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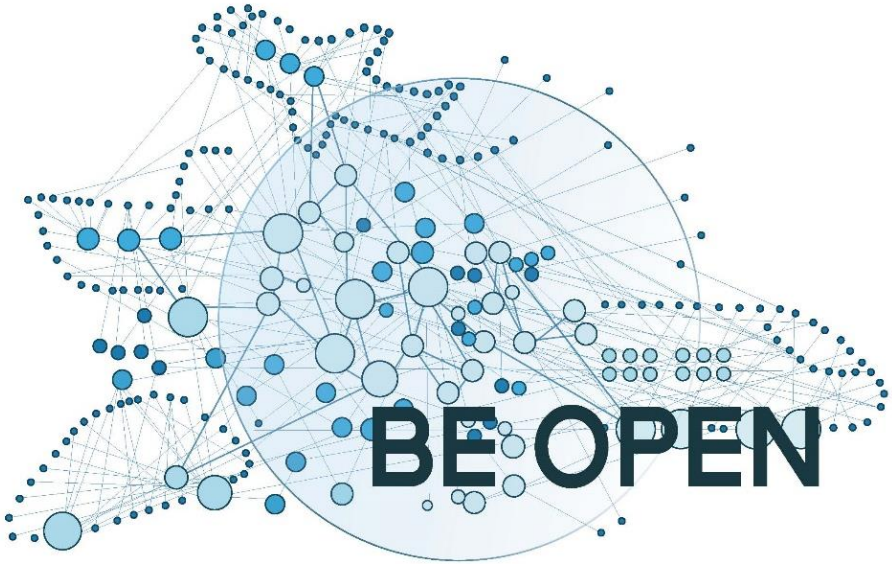

European forum and oBsErvatory for OPEN science in transport

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D2.1 Open access publications and the performance of the European transport research

Final

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0.4	30/06/2019	George Yannis (NTUA), Katerina Folla (NTUA)	Final Version

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Abbreviations and Terminology

APC	Article Processing Charge
CORDIS	Community Research and Development Information Service
DMP	Data Management Plan
DOAJ	Directory of Open Access Journals
EC	European Commission
EOSC	European Open Science Cloud
EU ODP	European Union Open Data Portal
FAIR	Findable, Accessible, Interoperable, Reusable
GDPR	General Data Protection Regulation
ICTs	Information and Communication Technologies
IPR	Intellectual Property Rights
LeMO	Leveraging Big Data for Managing Transport Operations
OECD	Organisation for Economic Co-operation and Development
STRIA	Strategic Transport Research and Innovation Agenda
TRIMIS	Transport and Research and Innovation Monitoring and Information System
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization

Executive summary

The objectives of the BE OPEN project are to create a common understanding on the practical impact of Open Science and to identify and put in place the mechanisms to make it a reality in transport research. Achieving open access publications and the performance of the European transport research will constitute the basis of mapping the existing Open Science sources in transport and as such, a thorough analysis of the existing Open Science sources in current European Transport research was executed to map open access related publications, policy and repositories in European transport research.

The purpose of the present deliverable is to study the European transport research on three topics:

i) knowledge and use of open access publications (including also open peer review),

ii) existence and knowledge of official open access policy and

iii) existence and use of repositories.

On that purpose, a targeted review of literature on knowledge and use of open access publications, official open access policy and repositories in Europe was conducted. The study was accomplished through a desk research distributed to BE OPEN researchers and research institutes active in the key areas of legal/regulatory, technological, transport planning, business modelling, socio-economic and environmental issues.

The first section of this deliverable discusses the purpose of this document and describes how the corresponding Task 2.1 was implemented. Then, the methodology of the literature review is presented in Section 2 and the results are provided in Section 3. Section 4 summarizes the key findings of reviewing scientific documents, policy documents, strategic implementation documents of open science initiatives, reports, project deliverables, articles published in scientific journals or delivered in conferences etc. and Section 5 examines the available Open Science Sources. A synthesis of results presenting the current situation of Open Science in Transport is presented in Section 6. Finally, a review on transport keywords is provided in Section 7 and the overall results are drawn in the Section 8.

1 Introduction

1.1 Purpose of the document

The purpose of the present deliverable is to study the European transport research on three topics i) knowledge and use of open access publications (including also open peer review), ii) existence and knowledge of official open access policy and iii) existence and use of repositories in an attempt to map open access related publications, policy and repositories in European transport research. To achieve this goal, a thorough literature review of knowledge and use of Open Access publications, official Open Access policy and repositories in Europe was conducted. The focus is given on:

- scientific documents, policy documents, strategic implementation documents of open science initiatives etc. that cover different domains (i.e. transport, open science governance models, open data sharing practices, EOSC, etc.). This information can further support the following stages of the project, and provide the basis to the organisation and governance of open science in transport.
- Open Science systems, i.e. sources and hubs that provide publications, project results, data and information related to all aspects of transport and they are available to scientific community.

To this end, needs, challenges, risks and opportunities are presented in the context of open access publications and the performance of the European transport research is specified and could be used within the development of TOPOS forum and observatory. It is also important to mention that a comprehensive framework is developed in order to identify and collect all transport related open access publications of different sources.

1.2 Procedure description

The objectives of deliverable 2.1 is to study the European transport research on three topics i) knowledge and use of open access publications (including also open peer review), ii) existence and knowledge of official open access policy and iii) existence and use of repositories. The main aim is to conduct a targeted review of literature on knowledge and use of open access publications, official open access policy and repositories in order to provide information about data and metadata, infrastructure, governance, ethical issues. This literature review aims to:

- provide Tasks 2.3 with existing documents concerning the design and principles of EOSC
- provide Task 2.4 with existing documents concerning the mapping of governance and operational models
- assist WP3 in the design and development of the TOPOS Forum and Observatory, by shedding light on existing or suggested governance schemes, open access principles, data standards and infrastructure etc.
- provide with the existing documents and open science in transport sources to be included in the TOPOS observatory,
- assist WP4 in the identification and tackling issues of IPR, data protection, FAIR principles etc.

More specifically, Open Science documents (i.e. scientific documents, policy documents, strategic implementation documents of open science initiatives, papers, reports, deliverables etc.) focused on transport domain as well as Open Science Transport Systems (i.e. open science sources and hubs) are reviewed and analysed. The basic principles of the EOSC development are considered and focus is also given on FAIR data in order to facilitate knowledge discovery by making them easily accessed, processed and analysed by both humans and machines. In this context, the General Data Protection Regulation (GDPR) is also taken into account. Governance and new operational business models that are currently developed to provide better data access in view of their integration within the European Open Science cloud are also assessed.

A review is also carried out concerning the existence and use of open science sources, from which open access publications, data and software related to transport research could be extracted. The sources have been grouped based on type of transport research data, as defined by the literature review of open science documents. Finally, transport related keywords are defined that cover all aspects of transport domain in an attempt to be used in text mining and Machine Learning techniques within the BE OPEN project implementation.

2 Literature Review Methodology

2.1 Objectives

A desk research is used to identify and analyse open access publications, official open access policy and repositories and the main objectives are:

- provide information about the design and principles of EOSC
- provide information about the mapping of governance and operational models
- assist in the design and development of the TOPOS Forum and Observatory, analysing existing or suggested governance schemes, open access principles, data standards and infrastructure etc.,
- provide relevant information and data about open science in transport sources to be included in order to be included in the TOPOS observatory,
- assist in the identification and tackling issues of Intellectual Property Rights (IPR), data protection, FAIR principles, GDPR etc.

2.2 Literature Search

The proposed methodology (depicted in Figure 1) of the literature review involves two main phases: i) the collection phase in which scientific papers, policy documents, strategic implementation documents of open science initiatives, scientific papers, reports, project deliverables etc. are collected (Well-known online tools are used such as Scopus, Science Direct, Google Scholar, Web of science, TRIMIS, CORDIS etc.) and ii) the analysis phase in which apart from generic documents of Open Science, the main focus is mainly given on transport domain which includes:

- Road Transport
- Rail Transport
- Air Transport
- Maritime Transport
- Combined Transport

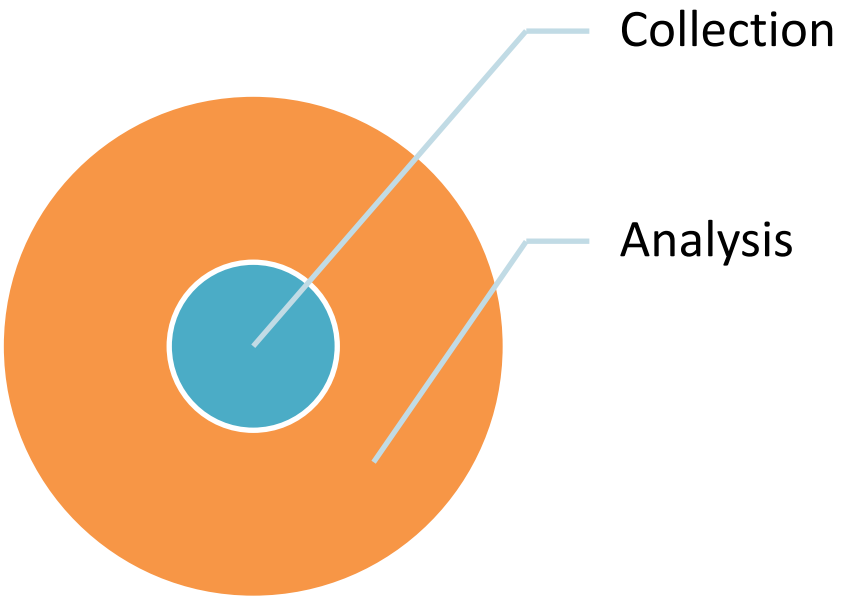


Figure 1: Proposed Methodology

For each of the aforementioned categories and sub-categories a standardised literature search was conducted. The search was limited to the period 1969-2019.

In order to identify an adequate and reasonable number of relevant studies, search terms and logical operators are used in the online databases. Indicatively, some of them are presented below:

- Open Access OR
- Open Science OR
- Open Research OR
- Open Data OR
- Science Cloud
- ……..

AND

- Transport OR
- Road OR
- Maritime OR
- Rail OR
- Air
- ……..

The selection of the related publications is based on the following criteria:

- Relevance
- Importance
- Most recent studies
- Quality of studies

- Country
- Language
- Peer-reviewed journals

2.3 Organisation of Literature Results

A literature reference table (Excel Spreadsheet) is developed, in which all partners provide their input (see ANNEX I) in order to support the collection phase of the proposed methodology.

Each study includes the following information:

- Study Title
- Issue Date
- Authors / Publisher
- Country of Publisher
- Language
- Type of publication
- Link/Filename (if available online)

- Category 1 (entries restricted to: General, Road Transport, Rail, Transport, Air Transport, Maritime Transport, Combined Transport)
- Category 2 (concerns the entries of Category 1 related to Transport; entries restricted to: Passenger Transport, Freight Transport, Urban Transport, Inter-urban Transport, National Transport, International Transport)
- Keywords (primary, secondary-1, secondary-2 etc.)
- Remarks / Interesting Parts: the reviewer will fill in any interesting points that he/she considers useful for the project (only for internal use).
- Review by: the name of the BeOpen partner responsible for the review of the specific study (only for internal use).

Each source includes the following information:

- Title
- Type of Source
- Publisher
- Link
- Type of publications
- Country of Publisher
- Language
- Aims and Scope
- Repository Criteria
- Number of Articles
- CiteScore (if available)
- Access Status

2.4 Implementation of Literature Review

In order to identify as many publications and sources related to open science as possible, the partners involved in the Task 2.1 of the project were assigned to explore specific types of documents and sources and record in the reference list those that are related to open science. More specifically, the documents and sources explored were divided in the following categories:

- Reports
- Papers
- International Sources
- EU Project Deliverables and Sources
- Project Deliverables and Sources outside EU
- National Project Deliverables
- National Open Science Sources.

It is noted that for the two last types of documents and sources, the literature reference table was also sent to all project partners, who provided the related information for their countries.

3 Results of Literature Review

The detailed results are presented in Annex I and Annex II. The first Table presents publications related to open science and the second Table describes the open science sources identified. The data and information of the second table will be used and further analysed in the D2.2 “Open/FAIR data, software and infrastructure in European transport research”.

3.1 Documents

We searched in the databases TRID, Scopus and Web of Science, by using the keywords "open access" or " open science" or "open research" or "science cloud" or "open data", 1,754 articles, reports or conference proceedings were obtained. These publications were divided in the following categories, based on their relevance to the objective of the search:

1. Irrelevant (1486)

2. Uncertain (104)

3. Somewhat relevant (64)

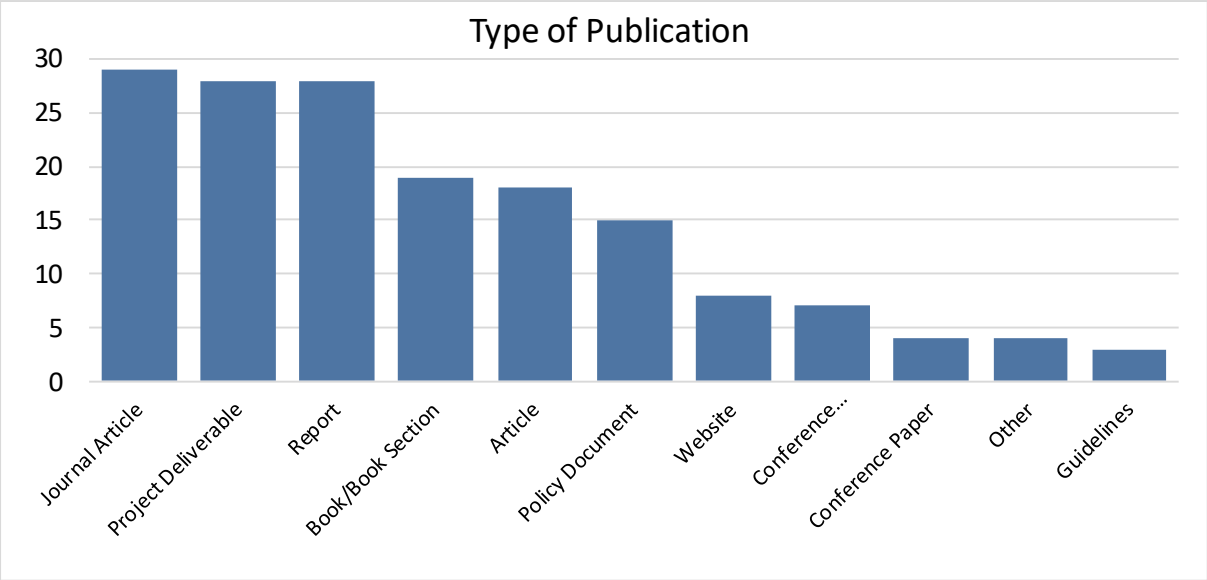
4. Relevant (59)

5. Very Relevant - Transport (25) and

6. Very Relevant General (11).

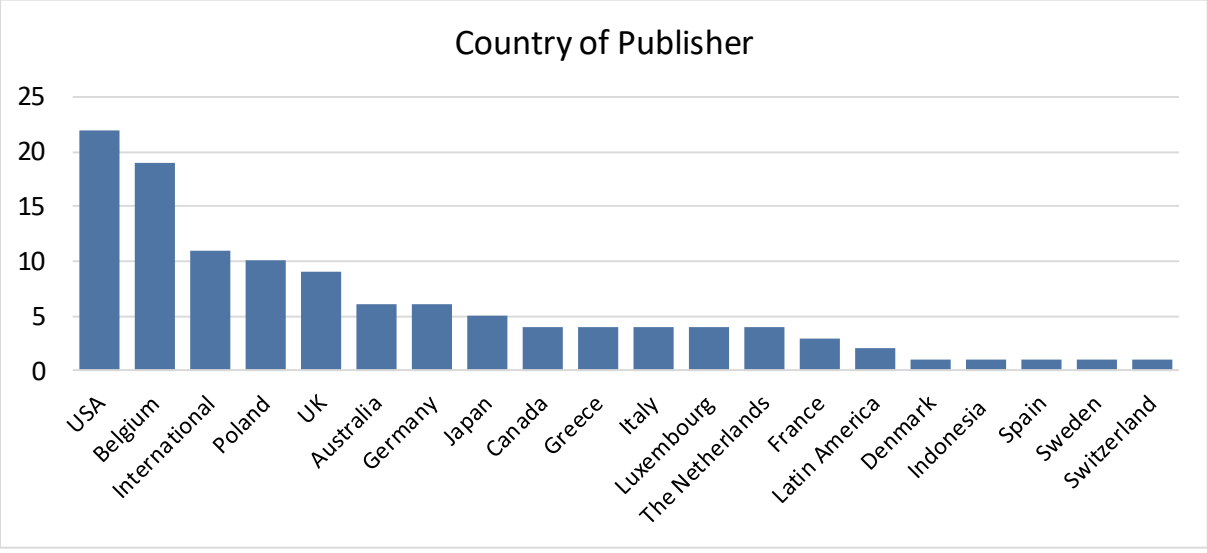
From the above categories, the two last categories were included in the final literature reference table and were taken into account in the thorough literature review, while the remaining documents could be available to project partners and end users through the TOPOS observatory. In this final set also articles from Google scholar were included. The final Table with the literature references includes 163 documents related to open science. From these documents 29 concerned journal articles, 28 Project Deliverables and 28 reports, as shown in Figure 2. Figure 3 depicts the distribution over countries.

Figure 2: Distribution of identified documents in literature search by type of document



Additionally, as shown in Figure 3, most publishers of the documents included are from the United States, followed by Belgium. In total, 72 documents come from European publishers, 35 documents come from countries outside Europe and 11 documents are from international publishers.

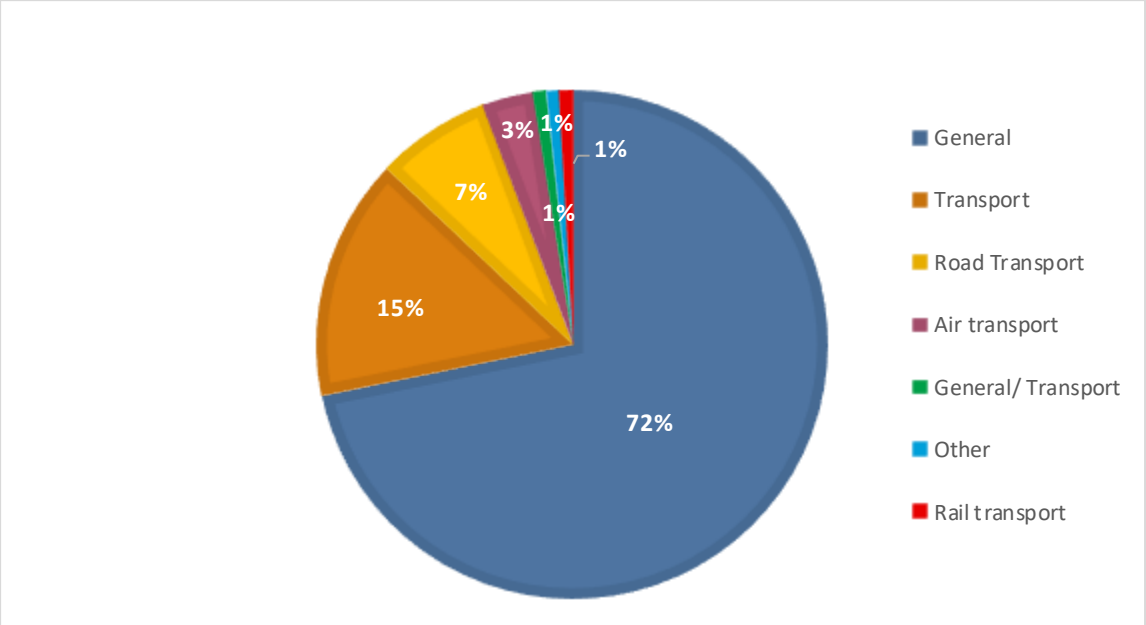
Figure 3: Distribution of documents by country of publisher



Concerning the several transport categories, Figure 4 presents that the vast majority of the publications concerned the open science in general (89), while about 20 concerned transport and open science. Publications regarding open science in specific transportation modes were extremely few. It is noted that further categorization (category 2) was not achieved, since most of identified

publications concerned transport or transport modes in a generic view. The results are shown in the Annex I.

Figure 4: Distribution of documents by category



3.2 Sources

The table of Annex II includes 126 sources from aggregators, editors or journals, databases, repositories, infrastructure sources and public authorities.

4 Key findings from Documents Review

4.1 Introduction

The aim of this chapter is to present the basic results derived from the review of the open science documents. The literature findings are grouped and presented in the following sub-chapters based on the basic principles of EOSC. Moreover, the main thematic areas of open scientific clouds are discussed i.e. data and metadata, infrastructure, governance and ethical issues.

4.2 Open Science in Europe

The European Commission presented its vision for the European Open Science Cloud (EOSC) on April 2016, with its Communication on the 'European Cloud Initiative', as a part of the Digital Single Market Strategy. The objective of the EOSC is to provide the European Union with a global lead in research data management and ensure that European scientists will be benefited from a data-driven science, by offering to them a "virtual environment with free at the point of use, open and seamless services for storage, management, analysis and re-use of research data, across borders and scientific disciplines" (11).

Within this context, the EOSC has emerged as a clear policy priority for European research and innovation. It has been strongly supported by the European scientific community in the EOSC Summit and Declaration, by the Council in Council Conclusions (May 2015 and May 2016) and by the European Parliament in a Resolution (January 2017) (11).

The EOSC summit of June 2017 concluded to the EOSC Declaration and its principles (7,8), guiding the implementation of the EOSC. The EOSC declaration includes 33 goals for the European organisations engaged in research data management under the following categories:

- Data culture and FAIR data [15]
- Research data services and architecture [11]
- Governance and Funding [7]

The principles of the EOSC Declaration have been endorsed by the undersigning of stakeholders, who are also committed to specific actions to implement it (Action List). An overview of the ten actions declared is presented below (8):

- Data Culture: European science must be grounded in a common culture of data stewardship, so that research data is recognised as a significant output of research with the active participation of the disciplines, institutions or countries.
- Skills: The necessary skills and education in research data management, data stewardship and data science should be provided as part of higher education, the training system and on-the-job best practice in the industry in the EU.
- FAIR data governance: In order to make FAIR data a reality, the engagement of stakeholders is required, based on a solid stakeholder engagement strategy, on inter-institutional arrangements, well-established frameworks and decision making flows.
- Implementation and Transition to FAIR: The implementation of FAIR principles requires careful prioritisation and orchestration. The FAIR Data Action Plan 2018-2020 is an important

tool so that the EOSC will embed the FAIR principles, while existing activities working within this field should be complemented by new initiatives.

- Research Data Repositories: Data repositories must be easily findable and accessible and be fully transparent concerning their services by the users, so that scientists will be able to deposit and share their data.
- Data Management Plans: The use of DMPs should become obligatory in all research projects generating or collecting publicly funded research data, based on online tools conforming to common methodologies.
- User Needs: Users should see the EOSC as a one-stop-shop to find, access, and use research data and services from multiple disciplines and platforms.
- Service Deployment: The EOSC will support different deployment models (e.g. Infrastructure as a Service, Platform as a Service, Software as a Service), to meet the needs of communities concerning the provision and use of research data services.
- Thematic Areas: The co-ordination and progressive federation of open data infrastructures developed in specific thematic areas (e.g. health, environment, food, marine, social sciences, transport) will be promoted.
- Governance Model: A strong and flexible governance model is needed, which should be based on representativeness, proportionality, accountability, inclusiveness and transparency.

4.3 Data and Metadata

4.3.1 Science Culture

Within the research community, it is well-known that the existence of open data and their provision under common practices will benefit the evolution of science. However, while researchers acknowledge the benefits of open data, data sharing practices are still limited. A global online survey of 1,200 researchers found that many researchers perceive data as personally owned (3). It was found that data sharing practices depend on the field of science. For example, in those scientific fields that transfer of data among the collaborative parties is not essential for the data analysis, open data practices are not always uniform or in some cases may be even absent. However, research data management, privacy and proprietary issues, as well as ethics are among the main common obstacles of data sharing to all fields.

The survey also found that while most researchers recognize the benefits of sharing unpublished research data, few are willing to share data or dispose shared data, which could be attributed to lack of training in data sharing or due to lack of credibility of open data.

Regardless of the benefits, additional effort and resources are required in order to decide what data can be shared, how they should be shared and make them easily usable by the scientific community. On that purpose, common open data practices should be developed, including, for instance, training programs on data sharing, management, and reuse. A key role in data sharing can play the universities and institutions by highlighting the benefits of open data to the research enterprises, encouraging publication of research data, and provide the necessary tools and guidance to support data sharing.

It is noted that several surveys among researchers worldwide have shown that over the past decade, the share of open access articles has increased (29, 22).

Finally, an overall change in the scientific culture is needed in order to promote open data sharing, involving all related stakeholders (research communities, funding bodies, publishers, research institutions etc.). Researchers should be stimulated and rewarded for sharing data, as well as examples of institutions implementing and supporting research data sharing policies should be highlighted.

Some surveys have also explored the researchers' attitudes concerning the publications in open access journals, revealing possible barriers which also could be reflected in data sharing attitudes. For example, a large-scale survey (6) showed that while researchers are positive towards open access publishing, for most of them, the main barrier to publish via open access is funding, followed by the quality of open access journals.

4.3.2 Transport Research Data

When referring to a transport cloud, as a point of access and sharing transport research data, results, publications, services and tools, it is imperative to define and identify transport research data. Transportation concerns all aspects and stages referring to the movement of persons or goods, however, more aspects of this sector reveal, if it is viewed in different manners as the result of the interplay of different technologies or behaviours with impacts on economic, environmental and geographical aspects (15, 18, 31). An attempt to define the dimensions of the transport sector has been carried out for the European Commission (2). It is suggested that in order to define transport research data, the transport sector should have been explored previously and all its aspects should be taken into account. The main transport aspects that should be explored are categorized in the following groups:

- Transport modes (e.g. road, rail, air etc.)
- Types of "intermodals" (e.g. inter-modal, multi-modal, trans-modal transport etc.)
- Transport sectors (e.g. passenger and freight transport)
- Vehicles (e.g. types of different vehicles)
- Geographic area (e.g. urban, rural, international etc.)
- Infrastructure (e.g. road, rail, ports etc.)
- Evaluation perspectives (e.g. long-term, regional impacts, social cost etc.)
- Policy aspects (e.g. financing, regulation, transport planning etc.)
- Technology (e.g. ITS, connected vehicles, big data etc.)
- Applications (e.g. capacity planning, emergency response, maintenance etc.)
- Types of data (e.g. traffic data, infrastructure data, environmental data etc.).

However, it should be noted that not all transport data can be considered as "transport research data". Consequently, the authors of the research concluded that three main categories should be taken into account as transport research data:

- Original research data (e.g., data from Field Operational Tests, Naturalistic Driving Studies, research results and research models)
- Operational data directly related to research (as accident data, transport volumes data, etc.)
- Data from published transport research (as presented in scientific journals, delivered at conferences, workshops, etc.)

4.3.3 Metadata

A key issue of the reusability of open transport data is the availability of high quality metadata, which will provide with precise information on data collection procedure, data process, access etc. Within this context, the European Commission (EC) released the DCAT Application Profile for data portals in Europe (DCAT-AP), based on the Data Catalogue Vocabulary (DCAT), which provides with some basic principles of the minimum information that should be included in the metadata (2):

- metadata information (date of creation of metadata, metadata language),
- content information (name of dataset, description of dataset),
- temporal information (publication date, date of expiry),
- geographical information,
- contact information (including data ownership),
- conditions for usage,
- access information (data format, data structure, access URL),
- quality information (update frequency, data collection methodology).

4.3.4 FAIR Data

In open science, data must be shared in such a way that both humans and machines are facilitated to access, understand and re-use them. For that purpose, a few years ago a group of researchers published the FAIR Data Principles, a concise and measureable set of principles, which aim to act as a guideline in order enhance the reusability of data (42). According to this research, the characteristics research data should possess when shared are: Findability, Accessibility, Interoperability and Reusability.

The League of European Research Universities (LERU) has published a set of recommendations concerning FAIR data, within the exploration of the role of open science in universities, as follows (29):

- adopt or update an institutional policy on research data management embracing the FAIR principles and based on an ‘as open as possible, as closed as necessary’ philosophy,
- design and establish services for data stewardship,
- create a catalogue where researchers have published data,
- provide free access to metadata in order to facilitate the discovery of data for which access must be restricted because of privacy, security, or confidentiality issues,
- establish training sessions on research data management at all education and research levels
- work together with local, national or international activities.

4.4 Infrastructure

A significant issue for consideration concerning open data is the size and complexity of datasets. The process and analysis of “big data” require large storage space and powerful computers, which will allow the extraction of the desirable knowledge hiding behind this large volume of data. Curating, storing and handling the large and unstructured datasets requires the appropriate infrastructure to ensure the proper management of the stored data, as well as make access and reuse as simple as possible (2). This infrastructure should include storage, computing systems, web services, security systems etc.

As highlighted in the "*Analysis of the State of the Art, Barriers, Needs and Opportunities for Setting up a Transport Research Cloud*" (2), the infrastructure used to support the open data platforms should be created in such a way in order to ensure the ease of their use by both data providers and data users. For data providers, the process of uploading data, alongside with the required metadata, should be an easy process, which will not require much effort and will not distract them from their research activities. On the other hand, for the data user, searching for data, understanding their meaning, assessing their validity and quality for reuse, understanding legal rights requirements, etc. should be also a non-problematic process and a more attractive option than creating a brand new dataset.

It is recommended that the infrastructure of an open transport research cloud should be developed and governed in a similar manner to that of EOSC for compatibility and complementarity issues. Consequently, all standards of such a cloud should be conformed with those of the EOSC, by taking into account all particularities related to the transport sector. Currently, the European Commission offers support infrastructure, e.g. OpenAire and associated services and supports the development of this infrastructure through its funded projects under OpenAIRE Advance.

4.5 Governance

The success of an open research cloud is also relied on a successful governance structure. Within the context of the EOSC development, a list of principles that should guide its governance has been set (35), which should be taken into consideration in the development of European research clouds of different disciplines:

- Representative, inclusive and interdisciplinary: it should include as more different disciplines as possible, also, the so-called long tail of science and citizen science, and the major research programmes.
- Accountability: It should be accountable to all key stakeholders, research infrastructures and the scientific communities.
- Driven by the needs of science: The governance structure should be designed in such a manner that the cloud will serve primarily the science and allow for user and data-driven innovation.
- Pragmatism and proportionality: The development of the governance structure should facilitate the implementation, while the structure of the cloud should be gradually evolved over time.
- Flexibility: The governance structure should be flexible giving the opportunity to the cloud to be improved over time, based on parallel developments.
- Efficient and effective: The governance structure needs to be efficient and able to make decisions quickly enough to keep pace with the evolution of big science and information and communications technologies.
- Action-orientated: The governance structure should be designed to ensure a smooth operation.
- Open for business: It should not prevent the co-operation with private companies and the potential of making a financial return by supplying products and services.
- Strong and streamlined: The size of the board should be the appropriate for the proper function of the cloud, without being blocked by administrative procedures.

- Global outlook: The cloud should be compatible with those being developed in other countries worldwide (e.g. US, Australia, South Africa, Canada etc.).
- Transparency: The interests of involved stakeholders need to be transparent and engender trust.
- Reinforce the FAIR principles: The governance structure needs to be designed to strengthen the FAIR principles of data stewardship.
- Focused: The cloud needs to focus exclusively on a well-defined core mandate.
- Trusted: Both the cloud and its governance structure need to be trusted by regulators and policymakers.

It is noted that several projects funded by the European Commission, namely the EOSC Pilot (https://eoscpilot.eu/) and e-Infrastructures such as eInfraCentral (https://www.einfracentral.eu/home), EOSC-Hub (https://www.eosc-hub.eu/) and OpenAIRE (https://www.openaire.eu/) are defining the governance framework and establishing initial EOSC services for 2020.

4.6 Ethical Issues

The discussion on open data raises several ethical issues, such as personal or privacy sensitivity, intellectual property rights (IPR), which should be taken into consideration within the development and operation of an open research cloud. Within a survey conducted among 87 researchers of academic institutions and representatives of public authorities and commercial sector for 29 European countries in the summer of 2018 (2), most respondents declared that while data should be available for research purposes, some data (e.g. survey data) might be sensitive due to data privacy issues and thus, restrictions should exist in some cases. For instance, a way to ensure and protect privacy is to permit the access only to aggregate data.

Especially transport data are often ethically or commercially sensitive, requiring tight controls as far as access to the data is concerned and ensuring that they are stored within geographic areas where the legislative frameworks match with European data requirements. This means that all involving parties, from researchers that originally collect the data up to the researchers who will reuse the data should be aware of the ethical and legal constraints regarding the publication and the reuse of data, as well as the platform hosting the data should be in accordance with the national or European legislation on data security and privacy.

Consequently, the existence of a clear legislation and a legal framework supporting data security, data protection and privacy is more than imperative. Other issues that the legislation should forecast concern fair competition, cybersecurity, road safety and liability. For example, the interest of third-party service providers and new competitors in accessing vehicle data and using them for commercial purposes is such an issue. A regulatory framework for the access to vehicle data is needed, which will also take into account the efforts of vehicle manufacturers to generate data, as well as their responsibility concerning vehicle's safety and protection of the user's personal data and privacy (2).

5 Review of Open Science Sources

Within this chapter, available sources providing information concerning open sources with publications, data and software, are presented. As referred in the previous chapter, transport research data could be considered the following (2):

- Original research data
- Operational data directly related to research
- Data from published transport research

The available open science sources have been categorised and presented for each type of data.

5.1 Research data

For research data a number of public and private sources can be identified (2). Some of these sources are:

- EC funded research projects, including all types of H2020 Actions and probably previous FP Programs, Research and Innovation Actions, Innovation Actions, FOTs, NDSs (e.g. U-DRIVE), Research Infrastructures and e-Infrastructures.
- Non-governmental and government projects and initiatives, such as Transforming Transport (TTT), Big Data Europe (BDE), NOvel Decision Support tool for Evaluating Strategic Big Data investments in Transport and Intelligent Mobility Services (NOESIS), DATA science for SIMulating the era of electric vehicles (DATA SIM), etc.
- Industry and research projects: "On-Road Integrated Optimization and Navigation system" (ORION), Railigent – Siemens, etc.
- Various libraries of research activities, either operated by public entities (e.g. CORDIS, TRIMIS), by public research entities (e.g., universities), private institutions (e.g. publishing houses or research institutes), or in public-private operated associations (e.g. ERTICO).
- Other international research projects.
- University projects and initiatives.

5.1.1 CORDIS

The Community Research and Development Information Service (CORDIS) is the European Commission's primary source of results from the projects funded by the EU's framework programmes for research and innovation (FP1 to Horizon 2020) since 1990. The CORDIS aims to make research results accessible to researchers, within the context of fostering Open Science.

CORDIS has a rich and structured public repository with all information on projects held by the European Commission, such as project factsheets, participants, reports, deliverables and links to open-access publications, while also produces its own range of publications and articles, in order to facilitate the user to find relevant results in each domain. The print editions are in English, while the web versions are also available in French, German, Italian, Polish and Spanish.

As far as the domain of Transport and Mobility in general is concerned, around 3,176 results (date of access: May 2019) were found including:

- Projects
- Results packs
- Research EU magazines
- Results in brief
- Report summaries
- Project deliverables
- Project publications

5.1.2 TRIMIS

The Transport and Research and Innovation Monitoring and Information System (TRIMIS) supports the implementation and monitoring of the Strategic Transport Research and Innovation Agenda (STRIA) that outlines future transport research and innovation (R&I) priorities to decarbonise the European transport sector. TRIMIS maps and analyses technology trends and R&I capacities in the transport sector providing open-access information.

In coordination with Member States and transport stakeholders, STRIA aims to set out common priorities to support and speed-up the research, innovation and deployment process leading to radical technology changes in transport. STRIA builds on and integrates seven thematic transport research areas:

- Cooperative, connected and automated transport
- Transport electrification
- Vehicle design and manufacturing
- Low-emission alternative energy for transport
- Network and traffic management systems
- Smart mobility and services
- Infrastructure

The available projects and programmes can be browsed by:

- Thematic research area
- Transport mode
- Transport policy
- Transport sector
- Funding origin

5.1.3 EOSC-hub

EOSC-hub brings together multiple service providers to create the Hub: a single contact point for European researchers and innovators to discover, access, use and reuse a broad spectrum of resources for advanced data-driven research. The project mobilises providers from the EGI Federation, EUDAT CDI, INDIGO-DataCloud and other major European research infrastructures to deliver a common catalogue of research data, services and software for research.

EOSC-hub collaborates closely with eInfraCentral, EOSCpilot, GÉANT 4.2, OpenAIRE-Advance and the RDA Europe 4.0 projects to deliver a consistent service offer for research communities across Europe.

The objectives of the project are:

- Simplify access to a broad portfolio of products, resources and services provided by the major pan-European and international organisations through an open and integrated service catalogue
- Remove fragmentation of service provisioning and access to high-quality digital services in Europe and beyond through the technical integration and adoption of standards for interoperability of compute, storage, data and software platforms
- Consolidate e-Infrastructures by expanding capacity and capabilities and improving service quality
- Widen the access to services to all user groups including researchers, high-education, business organisations and expand the user base
- Provide a knowledge hub
- Increase innovation capacity of research e-infrastructures.

5.1.4 EU Open Data Portal

The European Union Open Data Portal (EU ODP) provides access- free of charge - to an expanding range of data from the European Union (EU) institutions and other EU bodies. These data can be used and reused for commercial or non-commercial purposes, without any copyright restrictions. The portal aims also to make the EU institutions and other bodies more open and accountable.

The data concerned include:

- geographic, geopolitical and financial data
- statistics
- election results
- legal acts
- data on crime, health, the environment, transport and scientific research.

All these data are freely available and they can be reused in databases, reports or projects provided that the source is acknowledged. A small number of data are subject to specific conditions on reuse, most of which have to do with protecting third-party intellectual property rights. A variety of digital formats are also available from the EU institutions and other EU bodies.

Currently, there are 13,228 available datasets in the portal, which can be browsed by thematic subject or group. 683 of them are found in the transport subject, which come from 10 publishers, while 50 keywords have been used for the indexing of datasets.

5.1.5 European Data Portal

Another example of an open data portal in the European Union is the European Data Portal (https://www.europeandataportal.eu/data/en/group/transport). The European Data Portal harvests the metadata of Public Sector Information available on public data portals across European countries. Information regarding the provision of data and the benefits of re-using data is also included.

The transport section of the portal includes 7.210 datasets on different transport issues, however, only with elementary search capabilities (by country, catalogue, tag, format and license). The portal has limited practical use due to the lack of standards and high quality metadata to describe the actual databases.

5.1.6 Registry of Research Data Repositories

Registry of Research Data Repositories (re3data.org) is a global registry of research data repositories that covers research data repositories from different academic disciplines since 2012, when funded by the German Research Foundation (DFG). It presents repositories for the permanent storage and access of data sets to researchers, funding bodies, publishers and scholarly institutions.

Project partners in re3data.org are the Berlin School of Library and Information Science at the Humboldt University of Berlin, the Library and Information Services department (LIS) of the GFZ German Research Centre for Geosciences, the KIT Library at the Karlsruhe Institute of Technology (KIT) and the Libraries of the Purdue University. The German partners are actively involved in the German Initiative for Network Information (DINI) and current research data management activities.

Data sources can be browsed by:

- content type
  - Archived data
  - Audiovisual data
  - Configuration data
  - Databases
  - Images
  - Network based data
  - Plain text
  - Raw data
  - Scientific and statistical data formats
  - Software applications
  - Source code
  - Standard office documents
  - Structured graphics
  - Structured text
  - Other
- subject
  - Humanities and Social Sciences (749)
  - Life Sciences (1.257)
  - Natural Sciences (1.152)
  - Engineering Sciences (372)
- country

5.2 Operational Data

For operational data, potential sources are Eurostat, national statistical agencies, national governmental bodies (e.g. Ministries or General Secretariats of transport, of infrastructures, etc.), cities and localities, port authorities and aviation authorities.

5.2.1 EUROSTAT

Eurostat is the statistical office of the European Union situated in Luxembourg, with mission to provide high quality statistics for Europe. Currently, Eurostat offers a whole range of important and interesting data that governments, businesses, the education sector, journalists and the public can use. Eurostat has a policy of encouraging free re-use of data, both for non-commercial and commercial purposes. All statistical data, metadata, content of web pages or other dissemination tools, official publications and other documents published on its website, with some exceptions, can be reused without any payment or written licence provided that the source is indicated and when re-use involves modifications to the data or text, this must be stated clearly to the end user of the information.

5.3 Published research data

The category of published research data includes published transport research articles appearing in scientific journals or being delivered at conferences, workshops, etc. Currently, data from published research should be available through the websites and portals of the various publishers, however, they are not always for free.

In general, open access stands for the free and permanent access to published research, combined with clear guidelines for readers to share and use the content. The two main routes to open access are [24]:

A. Self-archiving / 'green' open access – the author, or a representative, archives (deposits) the published article or the final peer-reviewed manuscript in an online repository before, at the same time as, or after publication. Some publishers request that open access be granted only after an embargo period has elapsed. Authors may ask for shorter embargo periods to the Editor due to the funder OA mandate by sending a specific request before or even after signing the copyright[1]

In some cases, in order to comply with the Open Access mandate of the EC in H2020, to ensure the 6 (12) months embargo period, an APC (Article Processing Charge) could be required by the editor.

B. Open access publishing / 'gold' open access - an article is immediately published in open access mode. In this model, the payment of publication costs is shifted away from subscribing readers. The most common business model is based on one-off payments by authors. These costs, often referred to as Article Processing Charges (APCs) are usually borne by the researcher's university or research institute or the agency funding the research. In other cases, the costs of open access publishing are covered by subsidies or other funding models. For H2020 grants, APC are eligible costs.

[1] see a specific template provided by the EC for H2020 grants at: http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/oa-pilot/h2020-oa-guide-model-for-publishing-a_en.pdf

5.3.1 DOAJ

The Directory of Open Access Journals (DOAJ) was launched in 2003 at Lund University, Sweden, with 300 open access journals. Today, the database contains 12.000 open access journals covering all areas of science, technology, medicine, social science and humanities. DOAJ is a membership organisation and membership is available in three main categories: Publisher, Ordinary Member and Sponsor. A DOAJ Membership is a clear statement of intent and proves a commitment to quality, peer-reviewed open access.

DOAJ is a community-curated list of open access journals and aims to be the starting point for all information searches for quality, peer reviewed open access material. To assist libraries and indexers keep their lists up-to-date, a list of journals that have been accepted into or removed from DOAJ is published. Its mission is to increase the visibility, accessibility, reputation, usage and impact of quality, peer-reviewed, open access scholarly research journals globally, regardless of discipline, geography or language.

DOAJ uses the services of approximately 100 voluntary editorial staff who review applications. Volunteers are bound by a Code of Conduct and an Agreement that they must sign and return to DOAJ before they can carry out their duties. Currently, 13.321 journals are available, with 10.331 searchable at article level, while the number of available articles is more than 4 million.

5.4 Open Software Sources

Besides the open data and publications, open sources that provide for free software significant to research activities should also be recorded and highlighted.

5.4.1 Software Heritage

The aim of the Software Register is to collect, preserve and share all software that is publicly available in source code form. On this foundation, a wealth of applications can be built, ranging from cultural heritage to industry and research. Within this context, a large archive of software source code has been built, which is indexed, organized and broadly accessible.

5.4.2 GitLab

GitLab is a tool for software management. GitLab is a single application for the entire DevOps lifecycle, covering every stage from project planning to monitoring, while it also allows to manage and secure across all stages.

5.4.3 GitHub

GitHub is a development platform, where a repository can be created allowing to host and review code, manage projects and build software alongside 36 million developers.

6 Synthesis of Review Results

6.1 Current Situation in Open Science

New digital technologies offer significant opportunities for the accomplishment of open science. Open access to the scientific literature and to related data and software constitutes a powerful mechanism for creating knowledge and for supporting the development of science as a public good. The scope of open science is broader than open access publications or data and involves many aspects and stages of research process, including the interoperability of scientific infrastructure, open and shared research methodologies, machine-friendly tools etc.

The open science approach may offer benefits to the research community, which gradually will be more and more motivated to share scientific inputs and outputs. The availability of high quality data enables researchers to reproduce and replicate already reported work, increasing thus the scientific reliability. Additionally, open search tools can also contribute to both the efficiency of research as well as its diffusion. The effectiveness and productivity of the scientific community can be improved, since the greater access to more research data and results can lead to a reduction of the costs in collecting, creating and transferring data and scientific tools. More research can thus be produced by the same datasets, while opportunities for a global participation in the research process and for interdisciplinary collaborations may arise.

Several actors in national and global systems are involved in open science efforts, with the researchers playing the most significant role, while national strategies have been also developed by governmental authorities in order to support open science movement. Research funding agencies are key actors in the promotion of open science, since they are those who define the mechanisms and requirements in order to benefit from grants and funding for research (35). Universities, public research institutes, libraries and repositories constitute the physical infrastructure that enables scientists to create and share their work. Moreover, private organisations may play a significant role in raising awareness and encouraging open science culture, while various private scientific publishers offer a broad range of open access publishing choices. International organizations and foundations, such as Organisation for Economic Co-operation and Development (OECD), United Nations Educational, Scientific and Cultural Organization (UNESCO), World Bank etc., have been also active in recent years in promoting open science efforts.

Within this context, in 2016, the European Commission presented its vision for the European Open Science Cloud (EOSC), with aims to provide the European Union with a global lead in research data management and create the proper conditions for the European scientists in order to benefit from a data-driven science (6, 7). It is worth noting that in 2012, the OpenAire project was preceded, which was set up by the European Commission within the Seventh Research Framework Programme (FP7). It was a pilot initiative on open access to peer-reviewed research articles, aiming to ensure that the results of the research under its funds are disseminated as widely and effectively as possible.

Openness is based on the perception that data and research results funded by public money should be considered as a public good. Under this perspective, Horizon 2020 recommends that all publications resulting from work carried out within its projects be in open-access journals (17). Similarly, in the USA, according to a Government directive issued by the Office of Science and

Technology Policy, all federal agencies with more than USD 100 million per year in research and development expenditure are required to develop plans to make the published results of federally funded research freely available to the public within one year of publication (OECD, 2015).

Currently, there are various types of open access publishing, with the most prevailing being known as gold, green and hybrid open access models. Under the gold open access model, an article is immediately published in open access mode. In the green open access or self-archiving mode, authors deposit the published article in an online repository before, at the same time or after the publication, while in some cases an embargo period interferes until open access is granted. Hybrid open access refers to the open access provided by subscription-based journals where some articles are available in open access, provided that APCs have been paid.

Several surveys among researchers worldwide have shown that over the past decade, the share of open access articles has increased (35, 27). According to a research of 2012 (28), about 17% of scientific articles published in 2011 and indexed in Scopus were available through journal publishers (i.e. gold open access). Additionally, Lewis in 2012 (30) suggests that gold open access could account for 50% of the journal articles between 2012 and 2017. However, the availability of open access articles and the embargo length vary among the different disciplines. The publication of green open access is higher in physics and astronomy, earth and environmental sciences, mathematics and social sciences, arts and humanities, than in medicine, chemistry or biology and genetics (1, 41).

Data sharing is also considered a crucial activity, which allows the verification of the scientific results, reduces the efforts of the researchers to collect already available data sets and fosters collaborations. So far, four types of research data are considered essential, i.e. observational, experimental, computational and reference data (35). However, an important element that defines the data usefulness is the quality of the published data.

In 2004, a meeting with the ministers of science and technology of OECD countries was held in Paris with objective to discuss guidelines on access to research data. In 2007 the adoption of the OECD Principles and Guidelines for Access to Research Data from Public Funding followed. The Principles and Guidelines acknowledge the importance of open access to research data, but they also recognise the need for conformity with national legal frameworks, such as copyright laws and intellectual property protection (32).

Furthermore, a few years ago, the FAIR Data Principles were published by a group of researchers. According to these principles, research data, when shared, should have the following characteristics: Findable, Accessible, Interoperable and Reusable. The EOSC Declaration recognises the need of the shared data to be FAIR and has set 33 goals, 15 of which refer to data culture and FAIR data (8).

As already referred, a key element for the data re-use and sharing is the good quality of the published data. The OECD (2011) Quality Framework and Guidelines for OECD Statistical Activities identifies seven key aspects of data quality, i.e. relevance, accuracy, credibility, timeliness, accessibility, interpretability, coherence. In many countries or scientific communities, there is no protocol for the assessment of the data quality. Since the data should be not only accessible, but also trustworthy and reusable, detailed data-sharing information and metadata should exist, in order to enable their proper use. However, scientists and researchers are not necessarily able to perform these tasks. On that purpose, data citation could offer a solution to this issue. Currently, there are

some organisations involved in promoting data citation, such as DataCite (https://datacite.org/), ORCID (https://orcid.org/), Dryad Digital Repository (https://datadryad.org/) and ResearcherID (researcherid.com).

An important issue of open science is that a legal framework should exist, ensuring data reuse rights and providing with explicit guidelines. More and more countries are developing legal and policy frameworks, guidelines and initiatives for data sharing, however, it is obvious that policies concerning open access to publications are more advanced compared to those of open research data. According to a survey prepared for the European Commission (38), out of 48 funding bodies of open access policies listed on ROARMAP (a registry for open access policies) in Europe, Canada, the United States and Brazil, 23% excluded the release of data and 38% did not mention data in the policy description.

A data protection framework should also exist, ensuring the copyright protection. Many OECD countries, e.g. EU, Japan, Korea, dispose copyright laws, while in the United States, there is no special IP protection for the datasets.

There are also some limited cases, that openness is restricted by the law. These cases concern personal information, safety, national security, sensitive commercial and cultural information and other information which could cause harm to research, if released. Individual disciplines have protocols for identifying, when the access to data should be constrained. These protocols are often supported by, and developed in the context of, national legislative frameworks relating to freedom of information and protection of personal data.

In the EU, the GDPR is in force in order to protect the personal data, which could make the individuals identifiable. The GDPR has clarified that any data that can be linked to a particular individual constitutes personal data, such as a name, an address, localisation data, health information, income, cultural profile qualify as personal data. The second key concept of the GDPR is “processing”, which is understood as an operation or set of operations, performed on personal data or on sets of personal data. These operations involve the collection, recording, organisation, storage, adaptation, alteration, retrieval, consultation, use, disclosure, dissemination Any activity which involves personal data, including the (re-)use, sharing of and linking of personal data is therefore subject to the principles of the GDPR (39).

6.2 Current situation in Open Science in Transport Research

In the EU, the establishment of a Transport Research Cloud (TRC) is foreseen as an important step in order to enhance the use of transport research data and to promote. A primary aim for a Transport Research Cloud will be to provide researchers in the transport and logistics with access to open data sets covering topics of importance to their research. Current approaches to data access and individual knowledge of where data resides, are insufficient to provide the broad access to properly curated data needed by researchers in this domain. It is noted that the Transport Research Cloud should be in line with the EU's open science efforts and the EOSC.

To identify the scope of a TRC, it is important to understand the dimensions of the transport sector, which also explains the complexity of transport related research. Another fundamental issue for its development is to identify what data are considered to be "transport research data" in contrast to transport data in general.

Transport is a domain with a high volume of data, while even more data are expected to be generated with the development of automation, connected vehicles, smart cities etc. These are mainly Big Data, that need specific handling in many aspects, such as ample storage space and powerful computers to process the data. Processing power and machine learning algorithms, therefore, are a vital element for Big Data transport research (2).

Several projects have been held in the EU under the scope of the use of big data in transportation. Such a project is the AutoMat project, with objective to innovate an open ecosystem for Vehicle Big Data. The need to make mined and anonymous vehicle data, while building upon current trends in Big Data, is highlighted. A potential risk of the existence and use of such data is the massive leak of personal data. For this reason, a cybersecurity framework is needed to be developed, that could be used not only from researchers but also from future stakeholders.

Another EU project lying into this domain is the LeMO project (Leveraging Big Data for Managing Transport Operations), which targets at developing a strategy that defines the necessary research efforts for the realisation of the big data economy in the transport sector. More precisely, the LeMO project has three main objectives (18):

- To produce a Research and Policy Roadmap towards data openness, collection, exploitation and data sharing to support European transport stakeholders in capturing and addressing issues that range from technical to institutional, including legitimacy, data privacy and security.
- To involve European transport sector actors in order to identify and analyse concrete opportunities, barriers and limitations of the transportation systems to exploit big data opportunities.
- To disseminate the LeMO findings, recommendations and the contribution of the LeMO project to evidence–based decision making by improving knowledge on methodological and exploitation issues taking also into account economic, legal, social, institutional and technical aspects.

The SafeClouds.eu - "Data-driven research addressing aviation safety challenges" is another project focused to the domain of air transport, which can provide with valuable input at new approaches for

data mining in aviation safety (data cleaning, transformation/optimization etc.), representing novel data structures and safety knowledge in a cost-effective manner, assembling and validating safety data analysis paradigms (9, 12, 13).

Big Data opens up new opportunities to define "Intelligent" mobility and transportation solutions. Vast volumes of data are generated on a daily basis through e.g. sensors in passenger and vehicle counting, ticketing and fare collection systems. However, much of this Big Data are non-standard data (e.g., social, geospatial or sensor-generated data that does not fit into traditional, structured, relational data warehouses or databases), while many of these may not be valuable for researchers (18).

There are also European and national policies that either hinder or facilitate access, linking and sharing of Big Data, especially those concerning public sector. Some policies have been implemented, aiming to protect the privacy of citizens, encourage data sharing among private and public sector entities, and develop policies that support the digitalization of the transport sector. Some of the key areas of policy in the transport sector are for instance the implementation of Intelligent Transport System, the increased Open Data policies, Automated Driving, and Smart Mobility.

Public fear in automation and artificial intelligence highlights the need for transparency and thus openness, by simultaneously ensuring confidentiality and privacy protection. Within this context, the GDPR is significantly efficient concerning the processing of personal data, while it is also more stringent than the previous Directive 95/46/EC that it is replaced.

6.3 Future Challenges

Within this chapter the main challenges, that should be overcome in the future in order to achieve the implementation of open science, are presented as identified by the literature review (2, 34).

- Different stakeholders: There are many different stakeholders related to the transport domain that generate and use an increasing amount of data. These stakeholders may come from the public sector and be interested in traffic control, vehicle management and safety, mobility planning etc. The private sector exploits also increasing amounts of data for route planning, while individuals increasingly use data via websites, mobile device applications, and GPS information. All of these stakeholders have different interests in transport data, and thus create different requirements for data access.
- Different data ownership: Data ownership depends on who generates and collects the data. Many system operators or agencies may generate transport data, but they are not willing to share them because of privacy, legal liability, IP, competition or cost related issues.
- Data quality: Massive amounts of digital data are generated, thanks partly to the advent of Information and Communication Technologies (ICTs). However, the reliability, statistical validity and generalisability of new forms of data are not yet fully understood.
- Costs and infrastructure. There are significant remaining cost barriers that do not permit a wider implementation of open science. New technological and institutional infrastructure within specific disciplines and across disciplines need to be developed.
- Lack of expertise: An effective ecosystem requires data scientists and engineers with expertise in analytics, statistics, machine learning, data mining, and data management.

- Legal concerns: Sharing data, code, and other research products is becoming more common, but barriers related to ensuring patient confidentiality and the protection of national security information exist in some domains. Proprietary research also presents barriers.
- Lack of supportive culture, incentives and training. Open practices such as preparing datasets and code for sharing and making preprints available are not generally rewarded and may even be discouraged by current incentive and reward systems. This may have the unintended consequence of causing a disadvantage to early career researchers.
- International Collaboration: Collaboration and experience sharing across countries in the development of comparable data resources is necessary to fully exploit the potential of open data sets.

7 Review on transport keywords

Within this chapter the framework for the identification of open access publications related to all aspects of the transport sector is given. The selection of the most appropriate document as a source for the desired keywords was based on the need to cover all main transport aspects as defined in Chapter 4.3.2. An overview of the indicative keywords that should be used for the identification of all these publications through machine learning techniques and text mining procedures is provided below.

7.1 Exploration of keywords

A source that could be used for this purpose is the Glossary for Transport Statistics (40), which has been jointly published by the United Nations Economic Commission for Europe (UNECE), Eurostat and the International Transport Forum. The Glossary provides definitions of statistical terms for all modes of transport, from infrastructure, vehicles and traffic measurement, through to transport safety, energy consumption and intermodal movements.

The advantage of this glossary is that the terms are applied to a common questionnaire administered jointly by the three organisations, ensuring that identical data are reported to all at the same time and that data can be compared across transport modes and countries. A further advantage of this glossary to be used for the needs of the BEOPEN project is that, the last edition has achieved to improve the global scope of the glossary, ensuring that definitions are relevant for countries in all regions and not just Europe.

The Glossary disposes definitions of transport statistical terms for the following categories, including all transport modes:

A. Railway Transport

B. Road Transport

C. Inland Waterway Transport

D. Pipelines (Oil and Gas) Transport

E. Maritime Transport

F. Air Transport

G. Intermodal Freight Transport

For each section, the terms are further categorized into the following sub-categories:

I. Infrastructure

II. Transport Equipment

III. Enterprises, economic Performance and Employment

IV. Traffic

V. Transport Measurement

VI. Energy Consumption

VII. Accidents

The 4th Edition of the Glossary includes more than 700 definitions in transport statistics:

Table 1 Number of available definitions of transport terms by transport mode

	Rail	Road	Inland Waterway	Pipeline	Maritime	Air	Intermodal Freight
Introduction	-	-	-	-	-	-	11
Infrastructure	25	18	17	6	16	11	-
Transport Equipment	45	55	42		26	6	16
Enterprises, economic Performance and Employment	11	14	11	7	12	10	-
Traffic	14	11	12	18	16	33	-
Transport Measurement	32	35	31		51	40	-
Energy Consumption	10	8	5	9	5	3	-
Accidents	17	20	18	-	-	12	-
Total	**154**	**161**	**136**	**40**	**126**	**115**	**27**

However, these terms have to be checked for duplications, since some values are included in the definitions of the above terms may be referred to more than one.

A new edition (5th) is to be published in the near future in which new definitions reflecting changes in bicycle infrastructure (and electric bicycles), a new definition for serious injuries in road traffic (MAIS), as well as new definitions of different levels of autonomous driving will be included.

8 Conclusions

The purpose of the current deliverable is to map Open Access related publications, policy and repositories in European transport research. On that purpose, a thorough review of literature on knowledge and use of Open Access publications, official Open Access policy and repositories in Europe was conducted. The study was accomplished through a desk research distributed to BE OPEN partners and a large number of scientific documents, policy documents, strategic implementation documents of open science initiatives etc. was collected.

The literature review led to the presentation of key findings concerning open science in transport, highlighting the current situation and the needs identified at European level. More specifically, issues concerning open transport research data, metadata standards, FAIR data principles, infrastructure needs, open science governance models and ethical issues regarding data sharing were analysed. Additionally, a review of the available open science sources was conducted, which were grouped based on the type of data and services they provide. It is noted, however, that a more detailed review of the available open science sources and their use in European transport research is presented in the Deliverable 2.2. A synthesis was also developed concerning the progress of open science in Europe and in comparison with other countries, the progress of open science in the transport sector, while key challenges that should be addressed in the future are also summarized. Finally, the overview of an indicative source is given, which could provide with all transport related keywords for the classification and the topic analysis of the transport related publications in the next stages of the project.

It is recommended that the review of Open Science publications and sources be an on-going procedure, with the related lists being constantly updated, while all of these should also be available not only to the partners for their work within the context of the project, but also to the end users of the TOPOS Forum and Observatory. All national publications and sources related to open science that may not be available in English language should also be explored and recorded.

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10 ANNEX I: Open Science Documents

a/a	Title	Issue Date	Author	Publisher	Country of Publisher	Language	Type	Link/File Name	Category 1	Keywords				
										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
1	Open Science 2030 - A Day in the Life of a Scientist, AD 2030	2015		European Commission	Belgium	English	Article	Open_science_2030.pdf	General	lab	virtual research	standards		
2	Big and open data in transport	2014		The Parliamentary Office of Science and Technology	UK	English	Article	http://researchbriefings.files.parliament.uk/documents/POST-PN-472/POST-PN-472.pdf	Transport	open data	big data	state-of-the-art	applications	
3	How open science helps researchers succeed	2016		McKiernan et al	International	English	Article	DOI: 10.7554/eLife.16800	General	lab	practices	research		
4	California passes first state-level open access law	2014	Robinson S.		USA	English	Article	https://www.mhpbooks.com/california-passes-first-state-level-open-access-law/	General	lab	implementation model	economic benefits		
5	Fourth time lucky for US open-access bill?	2013	Van Noorden R.		USA	English	Article	http://blogs.nature.com/news/2013/02/fourth-time-lucky-for-us-open-access-bill.html	General	data sharing	costs	economic benefits		
6	The Emerging Open Access Policy Framework in the United States	2013	Heather J.		USA	English	Article	http://sparc.arl.org/sites/default/files/US%20OA%20Policy%20B11.pdf	General	universities	policy	governance		
7	Open Access in the USA: A Ridiculously Brief and Hopelessly Incomplete Overview	2017	Engsberg M.	International Journal of Legal Information	UK	English	Article	https://www.cambridge.org/core/journals/international-journal-of-legal-information/article/open-access-in-the-usa-a-ridiculously-brief-and-hopelessly-incomplete-overview-1/E73713E6975D836FA28C86ACF87F8BF7	General	universities	practices	implementation		
8	Why open access publishing is growing in Latin America	2018	Colodrón V.		Latin america	English	Article	https://www.timeshighereducation.com/blog/why-open-access-publishing-growing-latin-america#survey-answer	General	universities	practices	implementation		
9	Open Access Movement Grows Rapidly in Latin America	2018		Prof. Michael Prieler	USA	English	Article	https://www.enago.com/academy/open-access-movement-in-latin-america/	General	universities	practices	implementation	financial model	
10	Open access in Latin America: Embraced as key to visibility of research outputs			Caralee Adams	USA	English	Article	http://www.sparc.arl.org/news/open-access-latin-america-embraced-key-visibility-research-outputs	General	intellectual property regimes	roadmap	research		
11	Expanding Public Access to the Results of Federally Funded Research	2013		Michael Stebbins	USA	English	Article	https://obamawhitehouse.archives.gov/blog/2013/02/22/expanding-public-access-results-federally-funded-research	General	IPR	roadmap	research		
12	UQ leads the way in Open Science	2018		University of Queensland	Australia	English	Article	https://www.uq.edu.au/news/article/2018/08/uq-leads-way-open-science	General	universities	governance	guiding principles		
13	Policy Developments on Open Science in Japan	2018		Research Centre for Open Science and Data platform	Japan	English	Article	https://rcos.nii.ac.jp/en/openscience/internal/	General	big data	governance	research		
14	Promoting Open Science in Japan - Opening up a new era for the	2018		Ministry of Science/Research	Japan	English	Article	https://www8.cao.go.jp/cstp/sonota/openscience/150330_openscience	General	big data	governance	guiding principles		

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										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
	advancement of Science							_en2.pdf						
15	Promoting Open Science in Japan	2015		The Expert Panel on Open Science, based on Global Perspectives Cabinet office, Government of Japan	Japan	English	Article	https://www8.cao.go.jp/cstp/sonota/openscience/150330_openscience_en1.pdf	General	big data	roadmap	guiding principles		
16	"Open Science" as a Practice?	2016		Yuko Harayama, Executive Member, Council for Science, Technology and Innovation (CSTI)	Japan	English	Article	https://jipsti.jst.go.jp/rda/common/data/pdf/lecture/Harayama_Symposium.pdf	General	intellectual property regimes	actions	roadmap		
17	Moving from Open Data to Open Science A Response to Canada's Open Government Draft Plan	2017		Dr. Alana Westwood on behalf of Evidence for Democracy	Canada	English	Article	https://evidencefordemocracy.ca/sites/default/files/evidencefordemocracy_-_responsetoaccesstoopengovernmentplan.pdf	General	data sharing	governance	guidelines		
18	Open Science: What's up with Canada?	2017		Emily Johaniuk	Canada	English	Article	https://medium.com/@EmilyJohaniuk/open-science-whats-up-with-canada-4a4ab762df2d	General	data sharing	governance	guiding principles		
19	Open Innovation, Open science, Open to the world - a vision for the Europe	2015		European Commission	Luxembourg	English	Book	http://publications.europa.eu/resource/cellar/3213b335-1cbc-11e6-ba9a-01aa75ed71a1.0001.02/DOC_2	General	framework	governance principles	sustainability	policy	
20	Open Science by Design	2018		The National Academies Press	USA	English	Book	https://www.nap.edu/download/25116	General	open research	information sharing	methodology		
21	Open	2017	Biswas-Diener R. & Jhangiani R.	Ubiquity Press	UK	English	Book	https://www.doabooks.org/doab?func=search&addFilter=utpub:%22Ubiquity%20Press%22&template=&fromYear=&query=au%3A%22Biswas-Diener%2C%20Robert%22&toYear=&uiLanguage=en	General	open research	open educational resources	open pedagogy	open textbooks	psychology
22	Open Access	2012	Suber P.	The MIT Press	USA	English	Book	https://www.doabooks.org/doab?func=fulltext&uiLanguage=en&rid=31770	General	open research				
23	Open Access and the Library	2019	Oberländer A. & Reimer T.	MDPI - Multidisciplinary Digital Publishing Institute	Switzerland	English	Book	https://www.mdpi.com/books/pdfview/book/1211	General	open research	Open science			
24	Open Data and the Knowledge Society	2017	Finn R., Wadhwa K., Wessels B., Sveinsdottir T.	Amsterdam University Press	The Netherlands	English	Book	https://www.doabooks.org/doab?func=fulltext&uiLanguage=en&rid=20713	General	open research	open data movement	data	knowledge	
25	Open Data Protection - Study on legal barriers to open data sharing - Data Protection and PSI	2017	Wiebe A. & Dietrich N.	Universitätsverlag Göttingen	Germany	English	Book	http://www.oapen.org/search?identifier=640389	General	open research	Open research			
26	Opening Government	2018	Vincent S. & Wanna J.	ANU Press	Australia	English	Book	https://www.doabooks.org/doab?func=fulltext&uiLanguage=en&rid=27031	General	open research	Public policy	transparency	digital technology	Australia
27	Opening Science: The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing	2014	Sönke Bartling --- Sascha Friesike	Springer	Germany	English	Book	https://www.doabooks.org/doab?func=fulltext&uiLanguage=en&rid=15596	General	open research	Open data	collaborative work	scientific intellectual property	computers and society
28	Effective Data Quality Diagnostic	2017	Mejia-Lavalle M., Meusel W., Tavira	IEEE Intelligent Transportation	USA	English	Book	Mejia-Lavalle-2017-Effective Data						

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										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
	Schema for Big Data		J. V., Cruz M. C.	Systems Magazine				Quality Diag						
29	Legal aspects of open access to publicly funded research	2015		OECD	Paris	English	Book chapter	https://www.oecd.org/sti/ieconomy/Chapter7-KBC2-IP.pdf	General	legal issues	policy considerations	open research data		
30	Digital Maps for Railway Applications based on OpenStreetMap Data	2013	Rahmig C., Kluge A., IEEE	IEEE Intelligent Transportation Systems Magazine	USA	English	Book Chapter	openstreet						
31	Cloud Computing adoption in developing countries: A systematic literature review	2018	M'Rhaouarh I., Okar C., Namir A., Chafiq N., IEEE	IEEE Intelligent Transportation Systems Magazine	USA	English	Book Section			Technology-Organization-Environment (TOE)	Cloud computing	developing	countries	Adoption
32	Cognitive Radio Techniques for Satellite Communication Systems	2013	Sharma S. K., Chatzinotas S., Ottersten B., IEEE	IEEE Intelligent Transportation Systems Magazine	USA	English	Book Section			Cognitive Satellite Communications	Spectrum Sensing	underlay	dual	Satellite Systems
33	Robust RFID Authentication for Supply Chain Management	2012	Vaidya B., Makrakis D., Mouftah H. T., IEEE	IEEE Intelligent Transportation Systems Magazine	USA	English	Book Section			RFID network	Supply chain management	authentication	public key	cryptography
34	The Impact of Data Complexity on Privacy Management in Vehicle to Infrastructure Applications	2013	Zierfuss A., Sendag R., IEEE	IEEE Intelligent Transportation Systems Magazine	USA	English	Book Section	Zierfuss and Sendag 2013						
35	Data sharing of transport research data	2016		Transportation Research Procedia		English	Conference paper	Data sharing of transport research data.pdf	Road Transport	data sharing	metadata	data protection	financial model	implementation
36	2018 Australasian Open Science Conference	2018		University of Queensland School of Psychology	Australia	English	Conference paper	https://www.uqopenscience.org/	General	universities	implementation model			
37	Open data for air transport research: Dream or reality?	2014	Bourgois M. & Sfyroeras M.			English	Conference Paper	Bourgois-2014-Open data for air transport rese		access policies	Air Traffic Management	Air transport	data type	data-sources
38	Open data: Challenges and opportunities for transit agencies	2014	Schweiger C.			English	Conference Paper	Schweiger, Carol L. - Open Data - Challenges a		decision support systems	Intelligent systems	social networking (online)	traffic control	urban transportation
39	A Tentative Research of Internet of Things (IOT) in Automotive Transportation	2018	Huang Q., Zhang G., She C.	Atlantis Press	France	English	Conference Proceedings	https://www.atlantis-press.com/article/25907221	Transportation	application	cloud service	automotive transportation		
40	Making Open Transportation Data Useful and Accessible: Recommendations for Good Practices in Open Data Standards Management	2017	Sall E., Zorn L., Cooper D. S., Bhargava C. S., Transportation Research Board			English	Conference Proceedings			best practices	data standards	open data	standardization	methodology
41	Managing models in the age of open data	2016	Davidson P. & Spinoulas A.			English	Conference Proceedings			Australia	behavior	data collection	improvement	land use
42	Usability evaluation of an open data platform	2017	Osagie E., Waqar M., Adebayo S., Stasiewicz A., Porwol L., Ojo A.			English	Conference Proceedings	Osagie-2017-Usability evaluation of an open da		computer applications	non-technical users	open datum	software developer	software products
43	Making Open Transportation Data Useful and Accessible: Recommendations for Good Practices in Open Data Standards Management	2017	Sall E., Zorn L., Cooper D., Sana B., Coe S., Transportation Research Board			English	Conference Proceedings			Best practices	data standards	methodology	open data	standardization
44	ADAS&ME , D10.2:ADAS&ME Data Management Plan	2017	CERTH/HIT		Greece	English	Deliverable	http://www.adasandme.com/wp-content/uploads/2017/05/ADASANDME_Deliverable_10.2.pdf	Road Transport		privacy	standards	platform	

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										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
47	SocialCar. Open social transport network for urban approach to carpooling, D2.3: Data Sources and Data Formats	2016	Zight		The Netherlands	English	Deliverable	https://trimis.ec.europa.eu/sites/default/files/project/documents/20100318_173636_67806_PEPPER_Final_Report_20081014.pdf	Road Transport	data availability	formats	data infrastructure	real time data	
48	PEPPER: Police Enforcement Policy and Programmes on European Roads, D17: Final Report	2008	VTT, 4Sight, TØI, KLPD/TISPOL, DTU, CERTH		Finland, Israel, Norway, Netherlands, Denmark, Greece	English	Deliverable	https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5b9858bc6&appId=PPGMS	Road Transport	data availability	policy	database structure	data security	
49	AutoMat,D2.5 Cyber Security Framework	2018	Trialog, EPRC		France, Germany	English	Deliverable	https://static1.squarespace.com/static/59f9cdc2692ebebde4c43010/t/5b6d4674032be489a442fa8b/1533888127770/20180716_D1.3_Big+data+methodologies%2C+tools+and+infrastructures_LeMO.pdf	Road Transport	security	privacy	cloud storage	data collection	
50	LEMO, D1.3 Big Data Methodologies, Tools and Infrastructures	2018	Goethe-University Frankfurt		Germany	English	Deliverable	https://static1.squarespace.com/static/59f9cdc2692ebebde4c43010/t/5bdab3e2cd8366e9378d02b1/1541059569380/D2.2_Report+on+Legal+Issues_LeMO+-+FINAL.pdf	Transport	big data technologies	big data architectures	big data analytics	platform	
53	LEMO, D2.2 Report on Legal Issues	2018	Bird & Bird		Belgium	English	Deliverable	https://static1.squarespace.com/static/59f9cdc2692ebebde4c43010/t/5b88f069352f53395f7814c5/1535701109734/20180829_D2.3_Report+on+Ethical+and+Social+Issues_LeMO.pdf	Transport	privacy and data protection	security	breach-related obligations	anonymisation / pseudonymisation	
54	LEMO, D2.3 Report on Ethical and Social Issues	2018	Bird & Bird		Belgium	English	Deliverable	https://static1.squarespace.com/static/59f9cdc2692ebebde4c43010/t/5b49c213352f534ffb42e3d8/1531560480749/20180711_D1.1_Understanding+and+mapping+big+data+in+transport+sector_LeMO.pdf	Transport	ethical and social issues	privacy	personal Data Ownership	trust	
55	LEMO, D 1.1 Understanding and Mapping Big Data in Transport Sector	2018	Goethe-University Frankfurt		Germany	English	Deliverable	https://static1.squarespace.com/static/59f9cdc2692ebebde4c43010/t/5b49c292aa4a9974b212fa16/1531560603865/20180710_D1.2_Big+Data+Policies_LeMO.pdf	Transport	understanding big data	data sources			
56	LEMO, D 1.2 Big Data Policies	2018	Panteia B.V.		Holland	English	Deliverable	https://trimis.ec.europa.eu/project/open-access-virtual-testing-protocols-enhanced-road-users-safety#tab-partners	Transport	policy	regulation	directive	open data	
57	Big Data Europe- Empowering Communities with Data Technologies D 3.5: Big Data Platform Requirements, Architecture and Usage	2016	TenForce, UBO, FhG, NCSR-D			English	Deliverable	https://www.big-data-europe.eu/wp-content/uploads/D3.5-Big_Data_platform_requirements_architecture_and_usage.pdf	General	platform	data requirments	data architecture	data usage	

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										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
58	Big Data Europe- Empowering Communities with Data Technologies D4.3, Final Big Data Integrator Platform Release	2017	Ubo, InfAI, Ten Force, FhG		Germany	English	Deliverable	https://www.big-data-europe.eu/wp-content/uploads/D4.3-Final-Big-Data-Integrator-Platform-Release.pdf	General	Integrator Platform	architecture	data storage		
59	SafeClouds.eu-Data-driven research addressing aviation safety intelligence- D3.2 INFORMATION REPRESENTATION	2018				English	Deliverable	https://safeclouds.eu/	Air transport	cloud	data collection	data analysis and structure		
60	SafeClouds.eu-Data-driven research addressing aviation safety intelligence- D5.1 Large Scale Infrastructure v0 development	2018				English	Deliverable	https://safeclouds.eu/	Air transport	cloud	infrastructure development	data collection	data Pools	secure data fusion
61	SafeClouds.eu-Data-driven research addressing aviation safety intelligence- D3.1 DATA PREPARATION	2017				English	Deliverable	https://safeclouds.eu/	Air transport	cloud	data case studies	data cleaning	data transformation	data merging
63	EGI-Engage. D5.3 The evolution in security policies, procedures and best practices in EGI	2017	CERN, STFC, Nikhef		UK, the Netherlands etc.	English	Deliverable	https://documents.egi.eu/public/ShowDocument?docid=3027	General	security	policy	best practices		
64	EGI-Engage. D4.9 Open Data Platform: Demonstrator, Experience Report and Use Cases	2017	Cyfronet		Poland	English	Deliverable	https://documents.egi.eu/public/ShowDocument?docid=3033	General	open Data platform	DataHub	use cases		
65	OpenAIRE2020-Open Access Infrastructure for Research in Europe D7.6 The Open Research Data Pilot: Personal Data and PSI Rules	2017				English	Deliverable	OpenAIRE_D7.6 The Open Research Data Pilot. Personal Data and PSI Rules.pdf	General	personal Data	PSI			
66	OpenAIRE2020-Open Access Infrastructure for Research in Europe D7.6 The Open Research Data Pilot. Personal Data and PSI Rules	2017				English	Deliverable	OpenAIRE_D7.6 The Open Research Data Pilot. Personal Data and PSI Rules.pdf	General	personal Data	PSI			
67	EGI-Engage. D3.17 Final release of the accounting and operational tools	2018	CNRS, GRNET, STFC, CESNET, CSIC,EGI F.-INFN		France, Greece, UK etc.	English	Deliverable	https://documents.egi.eu/public/ShowDocument?docid=3037	General	operation Portal	security Monitoring	Accounting Repository and Portal		
68	OpenAIRE2020-Open Access Infrastructure for Research in Europe D9.1 OPENAIRE PORTAL SERVICES	2016	ARC		Greece	English	Deliverable	https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5aee485ed&appId=PPGMS	General	Portal	requirements			
69	EOSCpilot-The European Open Science Cloud for Research Pilot Project D5.5: EOSC Service Portfolio Roadmap	2019	EGI, SURFsara, ATHENA		The Netherlands, Greece	English	Deliverable	https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c4343131&appId=PPGMS	General	EOSC	portfolio roadmap	data infrastructures		
70	EOSCpilot-The European Open Science Cloud for Research Pilot Project D5.2: EOSC Service Portfolio	2018	EGI, SURFsara, JISC, GRNET, GEANT, EMBL, STFC			English	Deliverable	https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5b7ca09e5&appId=PPGMS	General	EOSC	service portfolio			

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										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
71	EOSCpilot-The European Open Science Cloud for Research Pilot Project D6.9: Final report on Data Interoperability	2019	ICOS-ERIC, JISC, ELIXIR - UMAN, CNR, KIT, INAF, UFlorence, BGS/NERC, Athena, ELIXIR - EMBL,CNRS			English	Deliverable	https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5c434fb9a&appId=PPGMS	General	EOSC	Data Interoperability	data resources	Data standards	
72	OpenDataMonitor D2.1 Open dtata topologies, catalogues and metadata harmonization	2014	SOTON, ODI, IfG.CC, ATHENA, SYNYO			English	Deliverable	https://project.opendatamonitor.eu/deliverables/	General	open data	open data landscape	metadata		
73	OpenDataMonitor D3.3 Tool architecture and components/plugins programming status 1	2014	ATHENA		Greece	English	Deliverable	https://project.opendatamonitor.eu/deliverables/	General	open data	data architecture			
74	RECODE-Policy RECommendations for Open access to research Data in Europe D1.1 Stakeholder Values and Ecosystems	2013	University of Sheffield, Blekinge Institute of Technology, National Documentation Centre, Greece, Amsterdam University Press		UK, Greece etc.	English	Deliverable	https://trilateralresearch.co.uk/wp-content/uploads/2018/09/RECODE_D1-Stakeholder-values-and-ecosystems_Sept2013.pdf	General	policy recommendations	stakeholders	research data	case studies	
75	RECODE-Policy RECommendations for Open access to research Data in Europe D3.1: Legal and ethical issues in open access and data dissemination and preservation	2014	Trilateral Research & Consulting, University of Sheffield, Royal Netherlands Academy of Arts and Sciences and Amsterdam University Press		UK, the Netherlands etc.	English	Deliverable	https://trilateralresearch.co.uk/wp-content/uploads/2018/09/D3.1-legal-and-ethical-issues-FINAL.pdf	General	legal and ethical issues	data dissemination	data preservation	data protection	
76	OpenTransportNet - Spatially Referenced Data Hubs for Innovation in the Transport Sector	2017				English	Final report	https://cordis.europa.eu/docs/projects/cnect/3/620533/080/reports/001-OTNFinalReportv11.pdf	Transport	open data	data visualisation	data harmonisation	Linked Open Data.	
77	The relationships between university IP regimes, scientists' motivations and their engagement with research commercialisation in Europe	2017		European Journal of Law and Technology	UK	English	Journal Article	IP regimes vs. scientists' motivations (EJLT, 2017) .pdf	General	intellectual property regimes	individual motivation	research commercialisation	patents	spin-offs
78	Improving journeys by opening data: The case of transport for London	2017	Stone M. & Aravopoulou E.	Emerald	UK	English	Journal Article	https://www.researchgate.net/publication/322536163_Improving_journeys_by_opening_data_The_case_of_Transport_for_London_TfL	Transport	big data	open data	approach	applications	
79	Analysing Transportation Data with Open Source Big Data Analytic Tools	2017	Beeharry Y.,Fowdur T. P., Hurbungs V., Bassoo V.,Ramnarain-Seetohul V.	International Journal on Electrical Engineering and Informatics	Indonesia	English	Journal Article	https://www.researchgate.net/publication/317368854_Analysing_Transportation_Data_with_Open_Source_Big_Data_Analytic_Tools	Transport	big data	open source	analytic tools		
80	Fostering Open Science at Fraunhofer	2019	Kusters & Klages	Elsevier	Global	English	Journal Article	https://www.researchgate.net/publication/328956378_Fostering_Open_Science_at_Fraunhofer	General	open science infrastructure	open data	open access	case study	
81	The role of CRIS's in the research life cycle. A case study on implementing a FAIR RDM policy at Radboud University, the Netherlands	2019	Jetten, Simons, Rijnders	Elsevier	Global	English	Journal Article	https://www.sciencedirect.com/science/article/pii/S187705091930095X	General	open research data	research information system architecture	data life cycle	archiving data	
82	Next generation Institutional repositories: The case of the CUT Institutional Repository KTISIS	2019	Zervas, Kounoudes, Artemi, Giannoulakis	Elsevier	Global	English	Journal Article	https://dspacecris.eurocris.org/handle/11366/641	General	research information system	next generation repositories	scholarly publications		

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										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
83	An Open Source Modeling Framework for Interdependent Energy-Transportation-Communication Infrastructure in Smart and Connected Communities	2019	Lu X., Hinkelman K., Fu Y., Wang J., Zuo W., Zhang Q., Saad W.	IEEE Access		English	Journal Article	https://ieeexplore.ieee.org/document/8700176/	General	interconnected systems	Modelling	object-oriented methods	Open source software	
84	Applications of Knowledge Discovery in Massive Transportation Data: The Development of a Transportation Research Informatics Platform (TRIP)	2019	Majka K., Nagler E., James A., Blatt A., Pierowicz J., Anastasopoulos P., Fountas G.	DOT National Transportation Integrated Search - ROSA P		English	Journal Article	https://trid.trb.org/view/1577767	Transportation	big data	informatics	analytics	safety	
88	Open science challenges, benefits and tips in early career and beyond	2019	Allen C. , Mehler D.	Public Library of Science		English	Journal Article	http://dx.plos.org/10.1371/journal.pbio.3000246	General	early career researchers	challenges	benefits		
94	Open-source VRPLite Package for Vehicle Routing with Pickup and Delivery: A Path Finding Engine for Scheduled Transportation Systems	2018	Zhou X.,Tong L., Mahmoudi M.	Springer Berlin Heidelberg		English	Journal Article	http://link.springer.com/10.1007/s40864-018-0083-7	Transportation	open source	vehicle routing	network modelling		
95	The Open Energy Modelling Framework (oemof) - A new approach to facilitate open science in energy system modelling	2018	Hilpert S., Kaldemeyer C., Krien U.	Energy Strategy Reviews		English	Journal Article	https://linkinghub.elsevier.com/retrieve/pii/S2211467X18300609	General	energy system modeling	collaborative development	decision support	optimization	
96	Travel times and transfers in public transport: Comprehensive accessibility analysis based on Pareto-optimal journeys	2017	Kujala R., Weckström C., Mladenović M.	Computers, Environment and Urban Systems		English	Journal Article	https://linkinghub.elsevier.com/retrieve/pii/S0198971517300923	Transportation	transit	routing	temporal distance profile	temporal natwork	openstreetmap
97	Sustainable Urban Mobility Planning (SUMP) at subregional area level with the use of transportation model	2017	Karon G. & Krawczyk G.	yadda.icm.edu.pl	Poland	English	Journal Article	https://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-524373ae-3349-408c-ab01-2316da298f6b;jsessionid=7E8ECF4921295BB1B223C33B18ECC887	Transportation	sustainable transport	urban mobility planning	SUMP	transportation model	
98	An evaluation of train control information systems for sustainable railway using the analytic hierarchy process (AHP) model	2017	Krmac E. & Djordjević B.	European Transport Research Review		English	Journal Article	http://link.springer.com/10.1007/s12544-017-0253-9	Transportation	ICT	railway sustainability	train control information system	key performance themes	
99	High Speed Railway Hubs in European Medium-Sized Cities: The Case of the ENTER.HUB Network	2016	Terrin J.	The Open Transportation Journal		English	Journal Article	https://opentransportationjournal.com/VOLUME/10/PAGE/119/	Transportation	urban mobility	railway stations	hub	high speed railway	
100	Open Science Practices Adopted by Latin American Caribbean Open Access Journals	2018		Caribbean Open Access Journals	Canada	English	Journal Article	https://hal.archives-ouvertes.fr/hal-01800164/document	General	universities	roadmap	implementation		
101	Big data, open government and e-government: Issues, policies and recommendations	2014	Bertot J. C., Gorham U., Jaeger P. T., Sarin L. C., Choi H.	Information Polity	The Netherlands	English	Journal Article	Bertot-2014-Big data, open government and e-go						
102	The use of narrative text for injury surveillance research: A systematic review	2010	McKenzie K., Scott D. A., Campbell M. A., McClure R. J.	Accident Analysis and Prevention		English	Journal Article			narrative text	injury surveillance	text mining	Health data	zealand forest industry

a/a	Title	Issue Date	Author	Publisher	Country of Publisher	Language	Type	Link/File Name	Category 1	Keywords				
										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
103	What is being done with open government data? An exploratory analysis of public uses of New York City open data	2016	Okamoto K.	Webology		English	Journal Article	Okamoto,K - fd3041ccadaa7fd6872739bf64b5a01749						
104	Open Access Publishing, academic research and scholarly communication	2015	Osborne R.	Online Information Review	UK	English	Journal Article	https://www.emeraldinsight.com/doi/full/10.1108/OIR-03-2015-0083		transportation	design/methodology/approach	open access	Scholarly communication	Best practices
105	Smart Mobility Trends: Open Data and Other Tools	2018	Soriano F. R., Samper-Zapater J. J., Martinez-Dura J. J., Cirilo-Gimeno R. V., Plume J. M.	IEEE Intelligent Transportation Systems Magazine	USA	English	Journal Article	Soriano-2018-Smart Mobility Trends_ Open Data		engineering	transportation			
106	Experimental Implementation of Big Data Analytics for Traffic Incident Management [Project]					English	Journal Article			case studies	data analysis	data collection	Feasibility analysis	Traffic incidents
107	A Guide to Ensure Access to the Publications and Data of Federally Funded Transportation-Related Research [Project]					English	Journal Article			access	best practices	data files	Information dissemination	Data management
108	Open PFLOW: Creation and evaluation of an open dataset for typical people mass movement in urban areas	2017	Kashiyama T., Pang Y. B., Sekimoto Y.	Transportation Research Part C-Emerging Technologies	UK	English	Journal Article	Kashiyama		Public Participation GIS (PPGIS)	data visualization	Urban simulation	Open data	Attitude formation
109	Spatial coverage index for assessing national and regional transportation infrastructures	2016	Magalhaes M. T.	Journal of Transport Geography	UK	English	Journal Article			transportation system spatial coverage	spatial indicators	infrastructure and service spatial coverage	GIS	National and regional
110	Open traffic data for future service innovation - Addressing the privacy challenges of driving data	2014	Rohunen A., Markkula J., Heikkilä M., Heikkilä J.	Journal of Theoretical and Applied Electronic Commerce Research	Chile	English	Journal Article	Rohunen-2014-Open traffic data for future serv						
111	Smart mobility trends: Open data and other tools	2018	Soriano F. R., Samper-Zapater J. J., Martinez-Dura J. J., Cirilo-Gimeno R. V., Martinez Plume J.	IEEE Intelligent Transportation Systems Magazine	USA	English	Journal Article			public administration	urban transportation	bluetooth sensors	Emerging technologies	Essential elements
112	Smart mobility trends: Open data and other tools (vol 10, pg 6, 2018)	2018	Zapater J. J. S.	IEEE Intelligent Transportation Systems Magazine	USA	English	Journal Article	Zapater-2018-Smart mobility trends_ Open data		engineering	transportation			
113	Open Science and its role in universities: A roadmap for cultural change	2018		League of European Research Universities	Belgium	English	Paper	LERU-AP24-Open-Science-full-paper.pdf	General	universities	FAIR data	education	recognition	
114	EOSC Declaration	2017		European Commission	Belgium	English	Policy Document	Eosc_declaration.pdf	General	EOSC	FAIR data	data services	architecture	governance
115	EOSC Declaration Action List	2017		European Commission	Belgium	English	Policy Document	Eosc_declaration-action_list.pdf	General	EOSC	actions	FAIR	data services	
116	European Cloud Initiative - Building a competitive data and knowledge economy in Europe	2016		European Commission	Belgium	English	Policy Document	EC Communication_European Cloud Initiative.pdf	General					
117	Draft Council conclusions on the European Open Science Cloud (EOSC) - Adoption	2018		Permanent Representatives Committee of EU Council	Belgium	English	Policy Document	Council conclusions on the European Open Science Cloud (EOSC).pdf	General	EOSC	implementation model	privacy	governance	
118	Council conclusions on "Accelerating knowledge circulation in the EU"	2018		General Secretariat of the EU Council	Belgium	English	Policy Document	Council conclusions on Accelerating knowledge circulation in the EU.pdf	General	EOSC	knowledge transfer	openness	dissemination	

a/a	Title	Issue Date	Author	Publisher	Country of Publisher	Language	Type	Link/File Name	Category 1	Keywords				
										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
119	Digitalisation in railway transport	2019	Scordamaglia D.	European Parliamentary Research Service (EPRS)	Belgium	English	Policy Document	http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635528/EPRS_BRI(2019)635528_EN.pdf	Rail transport	digitalisation	open data	approaches		
120	The Illinois Open Access to Articles Act	Current		State gov	USA	English	Policy Document	https://sparcopen.org/our-work/sb1900/	General	intellectual property regimes	policy	governance		
121	NY State Taxpayer Access to Publicly Funded Research Act	Current		State gov	USA	English	Policy Document	https://sparcopen.org/our-work/ny-tapfr/	General	intellectual property regimes	policy	governance		
122	The ARC Open Access Policy	2013		Australia Fed gov	Australia	English	Policy Document	https://www.arc.gov.au/policies-strategies/policy/arc-open-access-policy	General	data sharing	governance	research		
123	Canada's Commitment to Open Science	2018		Government	Canada	English	Policy Document	https://www.canada.ca/en/treasury-board-secretariat/services/access-information-privacy/canada-commitment-open-science.html	General	data sharing	governance	roadmap		
124	Recommendation on access to and preservation of Scientific Information	2018		European Commission		English	Policy Document	https://ec.europa.eu/digital-single-market/en/news/recommendation-access-and-preservation-scientific-information	General	data preservation	data access			
125	The case for the Cloud	2017		Science Business Publishing Ltd	Belgium	English	Report	The Case for the Cloud_Science Business.pdf	General	EOSC	SWOT analysis	research	industry	policy
126	Governing the European Open Science Cloud	2017		Science Business Publishing Ltd	Belgium	English	Report	Governing the European Open Science Cloud_Science Business.pdf	General	EOSC	governance	guiding principles	governing models	interoperability
127	IPR, Technology Transfer & Open Science	2017		European Commission	Luxembourg	English	Report	IPR, technology transfer & open science.pdf	General	IPR	privacy	governance	international standards	data infrastructure
128	Realising the European Open Science Cloud	2016		European Commission	Luxembourg	English	Report	Realising_the_european_open_science_cloud_HLEG Report_2016.pdf	General	EOSC	policy	governance	implementation	
129	The European Open Science Cloud: Who pays for what?	2018		Science Business Publishing Ltd	Belgium	English	Report	Who-pays-what-European-Open-Science-Cloud_Science Business.pdf	General	EOSC	costs	economic benefits	funds	
130	Open Data - The Researcer Perpective	2017		CWTS-Elsevier		English	Report	Open-data-report.pdf	General	data sharing	practices	attitudes	obstacles	
131	FACCE-JPI Workshop on Big Data	2017		Aalborg University Copenhagen	Denmark	English	Report	FACCE-JPI Big Data workshop Report_GB.docx	other	big data	FAIR data	roadmap		
132	Mobility 2030 – Data rules: Will anyone own data in the future?	2018		KPMG	UK	English	Report	mobility-2030-data-rules.pdf	Road Transport	data sharing	ownership	privacy	platform	
133	Analysis of the state of the art, barriers, needs and opportunities for setting up a transport research cloud	2018		European Commission	Luxembourg	English	Report	KI0318383ENN.en.pdf	General	cloud	data standards	data infrastructure	policy	training
134	Making open science a reality	2015		OECD	France	English	Report	https://www.oecd-ilibrary.org/docserver/5jrs2f963zs1-en.pdf?expires=1561124077&id=id&accname=guest&checksum=B874C1A2DB5DF2140803BC37F978114E	General	key actors	policy trends	rationales	policy messages	

a/a	Title	Issue Date	Author	Publisher	Country of Publisher	Language	Type	Link/File Name	Category 1	Keywords				
										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
135	Applications of Artificial Intelligence in Transport: An Overview	2019	Abduljabbar R., Dia H., Liyanage S., Bagloee S. A.	Multidisciplinary Digital Publishing Institute		English	Report	https://www.mdpi.com/2071-1050/11/1/189	Transportation	artificial intelligence	public transport	auto urban mobility	traffic management	
136	Towards Open Research Data in Poland	2016		Open Science Platform/University of Warsaw	Poland	English	Report	https://depot.ceon.pl/bitstream/handle/123456789/12489/Towards%20Open%20Research%20Data%20in%20Poland.pdf?sequence=1&isAllowed=y	General	research data	legal framework	Case studies		
137	Open access to scientific data and literature and the assessment of research by metrics	2014		ICSU Executive Board/International Council for Science	International	English	Report	http://www.pblcdsgn.de/	General	data sharing	practices	guiding principles		
138	Draft of Queensland 30 years vision	2018		Queennsland state	Australia	English	Report	http://www.queenslandplan.qld.gov.au/	General	big data	governance	guiding principles		
139	The European Data Market Monitoring Tool Report	2018		European Commission		English	Report	http://datalandscape.eu/sites/default/files/report/EDM_D2.2_First_Report_on_Policy_Conclusions_20.04.2018.pdf		data market	data companies			
140	Updating the European Data Market Study Monitoring Tool	2018		European Commission		English	Report	http://datalandscape.eu/sites/default/files/report/EDM_D2.1_1stReport_-FactsFigures_revised_21.03.2018.pdf	General	data market	data companies			
141	Opening Up Scientific Data For Innovation Story 2	2018		International Data Corporation (IDC) and the Lisbon Council		English	Report	http://datalandscape.eu/sites/default/files/report/Opening_Up_Scientific_Data_for_Innovation-Story_2_FinalNewFormat.pdf	General	data publication	scientific data re-use	IP		
142	Putting People on the Map: Protecting Confidentiality with Linked Social-Spatial Data	2007	National Research, Council			English	Report			confidentiality	data sharing	Geographic information systems	Geospatial data	Protection
143	FTA Open Data Policy Guidelines	2016	Catalá M., University of South Florida, Federal Transit/ Administration			English	Report	FTA_Report_No._0095		best practices	guidelines	open data	Policy	Transit operating agencies
144	Getting Started with Open Data: A Guide for Transportation Agencies	2012	Kaufman S. M. & New York University			English	Report	opendata		passenger information systems	data formats	data sharing	Open data	Benefits
145	The Evolving DOT Enterprise: Today Toward Tomorrow	2013	Miller D., Cambridge Systematics, Incorporated American Association of State, Highway Transportation, Officials National Cooperative Highway Research, Program			English	Report	The Evolving DOT Enterprise White Paper		case studies	communication	computer online services	Customer service	Information dissemination
146	Connected and automated vehicles (CAV): open data recommendations	2018	Somers A., Austroads	Austroads	Australia	English	Report	AustraliaDataSharingSept2018		automated vehicle control	data collection	systems analysis	Vehicle to infrastructure communications	Vehicle to vehicle communications

a/a	Title	Issue Date	Author	Publisher	Country of Publisher	Language	Type	Link/File Name	Category 1	Keywords				
										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
147	EU Transport Research & Innovation Status Assessment Report 2017: An overview based on the Transport Research and Innovation Monitoring and Information System (TRIMIS) database	2018	Tsakalidis A., Gkoumas K., Pekar F., Grosso M., Haq G., Marelli L., European Commission	European Commission	Belgium	English	Report	EU Transport Research & Innovation Status Asse		advanced traffic management systems	databases	electric vehicles	Europe	Intelligent transportation systems
148	Towards an integrated monitoring and assessment framework for the Strategic Transport Research and Innovation Agenda: using TRIMIS as a policy support mechanism: study	2018	Tsakalidis A., van Balen M., Gkoumas K., Grosso M., Haq G., Pekar F., European Commission	European Commission	Belgium	English	Report	KJNA29314ENN.en		advanced traffic management systems	alternate fuels	policy	Transport planning	Vehicle design
149	Action points for the public transport sector, The benefits of open data	2014	UITP, Advancing Public Transport	UITP, Advancing Public Transport	Belgium	English	Report							
150	The value of data for the public transport sector	2018	UITP, Advancing Public Transport	UITP, Advancing Public Transport	Belgium	English	Report							
151	Understanding the dynamics of open data: From sweeping statements to complex contextual interactions	2014	Meijer A., de Hoog J., van Twist M., van der Steen M., Scherpenisse J.			English	Serial	Meijer-2014-Understanding the dynamics of open						
152	Open Data: Challenges and Opportunities for Transit Agencies	2015	Schweiger C. L.			English	Serial	Open Data - Challenges and Opportunities for T/ Open Data - Challenges and Opportunities for 1/Open Data - Challenges and Opportunities for 2/ Open Data - Challenges and Opportunities for 3		case studies	customers	data analysis	Public transit	Quality of service
153	Implementation Roadmap for the European Open Science Cloud	2018		European Commission	Belgium	English	Staff Working Document	swd_2018_83_f1_staff_working_paper_en.pdf	General	EOSC	roadmap	implementation	FAIR	e-Infrastructure
154	Advancing Open Science in the EU and the US	2018		Wilson Centre	USA	English	Webcast	https://www.wilsoncenter.org/event/advancing-open-science-the-eu-and-the-us	General	universities	policy	governance		
155	OSCAR: Open ScienCe Aeronautic & Air Transport Research	2019	Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.v.(coordinator)		Germany	English	Website	https://trimis.ec.europa.eu/project/open-science-aeronautic-air-transport-research#tab-outline	Air transport	IPR protection				
156	OSSA-Open framework for Simulation of transport Strategies and Assessment	2000	Facultés Universitaires Notre-Dame de la Paix (coordinator)		Belgium	English	Website	https://trimis.ec.europa.eu/project/open-framework-simulation-transport-strategies-and-assessment#tab-outline	Transport	open framework	simulation	data collection	interconnectivity	
157	TIMON Enhanced real time services for an optimized multimodal mobility relying on cooperative networks and open data	2015	Universidad De La Iglesia De Deusto (coordinator)		Spain	English	Website	https://trimis.ec.europa.eu/project/enhanced-real-time-services-optimized-multimodal-mobility-relying-cooperative-networks-and#tab-outline	Road transport	open data sources	real-time information	cooperative open web based platform		
160	VIRTUAL-Open access virtual testing protocols for enhanced road users safety	2018	Statens Geotekniska Institut (coordinator)		Sweden	English	Website	https://trimis.ec.europa.eu/project/open-access-virtual-testing-protocols-enhanced-road-users-safety	Road Transport	open access tools	Open Source Virtual Testing (OpenVT)			
161	Open access in the United States	Current		Harvard	USA	English	Website	https://dash.harvard.edu/handle/1/4317666	General	universities	policy	research		
162	JST Policy on Open Access to Research Publications and Research	2017		Japan Science and Technology Agency	Japan	English	Website	https://www.jst.go.jp/EN/about/openscience/index.html	General	intellectual property	actions	guidelines		

a/a	Title	Issue Date	Author	Publisher	Country of Publisher	Language	Type	Link/File Name	Category 1	Keywords				
										Primary	Secondary-1	Secondary-2	Secondary-3	Secondary-4
	Data Management									regimes				
163	Implementation of a Geographic Information System with Big Data Environment on Common Data Model	2017	Sik D., Csorba K., Ekler P., IEEE	IEEE Intelligent Transportation Systems Magazine	USA	English	Book Section			GIS	geospatial	MapReduce	Big Data	Common Data Model

11 Annex II: Open Science Sources

a/a	Title	Type of source	Publisher	Link	Type of publications	Country of publisher	Language	Number of Articles	CiteScore
1	Alt.metrics	service		https://www.altmetric.com/	impact	USA	English		
2	Amnesia	service	Athena Research and Innovation Center/Open AIRE	https://amnesia.openaire.eu/	data anonymization	GR/EU	English		
3	Archives of Transport	journal	Warsaw University of Technology	http://www.archivesoftransport.com/?id=1	peer-reviewed papers	Poland	English, Polish	269	1,09
4	Australian Open Access stragegy group	Sydney	AOASG	https://aoasg.org.au/	advices database	Australia/New Zealand	English		
5	Aviation	journal	Vilnius Gediminas Technical University (VGTU) Press	https://journals.vgtu.lt/index.php/Aviation	peer-reviewed journals	Lithuania	English	Publication frequency 4 issues/year	CiteScore 2018 (Scopus) 1.13
6	BASE - Bielefeld Academic Search Engine	aggregator	University of Bielefeld	https://www.base-search.net/about/en/	OA publication records	DE/Global	English, all		
7	Canadian-Australian Partnership for Open Scholarship	Sydney/Ottawa		https://inke.ca/projects/canadian-australian-partnership-for-open-scholarship/	collaboration	Australia/Canada	English		
8	CatRIS	einfrastructure	EU consortium	https://project.catris.eu/	Research Infrastructure services	EU	English		
9	Center for Open Science	Website	Center for Open Science	https://cos.io/	website	USA	English		
10	COEMS — Continuous Observation of Embedded Multicore Systems	portal	EU Horizon 2020	https://www.coems.eu/		EU	English		
11	Connect Open Education Resources	Federal Gov	Scholarly Publishing and Academic Resources Coalition	https://sparcopen.org/our-work/connect-oer/	Platform	USA	English		
12	CORE	aggregator	Open University/JISC	https://core.ac.uk/	publications	UK	English		
13	CoreTrustSeal	certification service	The World Data System of the International Science Council (WDS) and the Data Seal of Approval (DSA)	https://www.coretrustseal.org/	certifiates	NL/Global	English		
14	Dados.gov	open data portal	Portuguese Public Administration	https://dados.gov.pt/pt/topics/transportes-e-infraestruturas/datasets	datasets	Portugal	Portuguese/English/Spanish/French	48 (concerning the transport sector)	
15	DART-EUROPE	aggregator	UCL/Liber	http://www.dart-europe.eu/basic-search.php	dissertations	UK/EU	all		
16	Data in Brief	journal	Elsevier	https://www.journals.elsevier.com/data-in-brief	data articles	Global	English		0,70
17	Data Science Journal	journal	Elsevier	http://www.datasciencejournal.org/	peer-reviewed papers	UK	English	537	1,25
18	DATACITE	identifier service	DataCite	https://datacite.org/	identifiers	UK/global	English		
19	DataONE	portal		https://www.dataone.org/organization	papers, data/metadata, journals, books	Global	English		
20	DataPortals.org	portal	Open Knowledge International	http://datacatalogs.org/about	databases, information systems	Germany	English		
21	Datos Científicos	Ministry		http://www.lareferencia.info/en/	repository	Argentina, Brazil, Chile, Colombia, Ecuador, México,Perú,Venezuela & El Salvador	spanish		
22	Directory of Open Access Books (DOAB)	directory	many publishers (# 316)	https://www.doabooks.org/doab?uiLanguage=en	books	Global	English, French, Italian, German, Norwegian, Spanish	about 18 thousand books	
23	DMP Online	DMP services	Digital Curation Center	https://dmponline.dcc.ac.uk/	services	UK	English		
24	DOAI	aggregator	CNRS	https://dissem.in/	publications	France	All		
25	DOAJ - Directory of OA Journals	registry	Community Based	https://doaj.org/	OA journal information	Sweden/Global	English		
26	EGI	eInfrastructure	EGI Foundation	https://www.egi.eu	computing	NL/EU	English, all		
27	einfraCentral	eInfrastructure	EU consortium	https://www.einfracentral.eu/home	eInfrastructure services	EU	English		
28	EOSC portal	web service	EU	www.eosc-portal.eu	services, data	EU	English		
29	EOSC-hub	eInfrastructure	EU consortium	https://www.eosc-hub.eu/	access to EOSC services	EU	English		
30	ePublishing (National Documentation Center)	portal	National Hellenic Research Foundation (EKT)	http://epublishing.ekt.gr/el/5128	peer reviewed papers, journals & books	Greece	Greek		
31	EUDAT	eInfrastructure	EUDAT CDI	https://eudat.eu/	data services	FI/EU	English, all		
32	European Fund for Strategic Investment (EFSI)	media repository	European Investment Bank (EIB)	https://www.eib.org/en/publications/all/index.htm	newsletters, reports	EU	English		
33	European Journal of Transport and Infrastructure Research	journal	Delft University of Technology	https://www.tudelft.nl/en/tpm/about-the-faculty/departments/engineering-systems-and-services/research/ejtir/	peer-reviewed papers	Netherlands	English	297	1,57
34	European Open Science Cloud (EOSC) hub	portal	EU Horizon 2020, EGI Foundation	https://www.eosc-hub.eu/about-us	magazines, technical papers, posters	EU	English	13	
35	European Transport - Trasporti Europei	journal	Universita degli Studi di Trieste / Gioradno Editore	http://www.istiee.unict.it/europeantransport/	peer-reviewed papers	Italy	English, Italian	202	0,24
36	European Transport Research Review	journal	Springer Nature	https://etrr.springeropen.com/	peer-reviewed papers	Global	English	357	2,40
37	FAIRsharing	registry	FAIRsharing is part of the ELIXIR infrastructure.	https://fairsharing.org/	standards, policies	UK	English		
38	FASTR: Fair Access to Science &	Federal Gov	Scholarly Publishing and Academic	https://sparcopen.org/our-work/fastr/	open sharing of research outputs and	USA	English		

a/a	Title	Type of source	Publisher	Link	Type of publications	Country of publisher	Language	Number of Articles	CiteScore
	Technology Research Act		Resources Coalition		educational materials				
39	FigShare	repository	Part of Digital Science Group	https://figshare.com	data, publications, software, other	UK	English/all		
40	FORCE11	initiative	Global consortium	https://www.force11.org/	recommendations, standards	Global	English		
41	FOSTER	learning	EU consortium	https://www.fosteropenscience.eu/	learning material	EU	English		
42	FOSTER (Fostering the practical implementation of Open Science in Horizon 2020 and beyond)	portal	EU Horizon 2020	https://www.fosteropenscience.eu/about	Training materials, reports, posters	EU	English		
43	FREYA	eInfrastructure	EU consortium	https://www.project-freya.eu/Plone/en	Persistent Identifiers	EU	English		
44	Geant	eInfrastructure	Geant Association	https://www.geant.org/	network, trust and identity	NL/EU	English, all		
45	GitHub	repository	Microsoft	https://help.github.com	software	USA	English		
46	GitLab	tool for software management	Gitlab Inc	https://about.gitlab.com/	software	Global	English		
47	GO FAIR	initiative	Go FAIR	https://www.go-fair.org/	services, training,	Global	English		
48	Google Scholar	search angine,	Google	scholar.google.com	authors, publications	USA	English		
49	Guide to Open Access publishing and Open Science	Website	De Gruyter Open Access	https://openscience.com/about/	Blog	USA	English		
50	HEAL-Link	observatory, portal		https://www.heal-link.gr/en/e-journals-by-discipline/#	peer reviewed papers, journals & books	Greece	Greek, English		
51	HITE publications	institution	Hellenic Institute of Transportation Engineers	http://www.ses.gr/index.php/vivliothiki/edeltia.html	newsletters, reports	Greece	Greek		
52	I4OC - Initiative for Open Citation	initiative		https://i4oc.org/	citations		English		
53	IATSS Research	journal	Elsevier	https://www.sciencedirect.com/journal/iatss-research	peer-reviewed papers	Global	English	265	1,91
54	IEEE Access	Journal	IEEE	https://ieeeaccess.ieee.org/?http://ieeeaccess.ieee.org/	General	Global	English		
55	International Journal of Transportation Engineering	Journal	Tarrahan Parseh Transportation Research Institute, Iran	http://www.ijte.ir/	transport related peer-reviewed journal	Global	English		
56	International Open Access Week: October 21-27, 2019	Federal Gov		http://www.openaccessweek.org/	event	usa	English		
57	IRUS-UK	service	Jisc	https://irus.jisc.ac.uk/	usage data	UK	English		
58	ITS Hellas	institution	ITS Hellas	https://www.its-hellas.gr/gr/projects/nationalprojects	projects, newsletters, reports	Greece	Greek		
59	Journal of Applied Engineering Science	journal	Institut za Istrazivanja I Projektovanja u Privredi	http://www.engineeringscience.rs/submit-an-article	peer-reviewed papers	Croatia	English	559	0,50
60	Journal of Sustainable Development of Transport and Logistics	Journal	Scientific Publishing House "SciView"	https://jsdtl.sciview.net/index.php/jsdtl/about	transport related peer-reviewed journal	Poland	English		
61	Journal of Traffic and Transportation Engineering	journal	Elsevier	https://www.sciencedirect.com/journal/journal-of-traffic-and-transportation-engineering-english-edition	peer-reviewed papers	Global	English	284	2,43
62	Journal of Transport and Land Use	Journal	University of Minnesota Center for Transportation Studies	https://jtlu.org/index.php/jtlu	transport related peer-reviewed journal	Global	English		
63	Knoema platform	portal	Knoema Corporation	https://knoema.com/about/us	databases, information systems	USA	English		
64	Latindex	Ministry		https://www.latindex.org/latindex/inicio	Indexing database	Mexico	spanish		
65	lens.org	aggregator and scholarly & innovation analysis tool	Cambia, an independent non-profit institute. The Lens is a joint initiative of Cambia and Queensland University of Technology.	https://www.lens.org/	publications, patents	Australia	English		
66	LIBER (Ligue des Bibliothèques Européennes de Recherche – Association of European Research Libraries)	portal	EU Horizon 2020	https://libereurope.eu/about-us/	papers,data/metadata, journals, books	Netherlands	English		
67	Lisboa Aberta	open data portal	Câmara Municipal de Lisboa (Lisbon City Council)	http://lisboaaberta.cm-lisboa.pt/index.php/pt/	datasets	Portugal	Portuguese	32 (concerning the transport sector: "Mobilidade")	
68	Make Data Count	standard	DataCite - DataOne - CDL	https://makedatacount.org/	data citations	Global	English		
69	Microsoft Academic Graph	service	Microsoft	https://www.microsoft.com/en-us/research/project/microsoft-academic-graph/	Graph/search	USA	English/all		
70	National System of Open Access to Knowledge (SNAAC)	Website		http://190.242.114.6:8080/web/guest/inicio	repository	Colombia	Spanish		
71	Open Access Button	service	The Open Access Button is currently funded by Arcadia – a charitable fund of Lisbet Rausing and Peter Baldwin.		publciations	EU	English		
72	Open Access, A2K & Scholarly Communication: Open Research/Open Science	University of Johannesburg		https://libguides.wits.ac.za/openaccess_a2k_scholarly_communication/OpenResearch_OpenScience	Indexing database	South Africa	English		
73	Open Citations	service		https://opencitations.net/	citations	UK	English		
74	Open Information Science	journal	De Gruyter		peer-reviewed papers	Poland	English	487	6,90

a/a	Title	Type of source	Publisher	Link	Type of publications	Country of publisher	Language	Number of Articles	CiteScore
75	Open Science and innovation	Ottawa	Canadian Science Policy centre	http://sciencepolicy.ca/open-science-and-innovation	event	Canada	english		
76	Open Science in Japan	Tokyo		https://openscience.jp/	event	Japan	english/japanese		
77	Open Science MOOC	learning	Volunteer initiative	https://opensciencemooc.eu/	cources	EU	English		
78	Open Transportation Journal	journal	Bentham Open	https://benthamopen.com/TOTJ/home/	peer-reviewed papers	Global	English	72	0,69
79	OpenAIRE	einfrastructure	OpenAIRE AMKE	www.openaire.eu	publications, data, software, funding information	GR/EU	English, all		
80	OpenAIRE Usage Analytcis	service	OpenAIRE AMKE	http://catalogue.openaire.eu/service/openaire.openaire_usage_statistics	usage data	EU	English		
81	OpenAPCs	database	University of Bielefeld	https://github.com/OpenAPC/openapc-de	APC prices	DE/Global	English		
82	Open-DAI (Opening Data Architectures and Infrastructures of European Public Administrations)	portal	Competitiveness and Innovation Framework Programme (CIP)	http://open-dai.eu/	databases, information systems, cloud infrastructure	EU	English		
83	OpenDMP	DMP services	Open AIRE/EUDAT	opendmp.openaire.eu	services	EU	English		
84	OpenDOAR - Directory of OA repositories	registry	JISC	http://www.opendoar.org/	institutional OA repository information	UK	English		
85	ORCID	identifier service	ORCID	https://orcid.org/	identifiers	USA	English		
86	OSF - Open Science Framework	repository/collaborative workspace	Center of Open Science - https://cos.io/	https://osf.io/	publications, data, projects, meetings, regirstrations	USA	English/all		
87	Portal for Italian scholarly e-literature in open archives and institutional repositories	portal	many publishers	http://find.openarchives.it/info#english	articles and books	Global	English, French, Italian, German, Norwegian, Spanish and others	more than 3.330.000 indexed items	
88	PRACE	eInfrastructure	PRACE alsbl	http://www.prace-ri.eu/	access to HPC	BE/EU	English, all		
89	Public Administration and Information Technology	books	Springer	https://link.springer.com/chapter/10.1007/978-3-030-14446-3_1	peer-reviewed journals and books	Spain	English		
90	Publons	service	Clarivate	https://publons.com/	impact (reviews and citation metrics)	Australia/UK	Enfglish		
91	re3data	registry		https://www.re3data.org/search	data repositories informationo	DE/Global	English		
92	Recherche - Transports - Securite	journal	Editions NecPlus	https://rts.revuesonline.com/accueil.jsp	peer-reviewed papers	France	French	201	0,09
93	Redalyc	Ministry		http://www.redalyc.org/home.oa	Indexing database	Mexico	spanish		
94	Research Data Alliance	global alliance	Global	www.rd-alliance.org	standards/recommendations for data interoperability	Global	English		
95	Research Data Alliance (RDA)	portal, forum	EC	https://rd-alliance.org/about-rda	articles, newsletters, publications	EU	English	29	
96	Right to Research Coalition	Federal Gov	Scholarly Publishing and Academic Resources Coalition	Right to Research Coalition	Platform	USA	English		
97	RoarMap	registry	University of Southampton.	https://roarmap.eprints.org/	institutinal and funder OA policies	UK	English		
98	Royal Society Open Science		Royal Society	https://royalsocietypublishing.org/journal/rsos	peer-reviewed journals and books	Australia	English		
99	Schema.org	vocabulary	Google/	https://schema.org/	interoperability	Global	English		
100	Scholix	portal		http://www.scholix.org/about	papers, magazines, journals, books	Global	English		
101	Science Impact	journal	Impact	https://link.springer.com/chapter/10.1007/978-3-030-14446-3_1	peer-reviewed journals and books	UK	English		
102	Scientific Electronic Library Online	Website		https://scielo.org/en/	Online Library	LA&C countries + Portugal, Spain & South Africa	Spanish & english		
103	SHERPA Services: Juliet	registry	JISC	http://v2.sherpa.ac.uk/juliet/	funder policies for OA and archiving	UK	English		
104	SHERPA Services: Romeo	registry	JISC	http://sherpa.ac.uk/romeo/index.php	publisher copyright policies	UK	English		
105	Software Heritage	repository	INRIA	https://www.softwareheritage.org/	software	France	English		
106	Software Package Data Exchange - SPDX	registry		https://spdx.org/licenses/	open source licences				
107	Springer Open	Publisher	Springer	https://www.springeropen.com/p/engineering/transportation-journals	transport related peer-reviewed journals	Global	English		
108	Sydney Open Research Network	Sydney		https://sydneyopenresearch.org/	advices database	Australia	English		
109	The Baltic Journal of Road and Bridge Engineering	journal	Riga Technical University (RTU) Press	https://bjrbe-journals.rtu.lv/	peer-reviewed journals	Latvia	English	Journal has been founded in 2006. Publication frequency 4 issues/year	CiteScore (Scopus) 2018: 0,85. Journal Impact Factor (Clarivate Analytics) 2017: 0,622
110	The Journal of Advanced Transportation	Journal	Hindawi	https://www.hindawi.com/journals/jat/	transport related peer-reviewed journal	UK	English		
111	The open transport journal	Journal	BENTHAM Open	https://opentransportationjournal.com/about-the-journal.php	articles	United Arab Emirates	English		
112	Transactions on Maritime Science	journal	Faculty of Maritime Studies	https://www.toms.com.hr/index.php/toms/about	peer-reviewed papers	Croatia	English	57	0,20
113	Transport	journal	Vilnius Gediminas Technical University (VGTU) Press	https://journals.vgtu.lt/index.php/Transport	peer-reviewed journals	Lithuania	English	Publication frequency 4 issues/year	CiteScore (Scopus) 2018: 1,78. Journal Impact Factor (Clarivate Analytics) 2017: 1,267
114	Transport Policy	Journal	Elsevier	https://www.elsevier.com/journals/transport-policy/0967-070x/open-access-options	transport related peer-reviewed journal	Global	English		
115	Transport Research and Innovation	portal	EU Horizon 2020	https://trimis.ec.europa.eu/	reports, technical papers, posters	EU	English	12	

a/a	Title	Type of source	Publisher	Link	Type of publications	Country of publisher	Language	Number of Articles	CiteScore
	Monitoring and Information System (TRIMIS)								
116	Transportation Research Procedia	Journal	Elsevier	https://www.sciencedirect.com/journal/transportation-research-procedia	transport related peer-reviewed journal	Global	English		
117	Transpose	database	consortium	https://transpose-publishing.github.io/#/	journal policies	EU	English		
118	Ubiquity Press	publisher	Ubiquity Press	https://www.ubiquitypress.com/	peer-reviewed journals and books	UK	English		
119	Unpaywall	aggregator	Impactstory	http://unpaywall.org/	publications	USA	All		
120	Urban Rail Transit	journal	Springer Nature	https://www.springer.com/engineering/mechanical+engineering/journal/40864	peer-reviewed papers	Global	English	91	1,57
121	Urban Science — Open Access Journal	Journal	MDPI	https://www.mdpi.com/journal/urbansci	articles	Switzerland	English		
122	Urban, Planning & Transport Research	Journal	Taylor and Francis	https://www.tandfonline.com/toc/rupt20/current	Urban, planning and transport research	Global	English		
123	zenodo	repository	CERN/OpenAIRE	https://zenodo.org/	all reserch outcomes	CH/EU	English/all		
124	Thessaloniki's Intelligent Urban Mobility Management System	portal	Region of Central Macedonia Hellenic Institute of Transport Municipality of Thessaloniki Thessaloniki's Integrated Transport Authority National Athens Observatory Norwegian Institute of Transport Economics	http://www.mobithess.gr/	GIS data, Traffic data	Greece	Greek		
125	Risk Data Portal of the Thessaloniki's Municipality	portal	Thessaloniki Urban Resiliency Initiative in cooperation with the World Bank - developed with the technical support of the Open Knowledge Foundation of Greece and EOFarm P.C.	http://riskdata.thessaloniki.gr/search/?limit=100&offset=0&category__identifier__in=transportation	GIS data	Greece	Greek		