability	Interop: Data Models & Formats	BAMM
11	Data Interoperability	Interop: Data Exchange API	NGSI-LD
12	Data Interoperability	Interop: Data Exchange API	NGSIv2
13	Data Interoperability	Interop: Data Exchange API	-

Moreover, it has some useful links to clarify any uncertainty or related question. Then, some additional information was provided for every specification, such as *long name, published by, original sources, type of specification* and so on. The details can be found in paragraph 3.3.

As explained in paragraph 2.1.2, the spreadsheet used as a basis for this analysis was produced by the DSSC project, in particular by the WP5. Some alignment took place to ensure that the spreadsheet was consistent, coherent and made full sense to conduct the analysis.

3. Key findings

This Chapter depicts the key findings that emerged when developing the use cases for the European data space for tourism, identifying its priority list of datasets and common building blocks with other data spaces. The Chapter further encompasses the findings originating from the interviews of the data sharing initiatives that were conducted.

3.1. Use cases

As previously mentioned in Chapter 2, the Project Team refined the initial long list of use cases and accordingly developed eight use cases, two for each of the four data purposes, based on the prioritized challenges identified during the February workshop. It is noteworthy to mention that the use cases are accordingly functional to the design of the technological and governance frameworks of the data space.

In this respect, the workshop 'Towards a Data Space for Tourism - Use Case Co-Creation' that took place in April aimed at further developing the needed datasets of each data types of the use case, as well as understanding the stakeholders' roles and relationships in the use case and any additional applications of the solution.

Accordingly, below in paragraph 3.1.1 can be found the eight developed use cases for each data purpose. Each use case encompasses the findings that emerged in the co-creation workshop. More specifically, each use case encompasses the key need or problem that should be addressed, the desired solution, the needed data types and data sets, the relevant stakeholders involved in the use case and their underlying role, the stakeholders' relations and type of data exchanged and, ultimately, the application of the solution.

3.1.1. Developed use cases

3.1.1.1. Sustainability & Accessibility

Use case I: Food inclusivity

Use Case Title	**Food inclusivity**
Reference	None
Data purpose(s)	**Increase of tourism sustainability & accessibility**
Challenge(s) addresses	Improve the supply and visibility of accessible tourism services
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Over the last years, a large share of tourists expresses needs related to

	food-allergy problems[4]. Indeed, food allergy limits millions of potential travellers from participating in regular travel and tourism activities. Travellers with specific food restrictions (diabetes, celiac, vegetarian/vegan) have sometimes troubles to find out which restaurants and hotels have food options adequate for them, and also which supplies are available at the destination's supermarkets. In particular, special attention must be paid by the restaurant industry and tourist service suppliers when it comes to deal with this sort of preference.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	Development and diversification of tourism products and services aimed at ensuring equal access to tourists. Indeed, providing access to data on the accessibility of a destination from a food perspective will help stakeholders to include this information in their offer in order to better attract travellers with specific food restrictions. This aspect of accessibility should be included in all the website/webapp regarding the promotion of tourism of a specific destination (DMOs). The solution should be able to include multiple functionalities, for example, being able to plan the route or distance, being able to search for offers, leave reviews, read reviews, compare prices etc.
Needed data type *Which are the main data types needed to be considered?*	Accessibility data, Demand and offer data, Tourist satisfaction & emotions, Behaviour of tourists, Related Industry Data.
Needed datasets per data type *Which are the main datasets (e.g.:. Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Accessibility datasets: • **List of tourism articles/blogs that showcase the accessibility of a destination from a food perspective.** The list should be developed per destination, per cuisine of the destination and per price range. • **List of restaurants, hotels and b&b's with option of menus,** such as gluten-free, vegetarian/vegan, and dairy free. The list should be per cuisine, per range of price, per star. • **List of restaurants that disclose food ingredients and allergens on menu.** The list should be per cuisine and per range of prices. • **List of restaurants that have special pricing offers in a destination,** per range of price and per cuisine. Demand and offer datasets: • **List of tours provided by operators that encompass a food-related activity,** per type of food restrictions. Tourists' satisfactions & emotions datasets: • **Reviews** on restaurants, per cuisine and range of price. • **Reviews** on hotels, per range of price. Behaviour of tourists' datasets: • **Number of travellers that eat in a vegan/vegetarian restaurant.** The granularity of such numbers should take into account typology of cuisine and range of prices of the restaurants.

[4] https://www.accessibletourism.org/resources/6_accessible_tourism_product_en.pdf

	• **Number of travellers that choose a vegan/vegetarian breakfast in hotels.** The granularity of such numbers should take into account the range of price of the hotels and per demographic characteristics of the tourist. Related Industry datasets: • **Medical database** encompassing a **list of forbidden substances for certain diseases or intolerance**. The database should be arranged by typology of diseases or intolerances (for example, a section should encompass ingredients that are detrimental for diabetic people, another section should encompass ingredients for celiac people etc). • **List of producers in a particular food supply chain,** Per certification, product, and suppliers.
Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Data provider • **Tourism service providers** • **HoReCA** • **Travel agency** • **Public authority** Data consumer • **Travel agency** • **Tourism service providers** • **DMOs** • **Public authority** Final user • **Tourists** • **Public authority**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organisation: • **Consumes** the datasets related to **list of restaurants, hotels and b&b's** with option of menus and **list of restaurants that disclose food allergens and ingredients** on menu. • **Consumes** datasets related to the **number of travellers that choose to eat in vegan/vegetarian restaurants**. • **Consumes list of restaurants that disclose food ingredients** and **allergens** on menu. Public authority: • **Provides and consumers** datasets on **producers in a particular food supply chain**, with underlying certifications. • **Provides datasets on restaurants, hotels and b&b's** with option of menus. • **Provides** a medical database encompassing a **list of forbidden substances for certain diseases or intolerance**. Tourists: • **Consume** datasets on a **list of tourism articles/blogs that showcase the accessibility of a destination** from a food perspective. • **Consume** datasets related **to a list of restaurants, hotels and b&b's**

	with option of menus. • **Consume** datasets on **restaurants that disclose food allergens and ingredients** on menu. • **Consume** datasets on **producers in a particular food supply chain**, with underlying certifications. HoReCa: • **Provides** datasets on the number **of travellers that choose to eat in vegan/vegetarian restaurants**. • **Provides** datasets on the **list of producers in a particular food supply chain.** • **Consumes** a medical database encompassing a **list of forbidden substances for certain diseases or intolerance**. Tour operator: • **Provides** datasets on a **list of restaurants, hotels and b&b's with option of menus**. • **Provides datasets on tours** that encompass a food-related activity. • **Provides** datasets on a **list of restaurants that have special pricing offers** in a destination. • **Consumes** datasets on the number **of travellers that choose to eat in vegan/vegetarian restaurants**. Travel agency: • **Provides** datasets on **reviews on restaurants and hotels**. • **Provides** datasets **on a list of restaurants, hotels and b&b's with option of menus**. Tourism service providers: • **Provide** datasets **on a list of producers in a particular food supply chain.** • **Provide** datasets on a **list of restaurants that have special pricing offers** in a destination.
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	The above-described solution can be adopted in a different context. Indeed, the diversification of tourism services and products should be further aimed at ensuring accessibility not only to those who require food inclusivity, but also those that suffer impairment such as physical impairments, visual impairments.

Use case II: Minimize tourism negative environmental and socioeconomic impacts

Use Case Title	**Minimize tourism negative environmental and socioeconomic impacts**
Reference	None
Data purpose(s)	**Increase of tourism sustainability & accessibility**

Challenge(s) addresses	Support the growth of sustainable parameters awareness among the tourism industry; Reduce negative impacts of tourists' behaviour on local communities and environment.
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Tourism has a major impact on natural and built environments, as well as on the wellbeing and culture of host populations. These effects can be positive or negative, depending on how tourism is developed and managed. To ensure the long-term sustainability of tourism, it is needed to effectively monitor its impacts, especially at the local level. Indeed, at destination level, tourism's positive and negative impacts are most felt, since tourism activities take place here, and tourists interact with service providers and residents. Some of the information that would be useful to monitor, for instance, pertains the impact of tourism on the environment, on the city, and on the local communities. Indeed, measuring and monitoring sustainability indicators could support DMOs and public authorities in adopting actions to mitigate tourism negative environmental and sociocultural impacts and fostering the positive ones. Unfortunately, the tourism industry is currently lacking full awareness regarding the development and use of environmental and social parameters.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	The EU tourism data space would provide reliable tourism environmental and sociocultural indicators, data useful for compiling such indicators, or simple data important to be monitored. The proposed solution consists of a dashboard allowing final users to monitor the data relevant for their environmental and social sustainability objectives. The aim of the solution is that of providing a reliable monitoring system, on which final users – e.g. DMOs, NGOs, tourism service providers, etc. – can ground their decision-making regarding how to respond and/or prevent any negative impact. At the same time, according to final users' objectives, the dashboard can be also used for leveraging on positive tourism effects. Examples of indicators regarding environmental impacts can be tourists' waste production, and energy and water consumption. Examples of those regarding sociocultural impacts can be local human pressure, ratio of residential vs travel accommodations, contribution of tourism to the GDP. Concerning this second type of impact, according to the data available, the dashboard will also provide a section for monitoring residents' satisfaction and opinions in regard to tourism in the area where they live. Regarding the geographical scope of the monitoring system, according to final users' objectives, the monitoring system will be able to cover national, regional, and local levels. However, due to the themes covered by the solution, it will most likely be used for monitoring data at destination level.

	Indeed, as mentioned above, this is the level where tourism impacts are most felt.
Needed data type *Which are the main data types needed to be considered?*	Sustainability data, Local/Residents' satisfaction and emotions, Tourist flows, Related industries data, Purchase Habits, Behaviour of tourists, Mobility data, Demand and offer data
Needed datasets per data type *Which are the main datasets (e.g.: Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Sustainability datasets: • **Quantity of energy used in tourism-related activities**, per type of energy use and type of activity. The energy can be light energy, heat energy, electricity, chemical energy and mechanical energy. • **Quantity of water used in tourism-related activities**, per type of activity. • **Quantity of pollution created through tourism-related activities,** per type of pollution and type of activity. The type of pollution could be acoustic pollution, air pollution, land pollution, water pollution. • **CO2 footprint of an average tourist,** by destination and by age of tourist. • **Waste production per tourist night compared to waste production of local residents per night, per person.** This should take into consideration the destination and the type of waste produced. • **List of tourism enterprises actively supporting the protection, conservation and management of local biodiversity of landscapes.** The list should take into consideration the typology of tourism enterprises, as well as the types of methodologies used to protect, conserve and manage the landscapes. • **List of good practices that support sustainable and responsible behaviour of tourists.** The list should consider the specific destination where the tourists are and the activities that the tourists take part in. Moreover, it should take into consideration the type of improvement that could be achieved through good practices. • **Contribution of tourism to the GDP,** per geographical area (region or city), and per type of activity. • **Statistics on tourism impact, such as percentage of tourists per resident, number of tourists per 100 residents,** by destination and by season/month. Local/Residents satisfaction and emotions datasets: • **Percentage of local residents that are satisfied with the tourists,** per destination and season/month. • **List of touristic activities that negatively impact local/residents' satisfaction and emotions**, per type of activity and per type of negative impact on locals. Tourist flows datasets: • **Average waiting time at POIs**, hourly, per destination and by season/month**.**

	• **List of POIs that suffer from overtourism and congestion.** Hourly, per destination and by season/month. • **List of areas with major tourist flows,** hourly, per geographical area (city) and per season/month. Related industries datasets: Purchase habits datasets: • **Tourist spending per capita vs local spending per capita,** per destination and per typology of tourist (foreign or inland tourist). Behaviour of tourists' datasets: • **Number of tourists that choose to travel to the most known cities**, by country of origin and per season/month. Mobility datasets: • **Number of moving vehicles in the main touristic areas/ streets,** hourly, per destination and per season/month • **List of streets with major traffic congestions and jams,** per destination, per time of the day, per density of congestion. Demand and offer datasets: • **Number of beds booked in commercial accommodation establishments per 100 residents,** per destination and per season/month. • **List of itineraries to enjoy destinations and POIS by walking,** per typology of POIs and difficulty to reach the POIs. • **List of less-known POIs close to well-known POIs.** By type of POI (cultural, gastronomic attraction) and per distance. • **List of appealing events, destinations and POIs that can be reached out of season,** per type of event, destination, POIs and per price range. • **Demand for POIS and activities,** per destination, season/month, time of day. • **Number of apartments on offer vs number of hotel rooms on offer in a touristic area,** per destination. • **List of short-term accommodations,** by type of accommodation, per destination and per geographical area. • **List of prices of touristic activities and POIs, and the price variations of such depending on the season,** by type of activity, per range of price and per season/month.
Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Data provider • **HoReCa** • **Travel agency** • **Public authority** • **DMOs** • **Private organizations** • **NGOs/Associations** Data consumer • **DMOs** • **HoReCa**

	• **Travel agency** • **Tourism service providers** • **Tour operator** Final user • **NGOs/Associations** • **DMOs** • **Public authority** • **Local residents**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organization: • **Provides** datasets on the **average waiting time at POIs**. • **Provides** and **consumes** datasets on the **number of beds booked** in commercial accommodation establishments **per 100 residents.** • **Provides** datasets on **the list of itineraries to enjoy destinations and POIS by walking.** • **Provides** and **consumes** datasets on the **list of prices of touristic activities and POIs, and the price** variations of such depending on the season. • **Provides** datasets on the **list of short-term accommodations.** • **Consumes** datasets on the number **of tourists that choose to travel to the most known cities.** • **Provides** and **consumes** datasets on the **number of apartments** on offer **vs number of hotel rooms** on offer in a touristic area**.** Public authority: • **Provides** datasets on the **contribution of tourism to the GDP.** • **Provides** datasets on the **percentage of local residents** that are **satisfied with the tourists.** • **Provides** statistics on tourism impact • **Provides** datasets on **tourist spending per capita vs local spending per capita.** • **Provides** datasets on the **list of streets with major traffic congestions and jams.** • **Provides** datasets on the **quantity of pollution** created through tourism-related activities. • **Provides** datasets on the **waste production** per tourist night compared to waste production of local residents per night, per person. • **Provides** datasets on the **list of POIs that suffer from overtourism and congestion.** • **Provides** datasets on the **CO2 footprint of an average tourist.** • **Provides** datasets on the **quantity of energy used in tourism-related activities**, • **Provides** a list of **tourism enterprises actively supporting the protection, conservation and management of local biodiversity of landscapes.** • **Provides** datasets on the **number of tourists that choose to travel**

	to the most known cities. NGOs/Associations: • **Provides** datasets on the list of **itineraries to enjoy destinations and POIS by walking.** • **Provides** datasets on the **CO2 footprint of an average tourist.** HoReCa: • **Provides** datasets on the **number of beds booked** in commercial accommodation establishments **per 100 residents.** • **Provides** datasets on the **list of prices of touristic activities and POIs, and the price variations** of such depending on the season**.** • **Consumes** datasets on the **number of tourists that choose to travel to the most known cities.** Tour operator: • **Provides** datasets on the l**ist of itineraries to enjoy destinations and POIS by walking.** • **Provides** datasets on the **list of streets with major traffic congestions and jams.** • **Provides** datasets on the **average waiting time at POIs.** • **Consumes** datasets on the **number of tourists that choose to travel to the most known cities.** Travel agency: • **Provides** datasets on the **list of touristic activities that negatively impact local/residents satisfactions and emotions.** • **Provides** datasets on the **demand for POIS and activities.** • **Provides a list of less-known POIs close to well-known POIs.** • **Consumes** datasets on the **number of tourists that choose to travel to the most known cities.** Tourism service providers: • **Provide** datasets on the **average waiting time at POIs.** • **Consumes** datasets on the **number of tourists that choose to travel to the most known cities.** Tourists: • **Consume list of less-known POIs** close to well-known POIs. • **Consume list of appealing events, destinations and POIs** that can be reached out of season. • **Consume list of short-term accommodations.** • **Consume a list of itineraries** to enjoy destinations and POIS by walking. • **Consume** datasets on the **average waiting time at POIs.** • **Consume** list of **good practices** that support sustainable and responsible behaviour of tourists. • **Consume a list of areas with major tourist flows.**

	Private organizations: • **Provide a number of moving vehicles** in the main touristic areas/ streets. • **Provide** datasets on **number of tourists** that choose to travel to the most known cities
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	The solution should focus on minimizing the tourism impact on local communities, for sure, but it should also focus on minimizing impacts that lead to disturbances of, for example, the normal activities of wildlife. Tourists should be informed on how their activities could have adverse effects on animals. It could be further useful to benchmark tourism with other industries, for example the production industry. Moreover, the solution should encourage neighbouring regions to collaborate. For example, some regions have too many visitors, whilst others too few. Collaboration could foster balance.

3.1.1.2. Conduct market analysis & decision-making

Use case I: Smart tourism observatory

Use Case Title	**Smart tourism observatory**
Reference	**HODEIAN: Smart Tourism for the territory of Gipuzkoa (Spain)**
Data purpose(s)	**Conduct market analysis and inform decision making,** Improvement of planning and operations of the tourism service
Challenge(s) addresses	Monitor the flow of visitors between districts and attractions; Develop effective business strategies and make investment decision
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Whereas tourism for several locations can be considered an important economic source and a great opportunity for economic growth, it can also produce burdens which entail significant impact on the destination itself. Indeed, often tourism destinations and attractions are "overwhelmed" and suffer from "overtourism". Overtourism appears to be closely linked with the popularity of particular attractions and points of interest that have become 'hotspots' suffering from congestion[5]. Moreover, overtourism generated a set of other challenges, including the effectiveness of public services, conservation of the cultural heritage (tangible and intangible), and management of security risks. For these reasons, cities and points of interest (heritage sites, natural parks, routes etc) need a solution to better manage the flows of tourists. The challenge

[5] Padrón-Ávila, H., & Hernández-Martín, R. (2019). Preventing overtourism by identifying the determinants of tourists' choice of attractions. *Sustainability*, *11*(19), 5177.

	of managing large tourist flows can be also linked to specific events (e.g. festivals, expos) organized in areas that are "constantly" overcrowded.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	To address the overtourism issue, stakeholders should have the possibility to monitor the flow and profile of visitors. Therefore, a tool like a dashboard could be helpful to increase the knowledge on the flow of tourists across districts and attractions and to inform real-time decision-making. Indeed, its aim is to be a decision-making aid for DMOs and public authorities. The solution can be developed either as a web app or a dashboard in a website which will show several metrics to monitor the flow of visitors. The observatory can monitor several tourism variables, with a high level of data granularity, allowing it to evaluate the appeal of tourist destinations/attractions and measure tourism potential of different areas, limiting negative impacts and risks of crowded places. Example: HODEIAN monitors the flow and profile of visitors and their consumption habits. HODEIAN makes use of heterogeneous data sources: 1) statistical data 2) expenditure monitoring 3) visitor movement tracking 4) counting sensors.
Needed data type *Which are the main data types needed to be considered?*	Tourists flow, Related industries data, Purchase habits, Behaviour of tourists, Tourists' satisfactions and emotions, Typology of tourists, Demand and offer data, Mobility data
Needed datasets per data type *Which are the main datasets (e.g.:. Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Tourists flow datasets: • **Number of passengers arriving by plane**, for a specific time and date, by country of origin. • **Tourist geolocalisation,** in real-time, for a specific POIs, with a distinction between national and foreign numbers Related industries datasets: • **Weather data and forecasts**, in real-time, hourly, per geographical area, short/mid-term forecasts Purchase habits datasets: • **List of tickets bought by tourists**, daily and hourly, per type of activity and POI, per season/month Behaviour of tourist's datasets: • **Individuals' time spent in a POI,** hourly, for each POI, and per demographic characteristic of tourists. Tourists' satisfactions & emotions datasets: • **Tourists' subjective feeling about destination**, by season/month. Typology of tourists' datasets: • **Demographics of visitors,** per POI, per time of the day, week, and per season/month Demand and offer datasets: • **List of restaurants, coffee shops**, by style, price and availability.

	• **List of tourist attractions**, by destination. • **Capacity** of an area, location, street, POI, per destination and per POI • **Number of hotel rooms available and percentage of booked rooms,** per range of prices and per season/month. Mobility datasets: • **Road traffic flow data** in real-time, with a specification between congestion and incidents.
Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Data provider • **DMOs** • **Private organization** • **Tourism service providers** • **HoReCa** • **Public Authority** • **Tour Operator** • **Travel Agency** Data consumer • **Public Authority** • **DMOs** • **Tourism service providers** Final user • **DMOs** • **Tourism service providers** • **Public Authority** • **HoReCa**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organisation: • **Provides** data about the **time spent by visitors** in a specific point of interest. • **Provides** a list of **tourist attractions**. • **Consumes** data on **time spent by visitors in a POI**. • **Consumes list of tickets** bought by tourists. • **Consumes tourists' subjective feelings** about destination. Public Authority: • **Provides weather data and forecasts.** • **Consumes number of passengers** arriving by plane. • **Consumes tourist geolocalisation** for a specific point of interest. • **Consumes** datasets on **time spent by visitors** in a point of interest. Tourism service providers: • **Provide a list of tickets** bought by tourists. • **Provide time spent by visitors** in a point of interest. • **Provide capacity of an area**, location, street, POI. • **Consume list of tourist attractions**. • **Consume** data about **demographics of visitors**.

	• **Consume** data on **tourists' subjective feelings** about the destination. HoReCa: • **Provides number of hotel rooms available** and percentage of booked rooms. • **Provides a list of restaurants, coffee shops.** Tour Operator: • **Provides time spent by visitors** in a point of interest. • **Provides a list of tickets** bought by tourists. Travel Agency: • **Provides number of hotel rooms** available and percentage of booked rooms**.** • **Provides a list of tickets** bought by tourists. Private organization: • **Provides tourist geolocalisation**. • **Provides weather data and forecasts**. • **Provides road traffic flow data**. • **Provides number of passengers** arriving by plane
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	No further application has been discussed during the workshop.

Use case II: Mitigate crisis management

Use Case Title	**Mitigate crisis management**
Reference	None
Data purpose(s)	**Conduct market analysis and inform decision making**
Challenge(s) addresses	Crisis management
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	The tourism industry is highly volatile due to seasonality and other determinants. Seasonality has been widely researched, but calamitous events and their impact on the tourism sector are still underestimated[6]. As Covid-19 pandemic thought, the tourism industry and supply chain can be suddenly disrupted if a dramatic event, such as natural disasters, terrorist attacks, political instability, and infectious diseases, takes place. In a nutshell, reliable information can support the pathway towards resilience

[6] Gricar, S., Bojnec, S., & Baldigara, T. (2022). Insight into Predicted Shocks in Tourism: Review of an Ex-Ante Forecasting. *Journal of Risk and Financial Management*, *15*(10), 436.

	and improve strategic decisions.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	Therefore, having updated, real-time and valuable information can help to form accurate and corresponding decisions for immediate actions. Indeed, integrating data relevant to crisis management (accidents, natural disasters, closed areas and trails) with data on tourist flows, weather can allow public authorities to plan preventive actions, interventions and also communication. Moreover, sharing this data with stakeholders, like tour operators, helps to provide real-time information on possible risks that could hinder tourists' safety. The same solution can be an App or a dashboard that provides updated and real-time information to facilitate decision-making. Moreover, the solution can be implemented also as a safety barometer (food safety, road safety, etc.).
Needed data type *Which are the main data types needed to be considered?*	Mobility data, Related industries data, Demand and offer data, Tourist flows, Sustainability data, Tourists' satisfaction & emotions.
Needed datasets per data type *Which are the main datasets (e.g.:. Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Mobility datasets: • Info mobility data: **number of accidents and street works** in real-time and per geographical area (city/location) • **Real-time updates on mobility issues** by geographical area (location). Related industry datasets: • **Weather data and forecasts**, in real-time, hourly, per geographical area, short/mid-term forecasts • **List of social events (e.g. rallies, protests, economic crisis,…),** in real time and per geographical area • **Updates on crisis**, in real-time and per geographical area (country/region) Accessibility datasets: • **Number of staff of tourism services who have received safety training**, per destination and by year of experiences. Tourist flows datasets: • **Guest flow**, in real-time, per destination, per season/month and by location (museum, hotels, etc). • **List of tourists who registered their travel abroad** per destination and expected arrival and departure time. • **Number of foreign people/travellers**, by destinations and subarea, per geographical area (country). • **Forecasts of expected visitors to a destination,** per season/month, by country of origin Sustainability datasets: • **Indicators of climate change** by geographic coverage and a specific time frame. • **Statistics on tourism impact**, such as percentage of tourists per

	resident, number of tourists per 100 residents. The statistics should be by destination and by season/month. • **Tourist spending per capita vs local spending per capita,** per destination and per typology of tourist (foreign or inland tourist) Tourists' satisfaction & emotions datasets: • **Tourists' subjective feeling about safety in destination**, taking into account the seasonality/month.
Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Data provider • **Public Authority** • **Private organizations** • **NGOs & Associations** • **Travel agency** • **Tour operator** • **HoReCa** Data consumer • **Public Authority** Final user • **Tour operator** • **DMOs** • **Travel agency** • **Tourism service providers** • **HoReCa**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organization: • **Provides** data about the **number of staff** of tourism services who have received safety training. Public Authority: • **Provides** data on a **list of social events (e.g. rallies, protests, economic crisis,…),** including historical data. • **Provides list of tourists who registered their travel abroad*** • **Provides statistics** on tourism impact. • **Provides tourist spending per capita vs local spending per capita** • **Provides indicators** of climate change. • **Consumes forecasts of expected visitors** to a destination. • **Consumes tourists' subjective feelings** about safety. Private organizations: • **Provide info mobility data** – number of accidents and street works – including real-time updates on mobility. • **Provide weather data and forecast.** HoReCa: • **Provides** data about the **number of staff** who have received safety training.

	Tour operator: • **Provides forecasts** of expected visitors to a destination. • **Provides** data of **foreign people/travellers**. Travel agency: • **Provides forecasts of expected** visitors to a destination. • **Provides** data of **foreign people/travellers**. Tourism service providers: • **Provide** data about **the number of staff** who have received safety training. • **Provide statistics** on tourism impact. • **Provide data on guest flow**. NGOs/Associations: • **Provide updates** on a crisis. • **Provide indicators** of climate change.
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	No further application has been discussed during the workshop.

3.1.1.3. Tourists' engagement

Use case I: AI-based recommender for sustainable tourism

Use Case Title	**AI-based recommender for sustainable tourism**
Reference	AIR project
Data purpose(s)	Increase of tourism sustainability & accessibility, improvement of planning and operations of the tourism service, **Improvement of the interaction and engagement of the tourist**
Challenge(s) addresses	Reduce negative impacts of tourists' behaviour on local communities and environment; Manage and reduce overcrowding of sites and services; Improve tourists' experiences by providing information on tourism flows
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Mass tourism to cultural sites and natural areas generate several issues for local residents and the environment. Just to mention the main ones, overcrowding could generate the impoverishment (or even destruction) of natural sites, increase in the amount of waste, and escape and malaise of residents. At the same time, it is hard to enjoy tourism experiences when sites are too crowded. Information regarding the amount of people actually visiting a specific point of interest and information regarding the most crowded moments will surely allow residents and tourists to make their visits safer and more comfortable.

Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	The overall objective of the use case is to contribute to a more sustainable tourism development by effectively managing visitors flows. AI-based procedures will be implemented and evaluated to identify and predict tourism hotspots. Based on nudging approaches, a recommender system will be developed to provide relevant information on saturation levels and suitable trip alternatives to enhance the visitor experience, as well as the quality of life in tourism regions. This use case foresees the development of solutions for destinations for managing visitors (e.g. digital visitor management system). At the same time, the same solution can become an App for visitors themselves. Such App, thanks to AI, will advise tourists on the most crowded moments for visiting places, provide them with real-time information and provide alternatives. According to workshop inputs, the solution should further take into consideration multiple additional elements, including: • Tourist and DMO Reviews / rating data on the sustainable recommendations made by the AI-based recommender; • How to market and publicize the solution to make it as effective as possible; • Integration into the destination measurement system aligned to strategy/policy targets 2030-2050; • Data privacy issues, especially taking into consideration people below the age of 18.
Needed data type *Which are the main data types needed to be considered?*	Tourist flows; Related industry data; Mobility data; Demand and offer data; Behaviour of tourists; Tourists' satisfactions and emotions; Sustainability data; Typology of tourists
Needed datasets per data type *Which are the main datasets (e.g.: Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Tourist flows datasets: • **Number of tourists entering or exiting a POI,** per time of the day. • **Number of tourists in a POI**, per destination and subarea; In real-time, per season/month; Per age of visitors* • **Historical data on number of tourists in a POI,** per destination and subarea; In real-time, per season/month (including historical series); Per age of visitors* • **Expected number of tourists in a POI,** per time of the day and week. • **Number of visitors that can fit into a POI,** for each POI; • **Number of tickets still available for a POI,** in real-time per POI. Related industry datasets: • **Weather data and forecasts**, in real-time, hourly, per geographical area, short/mid-term forecasts • **List of public holidays in home region and list of public holidays in bordering countries,** per geographical area (country) and per month • **List other events** taking place close to the POI (e.g. concerts, football, matches), per season/month.

	Mobility datasets: • **List of areas with traffic congestions**, per time of the day, per density of congestion. • **List of current closures of tracks, facilities and warnings,** per destination, per time and day of the week. Demand and offer datasets: • **Occupancy rate of accommodations**, per day, per typology of accommodation, per price range and per geographical area. • **List of opening and closing times of POIs,** per type of POI, and per season/month. Behaviour of tourist's datasets: • **Individuals' time spent in a POI,** hourly, for each POI, and per demographic characteristic of the tourist (for example, is the tourist part of a family, what is his/her age?). • **Online engagement rates of tourists on websites related to tourists' attractions,** per type of engagement on the platform and per type of user (registered or not), per demographic characteristics of tourist. • **List of cultural preferences of tourists.** By type of activity (culinary tourism, music, historic or heritage etc), per age of tourists Tourists' satisfactions and emotions datasets: • **List of satisfaction rates about POIs.** The list can be classified in accordance with the type of POIs and places, such as museums, restaurants, parks etc. Sustainability datasets: • **List of good practices that support sustainable and responsible behaviour of tourists.** The list should consider the specific destination where the tourists are and the activities that the tourists take part in. Moreover, it should take into consideration the type of improvement that could be achieved through good practices. For example, a good practice could be not throwing litter inside of protected natural sites and seas. In this case, waste and pollution could be reduced, and specific animals protected. • **CO2 footprint of an average tourist,** by destination and by age of tourist. Typology of tourists**:** • **Visitor demographics in a POI,** per time of the day, week, month. Purchase habits • **Historical data on reservations and booking in a specific place.** The list should take into consideration various times of the day. • **List of booked activities and number of people for each booking,** per destination, type of activity, per time and day of the week.
Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Data provider • **HoReCA** • **Tourism service providers** • **DMOs**

	• **Public authority** • **Private organizations** Data consumer • **DMOs** • **Private organizations** • **Public authority** • **HoReCa** Final user • **Tourists** • **Tourism service providers** • **Travel agency** • **DMOs** • **Public authority**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organization: • **Provides** datasets on the **number of visitors that can fit into a POI.** • **Provides** datasets on the **list of opening and closing times** of POIs**.** • **Provides** datasets on the **number of tickets still available for a POI** • **Provides** and **consumes datasets on online engagement rates** of tourists on websites related to tourists' attractions. • **Provides** data on **individuals' time spent in a POI.** • **Consumes** datasets on list of **booked activities and number of people for each booking.** • **Consumes** list of **preferences and satisfaction rates** of tourists**.** Public authority: • **Provides** datasets on the **list of current closures of tracks, facilities and warnings.** • **Provides** datasets on a **list of good practices** that support sustainable and responsible behaviour of tourists. • **Provides** data on the **CO2 footprint of an average tourist.** • **Consumes number of tourists in a POI.** • **Consumes** datasets on list of **booked activities and number of people for each booking.** • **Provides weather data and forecasts**. Tourists: • **Consume** datasets on the **opening and closing times of POIs.** • **Consume** datasets on **number of tickets still available for a POI** • **Consume list of good practices** that support sustainable and responsible behaviour of tourists. • **Consume list of public holidays** in the home region and a list of public holidays in bordering countries. • **Consume weather data and forecasts.** • **Consume list of areas with traffic congestions**. • **Consume datasets on the current closures** of tracks, facilities and warnings.

	HoReCa: • **Provides** datasets on **number of tickets still available for a POI** • **Provides** datasets on the **number of visitors that can fit into a POI.** • **Provides** data on **occupancy rate of accommodations.** • **Provides historical data on reservations and booking in a specific place** • **Consumes** datasets on **expected number of tourists in a POI.** • **Consumes** and **provides** a list of **preferences and satisfaction rates of tourists.** Tour operator: • **Provides** data on **individuals' time spent in a POI.** • **Provides a list of booked activities and number of people** for each booking. • **Consumes** and **provides a list of preferences and satisfaction rates of tourists.** • **Consumes** datasets on **expected number of tourists in a POI.** • **Provides** and **consumes** datasets on **visitor demographics in a POI.** Travel agency: • **Provides** datasets on **booked activities and number of people** for each booking. • **Consumes** list of **preferences and satisfaction rates of tourists.** • **Consumes** data on **individuals' time spent in a POI.** • **Provides** and **consumes** datasets on **visitor demographics in a POI.** Tourism service providers: • **Provide** datasets on **number of tickets still available for a POI** • **Provide** datasets on the **number of visitors** that can fit into a POI. • **Provide** data on **individuals' time spent in a POI.** • **Provide** a list of **good practices** that support sustainable and responsible behaviour of tourists. • **Provide a number of tourists in a POI.** • **Provide a list of booked activities and number of people** for each booking. • **Provide historical data on reservations and booking in a specific place.** • **Provide** datasets on the **number of tourists entering or exiting a POI.** • Provide historical data on number of tourists in a POI • **Consume** and **provide** datasets on **preferences and satisfaction rates of tourists.** Private organizations: • **Consume** datasets on **online engagement rates of tourists** on websites related to tourists' attractions. • **Consume** datasets on **preferences and satisfaction rates of tourists.** • **Provide** datasets regarding **areas with traffic congestions**.

	• **Provides weather data and forecasts**.
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	The solution could be adopted to showcase, for example, the locations of public toilets in a specific destination. This could be useful owing to the fact that overcrowding often causes confusion in a particular POIs, hence knowing the location of public toilets could help to better manage the tourism flows and make tourists' visits more comfortable. Moreover, the solution could further showcase mobility solutions to avoid overcrowded areas in a certain location.

Use case II: Customised immersive experiences using historical data

Use Case Title	**Customised immersive experiences using historical data**
Reference	5DCulture project
Data purpose(s)	**Improvement of the interaction and engagement of the tourist,** Conduct market analysis and inform decision making
Challenge(s) addresses	Develop innovative immersive and digital tourism experiences, Incentivize collaboration among different types of stakeholders, Answer to the so-called request for "hyper personalization" of travel experiences, Address the demand/needs of tourists of different generations
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Addressing the demand/needs of digital natives. Millennials, generations Z and Y will become tourism consumers in the medium term (until 2030) and the main consumers in the long run (2050). They are highly digitally skilled tourists and will most likely ask for more inclusive and interconnected digital solutions. Indeed, they are looking for "transformative experiences" that deeply involve their mind and that are customised to their current mind-set/life stage/interests.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	Based on digitalized cultural heritage (e.g. paintings, archaeology, architecture, fashion…), it is possible to create extended reality (XR) experiences, including mixed reality (MR) and virtual reality (VR). Based on customers' data, it will be possible to offer personalized VR experiences. Indeed, data regarding visitors' preferences, previous visits, interests, but also age, etc. will allow to tailor the experience in real time. Example: A VR experience at the "Eiffel Tower" could adapt to the profile of the visitor. For instance, the experience could provide technical information and depict the history of the construction processes for tourists with a technical background/interests. Similarly, a VR experience with a "romantic narrative" can be displayed to a young couple. Players from multiple data spaces (cultural heritage, smart city, etc) can share data with tourism players wanting to build extended reality experiences. For this, exchange of data with other Data Spaces is required,

	as well as procedures to ensure secure use of personal information and GDPR-compliance. The solution should further focus on increasing cooperation between cultural institutions and tourism stakeholders, as well as giving the possibility to showcase these experiences in multiple languages or dialects.
Needed data type *Which are the main data types needed to be considered?*	Related industry data; Behaviour of tourists; Purchase habits; Typology of tourists, Tourist Flow
Needed datasets per data type *Which are the main datasets (e.g.:. Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Related industry datasets: • **List of 3D city models, both historical ones and current ones for change detection,** per level of detail (LOD) and per country. • **Digital twins data** for cities, monuments, POI, by destination/POI • **List of historical cultural archives,** per geographical area (city/country), and per typology of material that can be found in the archive, such as audios, videos, images, georeferenced • **List of flora and fauna species that are currently extinct,** per extinction date and per risk of extinction if they are already not extinct. Per geographical location as well. • **List of attractions that can be used to generate transformative and extended reality experiences.** Per type of attraction and geographical area • **List of historical characters,** per geographical location and per era. • **List of current digital storytelling using extended reality,** per typology of storytelling (hence if it's supposed to showcase monuments, events etc). Behaviour of tourist's datasets: • **List of cultural preferences of tourists**. By type of activity (culinary tourism, music, historic or heritage etc), per age of tourists**.** • **Visitors' interactions with XR experiences**, per type of activity. Purchase habits datasets: • **Historical data on purchase of extended reality experiences (last 2 years),** per type of activity, and by demographic characteristics of tourist • **Tourist preferences on booking, hence if they book ahead or on site**. The preferences should consider demographic characteristics of tourists, and the type of activity they book their tickets for. Typology of tourist's datasets: • **Age of tourists potentially interested in a digital XR activity,** per typology of activity • **Gender of tourists potentially interested in a digital XR activity,** per typology of activity Tourists flow datasets: • **Number of tourists in a POI,** per destination and subarea; In real-time, per season/month; Per age of visitors.

Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Data provider • **Public authorities** • **DMOs** • **Tourism service providers** • **Private organizations** Data consumer • **Private organizations** • **Tour operators** • **Tourism service providers** Final Users • **Tourists**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organization: • **Consumes** datasets on **Number of tourists in a POI.** • **Consumes** datasets **on historical data on purchase of extended reality experiences (last 2 years)** • **Consumes** list of **cultural preferences of tourists.** Tour operator: • **Provides** and **consumes** datasets on the **cultural preferences of tourists**. • **Consumes** datasets on **Number of tourists in a POI**. • **Consumes** datasets on **historical data on purchase of extended reality experiences (last 2 years)** • **Consumes** datasets on **list of flora and fauna species** that are currently extinct. • **Consumes** datasets on **historical figures.** Tourists: • **Consume** datasets on a **list of 3D city models**, both historical ones and current ones for change detection. • **Consume** datasets on the list of **current digital storytelling using extended reality.** • **Consume** datasets on the list of **flora and fauna species** that are currently extinct. Tourism service providers: • **Consume** datasets on the **number of tourists in a POI.** • **Consume** list of **attractions** that can be used to generate transformative and extended reality experiences. Private organizations: • **Provide** datasets on a **list of 3D city models**, both historical ones and current ones for change detection. • **Provide** datasets on a list of **historical cultural archives.** • **Provide** datasets on the list of **flora and fauna species** that are currently extinct. • **Consume** dataset on **Number of tourists in a POI.**

	Public authority: • **Provides** datasets on the list of **flora and fauna species** that are currently extinct. • **Provides** datasets on **list of 3D city models,** both historical ones and current ones for change detection. • **Provides** datasets on **historical cultural archives.**
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	Going into detail, the extended reality and personalized experiences should focus on showcasing a multitude of elements, hence not only monuments but also historical events, as well as extinct species. The solution should further focus on giving a personalized experience not only to tourists, but also to local residents. Moreover, it is important to acknowledge that the solution could be implemented in a plethora of contexts, hence not only in the tourism context but also for schools/universities etc.

3.1.1.4. Planning & Operations

Use case I: Optimisation of tourist flows in protected areas

Use Case Title	**Optimisation of tourist flows in protected areas**
Reference	None
Data purpose(s)	**Improvement of planning and operations of the tourism service;** Increase of tourism sustainability and accessibility
Challenge(s) addresses	Understand and better forecast the tourism flow; Manage seasonality in tourism sector; Manage and reduce overcrowding of sites and services
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Tourism seasonality affects most destinations in the world, and it implies unequal distribution of tourism throughout the year. It results in periods where local resources are exploited over capacity and the local environment suffers from several issues, such as overproduction of waste and pollution. At the same time, crowds might also be detrimental for fragile landscapes and heritage sites. In addition to these issues, overcrowding of sites also affects the experience of tourists, making it less comfortable and potentially less safe.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	In order to effectively manage tourism flows in protected areas, a set of indicators should be adopted. Such indicators will focus on the site maximum capacity, considering taking into account environmental variables (e.g. resources consumption and waste and pollution production), other detrimental human impacts (e.g. vibration created by traffic, crowds' steps, people and infrastructure weight, noise…), and infrastructure capacity (e.g. public transport capacity, service facilities available etc…). In order to predict the value of such indicators in specific periods, it is important to

	estimate the amount of visitors in the period of analysis. To do so, it is possible to rely on other data, such as, for instance, bookings for accommodation, transports, and close visits/experiences in the analysed period (and related web searches), visits to the site website and site tickets purchasing. Such data could be displayed on a dashboard, to be used (not only) by people in charge of managing the area. Based on these data associated with impact indicators, it will be possible to forecast impacts and to adopt preventive measures. Preventive measures could for instance be the adoption of marketing campaigns with offers in less crowded periods or for similar but less famous destinations, policies to equally divide participants though the day, etc.
Needed data type *Which are the main data types needed to be considered?*	Tourists flow, Demand and offer data, Related industry data, Purchase habits, Sustainability data, Behaviour of tourists, Mobility data
Needed datasets per data type *Which are the main datasets (e.g.: Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Tourists flow: • **Individuals' time spent in a POI**, hourly for each POI. • **Tourist geolocalisation**, in real time, for specific POIs, with a distinction between national and foreign numbers. Demand and offer data: • **Accommodation occupancy rate and occupancy**, daily and by type of accommodation, per range of price and per geographical area • **List of all attractions** in the destination, by destination and per type of activity • **Schedule of activities for tourists**, updated daily. • **Online bookings for visiting natural resources**, in real time. • **Natural resources booking website analytics**, weekly, • **Ticket price for each attraction**, per typology of ticket (full-price, reduced-price). • **Calendar availability of activities** in webforms, in real time. Related industry data: • **List other events taking place close to the POI** (e.g. concerts, football, matches), per season/month • **Weather data and forecasts**, in real-time, hourly, per geographical area, short/mid-term forecasts Purchase habits: • **Preferred meal options** in the destination per season/month. Sustainability data: • **Environmental indicators** (such as floor usage, beach deterioration…), monthly updated. Behaviour of tourists: • **Amount of waste produced by (individual) visitors** per season. Mobility data: • **Number of flights towards the destination**, in real time • **Forecasts of flights towards the destination**, per time of the day and by country of origin

	• **Public transport geolocalisation**, updated in real time.
Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	Destination Management Organisations; Public Authority; HORECA; Travel Agency; Tour Operator; Tourism service provider Data provider: • **DMO** • **Public authority** • **Tourism service providers** • **HORECA** • **Travel Agency** • **Tour operator** Data consumer: • **DMO** • **Public authority** • **Tourism service providers** • **HORECA** Final user: • **DMO** • **Public authority** • **HORECA**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organization: • **Provides** and **consumes** a **list of all attractions** in the destination. • **Provides** and **consumes online bookings** for visiting natural resources. • **Provides list other events** taking place close to the POI, • **Provides** and **consumes calendar availability of activities** in webforms. • **Provides** and **consumes datasets on capacity of an area, location, street, POI**. • **Provides** and **consumes public transport geolocalisation**. • **Provides** and **consumes a schedule of activities** for tourists. • **Consumes** data on the **accommodation occupancy rate and occupancy**. • **Consumes** data on **tourist geolocalisation.** • **Consumes individuals' time spent** in a POI. • **Consumes environmental indicators.** • **Consumes number of flights** towards the destination. • **Consumes forecasts of flights** towards the destination. Public authority: • **Provides** and **consumes individuals' time spent** in a POI. • **Provides weather data and forecasts**. • **Provides datasets on capacity of an area, location, street, POI**. • **Provides a list of all attractions** in the destination. • **Provides online bookings** for visiting natural resources. • **Provides public transport geolocalisation**.

	• **Provides** and **consumes environmental indicators**. • **Provides** and **consumes** data on **tourist geolocalisation**. • **Consumes number of flights** towards the destination • **Consumes forecasts of flights** towards the destination • **Consumes** data on the **accommodation occupancy rate and occupancy**. <u>HoReCa:</u> • **Provides** data on the **accommodation occupancy rate and occupancy**. • **Consumes number of flights** towards the destination. • **Consumes forecasts of flights** towards the destination. • **Consumes list of all attractions** in the destination. • **Consumes list other events** taking place close to the POI. <u>Tour operator</u>: • **Provides and consumes a list of all attractions** in the destination. • **Provides** and **consumes a number of flights** towards the destination. • **Provides** and **consumes forecasts of flights** towards the destination. • **Consumes** data on the **accommodation occupancy rate and occupancy**. • **Consumes datasets on capacity of an area, location, street, POI**. • **Consumes** data on **public transport geolocalisation**. • **Consumes calendar availability of activities** in webforms. • **Consumes** data on the **schedule of activities** for tourists. <u>Travel agency</u>: • **Provides** and **consumes a number of flights** towards the destination. • **Provides** and **consumes forecasts of flights** towards the destination. • **Consumes datasets on capacity of an area, location, street, POI**. • **Consumes list of all attractions** in the destination. • **Consumes calendar availability of activities** in webforms. • **Consumes** data on the **schedule of activities** for tourists. • **Consumes** data on **public transport geolocalisation**. <u>Tourism service providers</u>: • **Provide** and **consume** Calendar availability of activities in webforms • **Provide** and **consume** Individuals' time spent in a POI • **Provide** and **consume** environmental indicators • **Provide** and **consume** data on **tourist geolocalisation**. • **Provide** and **consume** datasets on the **online bookings for visiting natural resources**. • **Provide datasets on capacity of an area, location, street, POI**. • **Provide** and **consume a number of flights** towards the destination. • **Provide** and **consume forecasts of flights** towards the destination. • **Consume a list of all attractions** in the destination. • **Consume weather data and forecasts.** • **Consume** data on the **accommodation occupancy rate and**

	occupancy.
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	• A similar tool can be applied to all saturated areas (e.g. in case of big events) • The tool can be at the base of the development of an app designed to avoid cues in saturated POIs. • The tool can be at the base of information needed to plan public transportation options and to adopt programs to incentivize sustainable behaviours.

Use case II: Data intelligence-based marketing campaign optimization system

Use Case Title	**Data intelligence-based marketing campaign optimization system**
Reference	None
Data purpose(s)	**Improvement of planning and operations of the tourism service**; Conduct market analysis and inform decision-making
Challenge(s) addresses	Manage seasonality in tourism sector; Develop effective business strategies & make investment decisions; Develop effective business strategies and make investment decision
Problem(s)/ need(s) *Explain the key need(s) or problem(s) that should be addressed*	Tourism seasonality affects most destinations in the world, and it implies unequal distribution of tourism throughout the year. It results in periods where local resources are exploited over capacity and the local environment suffers from several issues, such as overproduction of waste and pollution. At the same time, crowds might also be detrimental for fragile landscapes and heritage sites. In addition to these issues, overcrowding of sites also affects the experience of tourists, making it less comfortable and potentially less safe. A way for reducing tourism seasonality is that of being able to effectively target tourists with offers incentivizing them to visit destinations off season.
Desired solution *Describe key aspects that could / should improve the use case problem / challenge, mentioning the possible solution.*	To develop effective marketing campaigns (also useful for facing tourism seasonality) for hotels, it would be useful to develop an application that analyses data and provides relevant information for targeting marketing campaigns. Indeed, through hotel searches (period and characteristics of the accommodation), transport searches, search lead time, visits to destination's website, tourists' nationality and demographic information, etc. it is possible to implement a campaign aiming to attract tourists in a desired period. The aforementioned data will allow to understand where to run the campaign, how much in advance, and with which promotional message.

	This use case can be implemented by developing an application that automatically analyses daily the needed data automatically retrieved from the EU tourism data space. Such elaboration will be at the base of hotels' decision-making regarding marketing campaigns. Such application will allow to constantly monitor the market, resulting not only in the possibility to leverage on data for reaching specific objectives, but also to detect opportunities stemming from tourists' demand.
Needed data type *Which are the main data types needed to be considered?*	Related industry data, Demand and offer data, Purchase habits, Mobility data, Typology of tourists, Tourists flow, Behaviour of tourists, Tourists satisfaction and emotions
Needed datasets per data type *Which are the main datasets (e.g.:. Hotels, Flights, Points of Interest (POIs), events, etc.) and the level of granularity needed?*	Related industry data: • **List other events taking place close to the POI** (e.g concerts, football, matches), per season. • **Score of tourism impact of events**, daily. • **Weather data and forecasts**, in real-time, hourly, per geographical area, short/mid-term forecasts Demand and offer data: • **Accommodation availability in real time**. • **Accommodation rates and occupancy**, daily and by type of accommodation • **Accommodation locations,** per POI • **List of all attractions in the destination,** by destination and per type of activity • **Schedule of activities for tourist,** daily updated Purchase habits: • **Telecom subscriptions** (e.g. Tourist plans, Auto roaming data…). Per country of origin. Mobility data: • **Bookings of flights towards the destination,** by country of origin Typology of tourists: • **Nationality of marketing campaign targets** (based on where from the web search has been performed), for each individual. • **Type of traveller** (couple / single, family…) by destination and updated weekly. Tourists flow: • **Daily arrivals** by destination and subarea Behaviour of tourist: • **Length of stays** by destination and per season/month • **Search terms used in official websites (search engines embedded) and categories read**, updated daily Tourists satisfaction and emotions: • **Reviews on the destination**, by season/month and per market segment • **Destination social media engagement**, by channel and by hashtag

Stakeholders and roles *Who are the relevant stakeholders involved in this* use case? *With which role(s)?*	HORECA; Travel Agency; Tour Operator; DMO Data provider: • **DMO** • **HORECA** • **Travel Agency** • **Tour operator** Data consumer: • **DMO** • **HORECA** • **Travel Agency** • **Tour operator** Final user: • **DMO** • **HORECA** • **Travel Agency** • **Tour operator**
Stakeholders' relations and type of data exchanged. *How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?*	Destination management organization: • **Provides** data on **nationality of marketing campaign targets** • **Provides accommodations locations.** • **Provides and consumes reviews on the destination.** • **Provides a list of all attractions in the destination.** • **Provides a schedule of activities** for tourists. • **Provides** and **consumes the score of tourism impact of events.** • **Consumes** data on **telecom subscriptions.** • **Consumes** data on **accommodation rates and occupancy.** • **Consumes** data on the **destination social media engagement.** • **Consumes** data on **the type of traveller**. • **Consumes** data on **vacation period (start-end date) and location** • **Consumes** datasets concerning **search terms** used in official websites (search engines embedded) and **categories read** • **Consumes** data on **daily arrivals**. • **Consumes bookings of flights** towards the destination. • **Consumes** data on **accommodation** availability. • **Consumes weather data and forecasts.** HoReCa: • **Produces** datasets about **vacation period** (start-end date) and **location**. • Produces data on **accommodation availability**. • **Produces** datasets regarding the **accommodation rates and occupancy**. • **Produces** data on the **destination social media engagement**. • **Produces** and **consumes reviews on the destination**. • **Produces** and **consumes** data on the **type of traveller**. • **Produces** and **consumes** datasets on **arrivals by destination**.

	• **Produces** and **consumes** data on **accommodation location.** • **Produces** and **consumes** datasets concerning **search terms** used in official websites (search engines embedded) and **categories read**. • **Consumes** data on **telecom subscriptions**. • **Consumes** data on the **nationality of marketing campaign targets**. • **Consumes score of tourism impact** of events. • **Consumes list of all attractions** in the destination. • **Consumes** data on **schedule of activities for tourist** • **Consumes** data on **bookings of flights towards the destination** • **Consumes** data on **vacation period (start-end date) and location** • **Consumes weather data and forecasts** <u>Tour operator:</u> • **Produces** data on **nationality of marketing campaign targets**. • **Produces** and **consumes** data on **bookings of flights towards the destination**. • **Produces** and **consumes** data on **daily arrivals**. • **Produces reviews on the destination**. • **Produces** data on **destination social media engagement**. • **Produces** data on the **type of traveller.** • **Consumes** datasets about **vacation period** (start-end date) and **location**. • **Consumes** data on **telecom subscriptions.** • **Consumes** data on **accommodation availability.** • **Consumes score of tourism impact of events.** • **Consumes list of all attractions in the destination.** • **Consumes** data on the **schedule of activities for tourists.** • **Consumes weather data and forecasts.** • **Consumes** data on **accommodations locations.** <u>Travel Agency:</u> • **Produces bookings of flights** towards the destination. • **Produces** data on **the type of traveller**. • **Produces** datasets concerning **search terms** used in official websites (search engines embedded) and **categories read**. • **Produces** and **consumes** reviews on the destination • **Produces** data on the **destination social media engagement**. • **Produces** data on the **nationality of tourists**. • **Consumes** datasets about **vacation period** (start-end date) and **location**. • **Consumes** data on **accommodation availability**. • **Consumes** datasets regarding the **accommodation rates and occupancy**. • **Consumes weather data and forecasts**. • **Consumes bookings of flights** towards the destination. • **Consumes** data on **daily arrivals.** • **Consumes score of tourism impact** of events.

	• **Consumes** data on **accommodation location.** • **Consumes list of all attractions** in the destination. • **Consumes** data on the **schedule of activities** for tourists.
Application of the solution *In which other context and/or for which other final users the solution could be adopted?*	No further application has been discussed during the workshop.

3.2. Taxonomy and list of priority datasets

3.2.1. Taxonomy of data types

The following paragraph illustrates the structure for the taxonomy on the data types and the datasets needed for the 8 use cases.

Before delving into the taxonomy analysis, it is important to have a clear understanding of all the data types taken into consideration in the analysis. Table 3 gives an overview of the definition of the data types presented in the hierarchical structure.

Table 3 - Definition of data types

Type of data	Explanation
Sustainability & Accessibility	
Accessibility data	Data about accessibility and inclusivity of the destination.
Sustainability data	Data on the economic, social and environmental contributions and dependencies of tourism (e.g. loading capacity requirements for geographic destinations, use of natural resources by tourism, tourism water consumption).
Local/Residents' satisfactions and emotions	Data about communities' emotions related to local tourism.
Tourists' data	
Behaviour of tourists	Data concern to tourists' preferences related to the choice and fruition of (touristic) services while travelling.
Purchase habits	Data about how and in which occasions tourists spend their money while travelling (e.g. tourist expenditure by nationality, transaction data, consumption decisions both online and offline).
Tourists flow	Data about tourists' movement on a specific destination/point of attraction.

Type of data	Explanation
Tourists' satisfaction & emotions	Data about customers' opinion regarding their experience (e.g. data about customer experience, emotional aspects of tourists, review scores, sentiment analysis).
Typology of tourists	Data about profiling of tourists, including demographic characteristics, tourists' personal data.
Industry data	
Demand and offer data	Data allowing an estimation of the "amount" of services requested and supplied (e.g. occupancy rates and/or number of overnight stays on a daily basis, level of quality of tourism by region, prices by tour operators' contracts).
Mobility data	Data about the transportation sector, including maritime, air and train flow data, ticketing and payment services.
Related industry data	Data concern industries related to tourism (e.g. real estate, entertainment, agriculture…).

The structure of the taxonomy (Figure 5) shows the hierarchy of categories and subcategories within the data types. A colour scale was used to highlight the differences in the frequency of the datasets in the hierarchical structure, as depicted in Table 4.

Figure 5 - Taxonomy of data types

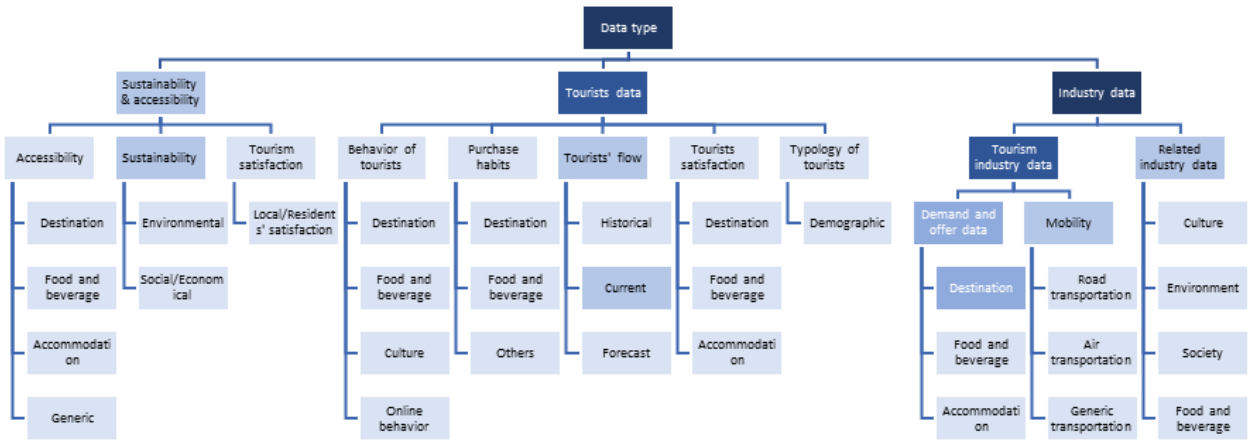


Table 4 - Legend of taxonomy

Data sources frequency	Colour legend
1 to 10	
11 to 20	
21 to 30	
31 to 60	
61+	

The taxonomy analysis shows that data related to the industry data category predominate in the eight use cases. Regarding this data type, tourism industry data is the most frequent (32 datasets) with a predominance of demand and offer data over mobility data. Demand and offer datasets occur 22 times in the 8 use cases, and they mostly relate to destination information, such as attractions, events and Point of Interests (POI). For what concerns mobility data, the 8 use cases include datasets about traffic flow and mobility issues.

The industry data category also includes related industry data, which mostly concerns datasets related to information about culture.

Regarding tourists' data, the most common data type throughout the eight use cases is tourists' flow (15). Within tourists' flow datasets, the majority (10) focuses on current information on the number of travellers in a destination. The second and third most common data types are behaviour of tourists and purchase habits, with 9 and 7 datasets respectively.

Finally, concerning sustainability & accessibility category, only 28 datasets are present in the eight use cases, mostly about environmental sustainability and accessibility. Only two datasets related the local/residents' satisfaction and emotions are present.

3.2.2. Priority datasets

The following tables present the 111 datasets identified through the 8 developed use cases. According to the methodology, these datasets are considered the **priority ones**, since the 8 use cases respond to the challenges that stakeholders identified as the most important. For each dataset, the tables shows

- its position within the taxonomy (3.2.1), presenting the line of layers (first, second and third) under which it falls,
- the needed granularity, and
- where from the dataset can be retrieved (data source[7]).

Each table refers to one label of the first layer, i.e. Sustainability & Accessibility, Tourists data, and Industry data. In the tables below, the datasets highlighted in bold are the ones appearing two or more times across the use cases, and the ones marked with an asterisk (*) are the ones including personal data.

Table 5 - List of priority datasets: Sustainability & Accessibility

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Accessibility	Destination	List of tourism articles/blogs that showcase the accessibility	Per destination, per cuisine and per price range	User generated data, Private businesses data, webscraping

[7] Following the data sources definitions adopted since the beginning of the project, i.e. during the data sharing inventory mapping phase.

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
		of a destination from a food perspective		
Accessibility	Food and beverage	List of restaurants with option of menus, such as gluten free, vegetarian/vegan, and dairy free.	Per cuisine, range of price and per stars	Private businesses data (restaurants, hotels, bnb), data of public services
Accessibility	Accommodation	List of hotels and b&b's with option of menus, such as gluten free, vegetarian/vegan, and dairy free.	Per cuisine, range of price and per stars	Private businesses data (restaurants, hotels, bnb), data of public services
Accessibility	Food and beverage	List of restaurants that disclose food ingredients and allergens on menu	Per cuisine and range of price	Private businesses data, data of public services
Accessibility	Food and beverage	List of restaurants that have special pricing offers in a destination	Per cuisine and range of price	Private businesses data, data of public services
Accessibility	Generic	Number of staff of tourism services who have received safety training	Per destination and by year of experiences	Private businesses data
Sustainability	Environmental	CO2 footprint of an average tourist	By destination and by age of tourist	Statistics, Public administration, NGOs
Sustainability	Social/Economical	**List of good practices that support sustainable and responsible behavior of tourists.**	By destination, per type of activity and objectives of the good practices	Public administration, NGOS
Sustainability	Environmental	Environmental indicators (such as floor usage, beach deterioration...)	Per month	Public administration, NGOS, private businesses data
Sustainability	Environmental	Quantity of energy used in tourism-related activities. The energy can be light energy, heat energy, electricity, chemical energy and mechanical energy	Per type of energy use and type of activity	Private businesses data (e.g. energy providers)
Sustainability	Environmental	Quantity of water used in tourism-related activities	Per type of activity	Private businesses data (e.g. waste providers)
Sustainability	Environmental	Quantity of pollution created through tourism-related activities. The type of pollution could be acoustic pollution, air pollution, land pollution, water pollution.	Per type of pollution and type of activity	Public administration, NGOS, private businesses data

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Sustainability	Environmental	Waste production per tourist night compared to waste production of local residents	Per night, per person, per destination and type of waste produced	Statistics, Public administration, NGOs
Sustainability	Environmental	List of tourism enterprises actively supporting the protection, conservation and management of local biodiversity of landscapes.	By typology of tourism enterprises, types of methodologies used to protect, conserve and manage the landscapes	Data of public services, Public administration
Sustainability	Environmental	Indicators of climate change	By geographical area and a specific time frame	Statistics, Public administration, NGOs
Sustainability	Social/Economical	Statistics on tourism impact, such as percentage of tourist per residents, number of tourists per 100 residents	By destination and by season/month	Statistics
Sustainability	Social/Economical	Contribution of tourism to the GDP	Per geographical area (region and city), and per type of activity	Statistics
Sustainability	Social/Economical	Tourist spending per capita vs local spending per capita	Per destination and per typology of tourist (foreign or inland tourist)	Statistics
Tourism satisfaction	Local/Residents' satisfaction and emotions	**Percentage of local residents that are satisfied with the tourists**	Per destination and season/month	User generate data - reviews on social networks, blog and forum
Tourism satisfaction	Local/Residents' satisfaction and emotions	**List of touristic activities that negatively impact local/residents' satisfactions and emotions**.	By type of activity and per type of negative impact on locals	User generated data, potentially DMOs' questionnaires

Table 6 - List of priority datasets: Tourists data

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Behavior of tourists	Destination	**Individual time spent by visitor in a POI**	Hourly, for each POI and per demographic characteristics of tourist	Sensors, GPS, Private businesses data (mobile phone companies)
Behavior of tourists	Destination	**List of cultural preferences of tourists**	By type of activity (culinary tourism, music, historic or	User profiles, subscriptions on platforms, apps

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
			heritage etc), per age of tourists	
Behavior of tourists	Online behavior	**Online engagement rates of tourists on websites related to tourists' attractions**	Per type of engagement on the platform and per type of user (registered or not), per demographic characteristics of tourist	Private businesses data (reseller website analytics)
Behavior of tourists	Destination	**Length of stays**	By destination and per season/month	Private businesses data (OTAs, airline companies, Hotels), Transaction data (Online booking)
Behavior of tourists	Food and beverage	Number of travelers that eat in a vegan/vegetarian restaurant	Per cuisine and range of price	Transaction data (Point of sales data)
Behavior of tourists	Food and beverage	Number of travelers that choose a vegan/vegetarian breakfast in hotels	Per range of price and per demographic characteristics of tourist	Private businesses data (Hotels)
Behavior of tourists	Online behavior	Search terms used in official websites (search engines embedded) and categories read	Daily	Web search and web scraping
Behavior of tourists	Destination	Number of tourists that choose to travel to the most known cities	By country of origin and per season/month	Statistics
Behavior of tourists	Culture	Visitors' interactions with XR experiences	By type of activity	Providers of XR experiences
Purchase habits	Destination	List of tickets bought by tourists	Daily and hourly, per type of activity and POI, per season/month	Private businesses data, online bookings
Purchase habits	Destination	Tourist preferences on booking, hence if they book ahead or on site.	Per type of activity, and by demographic characteristics of tourist	Transaction data – bookings (POI booking systems, DMO's)
Purchase habits	Others	Telecom subscription (tourist plans, auto roaming data)	By country of origin	Transaction data
Purchase habits	Destination	Historical data on purchase of extended reality experiences (last 2 years)	Per type of activity, and by demographic characteristics of tourist	Card transactions, private businesses data (e.g. purchases on Get Your Guide, Musement, cultural institutions…)

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Purchase habits	Food and beverage	Preferred meal options in the destination	Per season/month	Transaction data, private businesses data
Purchase habits	Destination	Historical data on reservations and bookings in a specific place	Per time of the day	Private businesses data
Purchase habits	Destination	List of booked activities and number of people for each booking	Per destination, type of activity, per time and day of the week	Provider Ecommerce Systems (e.g. attraction booking systems) Middleware Platforms Resellers (e.g. OTAs, tour operators)
Tourists' flow	Current	Individuals' time spent in a POI	Hourly, for each POI	Device data – Sensors, GPS, mobile phone
Tourists' flow	Current	**Tourist geolocalisation**	In real-time per POI with a distinction between national and foreign numbers.	Device data – Mobile operators (5G), mobile phones
Tourists' flow	Historical	Average waiting time at POIs	Hourly, per destination and by season/month	Private businesses data, device data - sensors
Tourists' flow	Historical	List of POIs that suffer from over tourism and congestion	Hourly, per destination and by season/month	Device data - Sensors, GPS, mobile phone
Tourists' flow	Current	List of areas with major touristic flows	Hourly, per geographical area (city) and per season/month	Device data - Sensors, GPS, mobile phone
Tourists' flow	Current	Number of passengers arriving by plane	For a specific time and date, by country of origin	Lide cams feeds, Private businesses data - Airports, airlines
Tourists' flow	Current	Number of foreign people/travelers	By destination and subarea, per geographical area (country)	Statistics
Tourists' flow	Forecast	Forecasts of expected visitors to a destination	Per season/month, by country of origin	Statistics, Private businesses data - Airports, airlines
Tourists' flow	Current	Number of tourists entering or exiting a POI	Per time of the day	Device data - Sensors, GPS, mobile phone
Tourists' flow	Current	Number of tickets still available for a POI	In real-time per POI	Private businesses data - booking websites

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Tourists' flow	Current	Daily arrivals	By destination and subarea	Statistics, Private businesses data - OTAs, hotels, Airbnb
Tourists' flow	Current	**Number of tourists in a POI**	Per destination and subarea; In real-time, per season/month; Per age of visitors*	Private businesses data - Mobile operator, Device data - mobile phone sensors, IoT (presence of sensors)
Tourists' flow	Historical	**Historical data on number of tourists in a POI**	Per destination and subarea; In real-time, per season/month (including historical series); Per age of visitors*	Private businesses data - Mobile operator, Device data - mobile phone sensors, IoT (presence of sensors)
Tourists' flow	Forecast	Expected number of tourists in a POI	Per time of the day and of the week	Private businesses data, public administration
Tourists' flow	Current	List of tourists who registered their travel abroad*	Per destination and expected arrival and departure time	Public authority registers
Tourists satisfaction	Food and beverage	Reviews on restaurants	Per cuisine and range of price	User generated data, private businesses data
Tourists satisfaction	Accommodation	Reviews on hotels	Per range of price	User generated data, private businesses data
Tourists satisfaction	Destination	Reviews on the destination	By season/month and per market segment	User generated data, private businesses data
Tourists satisfaction	Destination	POI satisfaction rates	By POI	User generated data, private businesses data
Tourists satisfaction	Destination	Individuals' opinions about destination safety	By season/month	Potential questionnaire
Tourists satisfaction	Destination	Destination social media engagement	By channel/by hashtag	User generated data, private businesses data
Typology of tourists	Demographic	**Demographics of visitors**	Per POI, per time of the day, week, and per season/month	Statistics, private businesses data
Typology of tourists	Demographic	Nationality of marketing campaign targets (based on where from the web search has been performed)*	For each individual	Private business datasets (OTAs, airline companies, etc...)

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Typology of tourists	Demographic	Type of traveler (couple / single, family...)	By destination, weekly	Private businesses data
Typology of tourists	Demographic	Age of tourists potentially interested in a digital XR activity	By type of activity	Private businesses data
Typology of tourists	Demographic	Gender of tourists potentially interested in a digital XR activity	By type of activity	Private businesses data

Table 7 - List of priority datasets: Industry Data

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Tourism industry data	Demand and offer data, Accommodation	Accommodation occupancy rate and occupancy	Daily and by type of accommodation, per range of price and per geographical area	Private businesses data (hotels, bnb)
Tourism industry data	Demand and offer data, Destination	List of all attractions in the destination	By destination and per type of activity	Private businesses data (Tourist info/city hall) , data of public services
Tourism industry data	Demand and offer data, Destination	Schedule of activities for tourist	Daily	Private businesses data
Tourism industry data	Demand and offer data, Accommodation	Accommodation availability	In real-time	Private businesses data (software proxies with commercial PMS)
Tourism industry data	Demand and offer data, Accommodation	Accommodations location	Per POI	Private businesses data (hotels, bnb), user generated data (tourist info)
Tourism industry data	Demand and offer data, Accommodation	List of short-term accommodations	By type of accommodation, per destination and per geographical area	Other data source (data of public services)
Tourism industry data	Demand and offer data, Accommodation	Number of beds booked in commercial accommodation establishments per 100 residents	Per destination and per season/month	Private businesses data (OTAs), Statistics (Locations metrics)
Tourism industry data	Demand and offer data, Destination	Online bookings for visiting natural resources	In real-time	Online booking data (Booking engine usually managed by local DMOs)

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Tourism industry data	Demand and offer data, Destination	Analytics on bookings for visiting natural resources	Weekly	Private businesses data - Business indicators (website of those POIs with reservation form embedded in website)
Tourism industry data	Demand and offer data, Destination	Ticket price for each attraction	Per typology of ticket (full-price, reduced-price)	Private businesses data
Tourism industry data	Demand and offer data, Destination	List of tours provided by operators that encompass a food related activity	Per type of food restrictions	Private businesses data, data of public services
Tourism industry data	Demand and offer data, Destination	List of itineraries to enjoy destinations and POIS by walking	Per POI and difficulty	Locations data
Tourism industry data	Demand and offer data, Destination	List of less known POIs close to well-known POIs	By type of POI (cultural, gastronomic attraction) and per distance	Locations data
Tourism industry data	Demand and offer data, Destination	List of appealing events, destinations and POIs that can be reached out of season	Per type of event, destination, POI and per range of price	Locations data
Tourism industry data	Demand and offer data, Destination	Demand for POIS and activities	Per destination, season/month, and time of the day	Private businesses data
Tourism industry data	Demand and offer data, Food and beverage	List of restaurants, coffee shops	By style, per range of price and availability	Private businesses data, data of public services
Tourism industry data	Demand and offer data, Destination	**Capacity of an area, location, street, POI**	By destination and per POI	Private businesses data, local administration
Tourism industry data	Demand and offer data, Accommodation	Number of hotel rooms available and percentage of booked rooms	Per range of price and per season/month	Private businesses data on occupancy, Tourism metrics
Tourism industry data	Demand and offer data, Accommodation	Number of apartments on offer vs number of hotel rooms on offer in a touristic area	Per destination	Tourism metrics
Tourism industry data	Demand and offer data, Destination	List of opening and closing times of POIs	By type of POI, and per season/month	Private businesses data (museums, historical places, public transportation companies, cultural providers)

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Tourism industry data	Demand and offer data, Destination	List of prices of touristic activities and POIs, and the price variations of such depending on the season.	By type of activity, per range of price and per season/month	Private businesses data, webscraping
Tourism industry data	Demand and offer data, Destination	Calendar availability of activities in webforms	In real-time	Private businesses data - booking websites
Tourism industry data	Mobility data, Road transportation	**List of streets with major traffic congestions and jams**	Per destination, per time of the day, per density of congestion	Sensors, webcam (national road traffic cameras)
Tourism industry data	Mobility data, Air transportation	Number of flights towards the destination	In real-time	Private businesses data - air traffic (Airlines, travel agencies) online bookings (GDS)
Tourism industry data	Mobility data, Air transportation	Forecasts of flights towards the destination	Per time of the day and by country of origin	Private businesses data - air traffic (Airlines, travel agencies) online bookings (GDS)
Tourism industry data	Mobility data, Generic transportation	Public transport geolocalization	In real-time	Device data - GPS of providers (bus, train, taxi...)
Tourism industry data	Mobility data, Road transportation	Number of moving vehicles in the main touristic areas/ streets	Hourly, per destination and per season/month	Sensors, webcam (national road traffic cameras)
Tourism industry data	Mobility data, Road transportation	Road traffic flow data	In real-time, with a specification between congestion and incidents.	Sensors, webcam (national road traffic cameras)
Tourism industry data	Mobility data, Road transportation	Info mobility data: number of accidents and street works	In real-time and per geographical area (city/location)	Sensors, webcam, private businesses data
Tourism industry data	Mobility data, Generic transportation	Real-time updates on mobility issues	By geographical area (location)	Sensors, webcam, private businesses data
Tourism industry data	Mobility data, Air transportation	Bookings of flights towards the destination	By country of origin	Transaction data (OTA, GDS, airlines)
Tourism industry data	Mobility data, Generic transportation	List of current closures of tracks, facilities and warnings	Per destination, per time and day of the week	Public administration, Webcam
Related industry data	Culture	**List other events taking place close to the POI**	Per season/month	Websites

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Related industry data	Environment	**Weather data and forecasts**	In real-time, hourly, per geographical area, short/mid-term forecasts	Public or private organizations providing weather forecasts
Related industry data	Society	Medical database encompassing a list of forbidden substances for certain diseases or intolerance.	By typology of diseases and of intolerances	Private businesses data
Related industry data	Food and beverage	List of producers in a particular food supply chain	Per certification, product, suppliers	Private businesses data
Related industry data	Society	Updates on crisis	In real-time and per geographical area (country/region)	Webscraping
Related industry data	Society	Score of tourism impact of events	Daily	Private businesses data
Related industry data	Society	List of public holidays in home region and list of public holidays in bordering countries.	Per geographical area (country) and per month	Public authorities
Related industry data	Culture	List of 3D city models, both historical ones and current ones for change detection	Per level of detail (LOD) and per country	Public authorities, POI management organisations, owners, heritage preservation organizations...
Related industry data	Culture	Digital twins data for cities, monuments, POI...	By destination/POI	Public authorities, POI management organisations, owners, heritage preservation organizations, Smart city data
Related industry data	Culture	List of historical cultural archives	Per geographical area (city/country), and per typology of material that can be found in the archive, such as audios, videos, images, georeferenced	Europeana and other digital/physical archives
Related industry data	Culture	List of flora and fauna species that are currently extinct	Per extinction date and per risk of extinction (if they are already not extinct), per geographical area	NGOs, Associations

2nd layer	3rd layer, 4th layer (if any)	Datasets	Granularity	Data sources
Related industry data	Culture	List of attractions that can be used to generate transformative and extended reality experiences.	By type of attraction and per geographical area	Private businesses data, data of public services, heritage preservation organizations
Related industry data	Culture	List of current digital storytelling using extended reality	Per typology of storytelling	Private businesses data, owners
Related industry data	Culture	List of historical characters	Per geographical area and per era	Webscraping
Related industry data	Culture	List of social events (e.g. rallies, protests, economic crisis)	In real-time and per geographical area	Webscraping

3.3. Overview of data sharing initiatives

This paragraph focuses on giving an overview of the state of the art of the EU tourism data sharing initiatives, regarding the maturity level, the data challenges, the governance, and the technical features. All evidence included in the paragraphs below was retrieved though the interviews described in the methodology (par. 2.1.1.1).

3.3.1. Level of maturity of initiatives

Through the conducted interviews, a multitude of elements concerning the maturity of the initiatives emerged. Going into the specifics of such findings, the Project Team uncovered how the significant majority of initiatives display a favourable degree of maturity.

Some common elements can be found throughout the initiatives that possess an advanced maturity. Starting off, the initiatives have a strong focus on collecting and connecting cross-sector data relevant for tourism and of different nature and have a multitude of future plans to include relevant additional data that can benefit actors pertaining to the tourism ecosystem. The initiatives further put a strong focus on data quality management and especially on the detection of duplicate data objects and enable convenient free and open access to semantically structured data. Advanced initiatives further display real time updates through dynamic interfaces, for example changes of public transport timetable information. They further enable the integration of data and services from both public partners (such as regions, public authorities, central administrations) and private partners (such as hotels, restaurants and caterings), allowing tourists to access a multiplicity of services through a single access point. Moreover, they focus on a model of growth and sustainability that guarantees a constant evolution of the initiative.

On the other hand, data sharing initiatives that portray a lower level of maturity incorporate elements such as not having much technical support in place, with most operations being performed manually without using any technical platforms. Moreover, they most often lack a steady cooperation with the private sector, which results in missing datasets from private businesses. Another component that characterises less mature initiatives is struggling to keep the data up-to date.

The interviews further uncovered how Artificial Intelligence or machine learning tools are commonly used to analyse the initiatives' data, or how various initiatives are planning to implement them in the near future. More specifically, 11 of the interviewed initiatives use machine learning or Artificial Intelligence (AI) tools, with France, Germany and Spain being the countries with the most use of those technologies. Artificial Intelligence is commonly used to aggregate data or analyse data in order to catalogue it and translate it into different languages. Similarly, Deep Learning techniques are being used for sentiment analysis, with attributes being identified using Natural Language Processing techniques. The use of Machine Learning techniques has also been used to make forecasts on time series. In like manner, 8 initiatives are planning to use Artificial Intelligence of Machine Learning techniques in the future, for example in data quality analysis, sentiment analysis, time series forecasting or for conversational user interfaces. Out of all countries, Italy was uncovered to be the country most willing to implement Artificial Intelligence or Machine learning tools in the future. Accordingly, it is right to say that there exists a widespread Artificial Intelligence and Machine Learning maturity through the initiatives, which have mastered AI and machine learning techniques in the right combination to provide an additional value to the stakeholders in the tourism sector.

3.3.2. Challenges of tourism sector from data perspective

Concerning the challenges related to data, the evidence collected from the interviews confirms many of the issues highlighted by the survey responses.

The first type of problem mentioned by the initiatives is the **data fragmentation**, meaning that tourism data are distributed across different systems and locations. Indeed, each tourism stakeholder produces and stores its data, but data is not yet kept in the same place nor accessible from a single point of access. This "silos" approach is strictly linked to a second type of problem: **data interoperability**. Several stakeholders complained that tourism players are using proprietary data standards, hindering the possibility to compare and combine data coming from different providers. Overcoming the issue of data interoperability is not only a technical feature, but also a matter of changing mindset, as pointed out by a stakeholder working on defining open standards to share tourism data. Indeed, building common standards means "bringing competing companies together and building trust to get them to work together on defining a common standard". Embracing a data sharing culture implies understanding the benefits of such collaboration, the main one being that having "a standardised open interface to transfer data will avoid the implementation of numerous proprietary interfaces de-facto dictated by big players such as Booking.com, HRS, Expedia, Google, etc".

Moreover, many interviewees mentioned **data quality and granularity** as one of the key challenges towards sector data sharing. An example of poor data quality mentioned by a representative is that participants make data accessible through dashboards, rather than through raw structured data. For what concerns granularity, the two most mentioned issues are the lag time – meaning that data are available "too late" – and the lack of disaggregated data at micro level – which is indeed important as the most of EU tourism players are SMEs operating at local level.

Another frequently mentioned challenge is the **low digitalization** of the industry and the **lack of digital and data analytics skills** of sector's workers. An interviewee mentioned that sector digitalisation is still a challenge, especially for smaller tourism service providers. At the same time, another pointed out that the digitalisation is necessary for the whole sector to benefit from the data. Concerning the lack of data analytics skills, an interviewee mentioned that its main challenge related to data is to "provide data in an easy and user-friendly way, so that the whole sector can have access to it". Moreover, an interviewee mentioned that current education and trainings for future tourism workers are still lacking digital and data skills in their curricula. To complement these findings, more than an interviewee mentioned a lack of business culture for data-based decision-making.

Finally, some interviewees mentioned the **protection of personal data** as a key challenge in their activities.

3.3.3. Insights on data governance

Through interviews, initial findings about the governance aspect of the selected data sharing initiatives were uncovered. These results will be deeper investigated in the next steps related to work package 4 – *Governance and Business Framework*.

Below, a brief overview of the initial insights is provided.

- The interviews highlighted that there is a strong awareness about procedures related to data quality and data interoperability. However, due to the fragmentation of data landscape – different formats in which data is produced and different providers from which data is spread – the major challenge is to establish common data standards and structures that is suitable for the majority of stakeholders.
- Speaking about the rules for the decision-making process to share or not a dataset, most of the interviewed initiatives do not implement any rules since they share public and open data. Therefore, in case of sharing private data, rules can be applied to a specific dataset or to a specific data user. Indeed, restrictions can be enforced on datasets concerning personal data, strategic data from private sector.
- The interviews show that different business models associated with data-sharing are being considered, including freemium-pay-per-use model, freemium model with charges applied based on the needs of customers.
- Regarding the legal structure of initiatives that are part of collective initiative/consortium, the most common structures are association with SMEs and DMOs, non-profit associations, and

research consortium. The reason of adopting these structures falls in the fact that these are the most suitable form to the purpose of the initiative and make easier the participation.

3.3.4. Insights on technical requirements

As outlined in paragraph 2.1.1.1, the interviews also focused on the technical aspects including technical requirements, features, architecture, and data standards. Initial findings about the technical frameworks of the selected data sharing initiatives were uncovered. These results will be deeper investigated in the next steps related to work package 3 – Technical Framework and Design.

The technical features and requirements mainly depend on the nature of the initiatives since they may differ depending on whether an initiative provides a dashboard, simply exchanges data or an open data platform. Nonetheless, some common grounds are indeed present in the initiatives, such as the different formats in which data could be downloaded or the usage of APIs for retrieving and exchanging data.

Moreover, the interviews show that some initiatives are more advanced than others from a technical perspective. In particular, these data sharing initiatives include additional features like the automatization of data harmonization, the handling of duplicate data, ETL process, scoring algorithm and the integration of different applications – chatbot, data lake and Artificial Intelligence.

3.4. Insights on data sharing in the tourism sector

The survey and the interviews (analysed in par. 3.4) pointed out several shortages regarding the current state of data sharing in the EU tourism sector. Incomplete data and interoperable data were the two main gaps that were pointed out when respondents were asked about gaps in the initiatives they are aware of. **Incomplete data** encompassed shortages such as incomplete metadata, inaccuracy, data not being updated in a timely manner and superficiality of data in terms of granularity. In particular, the issue of granularity does not allow for high quality analysis, such as forecasting and for the use of artificial intelligence (AI) and machine learning (ML). The issue of **interoperability** emerged from comments complaining about insufficient data exchange possibilities and the lack of standardized data and/or definitions[8].

Interoperability is intertwined with the problem of **lack of cooperation and coordination.** Indeed, lack of coordination may result in data being scattered into different repositories or being difficult to compare and to connect due to missing common standards/definitions. At the same time, lack of industry cooperation can hinder the availability and exchange of data.

[8] The gaps related to the themes of interoperability and data not being updated in a timely manner also emerged during the first workshop about on tourism stakeholders' business challenges prioritization, when participants were asked to investigate whether there were any missing challenges concerning the data purposes.

Another shortcoming which was extensively pointed out is the **limited awareness regarding data sharing benefits and data-related skills** of tourism sector workers. Evidence collected talks about the lack data analytics and data management skills, which prevent a meaningful exploitation of the value of data. Once the European tourism data space will be "up and running", data-related skills will not only be needed to analyse the data, but also to share them in conformity with the data space requirements.

Finally, these findings were confirmed by the Coalition of stakeholders during the validation workshop. When asked whether they agree that the aforementioned shortcomings are the main issues hindering back data sharing in the sector, all respondents agreed[9].

3.5. Common building blocks with other data spaces

As mentioned in Chapter 2, the Project Team identified the common building blocks, based on the work produced by the DSSC project. The building blocks defined by the OpenDEI project[10] are reusable and interoperable components that support the creation of common data platforms and data spaces in four industrial domains: manufacturing, agriculture, energy, and healthcare. Moreover, the building blocks are based on a unified architecture and an established standard and can be categorized into four pillars: **interoperability** building blocks, **sovereignty and trust**, **data value** building blocks and **governance**. The list of specifications will be considered for the definition of the technical design and architecture of the tourism data space.

Below, a list of 110 specifications used or selected by one or more initiatives is provided.

3.5.1. Data interoperability

Data spaces should provide a solid framework for an efficient exchange of data among participants, supporting full decoupling of data service providers and consumers. This requires the adoption of a "common lingua" every participant uses, materialized in the adoption of common APIs for the data exchange, and the definition of common data models. Common mechanisms for traceability of data exchange transactions and data provenance, are also required. The three most frequently used specifications are marked in bold font.

Table 8 - Data interoperability building blocks

Building block	Short name	Long name of specification
Interop: Data Models & Formats	**JSON-LD**	**JSON-LD**

[9] For this answer, we took into consideration only the answers from the Coalition stakeholders (13) and Consortium partners working in tourism (3). Only two respondents from the Coalition answered that there are some other relevant issues missing. However, they did not provide further inputs.

[10] Chapter 2, OPEN DEI Position paper Design principles for Data Spaces

Building block	Short name	Long name of specification
Interop: Data Models & Formats	XML	XML schema
Interop: Data Models & Formats	OGC standards	OGC standards
Interop: Data Models & Formats	ODATA	Open Data Protocol (Odata)
Interop: Data Models & Formats	-	Semantic Treehouse
Interop: Data Models & Formats	**SDM**	**Smart Data Models**
Interop: Data Exchange API	-	Details of the AAS Part 1 - Metamodel and Package File formats
Interop: Data Exchange API	-	Details of the AAS Part 2 - API
Interop: Data Exchange API	IRS	Item Relationship Service
Interop: Data Exchange API	Open Database Connectivity (ODBC)	Open Database Connectivity (ODBC)
Interop: Data Exchange API	**OpenAPI specification**	**OpenAPI specification**
Interop: Provenance & Traceability	Continuous Automated Monitoring	Continuous Automated Monitoring
Interop: Provenance & Traceability	Data Exchange Logging Service	Data Exchange Logging Service
Interop: Data Models & Formats	SKOS	SKOS Simple Knowledge Organization System
Interop: Data Models & Formats	Schema.org:	
Interop: Data Models & Formats	W3C Personal Data	Data Privacy Vocabularies and Controls Community Group (w3.org)
Interop: Data Models & Formats	Data quality W3C	Data on the Web Best Practices: Data Quality Vocabulary (w3.org)
Interop: Data Models & Formats	DATA tourism ontology	
Interop: Data Models & Formats	ODTA Open Data Tourism Alliance	ODTA Ontology
Interop: Data Exchange API	OTA	Open Travel Alliance
Interop: Data Models & Formats	AlpineBits	Hotel Data and Destination Data Standards

3.5.2. Data sovereignty and trust

The Data sovereignty and trust pillar consists of three building blocks: Identify management, Access and Usage Control, and Trusted Exchange.

The Identify management building block allows identification, authentication, and authorisation of stakeholders operating in a data space. It ensures that organisations, individuals, machines, and other actors are provided with acknowledged identities, and that those identities can be authenticated and verified, including additional information provisioning, to be used by authorisation mechanisms to enable access and usage control.

The Access and Usage Control/Policies building block guarantees enforcement of data access and usage policies defined as part of the terms and conditions established when data resources or services are published.

The Trusted Exchange building block facilitates trusted data exchange among participants, reassuring participants in a data exchange transaction that other participants really are who they claim to be and that they comply with defined rules/agreements.

The three most frequently used specifications are marked as bold font.

Table 9 - Data sovereignty and trust building blocks

Building block	Short name	Long name of specification
Trust: Trusted Exchange	**Verifiable Credentials Data Model**	**Verifiable Credentials Data Model**
Trust: Trusted Exchange	-	Trusted Issuer Registry API
Trust: Trusted Exchange	-	**DID resolution**
Trust: Trusted Exchange	-	Trusted Participants Registry API
Trust: Trusted Exchange	BPN	BPM-001 Business Partner Number (BPN)
Trust: Trusted Exchange	Issuing Agency	BPM-002 Issuing Agency
Trust: Trusted Exchange	Business Partner Data Pool API	BPM-003 Business Partner Data Pool API
Trust: Trusted Exchange	Company Attribute Verification	IAM - 004 Company Attribute Verification
Trust: Trusted Exchange	Certificate Authority (CA)	Certificate Authority (CA)
Trust: Trusted Exchange	Participant Information System (ParIS)	Participant Information System (ParIS)

Building block	Short name	Long name of specification
Trust: Trusted Exchange	**eIDAS**	**eIDAS**
Trust: Identity Management	eIDAS2	eIDAS2
Trust: Identity Management	EUDI RAF	EUDI Wallet Architecture & Reference Framework
Trust: Identity Management	Electronic Signatures and Infrastructures	Electronic Signatures and Infrastructures
Trust: Identity Management	DID	Decentralized Identifiers
Trust: Identity Management	Verifiable Credentials Data Model	Verifiable Credentials Data Model
Trust: Identity Management	OAuth 2.0 Authorization Server Metadata	OAuth 2.0 Authorization Server Metadata
Trust: Identity Management	OpenID Connect	OpenID Connect
Trust: Identity Management	SIOPv2	Self-Issued OpenID Provider v2
Trust: Identity Management	OIDC4VP	OpenID Connect for Verifiable Presentations (OIDC4VP)
Trust: Identity Management	OIDC4VCI	OpenID for Verifiable Credential Issuance
Trust: Identity Management	-	GXFSv2 Identity and Access Management
Trust: Identity Management	Authentication & Authorization	Authentication & Authorization
Trust: Identity Management	Personal Credential Manager	Personal Credential Manager
Trust: Identity Management	Organizational Credential Manager	Organizational Credential Manager
Trust: Identity Management	Identity of Member Companies	IAM - 001 Identity of Member Companies
Trust: Identity Management	Identity of Employees and Technical Users	IAM - 002 Identity of Employees and Technical Users
Trust: Identity Management	Identity Management Paradigm	IAM - 003 IAM & Access Control Paradigm
Trust: Identity Management	SAML 2.0	SAML 2.0
Trust: Access & Usage Control	XACML	Extensible Access Control Markup Language (XACML)
Trust: Access & Usage Control	Access Control Paradigm	IAM - 003 IAM & Access Control Paradigm

Building block	Short name	Long name of specification
Trust: Access & Usage Control	Authentication & Authorization	Authentication & Authorization
Trust: Access & Usage Control	-	GXFSv2 Identity and Access Management
Trust: Access & Usage Control	DAPS	Dynamic Attribute Provisioning Service (DAPS)
Trust: Access & Usage Control	DAPS	IAM - 006 Company Role by the Connector
Trust: Access & Usage Control	ODRL Information Model	ODRL Information Model
Trust: Access & Usage Control	IDS Connector	IDS Connector
Trust: Access & Usage Control	EDC	SOV-001 Eclipse Data Space Connector (EDC)
Trust: Access & Usage Control	SAML 2.0	SAML 2.0
Trust: Access & Usage Control	UMA	User-Managed Access (UMA) 2.0

3.5.3. Data value creation

The Data value creation pillar consists of three building blocks: Metadata & Discovery Services, Publication & Marketplace and Data Usage Accounting.

Metadata and Discovery Protocol: this building block incorporates publishing and discovery mechanisms for data resources and services, making use of common descriptions of resources, services, and participants. Such descriptions can be both domain-agnostic and domain-specific. They should be enabled by semantic-web technologies and include linked data principles.

Data Usage Accounting: this building block provides the basis for accounting access to and/or usage of data by different users. This in turn is supportive of important functions for clearing, payment, and billing (including data-sharing transactions without involvement of data marketplaces).

Publication and Marketplace Services: To support the offering of data resources and services under defined terms and conditions, marketplaces must be established. This building block supports publication of these offerings, management of processes linked to the creation and monitoring of smart contracts (which clearly describe the rights and obligations for data and service usage), and access to data and services.

The three most frequently used specifications are marked as bold font.

Table 10 - Data value creation building blocks

Building block	Short name	Long name of specification
Value: Metadata & Discovery Services	DCATv2	Data Catalog Vocabulary (DCAT) - Version 2
Value: Metadata & Discovery Services	DCATv3	Data Catalog Vocabulary (DCAT) - Version 3
Value: Metadata & Discovery Services	**DCAT-AP**	**DCAT-AP**
Value: Metadata & Discovery Services	D&S-001 EDC Discovery API	Data Discovery Services
Value: Publication & Marketplace Services	Open API Table	Open API Table
Value: Metadata & Discovery Services	Data Exchange Services	Data Exchange Services
Value: Publication & Marketplace Services	-	IDS Clearing House
Value: Publication & Marketplace Services	App Store	App Store
Value: Publication & Marketplace Services	**Federated Catalogue**	**Federated Catalogue**
Value: Publication & Marketplace Services	Federated Catalogue	Federated Catalogue
Value: Publication & Marketplace Services	Monitoring & Orchestration	Monitoring & Orchestration
Value: Publication & Marketplace Services	Data Contract Services	Data Contract Services
Value: Data Usage Accounting	Digital Clearing House	Digital Clearing House
Value: Metadata & Discovery Services	**IDS Information model**	**IDS Information model**

3.5.4. Governance

It has often been said that data is the "new oil". What is for sure is that data is the force pushing digital transformation of societies and economies, and the asset on top of which many new business models are built. The AI domain, for example, is completely dependent on data, from building models and analysing data to providing insights and creating new business value. Data is being continuously gathered everywhere around us and by a variety of entities using a plethora of methods. The importance of data starts to be acknowledged not just by companies and individuals from the technological sector, but also by industry at large, from large corporations to small enterprises.

However, as data is a new type of asset that can be used and reused in different scenarios generating more or less business value (depending on context, availability, accuracy, etc.), common business models are not capable of adequately supporting the growing needs of business. It is therefore important to define and create a business framework capable of supporting new business constellations. This would help the stakeholders of an ecosystem understand both the potential relationships between each other and the underlying business model(s). Jointly, with adequate rules and policies for sharing and using data in place, these data-driven business ecosystems will be able to create new business value more rapidly.

Governance is needed to configure and coordinate the necessary actions by different organizations involved in the data space initiatives, to meet their objectives and go through the different life cycle stages of the data space. In the context of data spaces, data governance cannot be separated from the governance of organisations and individuals.

This building block will focus on guidelines and advice on how data space initiatives can set up their governance and which layers they need to take in to account (e.g. public-private governance, from an ecosystem perspective, on strategic, tactical and operational level, on sector level, data space level, service level etc.).

The three most frequently used specifications are marked as bold font.

Table 11 - Governance building blocks

Building block	Short name	Long name of specification
Governance: Operational Agreements	**Onboarding & Accreditation Workflows**	**Onboarding & Accreditation Workflows**
Governance: Operational Agreements	**Registration and initial onboarding**	**ONB-001 Registration and initial onboarding**
Governance: Operational Agreements	**Minimal Data Provider Service Offering**	**ONB-002 Minimal data provider services offering**
Governance: Operational Agreements	Conformity assessment	ONB-003 Relevant standards for conformity assessments

4. Conclusions

The results presented in this report represent the conclusion of the work carried out for the analysis of the context and on the data space components (Work Package 2).

The core of this deliverable revolves around the **development of the use cases** for the European data space for tourism and the **tourism-related data spaces building blocks**.

Developing use cases is the most common methodology for designing data spaces. Since they are examples of the data space applications, use cases serve both to design data space characteristics and to communicate the initiative importance to potential users. To do so, the Project Team selected

eight use cases (Chapter 3) out of the long list presented in Annex III. At this stage, the eight use cases permit to identify the **priority datasets** to be exchanged though the data space (3.2.2), the **types of stakeholders** to involve, their **roles** and **which datasets do they consume and/or produce**. In the next stages of the project, they will also serve as the basis for **defining data spaces governance** and **technical requirements**.

Regarding the ways in which the stakeholders will participate to data sharing, it is likely that the most needed data will be provided by HoReCA companies, public authorities, and private organizations. At the same time, it is likely that the stakeholders most interested in retrieving data from the data space will be public authorities, tourism service providers, and DMOs[11]. Finally, the most frequently mentioned final users of the proposed solutions are DMOs, HoReCa, and public authorities.

The interviews conducted helped in better understanding the current challenges linked to data sharing, the governance models, and the technical requirements adopted by the initiatives.

Regarding the issues about data, the interviews confirmed many of the previous findings. The main challenges identified by respondents are **data fragmentation, data interoperability, data quality and granularity**. However, data sharing is not only held back by such data characteristics. The **under-digitalization of the sector, the lack of data analytics skills, and the lack of a sharing culture** are also hindering data exchange in the sector.

Regarding the governance, the interviews show that different business models are being considered, including **freemium-pay-per-use models**, and **freemium models** with charges applied based on customers' needs. Regarding the legal entity of the analysed initiatives, most of them are **associations of SMEs and DMOs, non-profit associations,** and **research consortiums**.

The technical requirements adopted vary according to the nature of each initiative. However, many of them use the **same formats** in which data can be downloaded and use **APIs for retrieving and exchanging data.** The most advanced initiatives include additional features like the automatization of data harmonization, the handling of duplicate data, ETL process, scoring algorithm and the integration of different applications – chatbot, data lake and Artificial Intelligence.

Concerning the **data space building blocks** results, the most commonly used specifications for data interoperability are JSON-LD, Smart Data Models, and OpenAPI specification; the ones for data sovereignty and trust are Verifiable Credentials Data Model, DID resolution, and eIDAS; the ones for data value creation are DCAT-AP, Federated Catalogue, and IDS Information model; while the ones for governance are Onboarding & Accreditation Workflows, ONB-001 Registration and initial onboarding, ONB-002 Minimal data provider services offering.

[11] Such considerations are based on the frequencies of the roles attributed to the stakeholders categories in the eight use cases.

The following steps of the project will further the research of governance and technical aspects of data spaces, in order define the requirements for the European data space for tourism.

Annex I – Interviews questionnaire

Introduction

The interviews are a part of a consultation process within the project ***DATES – Data Space for Tourism***, financed by the **Digital Europe Programme (DIGITAL)**. DATES is a kick-start for implementing of a European Tourism Data Space by involving all players on the supply and demand side. The objective of the project is developing a strategy roadmap for building a tourism data space, in collaboration with stakeholders of the tourism sector.

A **data space** is defined as a decentralised and standard-based structure to enable trustworthy data sharing between the data space participants on a voluntary basis, regulated through governance, business, legal and technical combined mechanisms.

The interviews will be conducted to deepen the knowledge on selected data sharing initiatives, allowing to better understand their datasets, business model, governance and technical structures, and how they solve data needs/problems of the tourism ecosystem. Moreover, the interviews will help the development of a list of use cases relevant for the tourism data space. More specifically, it will also allow to explore whether these initiatives could be used or adapted as use cases. At the same time, this activity will enable the Team to identify which datasets are needed in the data space to solve the identified needs.

What is a use case? A 'use case' is intended as a specific situation in which a product or service could potentially be used to address a need or solve a problem. In the context of this project, use cases are possible applications of the tourism data space. Indeed, use cases are situations in which actors of the tourism ecosystem, in order to improve their business, might find it interesting to share data with other actors.

Questions

The interview is structured as follows:

1. **Section 1,** regarding the **oral interview**, in which interviewer will ask general questions on use cases, technical requirements and governance,
2. **Section 2**, regarding the **written part**, in which the interviewee will answer a set of more technical questions on the topics of technical requirements and governance to the representatives.

Section 1: Oral interview

Use case overview

- Please provide a brief description of your initiative/solution.
- Which is the main functionality of the initiative/solution?

- What are the use cases that your initiative responds to?
- Can you suggest any use case for your data that you don't implement?
- Do you work or plan to work on cross-sectoral use cases with other sectors' ecosystems? If yes, how and which sectors?

Benefits and bottlenecks

- Which is the biggest challenge of the sector from a data perspective?
- Which is the biggest challenge that your initiative is trying to address?
- What are the obstacles, challenges and bottlenecks, both from a technical and an organisation point of view while adopting the solution?
- What gains do you foresee with the Data Strategy and the Data Spaces?

Technical requirements

- What are the technical features of your solution/initiative?
- Which is the technological level of your solution/initiative? Is it in the research phase? Development phase? Or the production phase?
- Which data/datasets are you missing?
- Do you use Artificial Intelligence or Machine Learning tools to analyse your data? Do you plan to implement them?

Governance

- How do you ensure data quality and validity while sharing (labels, ratings, processes, etc.)?
- Do you have processes/rules in place regarding data interoperability?
- What rules do you use regarding your decision-making process to share or not a dataset? Do you have any private dataset that you are considering sharing, or you would not be against sharing?
- Are you sharing data with other entities or consortiums? With which typology of entities do you share data: public /private/consortiums (here we can add a list)? What were the pain points?

Section 2: Written interview

Please answer all the following questions in the box provided.

Technical requirements

1. Standardization. Does your data follow any kind of standardisation related to harmonization of data schemas, ontologies or and vocabularies?

2. Interoperability. Do you communicate automatically with other systems or entities to exchange data? How? Are these activities related to interoperability aligned with the standardization initiatives endorsed at national level or by the European Commission (e.g. Doc. European Interoperability Framework – EIF)?

3. APIs. Is a catalogue of APIs (about the data provenance, usage and exchange) made available which ensures that the parties involved in the supply and use relationship are aware of the available APIs, and for them, the declared service levels?

4. Identity management. Do you manage the identity of the entity requesting the data? How? through email, API, Verifiable Credentials?

5. Privacy. The initiative was conceived following the principles of data protection by design and by default. Is the initiative in line with the GDPR and any national regulations? Do you have Privacy Enhancing Technologies (PET) in use?

6. Quality of Data. Which technical and organisational measures have you implemented to guarantee the quality of your offered data (completeness, actuality, compliance, coherence, etc.)? Do you consume data in real time? (e.g. Data from sensors).

7. Software suites. Do you use a 'best practice' software suite for operating your data space (e,g, CKAN suite, Eclipse Data Space Components, FIWARE catalogue components, IDSA Open Source Components, Gaia-X Federation Services suite, Combination of software from different sources, or custom software)?

Governance

1. Do you work with good practices/standards/models/tools coming from one of the following supporting organisations(DSSC/Gaia-X/IDSA/MyData/FIWARE/I4Trust)? What does it provide to you?

2. Which EU regulations have you identified as relevant for your project (DGA/DA/DMA/DSA, Interoperability Act/IA Act/sectoral data regulations/national data regulations/competition regulations)?

3. Do you have a business model associated with data sharing? Which one? How do you define your pricing model?

4. Do you use external compliance mechanisms for assessing data quality (audits/labels/other)?

5. If you are a part of a data-sharing collective initiative/consortium/ecosystem/data space, what is the legal structure of the project (no legal structure/association/private company/cooperative/other)? Why did you make that choice?

6. If you are a part of a data-sharing collective initiative/consortium/ecosystem/data space, have you defined a collective governance/legal/data charter setting the rules for sharing?

7. If you are a part of a data-sharing collective initiative/consortium/ecosystem/data space, how are the data sharing rules (who can share what with whom?) defined (voting mechanism/other)?

8. If you are a part of a data-sharing collective initiative/consortium/ecosystem/data space, how do you deal with competition and privacy issues?

9. If you are a part of a data-sharing collective initiative/consortium/ecosystem/data space, do you work at the sectoral level with other initiatives? If yes, how? Do you work on data-sharing standards and/or digital commons with them?

Questions for Data space

Please reply to these questions only if you are a Data space project.

1. Which assets does your organization provide to the Data Space project? (use cases, data models, labels, digital commons, standards, IT solutions, ecosystem animation, etc.)

2. How did you build the legal, business, technical models of your data space? What is the business model of the data space?

3. What will be the governance model of your data space: how are the decisions made, how do you ensure good governance, representativeness, and trust among stakeholders, what are the counter-powers?

4. Is the admission of participants to the data space controlled by a defined process, which includes identity and compliance assessments of the candidates? Is there a Web-Frontend in place?

5. Have you implemented or instantiated some of the 12 building blocks introduced by the OPEN DEI position paper? In which categories?
   - Interoperability
   - Trust
   - Data value
   - Governance
   - None

Annex II – Guide for use cases template

Document objective: This template needs to build comprehensive use cases of data spaces in the tourism sector, starting from already existing information that we have gathered through previous activities.

What is a use case? A 'use case' is intended as a specific situation in which a product or service could potentially be used to address a need or solve a problem. In the context of this project, use cases are possible applications of the tourism data space. Indeed, use cases are situations in which actors of the tourism ecosystem, in order to improve their business, might find it interesting to share data with other actors.

Task guide: To draft the use cases, we will take into account the following elements:

1. **Challenges addressed** (Annex 1)
2. **Types of data** (Annex 2)
3. **Impacted stakeholders** (Annex 3)

Starting from the aim of addressing the **challenges** (Annex 1), we need to **create uses cases**, identify the **types of data** needed to develop the use cases (Annex 2), and the **stakeholders impacted** by the use case (Annex 3).

How to: Add your use cases in the online template

- Step 1: Choose the **challenge** for which you want to build the use case from the ones **presented in Annex 1**.
- Step 2: Choose a title and describe the use case, i.e. the solution to the challenge chosen in Step 1. Apart from addressing the challenge at scope, which other benefits could it bring?
- Step 3: Identify the types of data must be shared though the data space, in order to implement the use case described in step 2. Please use the **types of data presented in Annex 2** (if some type of data is missing, please add it directly in the template).
- Step 4: Identify the stakeholders that will be impacted the most by the use case under scope. Please use the types of **stakeholders presented in Annex 3** (if some category of stakeholders is missing, please add it directly in the template).
- Step 5: If you used any specific reference for developing the use cases, please mention it

* Of course, one challenge can be addressed by more than one solution. Thus, **more than one use case can be developed for each challenge.**

Example: In the table below, you can find some use cases examples from the French tourism Data Space Themis-X

Table 4 - Examples from Themis-X

ID	Challenge	Use case title	Use Case description	Type of Data	Stakeholder
1	**Measure and reduce environmental footprint / Meet the demand for more sustainable tourism**	Allow tourists to monitor their environmental footprint	Tourists share their transactions (hospitality, mobility, activities) with travel assistants that aggregate it and help them to monitor their environmental footprint	Sustainability data, Purchase habits	Travel Agency, Tour Operator, HORECA, tourists
2	**Improve the supply and visibility of accessible tourism services**	Accessible itineraries	Tourists use travel assistant that will help them to build accessible itineraries adapted to their specific needs	Accessibility data , Purchase habits	Public Authority, HORECA, Travel Agency, Tour Operator, Tourists
3	**Support the growth of sustainable parameters awareness among the tourism industry**	Impact scores	Public or private organizations and their suppliers share impact data with each other to build impact scores (ex: a hotel asks its external laundry service about energy consumptions and aggregates it with other suppliers energy consumption data)	Sustainability data, Related industry data	Academia/Research, HORECA, DMO, Tour Operator, Public Authority, Private organizations
4	**Answer to the so-called request for "hyper personalization" of travel experiences**	"Tell us once" for agenda and preferences	Tourists share their past transactions and preferences (food preferences, interests, etc.) across services to benefit from hyper personalized services	Purchase habits, Related industry data, behaviour of tourists	HORECA, tourists, Tour Operator, Travel Agency, Private organizations
5	**Monitor the flow of visitors between districts and attractions / Assess impacts of events and infrastructure investments**	Tourism flow observatory	Public or private tourism services share tourism transactions and flow data (anonymized, aggregated) with scientists/public authorities for building a tourism flow observatory	Tourists flow, Purchase habits, Typology of tourists, Related industry data	Destination Management Organizations, Public Authority, HORECA, Tour Operators, Academia/Research
6	**Develop innovative immersive and digital tourism experiences**	Building immersive experiences	Players from multiple data spaces (cultural heritage, construction, space, smart city) can share data with tourism players wanting to build immersive experiences	Related industry data	Private organizations, tourists, DMO

Annexes

List of Challenges

Below you can find the list of the challenges and the description from which to build the use cases. Challenges are grouped by data purpose, i.e. (i) Increase of tourism sustainability & accessibility; (ii) Conduct market analysis and inform decision making; (iii) Improvement of the interaction and engagement of the tourist; (iv) Improvement of planning and operations of the tourism service)

Challenge Name	Description
Data purpose: Increase of tourism sustainability & accessibility	
Reduce negative impacts of tourists' behaviour on local communities and environment	• Sustainable tourism does not negatively impact the local residents' wellbeing, socio-economic conditions nor their cultural and religious traditions • Sustainable tourism does not harm the nature and the local environment • In the long run, disrespectful behaviours towards the local environment and communities would reduce the attractiveness of the destination
Measure and reduce environmental footprint	• Comprehensive industry data and sectoral category rules are required to be able to measure services performance and to compare them • R&I is needed to help develop sectoral category rules for specific tourism products and services in a transparent, non-discriminatory manner • Tools and technologies are also needed to make the measurement of the environmental footprint easier and user friendly for SMEs.
Meet the demand for more sustainable tourism	• A Eurobarometer survey from October 2021 indicated that 82% of Europeans are willing to change their travel habits towards more sustainable practices • These include consuming locally sourced products, reducing waste and water consumption, travelling off-season or to less visited destinations and choosing low impact transport options • More transparent information about the sustainability and environmental footprints of the destinations/tourism services would empower customers' choices

Challenge Name	Description
Sustainable mobility	• The European Green Deal calls for a 90% reduction in greenhouse gas emissions from transport, in order for the EU to become a climate-neutral economy by 2050, while also working towards a zero-pollution ambition • The approach of providing sustainable alternatives for mobility is connected to the EU strategy of multimodal ticketing • As set out in the 2030 climate target plan, increasing the modal shares of collective transport, walking and cycling, as well as automated, connected and multimodal mobility will significantly lower transport pollution and congestion and improve the health and well-being of people
Improve the supply and visibility of accessible tourism services	• Accessible and inclusive tourism is key to help all people to fully participate in society • It is important to ensure the supply of tourism services accessible to people with any kind of disability in all destination/structures • It is important to ensure the supply of tourism services to people without economic means, as unemployed, retired and people with low income • It is crucial to provide clear, accessible and easy to find information about these services
Support the growth of sustainable parameters awareness among the tourism industry	• Lack of awareness of sustainable parameters in the tourism industry • Need for developing measurables indicators to measure the green, digital and socio-economic impacts of tourism • Need for monitoring systems made available for all tourism stakeholders • Digital technologies can play a relevant role in gathering data and producing valuable impact score carding systems
Manage tourism seasonality	• Identify, address and mitigate the effects of the seasonal variation of waste, pollution and natural resources consumption generated by tourism • Impacts of crowds on fragile landscapes and heritage sites • Following Covid-19 pandemic, visitors are increasingly inclined to choose destinations with lower density and able to offer safe and diversified outdoors activities

Challenge Name	Description
Data purpose: Conduct market analysis and inform decision making	
Develop effective business strategies & make investment decisions	• Both private businesses and public authorities need to ground their strategic and investment decisions on reliable information. • Enhancement of data availability, data quality, and quality analysis are crucial for decision making. • The combination and interoperability of the many available data sources can help destinations in extracting meaningful insights, improving their strategies and the way priorities are defined and budget allocated.
Incentivize collaboration among different types of stakeholders	• Tourism is an industry that involves a wide variety of stakeholders. For this reason, vertical and horizontal governance are key for its success. • Having information on points of convergence between central/regional/local public authorities and private market players can incentivize collaboration for common purposes.
Manage the tourists-residents relationship	• Tourism can be an opportunity for local communities, either from an economic perspective and from a social perspective; but "overtourism" can produce negative effects on local communities. • Being aware of benefits and problems might help public authorities in making decision to manage tourism in a way that maximizes the positive sides and minimize the negative ones.
Cultural shift regarding tourism sector data sharing	• Tourism industry is facing a data silos problem, meaning that data are produced and kept at company/public authority level but there is no data infrastructure enabling their exchange. • Data producers/holders might be afraid that sharing some kind of data could somehow result in a damage for their organization. • A data space for the tourism sector aims exactly at solving this dichotomy: it enhances data sharing while it ensures owners' control over the data.
Monitor the flow of visitors between	• Often tourism destination and attractions are "overwhelmed" and suffer from "overtourism"

Challenge Name	Description
districts and attractions	• Cities and points of interest need a solution to better manage the flows of tourists. The challenge of managing large tourists flows con be also linked to specific events (e.g. festivals, expos…) organized in areas that are "constantly" overcrowded. • Over tourism also generates a set of other challenges, including of the effectiveness of public services, conservation of the cultural heritage (tangible and intangible), and management of security risks
Crisis management	• Tourism industry and supply chain could be suddenly disrupted if a dramatic event (e.g. pandemic, natural catastrophes, terrorists attack etc) takes place. • Reliable information can support the pathway towards resilience.
Assess impacts of events and infrastructure investments	• Events attracting big amounts of attendants might have negative environment spillovers. • The challenge of assessing economic, social and environmental impact of any activity is always increasing thanks to the 2030 SDG agenda and the increasing awareness and demand of tourists. • Similar reasoning can be applied to investment in tourism-related infrastructure
Answer to the so-called request for "hyper personalization" of travel experiences	• Following the Covid-19 pandemic there is an always increase request for hyper personalization of the travelling experiences. • Optimizing hyper-personalization and designing new processes and business models takes center stage in tourism and hospitality to reach new levels of customer service and experience.
Data purpose: Improvement of the interaction and engagement of the tourist	
Reach potential clients without being fully dependent on OTAs	• On one side, online travel agencies give visibility to tourism players' offers and help them in reaching potential clients • On the other side, they are so widespread that it is extremely difficult for players to reach clients without referring to such platforms • Additionally, these platforms generate large amounts of data that put them in an always privileged position

Challenge Name	Description
	• Data availability (and data spaces) could help tourism stakeholders (HORECA in particular) in finding ways to reach (potential) clients without using OTAs
Improve tourists' experiences by providing information on tourism flows	• Information regarding the amount of people actually visiting a specific point of interest and information regarding the most crowded moments allow residents and tourists to make their visits safer and more comfortable • Network of devices can collect anonymous real time data from a crowd stream by detecting Bluetooth devices • Such devices can also transmit messages to the users. E.g. for communication discounts, activities, events, or new routes for visitors
Manage online reputation and leverage on tourists' satisfaction	• In the last decades, the impact of traditional "word of mouth" has been amplified by the tourists' active use of Internet • Tourists often publish online information regarding their satisfaction and emotions ("sentiment") which can of course improve or damage tourism stakeholders • Sentiment analysis permits to measure the level of satisfaction expressed online regarding a service, a product or a brand • Being aware of own reputation can help in designing strategies on how to engage the customers and improve their satisfaction
Address the demand/needs of tourists of different generations	• Baby Boomers will become the oldest target group in the coming decades, with the highest spending capacity, but with lower digital skills than the other groups of interest. They will progressively require a set of personalized touristic services based on a combination of health and cultural tourism • Millennials, generations Z and Y are/will be highly digitally skilled tourists, but with lower spending capacity than their parents. • Generations Y and Z have the propensity to remain online, are likely ask for more inclusive and interconnected digital solutions and adopt a more ethical lifestyle

Challenge Name	Description
Develop innovative immersive and digital tourism experiences	• Consistently with the sociodemographic trends described above, tourists are and will always be asking more immersive and digital experiences • Virtual and augmented reality services enable real-like visitor experiences and might extend the participation to tourism services before and after the travel experience • R&I in this area could provide new innovative, sustainable and accessible forms of tourism services • These technologies can be used to provide new ways to help preserve natural and cultural resources at risk
Create and manage a relation with tourists	• A lot of effort is required especially by small tourism businesses to attract new customers • It makes sense then to consider the potential for stimulating repeat visits and/or referrals from them • A small increase in the number of loyal customers can result in reduced marketing costs, increased sales, and higher profits
Data purpose: Improvement of planning and operations of the tourism service	
Understand and better forecast the tourism flow	• Tourism enterprises are facing growing uncertainty. They will need to collect as much data as possible to cover the gaps in the decision-making process. • A key factor to boost competitiveness is to make better and more innovative use of data, so that operators are able to anticipate demand for their services, analyze customer profiles and business trends, and ultimately provide a better customer experience.
Manage seasonality in tourism sector	• Seasonality of demand is generally considered one of the major challenges in the tourism business. • Destinations with high fluctuations in seasonality often face various challenges, such as overcrowding, high prices, inadequate infrastructure in peak seasons, as well as a lack of services and job opportunities in shoulder and low seasons. • Seasonality is a measurable feature with significant economic and social impacts. Understanding the main characteristics can help to modify its occurrence.

Challenge Name	Description
Multimodal ticketing – smart mobility	• In the transportation sector, tracking and identifying tourists will become increasingly important. The technologies for controlling mobility and access will be key in this aspect. • Digitalization of the tourism ecosystem makes it increasingly easy to find and book journey tickets online. However, this is not easy if the door-to-door trip requires multimodal transport, for example combining air, train and local transport. • The digital transformation of the transport and mobility sector requires further efforts related to data availability, access and exchange.
Manage and reduce overcrowding of sites and services	• New tourists are more willing to be engaged with the resident population in less environmentally impactful solutions (e.g. visiting a touristic attraction when it is less crowded). • Data driven destination management tools, practices and technologies are needed to boost the sustainability of tourist destinations and reduce overcrowding of sites and services. • Provide relevant insights on tourists' flows and choices can help identify promptly the changes that require re-scheduling of activities.
Manage online reputation and leverage on tourists' satisfaction	• User-generated textual information is an important data source to explore tourist satisfaction and understand how to improve guest experience, competitive positioning and marketing activities. • Analysis of these data allows to understand tourist behaviour in a view to developing travel recommendation systems and improve marketing activities, with a view of improving overall efficiency and competitiveness of the tourism ecosystem.

List of Types of Data

Below you can find the list of types of data and their corresponding explanation.

Type of Data	Description
Accessibility data	Are about accessibility and inclusivity of the destination/services
Sustainability data	Are related to the economic, social and environmental impacts of tourism
Behaviour of tourists	Refers to their preferences related to the choice and fruition of (touristic) services while travelling
Demand and offer data	Allow an estimation of the "amount" of services requested and supplied
Local/Residents' satisfactions and emotions	Are about communities' emotions related to local tourism
Tourists' satisfaction & emotions	Are about customers' opinion regarding their experience
Mobility data	Are related to the use of transportation in and to the destination
Purchase habits	Are data about how and in which occasions tourists spend their money while travelling
Related industry data	Concern industries related to tourism (e.g. real estate, entertainment, agriculture…)
Typology of tourists	Are about profiling of tourists (e.g. socio-demographic characteristics and personal data)
Tourists flow	Relates to tourists' movement on a specific destination/point of attraction

List of potential Stakeholders Impacted

Below you can find a list of stakeholders that will have to be linked to the use case. Please keep in mind that this is not an all-comprehensive list, so if you think that there are some categories missing, please feel free to include them.

Stakeholders	Description
Destination Management Organisations (DMO)	DMOs are the backbone of tourism destinations. They exist to promote destinations, attract visitors, and develop a regional economy. DMOs are responsible for everything from attracting major sporting events to promoting local festivals. They work with businesses to help them understand what travellers need to have an enjoyable experience. E.G: Visit Finland
Travel Agency	A **travel agency** is a private retailer that provides travel and tourism-related services to the general public on behalf of accommodation or travel suppliers to offer different kinds of travelling packages for each destination. E.G: Kiwi.com
Tour Operator	A company that makes arrangement for travel and places to stay, often selling these together as package holidays. A tour operator does not always sell flights, they can also be purely ground-based. Cycling holidays, yoga retreats, wellness holidays, detox retreats, skiing holidays, hiking breaks, theatre breaks, cookery escapes are all examples. E.G: quasarex.com
HORECA	The 'HORECA' sector (sometimes referred to as the 'hospitality sector') covers two sub-sectors, namely hotels and accommodation (NACE code 55) and food and beverage service activities (NACE code 56) in restaurants and bars[12]. E.G: Hotels
Public Authority	Public Authorities such as Regions, Ministries, Local Authorities, etc. E.G.: Spanish Ministry of Industry, Tourism and Commerce
NGO/Associations	Non-profit associations/organisation with different focuses. E.G.: Association of Finnish Travel Industry
Academia/Research	Universities and Research Centers. E.G.: CERTH
Tourists	Tourists are the final users of tourism services
Private organizations	Private companies such as consulting firms, tech companies, etc. E.G: ATOS
Tourism service providers	Any company who sells and supply a tourism services (city tour, museums, parks, etc…).

[12] European Labour Authority (2021), *Tackling undeclared work in the HORECA sector*, p. 3

Annex III – Long list of use cases

Use case 1	Satisfactory tourism experience
Challenge	Manage online reputation and leverage on tourists' satisfaction
Data purpose	Improvement of planning and operations of the tourism service
Problem(s)/ need(s)	Latest trends show that tourists are increasingly looking for personalized services and experiences. Knowing tourists' preferences can help tourism services providers, tour operators and travel agencies to target clients with services interesting for them and to offer them tailored services. In some cases, tourism players might already own useful data, e.g. in the case they are implementing Customer Relationship Management programs. In other cases, companies might need other data to complement their own or they might not have any data at all and need third parties data to drive inferential analysis to be applied to their customers.
Desired solution	To address companies' needs to know what to offer to tourists, thanks to data space data availability, a recommendation platform can be developed. Such platform is supposed to be an instrument in support of the marketing of companies operating in the tourism sector. Based on tourists' data, the system will be able to suggest which are the company's services likely to be the most interesting for each client. The core of such predictive tool are those enabling to estimate tourists' preferences (e.g. reviews and past purchases). Such data will be then triangulated with data regarding demographics (e.g. age, nationality, gender…) and the purchase habits (e.g. budget usually spent per type of activity, purchase of combination of services…)
Type of Data	Behaviour of tourists, Tourists' satisfaction & emotions, Purchase habits, Typology of tourists, Related industry data
Stakeholders impacted	Destination management organization, Tourists, Travel Agency, HoReCa, Tour Operator, Private organizations, Tourism service providers

Use case 2	Accessibility indicators
Challenge	Improve the supply and visibility of accessible tourism services
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/ need(s)	Accessible and inclusive tourism is a key to helping all people participate fully in society. However, tourism industry is pervaded by a lack of awareness and a lack of appropriate accessibility measures. There is a need to provide much more valuable information to users of tourist services.
Desired solution	To support the development and diversification of tourism products and services aimed at ensuring equal access to tourist destinations and cultural heritage more measurable impact indicators and monitoring systems made available for both users and stakeholders.

Use case 2	Accessibility indicators
	Therefore, tourism service providers should share data on the accessibility of infrastructures and services in order to build accessibility indicators. A set of quantitative and qualitative indicators should be set-up, covering at least key areas such as accessibility. The indicators should be integrated in tourism services website and webapp.
Type of Data	Accessibility data
Stakeholders impacted	Public Authority, HORECA, Tourism service providers, Travel Agency, Tour Operator

Use case 3	Net-zero travel
Challenge	Sustainable mobility
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	The competitiveness of the tourism industry will largely depend on its capacity to meet the need and customer demand to become more sustainable. The European Green Deal calls for a 90% reduction in greenhouse gas emissions from transport, in order for the EU to become a climate-neutral economy by 2050 , while also working towards a zero-pollution ambition.
Desired solution	To achieve this systemic change, more sustainable alternatives should be made widely available. Therefore, tourists should use tools that can enable them to uncover sustainable routes and mobility options during their stays. Private company specialized in mobility should integrate data about the environmental footprint of each journey to create sustainable itineraries to and from the destination, including also the option to book the itinerary. The solution can be developed as a webapp.
Type of Data	Sustainability data, Purchase Habits, Mobility data
Stakeholders impacted	Public authorities, Tourists, Private organizations

Use case 4	Allow tourists to monitor tourism flows and density
Challenge	Improve tourists' experiences by providing information on tourism flows
Data purpose	Improvement of the interaction and engagement of the tourist
Problem(s)/need(s)	Nowadays, tourists are demanding for a new level of customer service and experience, primarily based on comfort and safety. However, often tourism destination and attractions are "overwhelmed" and suffer from "overtourism" and it is important to deliver information on tourism flows.

Use case 4	Allow tourists to monitor tourism flows and density
Desired solution	Tourism and hospitality actors, in order to meet the demand of tourists, should introduce and develop new solutions, allowing to reach new levels of customer service. Having information regarding the amount of people actually staying in a hotel and information regarding the most crowded moments in each facilities of a hotel will help tourists to make a safer and more comfortable visit. Integrating this information on the website of the hotel or providing it by travel agency will allow tourists to plan the visit according to their needs and expectations.
Type of Data	Tourists flow, Demand and offer Data, Behaviour of Tourists
Stakeholders impacted	HORECA, Tourists, Travel Agency, Tour Operators, Tourism service providers

Use case 5	Multimodal mobility
Challenge	Multimodal ticketing – smart mobility
Data purpose	Improvement of planning and operations of the tourism service
Problem(s)/need(s)	Travelers increasingly demand seamless passenger experience, especially regarding the mobility sector. To overcome the challenges involved in providing digital mobility services, different operators are trying to develop a smart mobility strategy, helping travellers plan and buy trips combining different means of transport, and allowing planning and purchasing tickets for multimodal journeys. However, addressing this need will involve overcoming the insufficient availability and accessibility of data. Indeed, the digital transformation of the transport and mobility sector requires further efforts related to data availability, access and exchange.
Desired solution	Actors in the mobility sector should share data, in particular real time data, on timetables, public transport connections and road traffic flow among each other to build synergies and develop a unified mobility experience for tourists. The solution can be developed as an app for intermodal trip planning, including filter option to search routes (e.g. only by bus / only by train), and for ticketing.
Type of Data	Mobility data, Tourists flow
Stakeholders impacted	Private organizations, Public Authority, Tourists

Use case 6	Reducing hidden tourism
Challenge	Incentive collaboration among different types of stakeholders
Data purpose	Conduct market analysis and inform decision making

Use case 6	Reducing hidden tourism
Problem(s)/need(s)	All countries suffer from the problem of tax evasion. Tax evasion has several negative effects on the economy and society, especially in tourism sector with the rising problem of short-term rental tax evasion. Searching into the causes of tax evasion has become a vital requirement to reach the most appropriate solutions to reduce this problem.
Desired solution	To overcome this risk and prevent task evasion, it is important to incentivize collaboration among different types of stakeholders. Therefore, by sharing data and information on taxes in a collaborative way, HoReCa actors, tourists and Public Authority might help each other in making decision managing tourism in a way that maximizes the positive sides and minimize the negative ones.
Type of Data	Demand and offer Data
Stakeholders impacted	Public authorities, Tourists, HORECA

Use case 7	Monitor the environmental footprint produced by tourists
Challenge	Measure and reduce environmental footprint / Meet the demand for more sustainable tourism
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	Calculating and monitoring the environmental impact in a destination of tourist activity is a difficult challenge to address. This is because, in addition to the impact caused by the means of transport, tourists carry out a series of activities in the destination that also cause an environmental footprint. Therefore, the calculation of the environmental impact in a destination has a twofold objective: to allow the authorities in charge of managing the destination (DMOs) to know in an aggregate way the impact generated broken down by various variables (country of origin, type of tourist, etc.), and to inform the tourists themselves at all times of the environmental footprint they create in the destination. In this way, tourists can monitor their impact not only at the end of their visit, but also in real-time for each activity they have carried out or are about to carry out. Having this information in real-time, tourists can minimize the impact, modifying their trip or stay (means of transportation, activities to be carried out at the destination, etc.).
Desired solution	The solution can be proposed as an online dashboard with all the information aggregated, allowing DMOs and other public authorities to identify trends, the profile of tourists and/or the activities with the highest environmental footprint. Based on this information, different policies and strategies can be defined with the aim of minimizing the environmental impact. Another possible implementation of the solution can be a website and/or a mobile app where, based on the details of the trip shared by tourists, a footprint calculation is performed, including real-time advice. Moreover, the solution can incorporate a gamification layer, giving the opportunity to users to receive prizes at the destination (free guided tours, offers on gastronomic products, passes to monuments, etc.) for any action aimed at minimizing their environmental impact at the destination.
Type of Data	Sustainability data, Purchase habits, Mobility data, Tourist flow, Typology of tourists, Related industry data

Use case 7	Monitor the environmental footprint produced by tourists
Stakeholders impacted	Travel Agency, Tour Operator, HORECA, Tourists, Public Authority, Private organizations, Tourism service providers

Use case 8	Destination benchmark system for different tourism subsectors
Challenge	Incentivize collaboration among different types of stakeholders
Data purpose	Conduct market analysis and inform decision making
Problem(s)/need(s)	Tourism in a destination comprises a large set of services of a different nature: transport and mobility, accommodation, restaurants, activities, etc. Therefore, it is important to incentivize collaboration among different stakeholders that, based on the information generated and shared, will help to develop a complete profile of tourists.
Desired solution	By integrating data obtained from reservation systems of companies with information provided by the DMOs and/or local authorities managing the destination, a profile of tourists and related trends can be identified. The solution can be proposed as a dashboard that, from the point of view of public authority and DMOs, will help to carry out a better profile of tourists and to optimize the marketing of the destination.
Type of Data	Demand and offer data, Typology of tourists, Tourists flow, Related industry data, Behaviour of tourists, Purchase habits
Stakeholders impacted	Private organizations, HoReCa, Tourism service providers, Public Authority

Use case 9	Closure of cycling path and hiking trails
Challenge	Sustainable mobility
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	Activities such as cycling, hiking, or climbing are part of the tourist offer in many destinations. However, Over the years, overcrowding and safety issues have become a serious problem. Indeed, mountain tourists lack the experience and the requisite attributes to summit difficult peaks. Therefore, the practice of these activities by amateurs and professionals demands specific and updated information, even to guarantee safety. The availability of certain cycling routes may not be up to date, or even information such as the level of difficulty of the route may vary depending on the weather conditions or the time of year.
Desired solution	To ensure safety of climbers and to overcome overcrowding in many destinations, local authorities and cycling, hiking, or climbing associations can provide relevant and updated information on the different locations where these activities can be practiced. The solution can be proposed as a mobile application where tourists and locals can search for different locations to practice cycling, hiking, or climbing

Use case 9	Closure of cycling path and hiking trails
	activities, receiving also real-time information on closed pathways and safety measures. Moreover, tourism service providers, gathering information on the different tourist and locals' profiles that practice these activities, can create more successful offers and recommendations tailored to the practitioners' profile.
Type of Data	Accessibility data, Sustainability data, Mobility data, Behaviour of tourists, Related industry data, Tourists flow
Stakeholders impacted	Destination Management Organisations, Tourism service providers, Tourists, Public Authority, Private organizations

Use case 10	Public assets information delivery
Challenge	Develop innovative immersive and digital tourism experiences
Data purpose	Improvement of the interaction and engagement of the tourist
Problem(s)/need(s)	There are certain public assets, such as public toilets, drinking fountains, or rest areas, for which it is very difficult to find accurate information on their location and status in real time. This information is usually hidden from local people and even more so from tourists. These types of public services help improve the experience of tourists and their perception of the destination.
Desired solution	Providing access to detailed information on these public goods, digital tourism platforms can create mobile application in which these public goods appear georeferenced with updated and in real-time information. The proposed solution could integrate the degree of accessibility for people with disabilities, detailed information on the features offered allowing to reach new levels of customer service. Moreover, giving the possibility to tourists to provide feedback about public assets will allow public authorities to improve the functioning of these services.
Type of Data	Related industry data, Demand and offer data, Accessibility data
Stakeholders impacted	Tourists, Public authority, DMOs

Use case 11	Public transportation and bus on-demand services in destinations
Challenge	Sustainable mobility, Meet the demand for more sustainable tourism
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	From the point of view of environmental sustainability, one of the most important factors is the emissions produced by tourists in their travels, especially when they use their own or rental vehicles. The choice of using this transport services relies on the fact that they are

Use case 11	Public transportation and bus on-demand services in destinations
	more flexible and convenient than the other alternatives such as public transport. Moreover, the absence of detailed and updated information on public transport makes difficult to shift to a more sustainable tourism. Indeed, information on public transport are provided in a more suitable way for its locals rather than for tourists, preventing to facilitate the mobility of the latter in the destination.
Desired solution	Nowadays, tourists are willing to switch to more sustainable modes of transport. Integrating information on mobility from different sources will allow to provide sustainable alternatives. The proposed solution is a on-demand bus system, especially suited for tourist destinations, including a router generator that will try to define different scenarios and forecast the public transportation needs to cover those scenarios (number of lines, buses, most frequently demanded stops).
Type of Data	Mobility data, Behaviour of tourists, Demand and offer data, Purchase habits
Stakeholders impacted	Destination Management Organisations, Public Authority, Tourists

Use case 12	Contextualized and embedded cultural heritage offer for a tourist destination
Challenge	Develop innovative immersive and digital tourism experiences
Data purpose	Improvement of the interaction and engagement of the tourist
Problem(s)/need(s)	Europe is well known for its vast cultural heritage. However, specialized tourist information on this type of heritage is lacking. This is due, among other factors, to the difficulty and the resources (knowledge and time) necessary to produce and disseminate this type of information. At the same time, in case those cultural assets are inventoried, and detailed information is available, they should be adapted and even translated into other languages to promote its consumption by tourists. Tourists, and even residents, know only a minor part of the existing cultural heritage. However, good dissemination of cultural heritage would undoubtedly enhance visitor experiences.
Desired solution	This use case proposes to create an application that provides information about the cultural heritage of a destination, helping to perceive the cultural heritage as the common thread of the tourism activity. The application will focus on providing contextualized information on the local culture, promoting also thematic routes in which the best-known monuments are combined with others that are less well known but equally valuable from a heritage point of view.
Type of Data	Demand and offer data, Typology of tourists, Tourists flow, Related industry data
Stakeholders impacted	Public authority, Tourists, Tourism services providers, Destination Management Organisations, Academia/Research

Use case 13	Forecast of worker recruitment needs for hotels and catering based on forecast demand and comparison with previous seasons
Challenge	Understand and better forecast the tourism flow, Manage seasonality in tourism sector, Manage and reduce overcrowding of sites and services
Data purpose	Improvement of planning and operations of the tourism service; Develop effective business strategies and make investment decision
Problem(s)/need(s)	Seasonality of demand is generally considered one of the major challenges in the tourism business. Destinations with high fluctuations in seasonality often face various challenges, such as overcrowding, high prices, inadequate infrastructure in peak seasons, as well as a lack of services and job opportunities in shoulder and low seasons. Since the demand for skilled workforce is directly linked to the number of overnight guests, the employment of seasonal workers is unavoidable. As qualified staff is increasingly scarce and the start, duration and intensity of each season varies from year to year, both the timing of a hiring campaign and the targeted number of seasonal workers hired are a game of chance. This represents a serious economic risk for the hotel management: If the actual number of guests does not compensate for the employment of a certain number of workers over a longer period of time, there will be a deficit business.
Desired solution	To fully understand the tourism flow based on previous seasons' experiences both on the individual service provider level and on a destination level, Hotel Management should have access to an easy-to-use tool that allows them to make more reliable predictions of the tourism flow into the destination. Moreover, such tools and procedure will allow to flatten the "curve" of seasonality to avoid periods of lack of visitors and loss-making operating costs.
Type of Data	Related industry data, Tourists flow, Demand and offer data
Stakeholders impacted	HORECA, Tourism services providers, Travel Agency, Tour Operator, Public Authority, DMOs

Use case 14	SmartData: Monitoring sentiments of tourists about destinations
Challenge	Manage online reputation and leverage on tourists' satisfaction
Data purpose	Improvement of planning and operations of the tourism service
Problem(s)/need(s)	Destination might experience a decline in tourism demand with negative implications for the service providers, the economy and local communities in the area. This is especially due to the increasing number of negative comments about the destination on social media and online platforms. These revolve around different perceived problems or negative experiences during the stay. Therefore, destination managers are severely limited in their options for action and have to initiate measures to increase the attractiveness of the destination without a reliable problem analysis.
Desired solution	A sentiment monitoring system of social networks and other online sources should be developed to paint a real-time picture of the general feeling of visitors towards any given destination. Therefore, sentiment indicators should be developed based on user reviews and comments with the aim of monitoring the perception of the destination over time and compare it to other destinations.
Type of Data	Tourists' satisfaction & emotions, Behaviour of tourists

Use case 14	SmartData: Monitoring sentiments of tourists about destinations
Stakeholders impacted	Destination Management Organisations, Tourism service providers, Public Authority

Use case 15	Supporting sustainable visitor behaviour in protected areas and protection of biodiversity
Challenge	Reduce negative impacts of tourists' behaviour on local communities and environment
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	The growing number of people active in nature puts increasing pressure on sensitive areas and endangered species. Rules and regulations for the use of nature are often difficult to get by and understand by non-experts. Moreover, communication channels like outdoor apps and digital platforms lack the access to a reliable database of valid rules and regulations, so they have no way of communicating verified rules and regulations.
Desired solution	Outdoor apps, digital platforms, and other communication channels could develop interactive activity to provide users with sufficient and easy-to-understand information about applicable rules and regulations for the use of nature. Moreover, inserting multiple touchpoints in strategic points will allow people to be aware of their potentially negative impact and applicable rules and regulations.
Type of Data	Sustainability data, Behaviour of tourists
Stakeholders impacted	Private organizations, Public Authority, Tourists

Use case 16	Circular hotels and the elimination of food waste
Challenge	Meet the demand for more sustainable tourism
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	The need for sustainable business practices is becoming increasingly apparent in the hospitality industry. One promising concept is that of "circular hotels" which aim to reduce waste, in particular food waste, by adopting standards of the circular economy. Although, going fully "circular" presents a big challenge for HORECA businesses as food demand by guests, available produce, and other factors are usually difficult to predict precisely. Also, as the food supply chain usually builds on a large number of varied suppliers, to monitor sustainability standards of the overall supply chain is difficult. Finally, to even monitor and analyse in-house (food) waste generation in HORECA businesses is challenging and currently requires a great deal of cooperation and awareness by staff.

Use case 16	Circular hotels and the elimination of food waste
Desired solution	To allow HoReCa businesses to keep track of and analyse the generation of (food) waste, a (food) waste monitoring system should be developed. Integrating sustainability data with other relevant data, such as occupancy rates, restaurant bookings and purchases, will allow better predictions of food needed while still maintaining a high level of convenience for guests.
Type of Data	Sustainability data, Purchase habits, Demand and offer data
Stakeholders impacted	HoReCa, Public Authority

Use case 17	Smart assistant for building accessible travel itineraries
Challenge	Improve the supply and visibility of accessible tourism services
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	Travelers with disabilities face countless obstacles along the customer journey, especially due to the absence of information about experiences and services at a destination that are barrier-free or have reduced barriers. When relying on false or incomplete information in their trip planning, travellers run the risk of arriving at a destination that is unable to cater to their needs. At the same time, destinations that do offer accessible and adaptive experiences and services often struggle to communicate these offers effectively and to reach the relevant target groups. Also, destination visitors with disabilities are currently not monitored in most cases, so the particular needs and requirements are often unknown to the destination managers. Furthermore, available information about accessibility of experiences, transportation, and tourism infrastructure is often very limited. To build travel itineraries that meet the specific needs of an individual traveller with a disability is therefore extremely time-consuming and complicated.
Desired solution	To fully understand the needs and requirements of travellers with disabilities, a tool for automated behavioural analysis should be developed with the aim of understanding better the needs and wishes of the guests and of developing experiences and services with high level of accessibility. The solution can include a smart, digital assistant that helps travellers with disabilities to build accessible travel itineraries adapted to their specific needs.
Type of Data	Accessibility data, Behaviour of tourists, Demand and offer data, Typology of tourists, Purchase habits
Stakeholders impacted	Private organizations, Public Authority, Tourists

Use case 18	Optimisation of tourist flows in protected areas
Challenge	Understand and better forecast the tourism flow, Manage seasonality in tourism sector, Manage and reduce overcrowding of sites and services

Use case 18	Optimisation of tourist flows in protected areas
Data purpose	Improvement of planning and operations of the tourism service
Problem(s)/need(s)	Tourism seasonality affects most destinations in the world, and it implies unequal distribution of tourism throughout the year. It results in periods where local resources are exploited over capacity and the local environment suffers from several issues, such as overproduction of waste and pollution. At the same time, crowds might also be detrimental for fragile landscapes and heritage sites. In addition to these issues, overcrowding of sites also affects the experience of tourists, making it less comfortable and potentially less safe.
Desired solution	To effectively manage tourism flows in protected areas, a set of indicators should be adopted. Such indicators will focus on the site maximum capacity, considering taking into account environmental variables and other detrimental human impacts. Such data could be displayed on a dashboard, to be used (not only) by people in charge of manging the area. Based on these data association with impact indicators, it will be possible to forecast impacts and to adopt preventive measures.
Type of Data	Tourists flow; Demand and offer data; Purchase habits; Sustainability data; Behaviour of tourists; Mobility data
Stakeholders impacted	Destination Management Organisations, Public Authority, HORECA, Travel Agency, Tour Operator, Tourism service provider

Use case 19	Data intelligence-based marketing campaign optimization system
Challenge	Manage seasonality in tourism sector
Data purpose	Improvement of planning and operations of the tourism service
Problem(s)/need(s)	Tourism seasonality affects most destinations in the world, and it implies unequal distribution of tourism throughout the year. It results in periods where local resources are exploited over capacity and the local environment suffers from several issues, such as overproduction of waste and pollution. At the same time, crowds might also be detrimental for fragile landscapes and heritage sites.
Desired solution	To develop effective marketing campaigns (also useful for facing tourism seasonality) for hotels, it would be useful to develop an application that analyses data and provides relevant information for targeting marketing campaigns. This use case can be implemented by developing an application that automatically daily analyses the needed data automatically retrieved from the EU tourism data space. Such elaboration will be at the base of hotels' decision-making regarding marketing campaigns.
Type of Data	Related industry data; Demand and offer data; Purchase habits; mobility data; Typology of tourists; Tourists flow
Stakeholders impacted	HORECA, Travel Agency, Tour Operator, DMO

Use case 20	AI-based recommender for sustainable tourism
Challenge	Reduce negative impacts of tourists' behaviour on local communities and environment, Manage and reduce overcrowding of sites and services, Improve tourists' experiences by providing information on tourism flows
Data purpose	Increase of tourism sustainability & accessibility, Improvement of planning and operations of the tourism service, Improvement of the interaction and engagement of the tourist
Problem(s)/need(s)	Mass tourism to cultural sites and natural areas generate several issues for local residents and the environment. Just to mention the main ones, overcrowding could generate the impoverishment (or even destruction) of natural sides, increase in the amount of waste, and escape and malaise of residents. At the same time, it is hard to enjoy tourism experiences when sites are too crowded.
Desired solution	The overall objective of the use case is to contribute to a more sustainable tourism development by effectively managing visitor flows. AI-based procedures will be implemented and evaluated to identify and predict tourism hotspots. Based on nudging approaches, a recommender system will be developed to provide potential visitors with relevant information on saturation levels and suitable trip alternatives to enhance the visitor experience, as well as the quality of life in tourism regions.
Type of Data	Tourist flows; Related industry data; Mobility data; Demand and offer data; Behaviour of tourists, Tourists' satisfactions and emotions, Typology of tourists, Sustainability data.
Stakeholders impacted	HoReCA, Tourism service providers, Destination management organization, Public Authority, Private organization, Tourists, Travel agency

Use case 21	Minimize tourism negative environmental and socioeconomic impacts
Challenge	Manage the tourists-residents relationship, Reduce negative impacts of tourists' behaviour on local communities and environment, Support the growth of sustainable parameters awareness among the tourism industry
Data purpose	Conduct market analysis and inform decision making, Increase of tourism sustainability & accessibility , Increase of tourism sustainability & accessibility
Problem(s)/need(s)	Tourism has a major impact on natural and built environments and on the wellbeing and culture of host populations, and these effects can be positive or negative, depending on how tourism is developed and managed. In order to ensure the long-term sustainability of the tourism sector, there is a need for effective monitoring of the impacts at all levels, especially at the local destination level, where tourism activities take place, tourists interact with service providers and with communities, and where tourism's positive and negative impacts are most felt.
Desired solution	Providing access to valuable and reliable data on the impact of tourism, digital tourism platforms can integrate that information and create dashboard that will inform in real time stakeholders on possible upcoming effects. This solution could minimize the tourism impact on local community since it will help stakeholders to respond promptly and prevent any negative impacts. The solution should further focus on making the voice and opinions of local residents heard, and not only monitor the impacts of tourism, but also implement mechanisms that pro-actively intervene to reduce the negative impacts that emerge from multiple touristic activities.

Use case 21	Minimize tourism negative environmental and socioeconomic impacts
Type of Data	Sustainability data, Local/Residents' satisfactions and emotions, Tourist flows, Related industries data, Behaviour of tourists, data, Demand and offer data, Purchase Habits
Stakeholders impacted	HoReCa, Travel Agency, Public Authority, Destination management organization, Private organizations, NGOs/Associations, Tour operator, Tourism service providers, Local residents

Use case 22	Mitigate crisis management
Challenge	Crisis management
Data purpose	Conduct market analysis and inform decision making
Problem(s)/need(s)	The tourism industry is highly volatile due to seasonality and other determinants. Seasonality has been widely researched, but calamitous events and their impact on the tourism sector are still underestimated. As Covid-19 pandemic thought, tourism industry and supply chain can be suddenly disrupted if a dramatic event, such as natural disasters, terrorist attacks, political instability, and infectious diseases, takes place. In a nutshell, reliable information can support the pathway towards resilience and improve strategic decisions.
Desired solution	Integrating data relevant to crisis management (accidents, natural disasters, closed areas, and trails) with data on tourist flows, weather can allow public authorities to plan preventive actions, interventions and also communication. Moreover, sharing these data with stakeholders, like tour operators, help to provide real-time information on possible risks that could hinder tourists' safety. The same solution can be an App or a dashboard that provide updated and real-time information to facilitate decision making.
Type of Data	Related industries data, Sustainability data, Tourist flows, Demand and offer data, Mobility data, Tourists' satisfaction & emotions.
Stakeholders impacted	Public Authority, Private organization, NGOs/Associations, Travel Agency, Tour operator, HoReCa, Tourism service providers, Destination management organization

Use case 23	Customised immersive experiences using historical data
Challenge	Develop innovative immersive and digital tourism experiences, Incentivize collaboration among different types of stakeholders, Answer to the so-called request for "hyper personalization" of travel experiences, Address the demand/needs of tourists of different generations
Data purpose	Improvement of the interaction and engagement of the tourist , Conduct market analysis and inform decision making , Conduct market analysis and inform decision making , Improvement of the interaction and engagement of the tourist
Problem(s)/need(s)	Addressing the demand/needs of digital natives. Millennials, generations Z and Y will become the become tourism consumers in the medium term (until 2030) and the main consumers in the long run (2050). They are highly digitally skilled tourists and will most likely ask for more inclusive and interconnected digital solutions. Indeed, they are looking for "transformative experiences" that deeply involve their mind and that are customised to their current mind-set/life stage/interests.

Use case 23	Customised immersive experiences using historical data
Desired solution	Based on digitalized cultural heritage (e.g. paintings, archaeology, architecture, fashion…), it is possible to create extended reality (XR) experiences, included mixed reality (MR) and virtual reality (VR). Based on customers' data, it will be possible to offer personalized VR experiences. Indeed, data regarding visitors' preferences, previous visits, interests, but also age, etc… will allow to tailor the experience in real time.
Type of Data	Related industry data (data from Data Space for Cultural Heritage - historical photos, 3 D models, documents …); Behaviour of tourists; Purchase habits; Typology of tourists, Tourist Flow
Stakeholders impacted	Public Authority, Destination management organization, Tourism service providers, Private organization, Tour operators, Tourists

Use case 24	Food inclusivity
Challenge	Improve the supply and visibility of accessible tourism services
Data purpose	Increase of tourism sustainability & accessibility
Problem(s)/need(s)	Travellers with specific food restrictions (diabetes, celiac, vegetarian/vegan) have sometimes troubles to find out which restaurants and hotels have food options adequate for them, and also which supplies available at destination's supermarkets. In particular, special attention must be paid by the restaurant industry and tourist service supplier when it comes to deal with this sort of preferences.
Desired solution	Provide access to data on the accessibility of a destination from a food perspective will help stakeholders to include this information in their offer in order to better attract travellers with specific food restricts. This aspect of accessibility should be included in all the website/webapp regarding the promotion of tourism of a specific destination (DMOs). The solution should be able to include multiple functionalities, for example, being able to plan the route or distance, being able to search for offers, leave reviews, read reviews, compare prices etc.
Type of Data	Accessibility data, Demand and offer data, Tourists' satisfactions & emotions, Behaviour of tourists, Related Industry Data.
Stakeholders impacted	Destination management organization, HoReca, Travel Agency, Tourism service providers, Public authority, Tourists

Use case 25	Smart tourism observatory
Challenge	Monitor the flow of visitors between districts and attractions, Understand and better forecast the tourism flow, Manage seasonality in tourism sector

Use case 25	Smart tourism observatory
Data purpose	Conduct market analysis and inform decision making, Improvement of planning and operations of the tourism service , Improvement of planning and operations of the tourism service
Problem(s)/need(s)	Often tourism destinations and attractions are "overwhelmed" and suffer from "over tourism". Over tourism generated a set of other challenges, including of the effectiveness of public services, conservation of the cultural heritage (tangible and intangible), and management of security risks. For these reasons, cities and points of interest (heritage sites, natural parks, routes etc) need a solution to better manage the flows of tourists.
Desired solution	To address the over tourism issue, stakeholders should have the possibility to monitor the flow and profile of visitors. Therefore, a tool like a dashboard could be helpful to increase the knowledge on the flow of tourists across districts and attractions and to inform real-time decision making. Indeed, its aim is to be a decision-making aid for DMOs and public authorities. The solution can be developed either as a webapp or a dashboard in a website which will show several metrics to monitor the flow of visitors.
Type of Data	Tourists flow, Related industries data, Purchase habits, Behaviour of tourists, Demand and offer data, Mobility data, Typology of tourists, Tourists' satisfactions and emotions.
Stakeholders impacted	Destination management organization, Private organization, Tourism service providers, HoReCa, Public Authority, Tour operator, Travel agency

Use case 26	Improving marketing campaigns
Challenge	Reach potential clients without being fully dependent on online travel agencies; Develop effective business strategies & make investment decisions
Data purpose	Improvement of the interaction and engagement of the tourist; Conduct market analysis and inform decision making; Create and manage a relation with tourists
Problem(s)/need(s)	Nowadays tourists can choose, configure, and assemble a highly customized journey by themselves, instead of referring to travel agencies. Indeed, travellers can nowadays refer to a large variety of online services, which enable them to compare offers, to flexibly combine different services (e.g. travel, accommodation, activities...), and to book them at competitive prices. Such online services are offered by the so-called Online Travel Agencies (OTAs). On one side, besides being convenient for tourists, these intermediaries provide benefits to local tourism players (e.g. HoReCa companies, tourism service providers, rental agencies...) because they give visibility to their offers, helping them in reaching potential clients. On the other side, OTAs are so widespread that it is extremely difficult for tourism players to reach clients without referring to them. Additionally, these platforms generate large amounts of data that put them in an always privileged market position. Therefore, an increased tourism-related data availability could help local tourism players in finding ways to reach clients without referring to OTAs.
Desired solution	The solution includes a tool for improving tourism SMEs (especially HoReCa) marketing campaigns. The idea is to develop a tool that, based on simple inputs provided by the user, will provide useful information for preparing effective marketing campaigns based on relevant datasets from the data space. Through such tool, by providing the period when it would like to attract clients, an accommodation

Use case 26	Improving marketing campaigns
	provider may receive information about the target market (e.g. country of origin of potential clients), the ideal launch campaign dates, and concepts/keywords to use in the campaign messages. The datasets needed for extracting information on the target market relate to accommodations Proprietary Management Systems (PMS), transportation searches (where from are these searches performed), and visits to DMOs and attractions websites. At the same time, information regarding the campaign launch dates may come from OTAs or transport websites (e.g. lag between first search and booking dates). Finally, information about the contents of the campaign may come from tourist reviews and visits patterns on DMO and attractions websites.
Type of Data	Tourists' satisfaction & emotions, Typology of tourists, Behaviour of tourists, Purchase habits, Mobility data, Demand and offer data, Related industry data, Accessibility data, Sustainability data
Stakeholders impacted	HORECA, Tourism service providers, Destination management organization (DMO), Travel agency, Tour operator, NGO/Association, Public authority, Tourists, Academia/research, Private organizations

Annex IV – Use cases co-creation workshop materials

Workshop date
28 03 23

Use Case: Food inclusivity

PROBLEM / NEED

Over the last years, a large share of tourists expresses needs related to food-allergy problems . Indeed, food allergy limits millions of potential travellers from participating in regular travel and tourism activities. Travellers with specific food restrictions (diabetes, celiac, vegetarian/vegan) have sometimes troubles to find out which restaurants and hotels have food options adequate for them, and also which supplies available at destination's supermarkets. In particular, special attention must be paid by the restaurant industry when it comes to deal with this sort of preferences.

SOLUTION

Development and diversification of tourism products and services aimed at ensuring equal access to tourist. Indeed, provide access to data on the accessibility of a destination from a food perspective will help stakeholders to include this information in their offer in order to better attract travellers with specific food restricts.
This aspect of accessibility should be included in all the website/webapp regarding the promotion of tourism of a specific destination (DMOs).

Consultation activity

DATA

1

Data type
5 min
Use case data types
Data types are just macro categories of the datasets.
For this use case, the project team identified the following data types

Accessibility data | **Related industry data** | **Demand and offer data**

Do you think the data types outlined above are enough?
Are there any other data type that you consider relevant?
Add a sticky note below (double click)!

Tourists satisfactions | Behaviour of tourists | A kind of medical data base | Supply chain data | Product codes | Restaurant register

2

Datasets
10 min
For each data type, which specific dataset would you need for implementing the use case?

For each identified dataset, please also mention the needed level of granularity and the data source (i.e. where do the data come from*)*
Following results discussion, the facilitators will mark the datasets including personal data with a red dot

Dataset	Granularity	Data source
List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free)	Per custom period (month, quarter, year, few data	Private business data, (booking, coffee shops, ...etc)
List of producers with ingredients	Restaurant by premises	Tourist start documents (questionnaires, satisfaction surveys, photographs)
List of forbidden substances for certain deseases	Per disease type	Medical specialists data base
List of hotels and b&b with different menus	Per price range, per services, etc.	Private business data
Restaurant reviews/ hotels reviews	Per custom period (month, quarter, year, few data	User generated data
Number of travellers that choose to eat in vegan/vegetarian restaurants	Per price range, per cuisine,	Points of sales data
Prices for special offers in the destination (e.g. gluten free)	Prices per items in the menu, or grouped by destination	Private business data
Restaurants with ingredients Menu	Per environmentally	Just-eat or other delivery companies
Personal data including characteristics and preferences of tourists	Per age of tourists, gender	Device data, user generated data
List of tourism articles/blogs that showcase accessibility of a destination from a food perspective	Per cuisines and pax ranges or prices	User generated data, private business data
List of tour offers that encompass a food related activity	Per food restrictions	Private business data

Public Authority

STAKEHOLDERS

3

Stakeholder roles
5 min
Use case stakeholder types
For this use case, the project team identified the following stakeholder types

DMO | Public Authority | Tourists | HORECA | Tour operator | Travel Agency | Tourism service providers | NGOs/Associations

Which is the role of each stakeholder type in this use case?

Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Data provider	Data consumer	Final user
Tourism service providers	Travel Agency	Tourists
Tourists	Tourism service providers	Public Authority
HORECA	DMO	Tourists
Travel Agency	Public Authority	
Private organizations (e.g Food Delivery business)	DMO	
Public Authority	Tourism service providers	
OTAs (for reviews)		

4

Stakeholder & datasets
10 min
Which dataset does each stakeholder type provides/consumes?
Add a sticky note (double click) mentioning the dataset in each cell of the table below

List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free) | List of producers with ingredients | List of forbidden substances for certain deseases | List of hotels and b&b with different menus | Restaurant reviews/ hotels reviews | Number of travellers that choose to eat in vegan/ vegetarian restaurants | Prices for special offers in the destination (e.g. gluten free) | Restaurants with ingredients Menu | Personal data including characteristics and preferences of tourists | List of tourism articles/blogs that showcase accessibility of a destination from a food perspective | List of tour offers that encompass a food related activity

Stakeholder type	Data provider	Data consumer
DMO		List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free); Number of travellers that choose to eat in vegan/ vegetarian restaurants; List of hotels and b&b with different menus; Restaurants with ingredients Menu
Public Authority	List of producers with ingredients; List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free)	List of producers with ingredients
Tourists	Restaurant reviews/ hotels reviews; List of tourism articles/blogs that showcase accessibility of a destination from a food perspective	List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free); Restaurants with ingredients Menu; List of producers with ingredients; List of hotels and b&b with different menus
HORECA	Prices for special offers in the destination (e.g. gluten free); Number of travellers that choose to eat in vegan/vegetarian restaurants	
Tour operator	List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free); List of tour offers that encompass a food related activity	Number of travellers that choose to eat in vegan/vegetarian restaurants
Travel Agency	Restaurant reviews/ hotels reviews; List of restaurants with option of menus (gluten free, vegetarian/ vegan, dairy free)	
Tourism service providers	Prices for special offers in the destination (e.g. gluten free); List of producers with ingredients	

SOLUTION

5

Solution
5 min
Solution: development and diversification of tourism products and services aimed at ensuring equal access to tourist. Indeed, provide access to data on the accessibility of a destination from a food perspective will help stakeholders to include this information in their offer in order to better attract travellers with specific food restricts.
This aspect of accessibility should be included in all the website/webapp regarding the promotion of tourism of a specific destination (DMOs).

Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?

Please add your comments in the sticky note below

The solution could be adopted in a different context indeed! For example, the diversification of tourism products should be further aimed at ensuring accessibility not only to those who require food inclusivity, but also those that suffer impairment such as physical impairments, visual impairments.

The solution should be able to include multiple functionalities, for example, being able to plan the route or distance, being able to search for offers, leave reviews, read reviews, compare prices etc.

Workshop date
28 03 23

Use Case: Minimize tourism impact on local community

PROBLEM / NEED

Tourism has a major impact on natural and built environments and on the wellbeing and culture of host populations, and these effects can be positive or negative, depending on how tourism is developed and managed.
In order to ensure the long-term sustainability of the tourism sector, there is a need for effective monitoring of the impacts at all levels, especially at the local destination level, where tourism activities take place, tourists interact with service providers and with communities, and where tourism's positive and negative impacts are most felt.
Moreover, tourism industry is pervaded by a lack of awareness of sustainable parameters. There is a need to provide valuable information to users of tourist services on the impact of tourism on the environment, on the destination and on the local communities. Indeed, better information through more measurable impact indicators and monitoring system provides the ability to ensure that tourism does not cause harm to the nature, local environment, social and cultural wellbeing of the local residents. Therefore, to measure and monitor effects of cultural tourism both on environmental and sociocultural dimension, planners and managers require reliable data, which can be gained by using the right indicators.

SOLUTION

Providing access to valuable and reliable data on the impact of tourism, digital tourism platforms can integrate that information and create dashboard that will inform in real time stakeholders on possible upcoming effects. This solution could minimize the tourism impact on local community since it will help stakeholders to respond promptly and prevent any negative impacts.

Consultation activity

DATA

1 Data type

5 min

Use case data types

Data types **are just macro categories of the datasets.**

For this use case, the project team identified the following data types

- Sustainability data
- Related industry data
- Demand and offer data
- Local/Residents satisfactions and emotions
- Tourist flows
- Behaviour of tourist
- Mobility data

Do you think the data types outlined above are enough?

Are there any other data type that you consider relevant?
Add a sticky note below!

- Water consumption (waste)
- Pollution and emissions, how is the environment impacted?
- Acustic pollution
- Data on over tourism and congestion of point of attractions
- How much waste is produced? Is there an overproduction of waste caused by tourism?
- Data and info to support sustainable and responsible behaviour of tourists
- Traffic jams frequency
- Energy consumption
- data to promote less know destinations close to well known ones
- Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities))
- Entrance price monitor to the POIs/ restaurant prices in the torusit areas
- Tourist movement (streams)
- Data to promote walking experiences and slow mobility
- List of short term accomodation
- Data to promote destinations (e.g. events) to address seasonality
- Share of tourism in the region's GDP

2 Datasets

10 min

For each data type, which specific dataset would you need for implementing the use case?

For each identified dataset, please also mention the needed level of granularity and the data source (i.e. i.e. where do the data come from).
Following results discussion, the facilitators will mark the datasets including personal data with a red dot ●

Dataset	Granularity	Data source
Number of beds booked in commercial accommodation establishments per 100 residents	Per destination and per month/season	Private business data (Airbnb, Booking)
Percentage of local residents that are satisfied with the tourists	Per destination and per month/season	Reviews on social networks, blog and forum
Share of torusim in region's GDP	Per region, per city	Governamental data
Sum of traffic jam time	Per week	
Waiting times at the POIs	Per destination, pet month/ season and per time of the day	Private business data
Itinerary to enjoy destinations by walking	By walking cultural routes	
Tourist spending per capita vs. local spending per capita in the region (or foreign tourists/ inland tourists)	Per destination and per typology of tourist (foreign or inland)	Public administrations, associations and data providers
Energy consumption	By area and data	Energy companies
Price index in restaurants/ POIs		
Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities))	By city and data	Public Authorities
Number of tourists per 100 residents	By city, region	
# of Apparments on offer vs. hotel rooms i na tourist area	By city, region	
CO2 foorprint of an average tourist		
Waste per capita per tourist		

Dataset	Granularity	Data source
List of short term accomodation	By area, neighborhood data/listing	Public Authorities, Private Business (AirDNA...)
Waste production per tourist night compared to general population waste production per person	Per destination and type of waste produced	
Data on tourist movement ●		From e.g. mobile providers
Percentage of tourism enterprises in the tourism sector actively supporting protection, conservation and mangement of local biodiversity of landscapes	Per type of tourism enterprises, per methodologies used to protect, conserve and manage the landscapes.	
Tweets of local population contra tourism		

STAKEHOLDERS

3 Stakeholder roles

5 min

Use case stakeholder types

For this use case, the project team identified the following stakeholder types

DMO · Public Authority · HORECA · Tour operator · Travel Agency · Tourism service providers · NGO & Associations · Academia/research · Local residents

Which is the role of each stakeholder type in this use case?

Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Data provider	Data consumer	Final user
HORECA, Travel Agency (for # of private rooms/ hotel rooms), Public Authority, DMO, Local residents, Tourists, Travel Agency, private companies (e.g. telecom, energy, ...)	DMO, DMO, Academia	NGO & Associations, DMO, Public Authority, DMO, local residents

4 Stakeholder & datasets

10 min

Which dataset does each stakeholder type provides/consumes?

Add a sticky note (double click) mentioning the dataset in each cell of the table below

Number of beds booked in commercial accommodation establishments per 100 residents · Percentage of local residents that are satisfied with the tourists · Share of torusim in region's GDP · Sum of traffic jam time · Waiting times at the POIs · Itinerary to enjoy destinations by walking · Tourist spending per capita vs. local spending per capita in the region (or foreign tourists/ inland tourists) · Energy consumption · Price index in restaurants/ POIs · Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities)) · Number of tourists per 100 residents · # of Apparments on offer vs. hotel rooms i na tourist area · CO2 foorprint of an average tourist · Waste per capita per tourist · List of short term accomodation · Waste production per tourist night compared to general population waste production per person · Data on tourist movement · Percentage of tourism enterprises in the tourism sector actively supporting protection, conservation and mangement of local biodiversity of landscapes · Tweets of local population contra tourism

Stakeholder type	Data provider	Data consumer
DMO	Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities)); Waiting times at the POIs; Number of beds booked in commercial accommodation establishments per 100 residents; itinerary to enjoy destinations by walking; Price index in restaurants/ POIs; List of short term accomodations; # of Apparments on offer vs. hotel rooms i na tourist area	# of Apparments on offer vs. hotel rooms i na tourist area; Price index in restaurants/ POIs; Number of beds booked in commercial accommodation establishments per 100 residents; Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities))
Public Authority	Share of torusim in region's GDP; Percentage of local residents that are satisfied with the tourists; Sum of traffic jam time per week; Pollution data; Waste per capita per tourist; Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities)); Number of tourists per 100 residents; Tourist spending per capita vs. local spending per capita in the region (or foreign tourists/ inland tourists); Real time data on overtourism; Waste production data; CO2 foorprint of an average tourist	
NGO and Associations	Itinerary to enjoy destinations by walking; CO2 foorprint of an average tourist	
HORECA	Number of beds booked in commercial accommodation establishments per 100 residents; real-time pricing information (if they use dynamic pricing)	
Tour operator	itinerary to enjoy destinations by walking; Local Markets data (change in destination of business - form citizen centred acitivites to tourist activities))	
Travel Agency	tourist reviews; demand (search) information for certain areas	
Tourism service providers	Waiting times at the POIs	

SOLUTION

5 Solution

5 min

Solution: providing access to valuable and reliable data on the impact of tourism, digital tourism platforms can integrate that information and create dashboard that will inform in real time stakeholders on possible upcoming effects. This solution could minimize the tourism impact on local community since it will help stakeholders to respond promptly and prevent any negative impacts.

Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?

Please add your comments in the sticky note below

- establish fora to make local voice heard
- not only monitor, but pro-actively intervene
- informing the locals about the contribution and the 'bad side' of tourism is useful
- provide data and info to engage residents in defining tourism development strategy and policies
- benchmark toruism with other industries (e.g. production)
- providing real time data on enerdy and waste management status
- probably you have not to minimize the impact always, but to be in accord with the wish of the local (if they want many tourists, they can have them)
- data to maximize equal development (at both regional and loal level)
- The solution should focus on minimizing the tourism impact on local communities, for sure, but it should also focus on miniziming impacts that lead to disturbances of, for example, the normal activities of wildlife. Toursits should be informed on how their activites could have adverse effects on animals
- Provide data about the structure of the destination (how many restaurants per capita, hotels, short-term rental, residents)
- encourage neighboring regions to collaborate (some have too many visitors, other too few), how to balance it?
- Providing data together with awareness raising campaigns on differents topis

Workshop date
28 03 23

Use Case: Smart tourism observatory

PROBLEM / NEED

Whereas tourism for several locations can be considered an important economic source and a great opportunity for economic growth, it can also produce burdens which entail significant impact on the destination itself. Indeed, often tourism destinations and attractions are "overwhelmed" and suffer from "over tourism". Over tourism appears to be closely linked with the popularity of particular attractions and points of interest that have become "hotspots" suffering from congestion.

Moreover over tourism generated a set of other challenges, including of the effectiveness of public services, conservation of the cultural heritage (tangible and intangible), and management of security risks. For these reasons, cities and points of interest (heritage sites, natural parks, routes etc...) need a solution to better manage the flows of tourists. The challenge of managing large tourists flows con be also linked to specific events (e.g. festivals, expos...) organized in areas that are "constantly" overcrowded.

SOLUTION

To address the over tourism issue, stakeholders should have the possibility to monitor the flow and profile of visitors. Therefore, a tool like a dashboard could be helpful to increase the knowledge on the flow of tourists across districts and attractions and to inform real-time decision making. Indeed, its aim is to be a decision-making aid for DMOs and public authorities. The solution can be developed either as a webapp or a dashboard in a website which will show several metrics to monitor the flow of visitors.
The observatory can monitor several tourism variables, with a high level of data granularity, allowing to evaluate the appeal of tourist destinations/attractions and measure tourism potential of different areas, limiting negative impacts and risks of crowded places.

Consultation activity

DATA

1

Data type
⏱ 5 min
Use case data types
Data types are just macro categories of the datasets.
For this use case, the project team identified the following data types

Tourist flow | Related industry data | Purchase habits | Behaviour of tourism | Demand and offer data | Mobility data

Do you think the data types outlined above are enough?
Are there any other data type that you consider relevant?
Add a sticky note below (doble click)!

2

Datasets
⏱ 10 min
For each data type, which specific dataset would you need for implementing the use case?
For each identified dataset, please also mention the needed level of granularity and the data source (i.e. where do the data come from*)*
Following results discussion, the facilitators will mark the datasets including personal data with a red dot ●

Dataset	Granularity	Data source
Time spent by visitors in a POI	Daily and hourly per POI	Sensors, GPS, mobile phone
Festival/ Museum tickets bought by tourists	Daily and hourly per month/season	Private business data, online transaction data
number of passengers arriving at the airports	For a specific time/date (aggregated data) By destination and origin	Life Cams feeds (trafic, people flows / areas...) — Logs from airports and airlines (if we can get that) — example: Olympic games
Weather data (Temp, rain, wind)	Weekly, daily	Weather/forecast data (current / near future) — insights: forecast more impact than actual weather)
● Mobile phone data	specific POIs, national (between districts) or foreign	Mobile phone provider — 2 datasets: one near real time (5 min delay w basic info on flows but no demographics) — 1 dataset with demographics (not real time)
Road traffic (AI)	Real-time, automatic	National Road Traffic cameras

Dataset	Granularity	Data source
Tourists' subjective feeling about destination		
Capacity: area, location, street, vehicle maximuns, people max...		
Hotel rooms available and booked		
● Demographics (Local, Day tourist, Overnight-stay)		
List of restaurants, coffee shops	By style, price and availability	
List of tourist attractions		

STAKEHOLDERS

3

Stakeholder roles
⏱ 5 min
Use case stakeholder types
For this use case, the project team identified the following stakeholder types

DMO | Public Authority | Tourism service providers | HORECA | Tour operator | Travel Agency | Private organizations

Which is the role of each stakeholder type in this use case?
Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Insight: no single relationshipand specific roles but roles depend on the context. A stakeholder can provide data and be the final user

Data provider	Data consumer	Final user
Private organizations (Mobile phone operator), DMO	Private organizations (tech companies, specialized in mobility)	DMO
DMO		Tourism service providers
Tourism service providers		Public Authority
HORECA	Private organizations (tech company)	HORECA
Private organizations		
Public Authority		
Tour operator		

4

Stakeholder & datasets
⏱ 10 min
Which dataset does each stakeholder type provides/consumes?
Add a sticky note (double click) mentioning the dataset in each cell of the table below

Time spent by visitors in a POI | Festival/ Museum tickets bought by tourists | number of passengers arriving at the airports | Weather data (Temp, rain, wind) | Mobile phone data | Road traffic (AI) | Tourists' subjective feeling about destination | Capacity: area, location, street, vehicle maximuns, people max... | Hotel rooms available and booked | Demographics (Local, Day tourist, Overnight-stay) | List of restaurants, coffee shops | List of tourist attractions

Stakeholder type	Data provider	Data consumer
DMO	Time spent by visitors in a POI; Mobile phone data	Tourists' subjective feeling about destination
Public Authority	Weather data (Temp, rain, wind); Road traffic (AI)	
Tourism service providers	Festival/ Museum tickets bought by tourists; Time spent by visitors in a POI	List of tourist attractions
HORECA	Hotel rooms available and booked	
Tour operator	Time spent by visitors in a POI	
Travel Agency		
Private organizations	Mobile phone data; Weather data (Temp, rain, wind)	

SOLUTION

5

Solution
⏱ 5 min
Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?
Please add your comments in the sticky note below

Workshop date
28 03 23

Use Case: Mitigate crisis management

PROBLEM / NEED

The tourism industry is highly volatile due to seasonality and other determinants. Seasonality has been widely researched, but calamitous events and their impact on the tourism sector are still underestimated . As Covid-19 pandemic thought, tourism industry and supply chain can be suddenly disrupted if a dramatic event, such as natural disasters, terrorist attacks, political instability, and infectious diseases, takes place. In a nutshell, reliable information can support the pathway towards resilience and improve strategic decisions.

SOLUTION

Therefore, having updated, real-time and valuable information can help to form accurate and corresponding decisions for immediate actions.Indeed, integrating data relevant to crisis management (accidents, natural disasters, closed areas and trails) with data on tourist flows, weather can allow public authorities to plan preventive actions, interventions and also communication. Moreover, sharing these data with stakeholders, like tour operators, help to provide real-time information on possible risks that could hinder tourists' safety.The same solution can be an App or a dashboard that provide updated and real-time information to facilitate decision making.

Consultation activity

DATA

1 Data type

5 min

Use case data types

Data types are just macro categories of the datasets.
For this use case, the project team identified the following data types

- Tourist flow
- Related industry data
- Mobility data
- Demand and offer data
- Sustainability data

Do you think the data types outlined above are enough?
Are there any other data type that you consider relevant?
Add a sticky note below (double click)!

2 Datasets

10 min

For each data type, which specific dataset would you need for implementing the use case?

For each identified dataset, please also mention the needed level of granularity and the data source (i.e. where do the data come from)
Following results discussion, the facilitators will mark the datasets including personal data with a red dot

Dataset	Granularity	Data source
Infomobility (number of accidents and street works)	Real time data, by location	Sensors, webcam, Private business data
Weather forecast	Hourly and by location	Remote sensing technologies
Overview on economy and society from government		
Crisis statistics (e.g. pandemic)		
Guest flow	Real time data	
Registration of citizens abroad	at certain time and to which destination	Private business data
Indicators of climate change		

Dataset	Granularity	Data source
Number of foreign people / travellers in a country / city		
Forecasts of expected visitors to destination (eg. flight and hotel reservations)		
Updates on crisis (status about the accidents)		
Statistics on tourism impact (percentage of tourist per resident; tourist spending vs local spending		
Amount of staff of tourism service who have received safety training	By destination	
Tourists' subjective feeling about safety in destination		

STAKEHOLDERS

3 Stakeholder roles

5 min

Use case stakeholder types
For this use case, the project team identified the following stakeholder types

DMO | Public Authority | Private organisations | HORECA | Tour operator | Travel Agency | Tourism service providers | NGO & Associations

Which is the role of each stakeholder type in this use case?

Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Data provider	Data consumer	Final user
Public Authority (Police, emergency services, Ministry - Foreign affairs, Interior)	Private organizations (tech company)	Tour operator
Private organisations (weather info providers, road traffic manager)	National / regional / local tourism organization	DMO
NGO & Associations		Travel Agency
		Tourism service providers
		HORECA

4 Stakeholder & datasets

10 min

Which dataset does each stakeholder type provides/consumes?
Add a sticky note (double click) mentioning the dataset in each cell of the table below

Overview on economy and society from government | Crisis statistics (e.g. pandemic) | Infomobility (number of accidents and street works) | Weather forecast | Guest flow | Registration of citizens abroad | Indicators of climate change | Number of foreign people / travellers in a country / city | Forecasts of expected visitors to destination (eg. flight and hotel reservations) | Updates on crisis (status about the accidents) | Statistics on tourism impact (percentage of tourist per resident; tourist spending vs local spending | Amount of staff of tourism service who have received safety training | Tourists' subjective feeling about safety in destination

Stakeholder type	Data provider	Data consumer
DMO	Amount of staff of tourism service who have received safety training	
Public Authority	Overview on economy and society from government; Crisis statistics (e.g. pandemic); Registration of citizens abroad; Infomobility (number of accidents and street works); Weather forecast; Statistics on tourism impact (percentage of tourist per resident; tourist spending vs local spending	
Private organisations	Infomobility (number of accidents and street works); Weather forecast	
HORECA		
Tour operator		
Travel Agency	Forecasts of expected visitors to destination (eg. flight and hotel reservations)	
Tourism service providers	Statistics on tourism impact (percentage of tourist per resident; tourist spending vs local spending; Guest flows	
NGO/Association		

SOLUTION

5 Solution

5 min

Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?

Please add your comments in the sticky note below

Business model is really important (just an idea or we can implement it)

Open API

The solution can be implemented also as a safety barometer (food safety, road safety etc.)

For all datasets, it is important to get real time data

Use of AI eg. to translate local data to English, to make forecasts

social media data is interesting, but needs to be checked through other sources (e.g. 3 or 5 sources depending on the criticality)

System resilience: different data sources for the same data

Predictive model (from previous experience) taking into account what factors influenced and how.

This would help forecasting tourist flows. It will require historical data and training model

Machine learning - Artificial intelligence.

Workshop date
28 03 23

Use Case: AI-based recommender for sustainable tourism

PROBLEM / NEED

Mass tourism to cultural sites and natural areas generate several issues for local residents and the environment. Just to mention the main ones, overcrowding could generate the impoverishment (or even destruction) of natural sides, increase in the amount of waste, and escape and malaise of residents.
At the same time, it is hard to enjoy tourism experiences when sites are too crowded.
Information regarding the amount of people actually visiting a specific point of interest and information regarding the most crowded moments will surely allow residents and tourists to make their visits safer and more comfortable.

SOLUTION

The overall objective of the use case is to contribute to a more sustainable tourism development by effectively managing visitor flows. AI-based procedures will be implemented and evaluated to identify and predict tourism hotspots. Based on nudging approaches, a recommender system will be developed to provide potential visitors with relevant information on saturation levels and suitable trip alternatives to enhance the visitor experience, as well as the quality of life in tourism regions.
The use case foresees the development of solutions for destinations for managing visitors (e.g. digital visitor management system).
The same solution can become an app for visitors themselves. Such app, thanks to AI, will advise tourists on the most crowded moments for visiting places, provide them with real-time information and provide alternatives

Consultation activity

DATA

1 Data type

⏱ 5 min

Use case data types

Data types are just macro categories of the datasets.
For this use case, the project team identified the following data types

Tourist flow | Related industry data | Mobility data | Demand and offer data | Behaviour of tourist

Do you think the data types outlined above are enough?
Are there any other data type that you consider relevant?
Add a sticky note below!

Weather data (Realtime and short/mid-term forecasts) | Climate Data (Long term planning based on predictions) | Events | Traffic congestions | AI service providers & tech companies | Timetables of activities and POI (Museums, etc) | Position - location & tourist flows | Current Closures of tracks and facilities | Holidays regional and of bordering countries in case of cross-international audience | Sustainability assessment data | Transactional Data (reservations / bookings) | For XR experiences you may need to consider the level of twin of the global metaverse | Preferences based on profiles (also historical data based on their previous tourists, including satisfaction rates) | Visitor / Demographics (e.g. age, nationality)

2 Datasets

⏱ 10 min

For each data type, which specific dataset would you need for implementing the use case?
For each identified dataset, please also mention the needed level of granularity and the data source (i.e. i.e. where do the data come from).
Following results discussion, the facilitators will mark the datasets including personal data with a red dot

Dataset	Granularity	Data source
Individuals' time spent in a POI	Hourly for each POI	Sensors, GPS, mobile phone
Accomodation occupancy rate	Daily for each area of interest	Private accommodation datasets (hotels, AirbnB)
Average visitation times	In relation to quarterly tourist flows (Aggregated target groups, e.g. age/sex, origin)	Google Maps / Mobile providers; Validation data (Tourist flows counted through access control systems)
POIs	Carrying capacity (e.g. number of people high in attention hotspots / time)	DMOs, Tourism Service Providers, Data Analysts
Service timetables	Number of tickets still available, Expected waiting time	Museums, historical places, visitor management systems, cultural providers
Transactional Data (bookings, PAX)	Individual Transactions (personal data)	Provider Platforms (e.g. Systems as a whole/ Booking systems); Middleware Platforms; Resellers (e.g. OTAs, tour operators)
Tourist / Customer Data	Persona (multi-parameter) / Individual (personal?)	Tourism Service provider CRM systems
Sustainability assessment data	Hotel level / Destination level / Aggregated by sustainability criteria (Sustainability criteria: Energy consumption, Water consumption, Waste production, Pollution, Biodiversity, Cultural heritage, Socio-economic impacts)	DMOs, Tourism service providers, Certification bodies
Tourist Flow Offline (in destination)	Individuals / personas	Mobile Apps (GPS tracking enabled)
Tourist Flow - Online Engagement	User level / Session level / Aggregated by channel	Aggregate Provider / Search Services / Metasearch (e.g. Google, Tripadvisor, Skyscanner, etc.)
Historical data sets documenting tourist flows in time → Modeling potential future flows		

STAKEHOLDERS

3 Stakeholder roles

⏱ 5 min

Use case stakeholder types
For this use case, the project team identified the following stakeholder types

DMO | Public Authority | Tourists | HORECA | Tour operator | Travel Agency | Tourism service providers | Digital platforms | Tech companies and AI Services | Policy makers

Which is the role of each stakeholder type in this use case?

Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Data provider	Data consumer	Final user
HORECA	DMO	Tourists
Tourists	Digital platforms	Tourism service providers
Tourism service providers	DMO	Tourism service providers
DMO	DMO	Travel Agency
Public Authority	Public Authority	Tourists
Digital platforms	DMO	DMO
Tech companies and AI Services	Digital platforms	Public Authority
Tourism service providers	HORECA	Tourism service providers
Digital platforms	DMO	

4 Stakeholder & datasets

⏱ 10 min

Which dataset does each stakeholder type provides/consumes?
Add a sticky note (double click) mentioning the dataset in each cell of the table below

Individuals' time spent in a POI | Accomodation occupancy rate | Average visitation times | POIs | Service timetables | Transactional Data (bookings, PAX) | Tourist / Customer Data | Sustainability assessment data | Tourist Flow - Offline (in destination) | Tourist Flow - Online Engagement | Historical data sets documenting tourist flows in time

Stakeholder type	Data provider	Data consumer
DMO	Sustainability Transparancy Data; POIs; Service timetables; Tourist Flow - Online Engagement	Average visitation times; Tourist Flow - Online Engagement; Transactional Data (bookings, PAX); Tourist Flow - Offline (in destination); Tourist / Customer Data; Sustainability Transparancy Data; Sustainability Preference data
Public Authority	Individuals' time spent in a POI; Closures of tracks and other facilities and warnings	Transactional Data (bookings, PAX); Historical data sets documenting tourist flows in time
Tourists	Sustainability Preference data	Service timetables; POIs; Sustainability assessment data; Carrying capacity and carbon emissions; Average visitation times
HORECA	Sustainability Transparancy Data; Tourist Flow - Offline (in destination); Service timetables	Expected tourism flows; Historical data sets documenting tourist flows in time
Tour operator	Sustainability Transparancy Data; Tourist Flow - Online Engagement; Tourist / Customer Data; Transactional Data (bookings, PAX)	Expected tourism flows; Average visitation times
Travel Agency	Transactional Data (bookings, PAX)	Sustainability assessment data; Average visitation times
Tourism service providers	Sustainability Transparancy Data; Individuals' time spent in a POI; Service timetables; Tourist / Customer Data; Tourist Flow - Offline (in destination); Tourist Flow - Online Engagement; Transactional Data (bookings, PAX); Historical data sets documenting tourist flows in time; Service timetables	Tourist / Customer Data
DIGITAL platforms	Sustainability Preference data; Sustainability assessment data / certification data	Service timetables; Public holidays data; Weather data

SOLUTION

5 Solution

⏱ 5 min

Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?
Please add your comments in the sticky note below

Maybe publicity/ marketing? | Data privacy issues (thinking also about people below 18) | Public toilets | Semantic interoperability | Data Standardisation (to facilitate sharing and aggregation) | Principles for data sharing (e.g. commercial sensitivity) | Integration into the destination management plans, aligned to strategic/policy targets 2030-2050 | Credit card companies data | Accessibility data for all customers | Online Analytics Data (channels, websites for DMOs, TSPs, etc.) | ISP Data | sustainable mobility solutions | Mobile network operators data | Tourist and DMO Reviews / rating data on the sustainable performance (made by the AI-based recommender)

Workshop date
28 03 23

Use Case: Customised immersive experiences using historical data

PROBLEM / NEED

Addressing the demand/needs of digital natives. Millennials, generations Z and Y will become the become tourism consumers in the medium term (until 2030) and the main consumers in the long run (2050). They are highly digitally skilled tourists and will most likely ask for more inclusive and interconnected digital solutions. Indeed, they are looking for "transformative experiences" that deeply involve their mind and that are customised to their current mind-set/life stage/ interests.

SOLUTION

Based on digitalized cultural heritage (e.g. paintings, archaeology, architecture, fashion...), it is possible to crate extended reality (XR) experiences, included mixed reality (MR) and virtual reality (VR). Based on customers' data, it will be possible to offer personalized VR experiences. Indeed, data regarding visitors' preferences, previous visits, interests, but also age, etc... will allow to tailor the experience in real time. Example. A VR experience at the "Eiffel Tower" could adapt to the profile of the visitor. For instance, the experience could provide technical information and depict the history of the construction processes for tourists with a technical background/interests. Similarly, a VR experience with a "romantic narrative" can be displayed to a young couple. Players from multiple data spaces (cultural heritage, smart city, etc...) can share data with tourism players wanting to build extended reality experiences. For this, exchange of data with other Data Spaces is required, as well as procedures to ensure secure use of personal information and GDPR-compliance.

Consultation activity

DATA

1 Data type

5 min

Use case data types

Data types are just macro categories of the datasets.
For this use case, the project team identified the following data types

- Tourist flow
- Behaviour of tourist
- Purchase habits
- Typology of tourists
- Related industry data (data from Data Space for Cultural Heritage

Do you think the data types outlined above are enough?
Are there any other data type that you consider relevant?
Add a sticky note below!

- Flora and fauna data (extinct species, point out what should be "regenerated")
- Tourist attractions
- Historical people data (e.g. Alexander the Great)
- Historical sites and how they looked before (imagery, videos, etc.)
- 3D City models (historical and current ones for change detection)
- User Interactions
- Digital Twin data
- Location-based data
- Digital Stories (combining maps, POIs, historical data)

2 Datasets

10 min

For each data type, which specific dataset would you need for implementing the use case?

For each identified dataset, please also mention the needed level of granularity and the data source (i.e. i.e. where do the data come from*).*
Following results discussion, the facilitators will mark the datasets including personal data with a red dot ●

Dataset	Granularity	Data source
Tourist past purchase of (similar) experiences	individual/ (anonymised) purchases in the last 2 years	Cash expenses (under-business-to-consumer (B2C) – Non-food, Non-beverage, Non-medicine)
Age of tourist / year of birth of participants potentially interested in this activity	For each participants	Questionnaire
3D City models (historical and current ones for change detection)	Level of Detail (LOD) to detail geometrical objects(CityGML)	Public authorities / Pro-consumption organisations, unions, damage associations, etc.
How tourists book, ahead or on site?		POI booking systems, DMO's,
Location-based data	Tourist coordinates	Mobile operators (GSM, GPS, various IoT sensors, Bluetooth sensors)
Type of tourists	Cultural preferences (e.g. Food, Goods, music, paintings, etc)	User profiles (Platforms, Apps, marketplaces,
Type of attractions		
Historical cultural archives data	georeferenced vector, scalline, images	Datasets of platforms like "Europeana" and similar
Flora and fauna data (extinct species, point out what should be "regenerated")		Educational data – digitalised, VR, etc.

STAKEHOLDERS

3 Stakeholder roles

5 min

Use case stakeholder types
For this use case, the project team identified the following stakeholder types

- DMO
- Tourists
- Tour operator
- Tourism service providers
- Private organisations
- Public Authorities
- Tourist Attractions
- Location-based providers (IoT sensors, Mobile operators)

Which is the role of each stakeholder type in this use case?

Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Data provider	Data consumer	Final user
Public Authorities	Digital Platforms	Tourists
DMO	Tour operator	
Tourist Attractions	Tourism service providers	
Location-based providers (IoT sensors, Mobile operators)		
Tourists		

4 Stakeholder & datasets

10 min

Which dataset does each stakeholder type provides/consumes?
Add a sticky note (double click) mentioning the dataset in each cell of the table below

Tourists' past purchases of (similar) experiences | Age of tourists / year of birth of participants potentially interested in this activity | 3D City models (historical and current ones for change detection) | How tourists book, ahead or on site? | Location-based data | Type of tourists | Type of attractions | Historical cultural archives data | Flora and fauna data (extinct species, point out what should be "regenerated")

Stakeholder type	Data provider	Data consumer
DMO	Cultural routes	Location-based data; Tourists' past purchases of (similar) experiences
Tour operator	Type of tourists	Location-based data; Tourists' past purchases of (similar) experiences; Flora and fauna data (extinct species, point out what should be "regenerated")
Tourists	Cultural preferences; Age of tourists / year of birth of participants potentially interested in this activity; Type of tourists	3D City models (historical and current ones for change detection); AR/ Digital Storytelling experiences; Flora and fauna data (extinct species, point out what should be "regenerated")
Tourism service providers		Location-based data
Private organisations	3D City models (historical and current ones for change detection); Historical cultural archives data; Flora and fauna data (extinct species, point out what should be "regenerated")	
Location-based providers (IoT sensors, Mobile operators)	Location-based data; 3D City models (historical and current ones for change detection)	
Public Authorities	Flora and fauna data (extinct species, point out what should be "regenerated"); Historical cultural archives data; 3D City models (historical and current ones for change detection); Historical cultural archives data	

SOLUTION

5 Solution

5 min

Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?
Please add your comments in the sticky note below

- Historic events? (Data on historic events, when, what...?)
- Flora & Fauna
- Metaverse
- AR-Hardware
- Cooperation between cultural institutions and tourism stakeholders
- Devices
- Educational approaches / Edutainment
- Language (e.g. AI speaking in local dialects, etc / translations)
- Residents (not just tourists)

Workshop date
28 03 23

Use Case: Optimisation of tourist flows in protected areas

PROBLEM / NEED

Tourism seasonality affects most destinations in the world, and it implies unequal distribution of tourism throughout the year. It results in periods where local resources are exploited over capacity and the local environment suffers from several issues, such as overproduction of waste and pollution. At the same time, crowds might also be detrimental for fragile landscapes and heritage sites. In addition to these issues, overcrowding of sites also affects the experience of tourists, making it less comfortable and potentially less safe.

SOLUTION

In order to effectively manage tourism flows in protected areas, a set of indicators should be adopted. Such indicators will focus on the site maximum capacity, considering taking into account environmental variables (e.g. resources consumption and waste and pollution production), other detrimental human impacts (e.g. vibration created by traffic, crowds' steps, people and infrastructure weight, noise…), and infrastructure capacity (e.g. public transport capacity, service facilities available etc…). In order to predict the value of such indicators in specific periods, it is important to estimate the amount of visitors in the period of analysis. To do so, it is possible to rely on other data, such as, for instance, bookings for accommodation, transports, and close visits/experiences in the analysed period (and related web searches), visits to the site website and site tickets purchasing. Such data could be displayed on a dashboard, to be used (not only) by people in charge of manging the area. Based on these data association with impact indicators, it will be possible to forecast impacts and to adopt preventive measures. Preventive measures could for instance be the adoption of marketing campaigns with offers in less crowded periods or for similar but less famous destinations, policies to equally divide participants though the day, etc…

Consultation activity

DATA

1 Data type

5 min

Use case data types

Data types **are just macro categories of the datasets.**

For this use case, the project team identified the following data types

Tourist flow · Purchase habits · Mobility data · Behaviour of tourists · Demand and offer data · Sustainability data

Do you think the data types outlined above are enough?

Are there any other data type that you consider relevant?
Add a sticky note below!

- Overview of all attractions in the destination
- website analytics
- Max. capacity per POI
- ticket price for each attractions
- Typology of tourist
- flights forecasts

2 Datasets

10 min

For each data type, which specific dataset would you need for implementing the use case?

For each identified dataset, please also mention the needed level of granularity and the data source (i.e. where do the data come from)
Following results discussion, the facilitators will mark the datasets including personal data with a red dot

Dataset	Granularity	Data source
Individuals' time spent in a POI	Hourly for each POI	Sensors, GPS, mobile phone
Accomodation occupancy rate	Daily for each area of inetrest	Private business datsets (hotels, Airbnb)
overview of all attractions in the destination	To know what are the alternative / similar attractions	websites
weather forecasts		
Flights forecasts / schedules	The number of flights into the destination	airlines, travel agencies, GDS
Booking engine reservations for those nature resources which have one	Almost real time	Bookin engine usually managed by local DMOs
Website analytics	weekly	website of those POIs with reservation form embedded in website
Calendar aviability in webforms	real time	calendar aviability can inform about future reservations and resource occupancy
Enviromental indicators (floor usage, beach deterioration...)	Monthly	Public administration /Owners
Tourist Geolocalisation	Real-time	Mobile operators (5G)
Maximum capacity per POI	Everytime it's updated	Each POI
IoT device info (number of people, movements...)	Real-time tracking	Owner of IoT devices (city hall, businesses...)
Availability at activities	Daily	Cpmpanies that offer the service
any other mega events happening	e.g concerts, football matches.	websites
Public transport movements	Real-time	Providers (bus, train, taxi...)

STAKEHOLDERS

3 Stakeholder roles

5 min

Use case stakeholder types

For this use case, the project team identified the following stakeholder types

DMO · Public Authority · HORECA · Tour operator · Travel Agency · Tourism service providers

Which is the role of each stakeholder type in this use case?

Please mind that each stakeholder migh have **more than one role**
Copy (Ctrl+C, Ctrl+V) the stakeholder type sticky note (above) under each relevant role (columns below)
If you want to add a stakeholder type not mentioned above, please add a new sticky note (double click)

Data provider	Data consumer	Final user
DMO	DMO	DMO
Public Authority	Public Authority	Public Authority
Tourism service providers	Tourism service providers	HORECA
HORECA	HORECA	Travel Agency (collaborating with PA for creating marketing capaigns)
Travel Agency	Tour operator (e.g. it will not be able to sell packages if there are no proper conditions of the area)	
Tour operator		

4 Stakeholder & datasets

10 min

Which dataset does each stakeholder type provides/consumes?

Add a sticky note (double click) mentioning the dataset in each cell of the table below. You can either copy and paste (Ctrl+C, Ctrl+V) the sticky notes displayed below

Individuals' time spent in a POI · Accomodation occupancy rate · overview of all attractions in the destination · weather forecasts · Flights forecasts / schedules · Booking engine reservations for those nature resources which have one · Website analytics · Calendar aviability in webforms · Enviromental indicators (floor usage, beach deterioration...) · Tourist Geolocalisation · Maximum capacity per POI · IoT device info (number of people, movements...) · Availability at activities · any other mega events happening · Public transport movements

Stakeholder type	Data provider	Data consumer
DMO	overview of all attractions in the destination; Booking engine reservations for those nature resources which have one; any other mega events happening; Calendar aviability in webforms; Website analytics; Maximum capacity per POI; Availability at activities; Calendar aviability in webforms; Public transport movements	Calendar aviability in webforms; Availability at activities; Public transport movements; Booking engine reservations for those nature resources which have one; Accomodation occupancy rate; Tourist Geolocalisation; Public transport movements; overview of all attractions in the destination; IoT device info (number of people, movements...); Individuals' time spent in a POI; Enviromental indicators (floor usage, beach deterioration...); Maximum capacity per POI; Flights forecasts / schedules; IoT device info (number of people, movements...)
Public Authority	Individuals' time spent in a POI; weather forecasts; Maximum capacity per POI; overview of all attractions in the destination; Booking engine reservations for those nature resources which have one; Public transport movements; IoT device info (number of people, movements...); Enviromental indicators (floor usage, beach deterioration...); Tourist Geolocalisation; Maximum capacity per POI; Public transport movements	Individuals' time spent in a POI; IoT device info (number of people, movements...); Flights forecasts / schedules; Tourist Geolocalisation; Tourist Geolocalisation; Accomodation occupancy rate; Enviromental indicators (floor usage, beach deterioration...); Maximum capacity per POI; Enviromental indicators (floor usage, beach deterioration...)
HORECA	Accomodation occupancy rate; Accomodation occupancy rate	Flights forecasts / schedules; overview of all attractions in the destination; any other mega events happening
Tour operator	overview of all attractions in the destination; Flights forecasts / schedules	Accomodation occupancy rate; Flights forecasts / schedules; Maximum capacity per POI; Public transport movements; overview of all attractions in the destination; Availability at activities; Calendar aviability in webforms; Flights forecasts / schedules
Travel Agency	Flights forecasts / schedules	Maximum capacity per POI; overview of all attractions in the destination; Flights forecasts / schedules; Availability at activities; Public transport movements; Calendar aviability in webforms
Tourism service providers	Availability at activities; Individuals' time spent in a POI; Enviromental indicators (floor usage, beach deterioration...); Availability at activities; Flights forecasts / schedules; Booking engine reservations for those nature resources which have one; Tourist Geolocalisation; IoT device info (number of people, movements...); IoT device info (number of people, movements...); Maximum capacity per POI	Tourist Geolocalisation; overview of all attractions in the destination; Flights forecasts / schedules; Enviromental indicators (floor usage, beach deterioration...); Availability at activities; Individuals' time spent in a POI; weather forecasts; Calendar aviability in webforms; Accomodation occupancy rate; Booking engine reservations for those nature resources which have one; Tourist Geolocalisation; IoT device info (number of people, movements...)

SOLUTION

5 Solution

5 min

Is there anything missing in this solution? Do you think the solution could be adopted in a different context and/or for other final users?

Please add your comments in the sticky note below

- How about accessibility options for travellers? E.g. wheelchair needs.
- Tourist app to avoid cues in saturated POIs
- Extend the tool to plan public transportation options depending on seasonality
- Incentivize sustainable behaviors E.g. Lower prices for electric cars, this is to promote more sustainable behaviours
- Adopt this tool to all saturated areas (e.g. in case of big events)
- Try to take advantage of seasonality (e.g. planning to sell some seasonal local products in specific periods)
- Adapt public services to high demand areas/periods