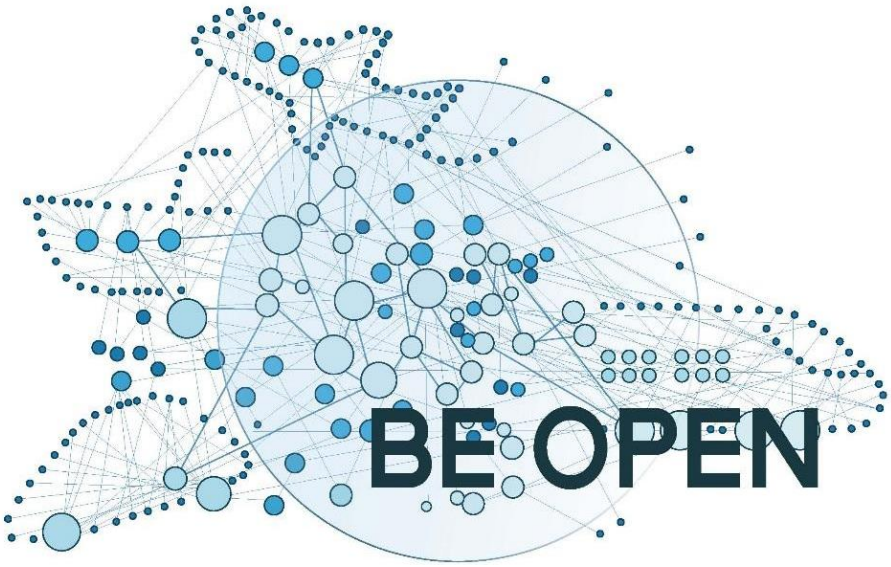
Pending EC/INEA approval



European forum and oBsErvatory for OPEN science in transport

Project Acronym:	**BE OPEN**
Project Title:	**European forum and oBsErvatory for OPEN science in transport**
Project Number:	**824323**
Topic:	**MG-4-2-2018 –Building Open Science platforms in transport research**
Type of Action:	**Coordination and support action (CSA)**

D3.3 TOPOS observatory visualization and user interface tools

Final

Deliverable Title:	TOPOS Observatory Visualization and User Interface Tools
Work Package:	WP3
Due Date:	28th February 2021
Submission Date:	25th February 2021
Start Date of Project:	1st January 2019
Duration of Project:	30 months
Organisation Responsible of Deliverable:	SCIPEDIA
Version:	Final
Status:	Final
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Reviewer(s):	Afroditi Anagnostopoulou (CERTH), Harry Dimitropoulos (ATHENA RC)
Nature:	☐R – Report ☐ P – Prototype ☐ D – Demonstrator ☒ O - Other
Dissemination level:	☒ PU - Public ☐ CO - Confidential, only for members of the consortium (including the Commission) ☐ RE - Restricted to a group specified by the consortium (including the Commission Services)

Document history			
Version	**Date**	**Modified by (author/partner)**	**Comments**
0.1	20/2/2021	Pavlos Spanidis (CERTH), Clara Garcia (Scipedia), Alessia Bardi (CNR), Attila Akac (CERTH)	Draft
0.2	23/2/2021	Afroditi Anagnostopoulou (CERTH), Harry Dimitropoulos (ATHENA RC)	Internal peer review
1.0	25/4/2021	Pavlos Spanidis (CERTH)	Final version

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Executive summary

The current deliverable, “D3.3 TOPOS observatory visualization and user interface tools”, includes a description of the TOPOS Observatory and Forum (TOPOS Gateway, TOPOS Observatory for Organizations platform, TOPOS for Individuals platform and TOPOS Forum). It also includes the open access requirements for transport research data in the frame of the BE OPEN project and the Data Management Plans (DMPs) as is a key element of good data management.

The Open Research Data Pilot of the European Commission enables open access and reuse of research data generated by Horizon 2020 projects. There are two main pillars to the Pilot: developing a Data Management Plan (DMP) and providing open access to research data, if possible.

1. Introduction

Deliverable 3.3 presents the Open Research Data Pilot (ORDP) of the BE OPEN project.

The Open Research Data Pilot aims to improve and maximise access to the research data generated by the EU-funded project BE OPEN. Benefits of taking an active approach to research data management include increased speed and ease of access, efficiency (fund once, reuse many times), and improved quality and transparency of research.

As described in the EC's Guidelines on FAIR Data Management in Horizon 2020, the ORDP aims to improve and maximise access to and re-use of research data generated by Horizon 2020 projects and takes into account the need to balance openness and protection of scientific information, commercialisation and Intellectual Property Rights (IPR), privacy concerns, security as well as data management and preservation questions.

2. TOPOS Observatory and Forum details

The aim of communication and dissemination in BE OPEN project is to comprehensively disseminate the technical and scientific advancements developed in Transport Research. The following sections highlight the main vision and goals of the TOPOS Observatory and how communication and dissemination can help to fulfil the objectives of the project.

2.1. TOPOS Gateway

The domain "topos-observatory.eu" was registered to set up the TOPOS Forum/Observatory and it has been used to incorporate the different subdomains of the project together with a general description of the BE OPEN project and the tools that incorporate the TOPOS Observatory and Forum.

Figure 1 TOPOS Gateway main web page

2.2. TOPOS Observatory for Organisations (openAIRE platform)

The TOPOS Observatory for Organizations has been defined with the objective to serve three categories of organizations in the field of Transport Research: content providers, i.e., technology platforms like institutional, thematic repositories, data archives and disciplinary web sites; research organizations, public and private, like research centers, universities, project consortia, research infrastructures, small and medium enterprises that participate in research activities; public authorities like national and international research funding organizations.

The TOPOS Observatory for Organizations Open Portal is available in the following link:

https://beopen.openaire.eu
http://openaire.topos-observatory.eu/

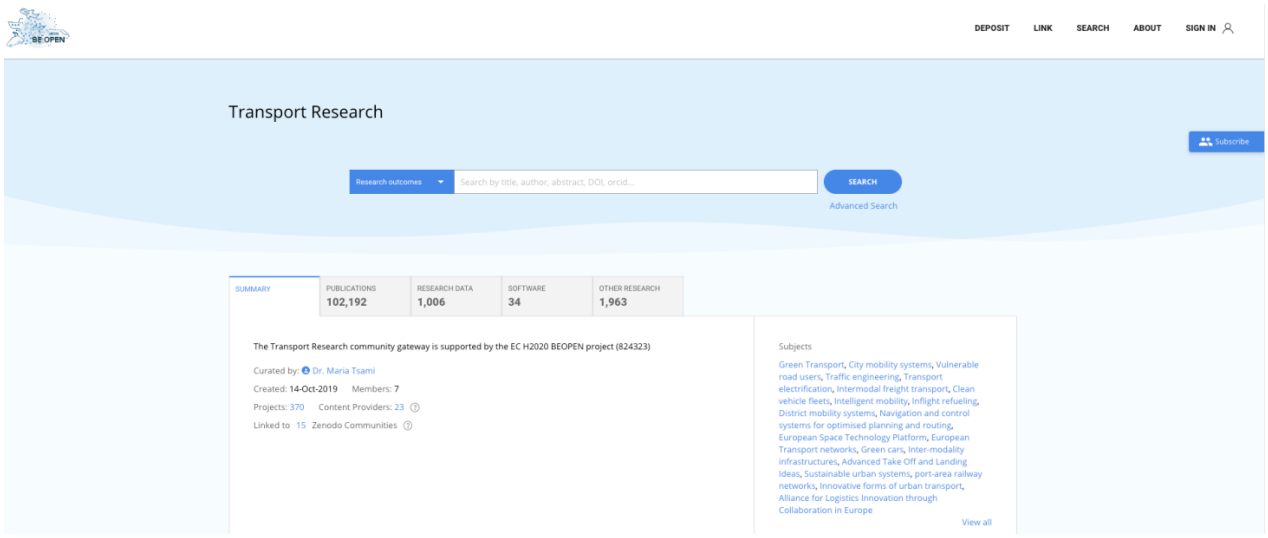

Figure 2 The home page of the TOPOS Observatory for Organisations

2.3. TOPOS Observatory for Individuals (Scipedia platform)

The TOPOS Observatory for Individuals is focused on individual users from the science and technology areas that are looking for sharing information. Scipedia, as the platform of the Individual TOPOS Observatory for Individuals, is an open professional network where professors, students, scientists, researchers and professionals in science and technology can share and access knowledge, expertise and the outcome of their work.

The TOPOS Observatory for Individuals Open Portal is available in the following link:

http://scipedia.topos-observatory.eu/
https://www.scipedia.com/institution/beopen-project.eu

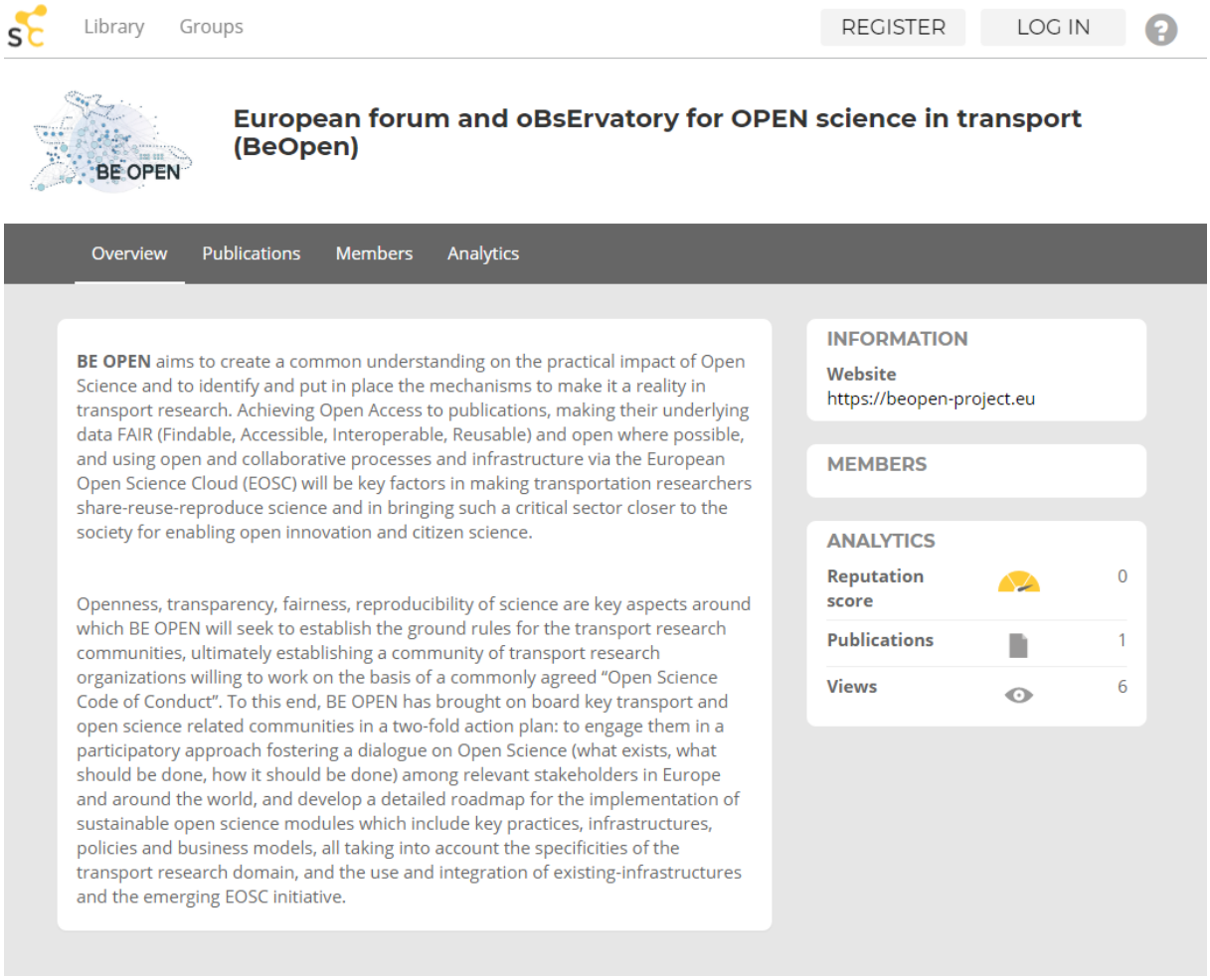

Figure 3 TOPOS Observatory for Individuals Open Portal

2.4. TOPOS Forum

TOPOS Forum aims to exchange ideas and share best practices for operationalising Open Science principles in transport research. The main goal is to capture and present the common culture and practices of data stewardship in transport research. Representatives of transport stakeholders (of all modes i.e. road, air, rail and water transport, and both private and public) are encouraged to endorse the principles of the TOPOS Forum declaration and its principles to guide the implementation of TOPOS Forum, and to commit to take up some of the specific actions declared in the roadmap and guidelines of the BE OPEN project so as to show their tangible support to the common effort to make the TOPOS Forum a reality and support the practical use of the EOSC.

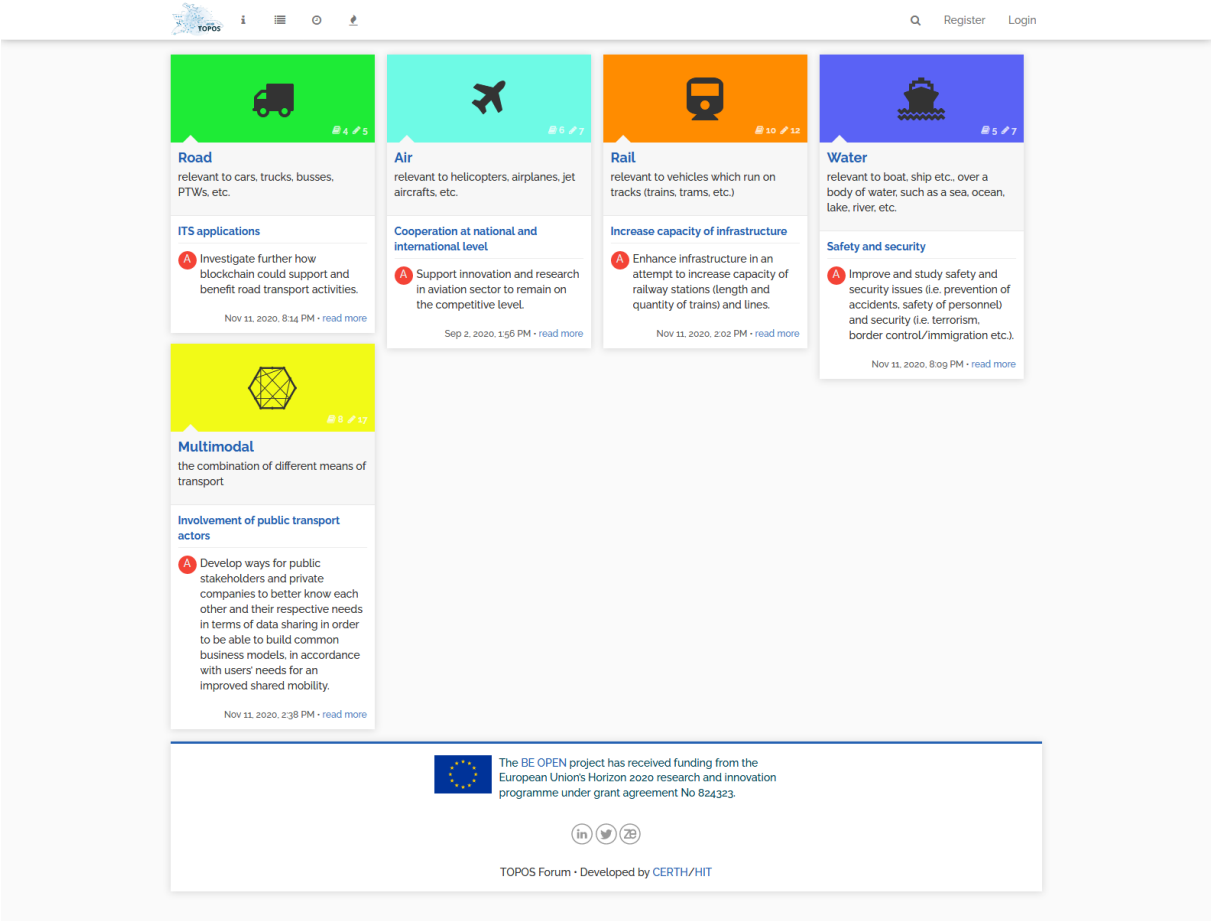

Figure 4 Homepage and the Main Categories

3. Open access requirements

3.1. Open access to scientific publications

Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results.

In particular, it must:

1. as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications. Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.
2. ensure open access to the deposited publication — via the repository — at the latest:
   - on publication, if an electronic version is available for free via the publisher, or
   - within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.
3. ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:

- the terms “European Union (EU)” and “Horizon 2020”;
- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable, and
- a persistent identifier

3.2. Open access to research data

Regarding the digital research data generated in the action (‘data’), the beneficiaries must:

1. deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate—free of charge for any user—the following:
   - the data, including associated metadata, needed to validate the results presented in scientific publications, as soon as possible;
   - other data, including associated metadata, as specified and within the deadlines laid down in the ‘data management plan’;
2. provide information — via the repository — about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and — where possible — provide the tools and instruments themselves).

Regarding the BE OPEN’s GA (section 4), this does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

As an exception, the beneficiaries do not have to ensure open access to specific parts of their research data), if the achievement of the action's main would be jeopardised by making those specific parts of the research data openly accessible. In this case, the data management plan must contain the reasons for not giving access.

3.3. Legal Issues and fundamental Principles

In order to identify the main legal issues as well as the fundamental principles of utilising Open Science in transport research, potential issues of data protection, IPR, security aspects and ethical concerns must be assessed in the spectrum of the fundamental principles of research integrity, i.e., reliability, honesty, accountability and respect[1]. Since high quality Open Science resources require proper reliable methodologies and analytical tools as well as transparent and fair review, the fundamental principles of research integrity can conflict with legal issues, such as privacy aspects.

For the purpose of the further assessment, "Open Data" is defined as data that can be freely accessed and further used, modified, and shared by anyone for any purpose[2]. In particular, availability and access, re-use and redistribution of data, as well as universal participation are the key factors of Open Data[3]. The essential benefits of Open Data range from transparency and efficiency (e.g., allowing research to be reproduced) to increasing innovation in general. On an institutional level, European Open Data portals are available, with several EU countries having their own Open Data portal in place[4] (public upon publication of the results).

For the purpose of the further assessment, "Open Science" is defined as making the primary outputs of publicly funded research results, research publications and the research data publicly accessible in digital format with no (or minimal) restriction as well as working on extending these principles of openness within the research community[5]. In Open Science, data must be shared in such a way that both humans and machines are facilitated to access, as well as able to understand and re-use them. For that purpose, the FAIR Data Principles have been published as concise and measurable set of principles, aiming to act as a guideline in order to enhance the re-usability of data[6]. As the following figure shows, these principal characteristics for research data are: Findability, Accessibility, Interoperability and Reusability. The main difference of Open and FAIR data involves the accessibility of the data. While both state that data should be as open as possible, FAIR data access can be restricted if necessary[7]. This necessity can change according to the purpose or lifecycle of the data (e.g., during the research phase data is private, becoming in order to determine the main legal issues as well as the fundamental principles of the main areas of Open Science in transport

[1] These fundamental principles are documented in: "The European Code of Conduct for Research Integrity", ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf, last accessed 14 August 2020, P 5.
[2] The definition for Open Data isderivedfromopendefinition.org, last accessed 14 August 2020.
[3] See opendatahandbook.org, last accessed 14 August 2020.
[4] Examples for EU Portals are listed online data.europa.eu, last accessed 14 August 2020.
[5] The definition for Open Science isderivedfromwww.fosteropenscience.eu.
[6] Wilkinson/Dumontier/Aalbersberg et al, "The FAIR Guiding Principles for scientific data management and stewardship", doi.org/10.1038/sdata.2016.18, last accessed 14 August 2020.
[7] www.go-fair.org/resources/faq/ask-question-difference-fair-data-open-data/

research, it is important to face the specific Open and FAIR data opportunities and challenges in the transport research against the background of the characteristics of transport data.

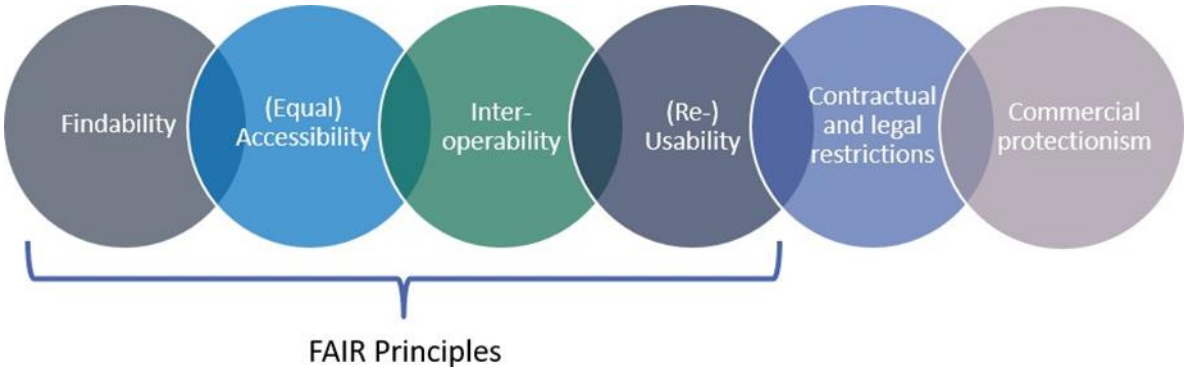

Figure 5 FAIR Principles in Relation to legal- and non-legal Issues for Open Science in Transport Research

For this purpose, "Transport Data" relates to a highly complex set of dimensions inherent to the transport sector. Amongst others, the several different transport modes (road, rail, water and air) serve as key feature, along with the respective variety of vehicles in every transport mode as well as the interrelated geographical data and connected infrastructure. To this end, the term Transport Data is characterised by a complex, multilevel topology, which corresponds to the various aspects of transport research, planning, design and operation, effectively translating into a high volume and variety of research data[8].

BE OPEN surveys have concluded that Open and FAIR data in the transport research is packed with legal challenges, predominantly from the field of privacy law and data protection. However, the surveys also showed important (non-legal) fundamental issues for Open Science in transport research. These issues can be divided into several aspects in the data lifecycle.

3.4. Barriers to Re-Use of Open Data

The identified barriers for the re-use of data show a large repository for legal- and non-legal issues which in turns are connected to the fundamental principles of research integrity[9].

In regards to non-legal issues, as the following figure shows, the assessment essentially displayed that:

1. the sheer volume and variety of data used in the transport sector as such creates several is- sues in regards to storing, preserving, compiling or combining the transport data;
2. technically, these issues are underlined by the fact that data collected for transport research or by governmental entities tends to be stored in distributed data silos which are subject to different ownerships and data formats. This in turns causes practical difficulties in light of cataloguing, finding, accessing and using research data;
3. ethical, financial and commercial concerns as well as cultural barriers interact with the fact that the quality of data is insufficient and minimises the usefulness of the data.

[8] BE OPEN deliverable D 1.2, "Open Science Framework Terminology and Instruments", P 14.
[9] BE OPEN deliverable D 2.2, "Open/FAIR data, software and infrastructure in European transport research", P 25, figure 3.

In regards to legal issues, the survey has singled out the sensitiveness of data as main barrier to the Open and FAIR use of data. This sensitiveness of the data can be seen from different legal angles relating to

1. (alleged) data ownership and issues of intellectual property rights;
2. the protection of personal data through privacy and data protection laws;
3. data security and access concerns which in turn may lead to detrimental effects of uncontrolled data access for safety and security.

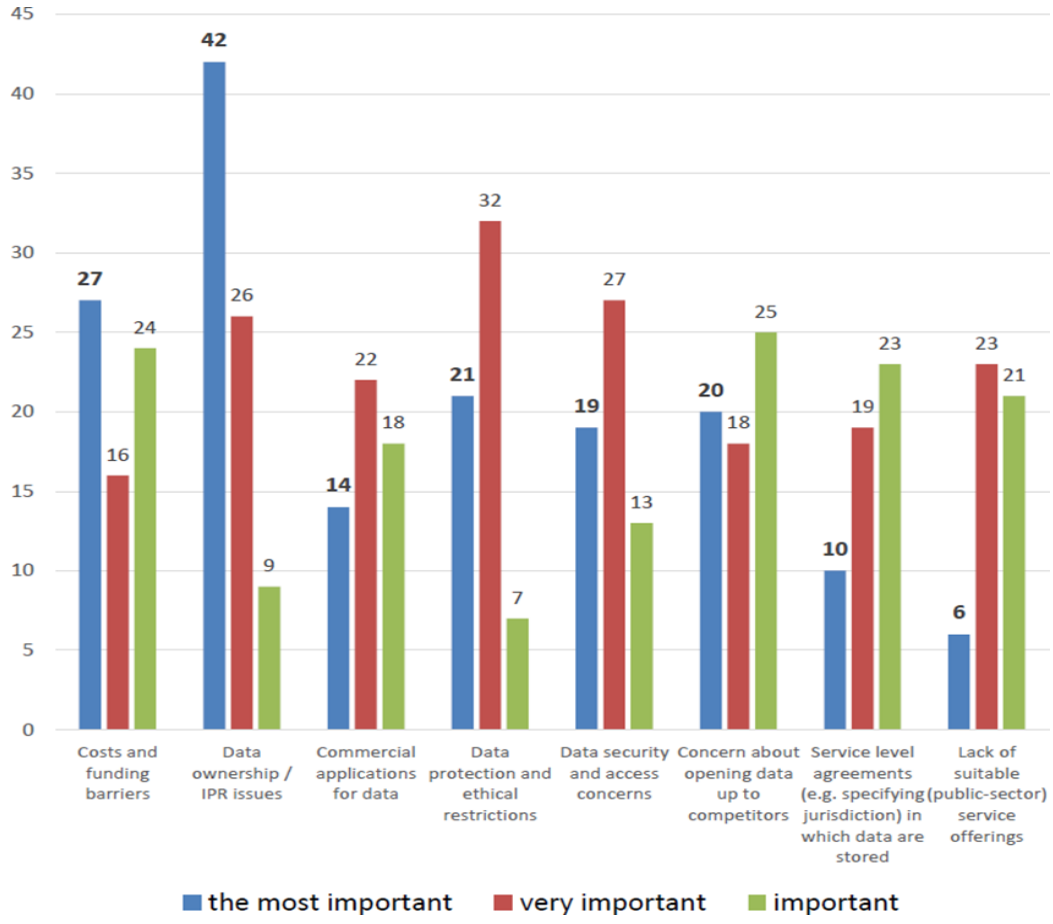

Figure 6 Barriers to Data Re-Use assessed by BE OPEN Deliverable D 2.2

3.5. Barriers for producing Open Data

Turning to the main barriers for producing data, as illustrated in the following figure, again legal aspects around privacy law and data protection are predominant. Legally, the outlined competitiveness of the organisation can relate to IPR issues as well as to underlying non-legal commercial aspects.

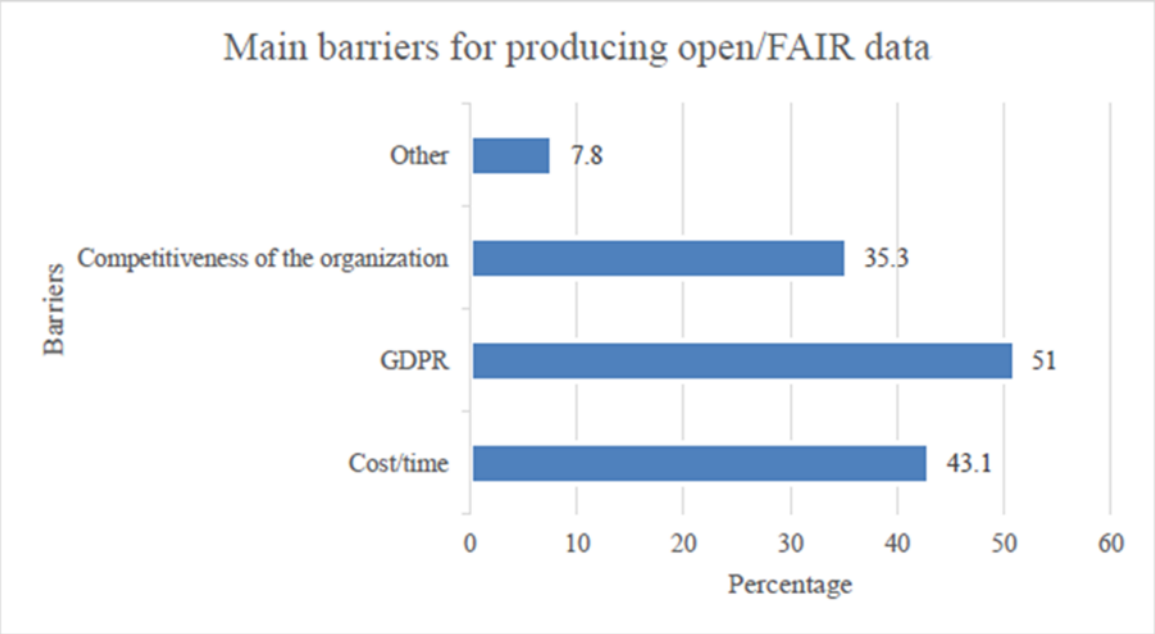

Figure 7 Barriers for producing Open/FAIR Data assessed by BE OPEN Deliverable D 2.2

3.6. Barriers for sharing Open Data Infrastructure

The picture is nearly similar when looking at the reasons why organisations do not share their open research infrastructure such as laboratories, computing systems, databases and models. According to the following figure illustrating the results of the BE OPEN survey, privacy aspects rank closely to the predominant competitiveness of the organisation.

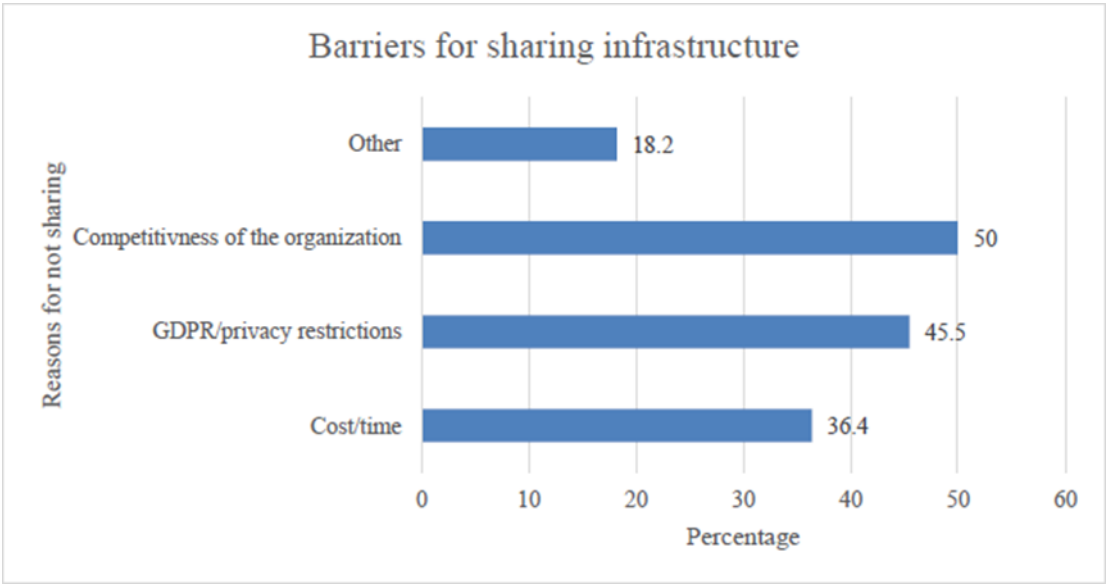

Figure 8 Barriers for sharing Infrastructure assessed by BE OPEN Deliverable D 2.2

In conclusion, different BE OPEN deliverables have focussed on various issues to Open Science in transport research with a strong focus on aspects determined as barriers for data sharing among researchers and the producers of data in general. Although the focus of these assessments varied in terms of stakeholders, transportation modes and countries, the outcome for the main legal issues

as well as the fundamental principles are nearly identical. Essentially, the main barriers for Open Science in transport research can be found in both the competitive mind-set and the fear of not complying with privacy aspects, especially in light of the General Data Protection Regulation ("GDPR"). Hence, these aspects touch local, national and international regulatory frameworks for legal data ownership and copyright on the one hand, and the need to protect personal data on the other hand. For the purpose of this assessment, the determined legal issues can be found in Section 3 while non-legal issues and fundamental principles for Open Science in transport research are presented in Section 4.

4. Data Management Plan

The Data Management Plan describes the data management life cycle for the data collected, processed and/or generated by the BE OPEN project. As part of making research data findable, accessible, interoperable and re-usable (FAIR), a DMP should include information on:

- the handling of research data during and after the end of the project
- what data will be collected, processed and/or generated
- which methodology and standards will be applied
- whether data will be shared/made open access and
- how data will be curated and preserved (including after the end of the project).

4.1. Making data openly accessible

The data produced in the project are interoperable and available online in the official website of the BE OPEN project at https://beopen-project.eu/resources. This allows data exchange and re-use between researchers, institutions, organisations, countries, etc. Almost all deliverables of BE OPEN project have "public" dissemination level as presented in the table below. A pdf format is used for all deliverables making them compliant with available (open) software applications, and in particular facilitating re-combinations with different datasets from different origins. In addition, deliverables, dissemination material and publications produced in the context of the BE OPEN project are available both in the official website and in the Zenodo Open Source digital library https://zenodo.org/communities/be-open-transport/?page=1&size=20. Zenodo also provides a list of metadata formats.

Table 1: List of Deliverables

Deliverable Number	Deliverable Title	Type	Disseminationlevel
D1.1	Taxonomy of actors,terminology and experimental tools	Report	Public
D1.2	Framework of common understanding of Open Science in transport sector	Report	Public
D1.3	Use case catalogue for future research	Report	Public
D2.1	Open access publications and the performance of the European transport research	Report	Public
D2.2	Open/FAIR data, software and infrastructure in European transport research	Report	Public
D2.3	Transport Research in the European OpenScience Cloud	Report	Public
	Governance and operational/business models for		

D2.4	Open Science in European Transport research	Report	Public
D3.1	TOPOS declaration	Report	Public
D3.2	TOPOS development	Report	Public
D3.3	TOPOS observatory visualization and user interface tools	ORDP: Open Research Data Pilot	Public
D3.4	Strategy for pan- European diffusion and global links	Report	Public
D3.5	TOPOS forum and observatory Sustainability Analysis Assessment	Report	Public
D4.1	Open Science in transport research: legalissues and fundamental principles	Report	Public
D4.2	Transport Open Data: Properties and Specifications for Open Science	Report	Public
D4.3	New business models to implement Open Access in transport research	Report	Public
D4.4	European Code of Conduct on Open Science in Transport	Report	Public
D5.1	Main challenges and opportunities, constraints and bottlenecks of Open Science in transport research	Report	Public
D5.2	KPIs for Open Science in transport evaluation	Report	Public
D5.3	Impact assessment of Open Science in transport	Report	Public
D5.4	Roadmap and guidelines to promote Open Science in transport research	Report	Public
D6.1	Project logo and website	Other	Public
D6.2	Dissemination strategy	Report	Public
D6.3	Project leaflet	Other	Public
D6.4	Social media	Other	Public
D6.5	Project Video	Other	Public
D6.6	Report on International cooperation	Report	Public
D6.7	Towards a unique engagement of Publishing houses	Report	Public
D7.1	Project Management Handbook	Report	Confidential, only for membersof the consortium(including the Commission Services)
D7.2	Quality, Ethics and Privacy Protection Manual	Report	Confidential, only for membersof the consortium(including the Commission Services)
D7.3	Inception Report	Report	Confidential, only for membersof the consortium(including the Commission Services)
D7.4	International Advisory Group actions report	Report	Confidential, only for membersof the consortium(including the Commission Services)

D8.1	H - Requirement No. 1	Report	Confidential, only for membersof the consortium(including the Commission Services)

4.2. Data Privacy and Protection

The data privacy runs compliantly with the EU Regulation 2016/679 (General Data Protection Regulation - GDPR), repealing Directive 95/46. This states that all data processing shall be lawful only if and to the extent there is a legal basis (Art 6 Para 1 GDPR). To protect data of stakeholders, measures have been described in section 5.2 and 6.4 in D7.2.

The BE OPEN project will serve as a platform for enhanced and scaled data sharing among diverse research groups in the field of transport. It performs so with due respect for all gathered data. Hence, verbatim extracts will be shared only if the participant has agreed and wishes to do so.

4.3. Data Processing

Data processing for research purposes must occur in accordance to EU and EU Member State laws. As described in D7.2:

1. subjects give their informed consent if there is no other legal basis (see article 6 Para 1 GDPR. This section is detailed in chapter 6.4 of D7.2)
2. data processing should be handled referent to GDPR, article 5 Para 1, GDPR)
3. the basis for this is a secure IT-infrastructure, where the data is stored
4. information obligations (Art 13, 14 GDPR) and in particular to the rights of the data subjects (Chapter III GDPR).
5. to be shown on the Informed Consent sheet

4.4. Data Security

According to D7.2, It is of high importance; adequate technical and organizational measures are imposed based on the risk-based approach in Art 32 Para 1 GDPR.

4.5. Data Management Plan, Open Access Strategy & knowledge management & protection

The following general principles will be applied to data preservation in the project:

a) The primary research material will be obtained and/or developed as background information by the Consortium,

b) All materials will be used in accordance with the good ethical practices to implement the objectives described earlier. Final reports are preserved permanently.

c) Research results developed using the funds of EC are expected to be published through peer-

review international academic journals and in selected Open Access Journals, while trusted data repositories will be used to deposit and share research results.

d) The ownership of research results belongs to the Consortium members that produced them. To support this, an according text on this issue will also be included in the Consortium agreement.

More specifically, BE OPEN will make its data available, in line with the Commission's Open Access to research data policy for facilitating access, reuse and preservation of its research data. For this purpose, BE OPEN proposed a Data Management Plan (DMP) that outline how research data will be handled during and after the project, describing what data will be collected, processed or generated and following what methodology and standards, whether and how this data will be shared and/or made open, and how it will be curated and preserved. BE OPEN DMP presents:

1. How the project will deposit in the institutional data repositories of our partners as well as in a repository service provided by national aggregators the project's publications and research data sets.
2. How the project coordinator will monitor, track and disseminate information about its produced research publications and data sets to the relevant channels so that they are included in the European research infrastructure of OpenAIRE.
3. How the project will take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate (free of charge for any user) the following:
    - the data (e.g., surveys and responses, data related to the observatory), including associated metadata, needed to validate the results presented in scientific publications or policy documents as soon as possible
    - other data, including associated metadata
4. Information on the tools and instruments needed to validate the results produced by using the specific data sets.
5. Guidelines, policy documents, support material, proposed workflows and tools for both the coordinator and each project partner, translating the generic requirements of the Open Access & Open Research Data Pilot into specific practical guidelines that they can apply during the lifetime of the project.

BE OPEN will register the institutional publication and data repositories of each partner, in order to provide information about the current systems that the project partners maintain. For partners that do not have a data repository to deposit their research data, BE OPEN will deposit in OpenAIRE's Zenodo repository 23.

The DMP could be constructed with online tools (e.g., DCC's DMPonline, OpenAIRE's OpenDMPS) and specify a set of recommended licensing schemes for the produced research data, preferably

using the Creative Commons24 Public Domain (CC0) and Attribution (CC BY) licenses as suggested by H2020. In the cases where the datasets cannot be publicly shared, the reasons will be mentioned in their metadata descriptions (e.g., ethical, personal/private data, IPR, commercial, security-related) while all actions will be taken to address GDPR issues. In particular, the management of the IPR of existing Open-Source schemes constitutes a challenging aspect of Open Science and it is advisable to start managing IPR at the very early stages of the development process. This will ensure the IPR evaluation of potential stakeholders and enable them to clearly state their roles and benefits.