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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.

The deliverable D2.4 (Governance and operational models) is produced within Work Package 2 (Mapping of existing Open Science sources in transport) of the BE OPEN project under Task 2.4. The purpose of this deliverable is to study the variety of Open Science activities done in different countries to find the main barriers and suggest best practice methods for EOSC and the transport research community working with open science. The activities were accomplished through interviews and desk research.

Interviews with different stakeholders (government, funders, data owners) and document studies where done in Norway, Belgium and Greece, and also interviews with some of the main transport research organisations in Europe where included to get their perspective on Open Science as well. Based on the interviews with the different stakeholders and document reviews, twelve (12) main topics were identified as important in order to promote Open Science in transport research:

- Knowledge and awareness
- GDPR and data ownership
- Competitiveness
- Cost and time
- Broad generation of data outside research
- Standardization and quality
- Openness vs. National/local sustainability
- Security
- Open publication and Coalition S (alliance of 11 EU countries agreeing to openly publish research from public funds)
- Practical expectations for the cloud
- Marketing
- Common vocabulary

The broad generation of data outside transport research institutes needs to be taken into consideration when making a governance model for Open Science in transport. Both technology platforms (different types of data producers/owners), research organizations and public authorities within road, rail, maritime, air and multimodal transport should give input to the executive board working with EOSC board in order to make Open Science a reality.



1 Introduction

1.1 Purpose of the document

Mapping governance and operational models in three different countries, this document identifies barriers to **data sharing** among researchers and data producers in the transport sector and some barriers related to open access publishing. Based on the challenges and opportunities facing EOSC and other open-science initiatives, policy advice is provided that can help establishing functional business models for data sharing across Europe.

1.2 Methodology

In this task case studies in Norway, Belgium and Greece have been examined to explore how governance structures in the different countries may give us insight into possible barriers for Open Science, and especially open data. These countries are chosen as cases based on two criteria: first, the cases represent different European regions, thereby ensuring some variation on dimensions of possible interest (e.g., wealth, bureaucratic traditions). Hence, the cases represent one Nordic country, one in Central Europe, and one in South Europe. Second, taking advantage of the project's already established network in the mentioned countries would ensure a relatively rapid process of data collection. In more detail,

- Norway is an interesting case because it is part of Coalition S, and it was the first country in Europe that managed to get an agreement of publishing openly in the major publishing houses without additional costs. Coalition S is an alliance of 11 European countries that from 2020 have agreed that all research from public grants must be published in Open Access journals.
- Belgium appears to have the highest distribution of documents by country of publisher of Open Access publications and it is placed in the second position at a global basis just after USA as presented in the deliverable 2.1 of the BE OPEN project (BE OPEN, 2019).
- In Greece, Athena Research and Innovation Centre supports actively the OpenAIRE initiative, which is a pan European infrastructure for open knowledge, a pillar to the European Open Science Cloud (EOSC). It was established a Legal Entity, in October 2018 and it has the legal form of a Non-Profit Partnership (NPP) incorporated under the provisions of Greek Law (articles 741 onwards of the Greek Civil Code) and Law No 4072/2012.

The case studies were based on interviews and documents studies (e.g., strategy and policy documents) with main funders in the respective countries, main data owners and providers (e.g., public transport companies) and important government entities. This would ensure a broad view on issues related to Open Science, how different stakeholders work with Open Science, and ensure a complementary perspective from the institute survey done in task 2.2. All of the interviews were semi-structured interviews based on the interview guides in the annex. Some questions where not relevant in all types of organizations and therefore the information gathered from different countries may differ depending on what type of organizations where interviewed.

In addition to interviewing stakeholders in three countries, interviews with three European transport organizations (NGO) was conducted to map their perspective on Open Science. An interview guide was



formed with open-end questions which was circulated amongst the participating organisations. The questions were grouped into Open Science-related and EOSC-related. Upon the sharing of the interview guide, an interview was set up, either to be conducted online with the presence of at least one representative of the organisation in question (EATEO), or the interview guide would be returned in written form for further analysis (ECTRI and FEHRL). See annex I for details about questions in the guide.

In Norway, the Ministry of Transport, The Norwegian Research Council and Ruter (the largest public transport company) were interviewed. In Belgium, STIB/MIVB (public transport company) and Belgian National Open Access Desk were interviewed and in Greece, the National Open Access Desk and Athena Research and Innovation Centre were interviewed. EATEO, FEHRL and ECTRI were chosen as representatives of the European transport research organisations covering different transport modes as described in the following table 1. They are also members of the BEOPEN project and this would ensure a rapid process of data collection and also that the organizations have knowledge and interest in the subject. TØI has covered the first case of Norway, UITP has covered the Belgian case and CERTH has covered the Greek case. Konnect-able was responsible for the European Transport Research Organizations. TØI and CERTH has both contributed to the general analysis and concluding remarks based on input from the other chapters.

EATEO	Mode of transport: Air
	Common forum for European aviation training and aviation education providers
	25 members from EU and US countries
FEHRL Mode of transport: Road	
	National research and technical institutes from across Europe
	31 member associates from non-European countries provide FEHRL with strong links
	to the considerable research capacity available globally (i.e. NETIVEI from Israel, CSIR
	from South Africa, TFHRC-FHWA from USA, ARRB from Australia)
ECTRI	Mode of transport: Multimodal
	Foremost research institutes and universities active in transport
	27 institutes/universities from 20 different countries

Overall, a top down approach (Scheme 1) is proposed in an attempt to define the different dimensions of OS in transport research based on the different OS initiatives that exist at a European level. Studying the several aspects and issues within different countries and end users, key findings for EOSC implementation about transport research are summarized and corresponding governance and operational/business models are proposed.

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Scheme 1: Top-down methodology approach



2 Case study: Norway

2.1 Open Science in Norway

Norway's main funder for research is The Research Council of Norway (RCN), which is a national strategic and funding agency for basic and industry-oriented research. RCN seeks to lead the way in making research "as open as possible and as closed as necessary". Open Science has been on the political agenda in Norway for more than ten years, but there has been a lack of a consistency on the field. The Norwegian focus is that publicly funded research should benefit the society and in white paper no. 20 (2008-2009) Norway joined OECD principles for access of publicly financed research data. In 2017, the government announced a goal of making all publicly financed scientific papers openly accessible by 2024.

The Research Council of Norway policy on Open Science covers both **open publishing**, **open data**, **open innovation**, **open infrastructure**, as well as **citizen science** and **user involvement**. There is considerable variance between these open-science fields regarding openness and the strength of the policies aiming at increasing openness.

The Research Council of Norway is a Coalition S member, and has implemented policies accordingly. Hence, much has been done to promote Open Publication in Norway. A common repository for Open publications is created for Norwegian research by UNIT - the Norwegian Directorate for ICT and Joint Services in Higher Education & Research. The repository can be found on https://www.unit.no/vitenarkiv-i-bragekonsortiet and for example, it is possible to find open versions of scientific articles from TØI (<u>https://toi.brage.unit.no/toi-xmlui/?locale-attribute=en</u>). Open publication has received considerable long-standing attention from policy makers and bureaucrats alike, and was already mentioned in a white paper in 2004. There are also economic incentives in publications that may have increased the speed of implementation: STIM-OA is an incentive where the research council covers 50 % of the APC (Article Processing Charge) for publications made in gold OA journals registered in the Directory of Open Access Journals (DOAJ). This incentive is going to last until 2022, then it will be part of indirect institute costs. On the other end of the spectrum, Open Innovation is one of the areas that lags somewhat behind.

Open Data is an area that has had a lot of focus in recent years, but it is more difficult to standardize compared to publication. This difference is due to the many field-specific challenges related to data sharing. According to the Research Council there is a need for guidelines concerning how to handle data and where to store them, and institutes need people that work with this specifically. Since 2018 the Research Council has required that projects have a data management plan, but none of the projects where this has been a requirement have finished yet. Hence, the effects of this requirement cannot yet be assessed. There are no current requirements concerning *where* data shall be stored, and it is important to get to know the different infrastructures available (i.e. databases for storing) – which would be important input to EOSC.

Moreover, citizen science is also further behind, which can maybe be explained by the fact that it is not universally relevant across all research fields and therefore receives less attention.





Figure 2: Overall maturity level segmentation – Norway (European Data Portal 2019).

The European Data Portal (2019) has made an analysis of the maturity level on Open Science in different European countries. Norway is listed as a "follower" in this analysis (see fig. 1). And as we can see in fig. 2 Norway is better than the average on policy framework, awareness, data provision and currency and completeness (quality). According to the Research Council of Norway, the most important step to increase the use of open data is to increase the **capacity of infrastructure** and to **standardize practices**. They have a soft policy strategy before making requirements. However, in the fields of Open publication and Open data there are some demands already established:

- Since 2000: requirement on archiving data in a proper way for a minimum of 10 years
- Since 2009: requirement on open access to scientific articles based on research funded by NRC. Following NFR's participation in Coalition S, these requirements will become stricter. In May 2019, the guidelines for open publishing in compliance with Coalition S were announced. In essence, publication in compliance with Coalition S can be achieved in three ways: Either publishing in an open journal, publish in a journal covered by one of the so-called transformative agreements, or to publish the findings separately in an archive if published in a closed journal.
- Since 2018: requirement on data management plan in all funded projects
- From 2021: requirement on open publishing in relation to Coalition S



There are no domestic requirements regarding the license restrictions imposed by the research institutes that are sharing their data. Therefore, it is possible to share quite restrictively. It is also up to the research institutes to choose what data they think is relevant to share. To avoid individual researchers "thinking that they own their data", The Research Council of Norway states the importance that the institutes take a lead in having good internal procedures to change the culture. In terms of competiveness on the institute level, there seems to be a different culture between fields of research. Where climate research, that has a long-standing culture for sharing and using data, does not have the same attitudes towards competitiveness as some other fields. In terms of competitiveness it is possible to have an embargo period (which indeed is in force today), where data is shared after a certain amount of time. When it comes to GDPR, many institutes are more afraid of this than they actually should be, probably because of the very high cost of not following the GDPR.

The Norwegian Ministry of Local Government and Modernization announced in December 2019 that they were preparing a white paper on the <u>data-driven economy and innovation</u>. Upon the announcement, the Minister listed several topics that the white paper would consider, including how data sharing may be incentivized. Echoing other actors' optimism concerning the potential benefits of openness, the minister stressed the need to make sure that Norway can harvest some of the rapidly increasing value of data, stating: "I <u>think that one precondition is that both the public and private sectors share more data than they do today</u>".¹



EU28 Average X% Norway

Figure 3: Performance of Norway (European Data Portal 2019).

2.1.1 Open Science in transport

The Ministry of Transport allocates funds to the Norwegian Research Council and gives input on how they want the funding to be spent, but they don't give funding directly to researchers. The Ministry of Education has formulated and presented <u>a strategy for access to and sharing</u> of research data, but there is not a separate policy for transport research. However, the guidelines from the Ministry of Education are also applicable to transport research data. The Ministry of Transport thinks it is

¹ Our translation from Norwegian.



important to not have any field-specific policies for openness in transport research, and rather have common guidelines across fields.

The Ministry of Transport has 16 subordinated entities (agencies and subordinated enterprises), i.e. The Norwegian Public Roads Administration, Norwegian Railway Directorate, Avinor AS (Airport company), Entur AS (fare and data sharing company), BaneNOR AS (railway infrastructure company) that produce a lot of transport data. The Ministry of Transport has developed a strategy aiming for all public data being made accessible and re-usable in machine-readable format. The Ministry's possibility to govern varies between the different subordinated entities. While the Ministry can give specific instructions to its subordinated agencies, it can only express expectations towards the subordinated enterprises (AS). Public transportation companies at regional level are owned by the counties and cannot be instructed by the government at central level with regard to making public data open and re-usable for external parties.

Today, some of the subordinated agencies and enterprises have resources and action plans in place for making data open and re-usable, while others haven't developed strategies and allocated resources for this task. For the subordinated companies, a certain amount of their data cannot be disclosed as they contain competition-sensitive data.

One exception is Entur AS, as sharing data is one of the core tasks of the company. The data that the agencies and enterprises produce can mostly be found on their webpages; however, there are also some national services that provide data:

- <u>www.data.norge.no</u> (Ministry of Transport underlying agencies/enterprises use for sharing data, only contains metadata and link to where the dataset can be found, follows the European standard for sharing data descriptions DCAT-AP)
- <u>www.geonorge.no</u> (national website for geographical and map data)
- <u>www.barentswatch.no</u> (surveillance and information system from Nordic ocean and coastal areas, administered by the Coastal Administration).

In February 2019, the EU announced an agreement introducing new rules concerning re-use of publicsector information (PSI), including transport data. These rules may have implications for actors in the transport sector. Because of Norway's membership in the European Economic Area (EEA), such rules are applicable to Norwegian actors. The new rules extend the scope of rules concerning re-use of PSI to include public undertakings in transport and utilities. These rules will likely be applicable to public transport agencies (PTAs), thereby potentially affecting a large share of Norway's transport sector. In essence, these rules imply that if public undertakings in the transport sector decide to release data, they must do so on a basis of non-discrimination. A recent report from an expert group appointed by the Ministry of Transport (Ekspertutvalget, 2019) stressed the fact that the future transport sector will be more data driven, which again will lead to more possibilities when it comes to analyzing, planning, optimizing processes etc. According to the expert group, there is a need to strengthen authorities' ability to manage the increasing volumes of data. The expert group advises the Ministry of Transport's underlying entities to give high priority to making public data open and accessible. They have also concluded that there is a need to look at how data management is organized and evaluate the datamanagement practices of private actors in the transport industry. According to the expert group, several countries require private actors to deliver data when given license to operate in the transport sector. This should also be considered in Norway. It is also mentioned that data management is essential to get better innovation and development.

2.1.1.1 SAGA

SAGA is the National Public Road administrations attempt to create a common database. The vision is to make "The administration to a more data driven organisation". The Road Administration has large amount of data but has identified four problems; data are stored in silos, bad format, no analysis between "silos" are made and API's are not always perceived as positive by users. The prediction is that in the future it will be more sensors with more data that need to communicate more often with each other.

Improve availability of transport data Assess and evaluate data quality	Data «Pipelines»	Data catalogue Metadata and tags Tables, analysis, shared projects Access control
Toolbox for effective data analysis Exploration Production	Data governance Access Control, Security, phasing out	Demonstrating innovative product oriented working methods

Figure 4: Parts of the SAGA database (from PM by Lars Meisingseth).

The SAGA database is under construction and is going to function as a cloud system online with available dataset for end-users. In the Data governance section (see fig. 3), the plan (as we understand it) is to certify different organisations to different levels of data protection, where it will be open access for some users, while other users that may use data for competitive purposes do not get access to the data. As discussed in the section below it can possible, if legal, be used to distinguish the accessibility of data between different actors as research institutes, corporations and global actors.

2.2 Data policies in Norway's largest PTA: The case of Ruter

Serving the capital Oslo and surrounding areas, Ruter (<u>www.ruter.no</u>) is the largest public transport agency (PTA) in Norway. Owned by the city of Oslo (60 percent) and Viken county (40 percent), Ruter plans, procures and markets public transport services in Oslo and the area previously known as Akershus.² Ruter's services are provided by under-contract operators. Bus and ferry contracts are procured through competitive tendering. Tram and metro is procured directly from a municipality-owned company. Totaling nearly 400 million annual journeys in 2018, travel volumes have been

² As part of a country-wide administrative reform, Akershus, Buskerud, and Østfold counties merged January 1st 2020. The new county was named Viken.



steadily increasing over time. Hence, the volume of data gathered and managed by Ruter is considerable. Given the abovementioned characteristics, Ruter is one of the most interesting non-academic institutions in the transport sector to interview about data policies.

Being owned by a city and a county, Ruter provides and develops services aiming at realizing goals set through relevant democratic processes. Importantly, Oslo's local political system is a parliamentary one, implying that Oslo is run by a City Government that answers to the City Council. Being consistent with the present City Government's urban development policies, Ruter's vision is to create "sustainable freedom of movement".³

Ruter's general data-sharing policy as of today is to make available what they are obliged to, but nothing more. That implies sharing travel schedules and real-time arrival/departure data, for instance through the national access point (NAP), <u>Entur</u>. Ruter's main reasons for not having a more liberal data-sharing policy are fourfold: First, data sharing may imply empowering actors that provide services that conflict with politically agreed targets (e.g., targets for urban development, for instance reducing congestion and giving priority to pedestrians and cyclists). Second, and related to the first point, the actors mentioned in point one may turn data into profit without channeling any value back to the society from which they mined data (e.g., through taxation). Third, there are competitiveness issues related to data sharing. Finally, security concerns may suggest a conservative data-sharing policy.

Explaining the restrictions on data sharing, Ruter points out that they generate large amounts of data that can be used (by commercial actors) to create services that may conflict with politically agreed targets for urban development. Examples of such services include shared, dockless cars and electric kickbikes. One can, for instance, think of situations where person-movement real time data is used to maximize e-kickbikes' occupation of space in city centers. That would certainly not be consistent with the policies of the present City Government of Oslo, and likely not with the policies of most other cities as well.

Ruter points out that there may be large differences between income-maximizing companies and publicly-owned companies such as Ruter. While the former's interests may often deviate from that of the public, the latter can be used as a governance tool to create public value in accordance with politically agreed targets. This difference can be illustrated by the fact that Ruter are working to reduce the demand for the services it provides, for instance by rewarding walkers through their ticketing system. Ruter argues, however, that commercial actors often play important roles in the development of sustainable mobility, but that the companies must do so as part of an ecosystem of actors that carries out actions needed to realize politically agreed targets.

Second, some (but surely not all) of the commercial actors mentioned above are currently not subjected to domestic taxation. Hence, to the extent that they make profit using data gathered by public entities, they do so without channeling value back into the society that enabled their profit. Because of such and similar issues, Ruter has called for legal adjustments to ensure that data is used to create public value.

³ Author's translation from Norwegian. Original phrasing: «Bærekraftig bevegelsesfrihet.»

Concerning the third category of issues concerning data sharing, Ruter points out that they receive competition-sensitive data from numerous companies, for instance companies that participate in tendering processes. Hence, despite such tender-contract proposals would certainly be useful for researchers studying competition in the local bus market, such information cannot be shared.

Finally, concerning security issues, Ruter stresses that the interest of public security suggests restrictions on sharing data on the movements of large passenger groups and infrastructure.

Nonetheless, Ruter is positively inclined to share data with researchers, given that the purpose and the expected outcome of the research is not conflicting with the overarching targets that municipality politicians have set for Ruter and urban development in general. That data availability does not have to be on a case-to-case basis; hence, data can be made generally available for researchers under certain conditions. As of February 2020, Ruter has no explicit policy to make data FAIR. They do, however, expect that much of their data could easily be made consistent with FAIR standards. However, to the extent that such data modifications are costly, Ruter cannot be expected to carry that cost. Hence, Ruter would normally request that their costs of compliance with FAIR principles are covered by the user of their data, or by a data facility/infrastructure (e.g., EOSC or EOSC funders).

2.3 General knowledge of EOSC in Norway

Based on the interviews with transport actors and poster-presentation of BEOPEN at the Mobility conference in Norway (Norway's largest mobility conference) we got the impression that the general knowledge of the European Open Science Cloud among the Norwegian transport and research actors is mixed. Many have not heard about EOSC, and only the Research Council of Norway had specific expectations of what they should contribute to in relation to research:

- Easier to find available datasets.
- Possibility to do analysis in a safe environment.
- Standardization of metadata description across research fields of research
- Being a guider for how rules and regulations should be.

3 Case study: Belgium

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3.1 Open Science in Belgium

Belgium recognized at an early stage the importance of Open Access with the Berlin Declaration on Open Access signed in 2007 by many Belgian research organisations. The accessibility and verifiability of scientific research and data is also an issue addressed by the "Code of Ethics for Scientific Research in Belgium" which established general principles and standards of behaviour to which researchers are obliged to conform in all disciplines. Relevant examples of such principles are "the results from a research project should be published and/or made accessible to other researchers as soon as possible" and "the primary data of a research project and the protocols must be kept and made accessible during a determined and sufficient period of time. When publications, especially review and summary articles, do not contain all the necessary data for verification, the data should nevertheless be available." The code does not explicitly refer to specific laws and regulations in force; instead it is based on values shared by the researchers, thus reflecting the process set-up for its creation via the Learned Societies (DCC, 2019).

Since then, relevant steps have been taken to support Open Access as the default option in circulating the results of Belgian academic and scientific research, among them:

- 2007, creation of the Immediate Deposit and Optional Access mandate (ID/OA) at Université de Liège (ULg). This example was followed in 2009 by the Ghent University and in January 2013 by l'Université Catholique de Louvain, which adopted a similar model;
- 2012, Brussels Declaration on Open Access signed by the Belgian, Flemish and French Community ministers of research. This declaration commits the signatories to" investigating possibilities and new opportunities in the broad Open Access field, all in frequent collaboration with relevant stakeholders, considering Open Access to scientific publications a forerunner of new initiatives in the Open Data and Open Science areas".
- 2015, creation of Open Access Belgium, a working group of Open Knowledge Belgium, which is considered as the informal network of Open Access enthusiasts in the Belgian research organisations;
- 2018, an Open Access provision has been adopted in the Belgian law. This law gives authors the right to make scholarly publications available in open access if the publication is a result of research funded by public funds for at least 50%, with a maximum embargo period of 12 months. The law doesn't mentioned data specifically;
- 2019, the Flemish Government approved the Flemish Open Science policy plan and the Open Science Board emerged. This body aims at unifying the Flemish stakeholders in a shared vision for the future with regard to Open Science and EOSC, and, supported by technical working groups, advising the policy on steps to be taken to fully integrate Flanders into the international Open Science landscape. Together with the Flemish Open Science Board, Flanders will invest €5 million on a recurring basis in Open Science to give substance to their European commitment. The aim is to reach 100% OA and make data sharing the default (with opt outs).



Figure 5: Overall maturity level segmentation – Belgium (European Data Portal 2019).

Today more than 15 Belgian research organisations have Open Access policies in place and the research system can count on a vast network of, mostly institutional, open access repositories.

Belgium is considered to be on stage 2, followers, in the maturity level segmentation (see fig. 4), and Belgium scores higher than average on portal usage, data provision, awareness and several of the quality measures (see fig. 5).

According to OpenAIRE (<u>https://www.openaire.eu/item/belgium)</u>, in Belgium about 350,000 OA publications are available (reference year 2018); full-text contents include doctoral and master theses, journal articles, conference papers, reports, books and book chapters. The number of Open Access publications in university repositories is steadily increasing and a relevant increase in this trend can be observed since 2014.

In Belgium, repositories are not centralized. At present almost all universities and major university colleges run Open Access repositories, more than 34 according to OpenDOAR. However, 4 repositories account for more than 58% of the total number of publications, namely:

- Open Repository and Bibliography, University of Liege;
- Ghent university Academic Bibliography;
- Lirias;
- Sygma.



As extensively explained on OpenAIRE, the governance of the Belgian research system reflects the federal structure of the country, which consists of a federal, Belgian, government and a Flemish and French Community government. It is important to note that there is no overarching national research council in Belgium. The three main governmental funders are BELSPO (federal), FRS-FNRS (French Community) and FWO (Flanders). All three have Open Access policies in place.

BELSPO requires depositing of publications in an Open Access repository under an 'immediate deposit - optional access' mandate at the moment. The BELSPO Open Research Data policy complies with FAIR principles and its conception is to be considered fully within the EOSC framework. Since December 2019, a new Open Research Data mandate is available on the BELSPO website. The mandate's key information is summarised in the following:

- It applies to digital data, collected or created within the scope of research projects entirely or partially funded by BELSPO. It relates to data needed to validate results in scientific publications but also to other curated and/or raw data specified in the Data Management Plan (DPM);
- Data sets will be linked to the scientific publication they underpin and which have either been deposited in, or linked to Orfeo, BELSPO's central Open Access Repository for publications;
- Data must be provided in a format and under terms that permit full redistribution and full reuse of the data;
- Grant applicants are required to provide a DMP, in case they will use, re-use and/or generate data. A BELSPO template for the DMP is available. BELSPO expects a provisional DMP upon submission of the grant application, and a completed DMP no later than 6 months after the start date of the project. After the end of the project data should be deposited in a certified and trusted data repository.

According to the general regulation of the Research Foundation-Flanders (**FWO**), it is mandatory to make publications resulting from FWO funded research publicly available in a repository after maximum 1 year.

- Open Access 'Gold' is optional, for which the FWO funded researchers can make use of the consumables or bench fees that are part of their funding. The main host institutions, i.e. the Flemish universities, have repositories in place to facilitate this measure.
- To stimulate exchange of good practices and expertise a working group on research data management has been established within the Flemish Interuniversity Council (VLIR).

The **F.R.S.-FNRS** has issued a regulation on the implementation of the policy of Open Access to scientific publications resulting from research programmes supported by the F.R.S.-FNRS and Associated Funds, which is in force since 30/06/2013.





EU28 Average X % Belgium



The point of view of the Belgian National Open Access Desk

Ghent University is National Open Access Desk for Belgium (NOAD) and part of the network of 34 OpenAIRE NOADs in Europe. Their goal is to develop capacity at a local level, in order to put in place the relevant support structures for open science practice. Overall, they constitute a network of experts well placed to align Open Science policies from European to local institutional level and to act as key contact points for open science in their countries.

"Facilitating open knowledge creation" is the motto of Ghent University Library. This says already a lot about the commitment of this research institution towards Open Science (OS).

Since the early 2000s the Library and the whole University have been very active in open access to publications, open data and OS-related themes, also thanks to the involvement in EU-funded projects like openaire (FP7-H2020) and its predecessor DRIVER (FP6-FP7) that deployed - among other achievements - the core technical infrastructure behind the OpenAIRE system. It is worth mentioning that Ghent University has also contributed to the evolution of digital repositories and in particular to the creation of the Open Archives Initiative Protocol for repository interoperability, thanks to the work of staff members.

In terms of policies, since 2009 Ghent University has adopted the Immediate Deposit / Optional Access (ID/OA) mandate, as many other universities in Belgium (e.g. Université de Liège). Ghent University adopted a policy on RDM⁴ in September 2016; to support this policy the University has recently established (Fall 2019) a small team of professional data managers committed to support research data management. The team has a threefold function: (i) raise awareness, inform, train and advise about RDM, (ii) contribute to infrastructure-related tasks/projects, esp. regarding Library RDM infrastructure and (iii) monitor and contribute to institutional & (inter)national RDM policy & strategy.

⁴ RDM policy: <u>https://www.ugent.be/en/research/datamanagement/policies/ghent-university.htm</u>

In Belgium, specific incentive schemes to stimulate open science have not been implemented. Providing support to researchers is the way the Belgian universities have mainly chosen to **stimulate** open access publishing and data sharing. Making incentives and rewards schemes for open science available is an area which need further efforts and, among others, the Flemish Open Science Board which emerged in 2019 will most probably provide insights on this.

Another critical point is how to make EOSC fully operational for all the Belgian research bodies. On one hand, there is the challenge of interoperability of data sets and data infrastructures among different disciplines. Protocols and standards (e.g. metadata standards) are needed to facilitate this process. However, there is quite some difference between disciplines to allow easily data exchanges and circulation. On the other hand, awareness needs to be built about the opportunities offered by EOSC. Effective data infrastructures already exist. Research bodies and institutions need to find convenient to connect to a wider platform and share data in a fully inter-disciplinary environment.

There is the need to create a new, open science oriented, culture and discipline among researchers, where excellent science is automatically open, in the sense that it is transparent, reproducible and FAIR. This is certainly one of the main barriers for introducing open science practices throughout the research cycle, in the concept of "as open as possible as closed as necessary", together with current research assessment practices, that are still too much focused on publications and their focus on impact factors and citations. Other challenges are GDPR limitations, costs and efforts needed for data management and preservation as well as the impact on the organisations' competitiveness. Creating a dedicated data team in all research institutions, as already done by the Ghent University, could support this process which will certainly require time and efforts.

The current system in which the output of scientific research is evaluated is an important barrier as well. Journal-based metrics, like the journal impact factor, are frequently used as the parameters to compare the scientific output of researchers and institutions. This habit has generated a business for the most prestigious journals which is now difficult to adapt to Open Science. This situation is expected to change and new open access journals have been emerging in the last years either as a mirror of already well-known and established journals (which is not a good practice) or as completely new comers. Moreover, more innovative open publishing platforms emerge, like the open publishing platform of the European Commission. This is a very fluid situation.

In this context, Ghent University since 2008 has changed the evaluation process for professors, with less emphasis on the traditional system based on number of publications and journal impact factors. This is fully in line with the San Francisco Declaration on Research Assessment⁵, already signed by more than 1,900 organisations.

Overall, the door to Open Science is widely open even though not yet fully operational.

⁵ <u>https://sfdora.org/read/</u>

3.2 Open Data in Public Transport

Data is widely recognised as the fuel for innovation. To make the most of the digital revolution and stay competitive, public transport stakeholders are becoming or they need to evolve into data-enabled businesses and develop a clear data strategy.

Data sharing and analytics can (i) improve cost-efficiency of already-existing mobility services, (ii) help developing new mobility services which are monetised (create new business models) and (iii) develop services more personalised and eventually reach new customers segments.



Figure 7: Overview of Open Data in Public Transport (UITP, 2014).

Many public transport operators (PTO) and public transport authorities (PTA) are now routinely providing data sets that enable application developers to provide new information services for mobile devices with multiple advantages for the actors involved (fig. 6). The public can quickly obtain a variety of applications and multi-modal information, often free of charge, to guide them in the use of public transport; they can choose the tools that most suit their personal needs and 'personalise' information even when using mass transit with millions of others. This 'personalisation' helps increase customer satisfaction and enhance the reputation of mobility service by allowing them to present a more 'human' face. Also, this can be seen as increased transparency by fare and tax payers, politicians and others who analyse their performance.

This approach clearly can stimulate innovation and jobs in the technology sector and can help further develop the concept of "Smart Cities" where social and environmental factors are demanding a more integrated approach to data and urban transport provision.

As an example, the Open Data feeds of Transport for London, which over 5,000 developers have registered to use free of charge, has produced hundreds of apps on all platforms, used by millions of



people and covering roads and all modes of public transport including buses, metro, cycle hire and many more⁶.

Open Data can be used to great benefit key areas for better mobility services and new trends which have been impacting urban mobility in the last years, among them: Mobility as a Service (MaaS), journey planners and customer relationship management, predictive maintenance as well as the increased need for safety and security. However, it is well-known that enabling the best used of data raises a number of challenges, namely:

- Diversity of standards and formats in the public transport world.
- Different local, national and international regulatory frameworks impacting the exchange and release of data. This applies to the exchange between public transport operators and authorities but also for the sharing between the transport sector and other sectors.
- Privacy and the need to protect personal data collected e.g. by the operators.
- Data cost. From its raw form, data needs to be shaped, processed and interpreted to either provide added value or be used in the decision-making process. Storage, maintaining, ensuring data quality as well security and privacy implies a cost as well. The question of the responsibility for bearing this cost, and/or for sharing it needs to be addressed and considered when data is sold or exchange.
- Data ownership is a key issue in the debate regarding data-sharing and the exactitude and reliability of data.

Finally, public transport organisations are facing today an increasing competition of new stakeholders of the digital market. Opening all data may lead to strategic and eventually commercial drawbacks. A governance framework for open data needs to be defined through which public transport operators and authorities can disseminate your data and at the same time preserve data which are key for their own business model (e.g. commercial data, expertise, industrial know-how).

Return of experience from STIB/MIVB

STIB/MIVB (SOCIETE DES TRANSPORTS INTERCOMMUNAUX DE BRUXELLES) is an entity under public law charged by the Brussels-Capital Region with organizing the operation of public transport on its territory. In 2018 STIB/MIVB operated 417,6 Million of trips with a fleet of 1,162 vehicles (bus, tram, metro) on 82 lines (source: <u>http://2018.stib-activityreports.brussels/fr</u>).

Sharing data is a complex matter for the STIB/MIVB because this implies sharing data with private competitors without any reciprocity. Also, the competitors don't have the same goals as they have as a public transport operator and a public company. STIB/MIVB main goal is the satisfaction of their users and this process might cause losing the direct link with them to the profit of private companies that focus more on profitability.

To limit the infrastructure costs needed for data sharing (budget that could be used to improve services and users' satisfaction), the company has a policy of limiting the access to their data currently available

⁶ UITP (2014), Action Points - The Benefits of Open Data.



via <u>https://opendata.stib-mivb.be/store/</u>. Practically, this means that each user must authenticate in the platform and GTFS (General Transit Feed Specification) can be accessed once a minute. Real time data can be accessed 20 times per minute. This incentivizes the developers to use the operator's APIs responsively and might reduce the competition to the operator's app.

Regarding the use of data for research purposes, researchers have access to the STIB/MIVB Open Data platform and can access the same datasets available to everybody. Specific requests of more sensible data are treated case-by-case.

STIB/MIVB is currently in the process of enhancing its Open Data platform, mainly in term of the technology and the infrastructure behind it, with the objective of improving security, monitoring and the reporting processes. The users will still have the same limitations as today (e.g., the 20 calls per minute) but we will be able to propose paying tiers to consumers who want to exceed these limitations. The goal is limiting the costs while providing the best service they can.

In conclusion, STIB/MIVB points out that costs, competition from private operators with different goals and the risk to lose the direct contact with the users are the main barriers that prevent Open Data in transport in Belgium.

4 Case study: Greece

4.1 Open Science in Greece

Open Science has been heard more and more frequently in recent years as discussions and conditions within the European Union (EU) on openness, transparency and democracy in knowledge dissemination and research intensify. As an integral part of the Digital Single Market and the European Research Area, Open Science is found in the EU Member States' research infrastructure roadmaps and acts as a means of development locally and at a wider European level. In Greece, OS is at an early stage (Figure 7) and several discussions initiated on the creation of a national "openness" framework that covers the needs of the entire life cycle of scientific research. Even though law 4310/2014 supports Open Access to publicly funded research, Greece has not implemented a national policy yet (OpenAIRE, 2020) and recently, a Working Group has been established to support **General Secretariat of Research and Technology**⁷ of the **Ministry of Education and Religious Affairs**⁸ in order to develop a national strategy on Open Science aligned with the European Research Area (ERA) roadmap and other related documents and present potential involvement of potential stakeholders.



Figure 8: Overall maturity level segmentation – Greece (European Data Portal 2019).

⁷ http://www.gsrt.gr/central.aspx?sld=119I428I1089I323I488743

⁸ <u>https://www.minedu.gov.gr/</u>



Regarding institutional policies, the Technical University of Crete and the International Hellenic University have currently adopted an Open Access policy, following the 2012 COM ⁹on access to and preservation of scientific information. The background in infrastructure, know-how and human resources is strong in the Greek area (Figure 8) and could support this initiative. There are sufficient institutional repositories that could host the research and academic production of the country's Universities. Network services, cloud computing and tools have already been developed for data analysis and an extensive and integrated legislative framework has been defined for public open data, open access support initiatives and open educational resources at national level (e.g. HEAL-Link). Athena Research and Innovation Center supports the development and adoption of Open Access and Open Science policies in Greece and acts as the National Open Access Desk (NOAD) by engaging key national stakeholders with an ultimate goal of delivering a national Open Science concept.



EU28 Average X% Greece

Figure 9: Performance of Greece (European Data Portal 2019).

4.2 Main Infrastructure in Open Science

4.2.1 Initiatives of National Documentation Centre

The **National Documentation Centre** constitutes the national infrastructure which collects, organizes and preserves Greek scientific, research and cultural output (content and data) making it available for dissemination nationally and internationally. It provides wide-ranging information on the various research and innovation sectors, support participation in national and European programs, promote innovative entrepreneurship and the exploitation of research findings, and produce statistics & indicators¹⁰ for research, development and innovation in Greece. The National Documentation Centre developed the **National Information System for Research and Technology**¹¹ to provide advanced

⁹ <u>https://ec.europa.eu/research/science-society/document_library/pdf_06/recommendation-access-and-preservation-scientific-information_en.pdf</u>

¹⁰ <u>https://metrics.ekt.gr/en</u>

¹¹ <u>http://www.epset.gr/en</u>

electronic services in the world of research and innovation, foster open access to knowledge and ensure access to users regardless of time and location.

4.2.2 National Search Portals

- The National Documentation Centre has participated in the **OpenArchives.gr** project which aims to develop the largest portal providing a single point of access to Greek scientific digital content of high quality. Content providers are 59¹² academic and research institutions, archives, libraries and scientific societies from Greece and Cyprus.
- The **OpenAccess.gr** has been also developed and supported by the National Documentation Centre in order to provide information on international and national developments in the area of Open Access.
- The **MedOANet.eu** addresses the necessity for coordinated strategies and policies in Open Access to scientific information in Europe. It aims to enhance existing policies, strategies and structures for Open Access and contributes towards the implementation of new ones in six Mediterranean countries: Greece, Turkey, Italy, France, Spain, and Portugal. The National Documentation Centre is the representative partner of the Greek area collaborating with the other Mediterranean countries.
- The **SearchCulture.gr** has been developed by the National Documentation Centre in an attempt to ensure the sustainability and reusability of content produced by publicly funded digitization projects, to provide central access to digital cultural resources.
- The Geodata.gov.gr provides geospatial data and services for Greece serving as a national open data catalogue. It has been developed in the context of EU-funded project PublicaMundi and maintained by IMIS/Athena RC¹³. This is a spatial data infrastructure that enables Open Geospatial Consortium services, interactive maps and data APIs utilizing open data.

4.3 Research Data Management Infrastructures

 HELIX initiative is funded by the OPERATIONAL PROGRAMME 'COMPETITIVENESS AND ENTREPRENEURSHIP' Programme and aims to develop the national eInfrastructure in support of data-intensive research, handling the data management, analysis, sharing, and reuse needs of Greek scientists, researchers and innovators in a cross-disciplinary, scalable, and low-cost manner. HELIX is a joint effort of Athena Research & Innovation Center and GRNET ¹⁴(National Infrastructures for Research and Technology). HELIX is the only horizontal eInfrastructure of the National Roadmap for Research Infrastructures and is powered exclusively by open source software. The system is deployed over the national Okeanos-Knossos ¹⁵ cloud computing infrastructure and exposes the national HPC infrastructure ERMIS¹⁶. All provided publications are harvested from OpenAIRE as well as national and institutional Open Access repositories.

¹² <u>https://www.openarchives.gr/aggregator-openarchives/portal/institutions</u>

¹³ <u>http://www.imsi.athenarc.gr/</u>

¹⁴ GRNET - National Infrastructures for Research and Technology (<u>https://grnet.gr/en/</u>) promotes Greece's Digital Transformation Goals and is responsible to leverage the educational and research activity and to provide networking and cloud computing services to academic and research institutions, to educational bodies at all levels, and to agencies of the public, broader public and private sector.

¹⁵ <u>https://okeanos-knossos.grnet.gr/home/</u>

¹⁶ <u>https://hpc.grnet.gr/en/</u>



- SCHOLIX aims to establish a high-level interoperability framework for exchanging information about the links between scholarly literature and data. It is a technical solution to wholesale information aggregation and supported by several organizations including OpenAIRE. In Greece, SCHOLIX will assist in the enhancement of repository metadata activities and through OpenAIRE, it will guide proper repository management and monitoring of data usage through the repository table service.
- The EA/AAK (Free Software / Open Source Software)¹⁷ has been founded in 2008 and it is supported by 31 Universities, Research Centers and public benefit organizations. It aims to contribute to openness and in particular to the promotion and development of Open Standards, Free Software, Open Content, Open Data and Open Architecture Technologies in the field of education, public sector, business and social economy in Greece as well as to become a knowledge center and a platform for open technologies.
- NI4OS is funded by the European Commission under the Horizon 2020 program and aims to be a core contributor to the European Open Science Cloud (EOSC) service portfolio, and aims to ensure inclusiveness on the European level for enabling global Open Science. It provides a training platform¹⁸ about Open Science supporting the regional ICT and science sector by preventing brain drain. Athena Research & Innovation Center and GRNET participate from Greece to this EU-funded initiative with the aim to empower the regional scientific and research community.
- ELIXIR-GR initiative brings together Research Infrastructures of the Greek National Roadmap¹⁹ including GRNET, Athena Research & Innovation Center and Centre for Research and Technology Hellas. It is the Greek National Node of the ESFRI European RI ELIXIR which focuses on the construction of a sustainable European infrastructure for biological information. ELIXIR-GR is funded by the EU Structural and Investment Funds and aims to supports life-science research and offers a catalogue of tools, services and benchmarks, ensuring best practices as well as sustainability and interoperability with other biological and medical science infrastructures.
- The Greek **RDA** Node is managed by Athena Research & Innovation Center and aims to interact with researchers and innovators in the local language, offering them a platform for exchange of information pertinent to the RDA and their activities and in strict compliance with RDA's guiding principles of Openness, Transparency, Consensus-based, Community driven, Harmonization and Non-profit. Figure 9 presents the different sectors participating in the Greek RDA and it is reasonable that Academia/Research constitute the majority of the members as RDA is an important source of knowledge on a variety of research data issues.

¹⁷ https://ellak.gr/

¹⁸ <u>https://training.ni4os.eu/</u>

¹⁹ http://www.gsrt.gr/News/Files/New987/road-map-web_version_final.pdf





Figure 10: RDA members in Greece Source: EU RDA Growth (2020).

4.4 OpenAIRE, the National Perspective

The main focus of **OpenAIRE²⁰ in Greece** is to support stakeholders in their Open Science activities by transferring knowledge and experience in order to align national initiatives with EU goals. As such, OpenAIRE establishes strong collaborations with key national stakeholders as well as work with policymakers, funders and research performing organisations. OpenAIRE provides guidance, tools and policies through workshops and webinars enhancing EOSC initiative and formulating the national OS strategy and policy framework based on each country's needs and in line with EU directions.

4.5 Open Science in Transport in Greece

Open Science in Transport Research requires precisely defined data, adjusted incentives and necessary training to researchers in order to use OS databases. Data collection standards, metadata, infrastructure and functional requirements should also be defined in order to ensure an appropriate level of service which (Yannis et al., 2019). In Greece, Open Science in Transport is mainly used for public transport services (i.e. OASA²¹ provides real-time information for buses and trolleys in Athens) and OpenAIRE utilizing tools like NI4OS and RDA could provide proper training for enhancing their use. Moreover, EOSC could provide services for disseminating knowledge and sharing research data. Transport researchers in Greece should understand the opportunity of EOSC that could provide not only a detailed service catalogue but also data protection and observation policies.

4.6 Solutions to possible barriers in Greece

• Financial

Financial barriers could arise in many different contexts and affect the quality of innovation activities in OS. In an attempt to address this constraint, a dedicated project is planned and

²⁰ <u>https://www.athenarc.gr/en/openaire-greece</u>

²¹ <u>http://telematics.oasa.gr/en/#main</u>



funded by an **NSRF grant** with the aim to monitor how open data are re-used for public bodies. Long-term stability and unrestricted re-use of open data should be provided for advancing researchers and citizens initiatives.

• Awareness

In Greece, the **Department of Transparency & Open Data** is officially responsible for raising awareness about Open Access and open data based on the law 4310/2014. It aims to inform decentralised areas in Greece and it also focuses on schools in order to enhance culture in OS by informing both teachers and students. In addition, it offers awareness to public organisations in order to inform and incentivise them to open the datasets they own. Training could also support specialized awareness (i.e. GDPR, data management etc.) and several meetings and training sessions are organized. The main training operators in Greece are Athena Research & Innovation Center, Hellenic Academic Libraries Link – HEALLink, Greek Open Technologies Alliance (GFOSS), The Greek portal for open access, University of Patras Library and Open Knowledge Greece.

4.7 Input to EOSC

EOSC promotes openness, transparency and democracy in the dissemination of knowledge and aims to contribute to the Innovation Union²² strategy which exploits research results and generates new products that lead to GDP growth and job creation. In Greece, Athena Research & Innovation Center is a leading participant in the Open Access and Open Science – **OpenAIRE** which is one of the EOSC pillars covering policy, training and services at a national, institutional and international. Moreover, the EOSC-hub project creates the integration and management system of the future EOSC that delivers a catalogue of services, software and data from the EGI Federation, EUDAT CDI, INDIGO-DataCloud and major research e-infrastructures. EOSC-hub aims to support scientific discovery and collaboration across disciplinary and geographical boundaries. It will work on service integration, training and engagement in an attempt to ensure EOSC implementation. **GRNET** participates in EOSC-hub project²³ and it is the advanced network, cloud and IT eInfrastructure and services provider for the Greek Educational, Academic and Research community.

4.8 Funding

The Hellenic Foundation for Research and Innovation (HFRI)²⁴ supports the actions of General Secretariat of Research and Technology in order to foster OS in Greece by funding researchers under the "Diversity, inequalities and social inclusion" programme in which Open Access will be provided to the derived outcomes. Requirements in Open Access and open data similar to H2020 are expected to future calls. Similar funding resources are provided by other regional programmes such as the OPERATIONAL PROGRAMME 'COMPETITIVENESS AND ENTREPRENEURSHIP'²⁵.

²²<u>https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/innovation-union_en</u>

²³ <u>https://www.eosc-hub.eu/</u>

²⁴ http://www.elidek.gr/en/homepage/

²⁵ <u>http://www.antagonistikotita.gr/english/</u>



5 European Transport research organizations

5.1 Introduction

After showcasing the OS initiatives in Norway, Belgium and Greece, in this chapter we are exploring the adaptability of those initiatives within European Transport research organisations.

5.2 **EATEO**

E OPEN

EATEO is the European Association of Aviation Training and Education Organizations. It aspires to be the European voice for driving the best aviation training and education practices and to provide a common forum for its Members, enabling them to contribute to aviation safety and other fields of civil aviation, to defend their common interests in European as well as international fora and to support them in their efforts as regards promotion of their training activities and the securing of new business.

The creation of EATEO, is the collective result of an initiative that began by certain training organisations, Universities and other experts, and with the encouragement and support of certain European Institutions.

The reasons that led to the initiative, is the realization that, in contrast with other parts of aviation, no Organisation representing collectively the European training providers and the relevant Educational Establishments existed in Europe. This constituted a deficiency, which has been recognized by ICAO, ECAC and other European Institutions, as well as by the training industry itself.

5.3 FEHRL

FEHRL - the Forum of European National Highway Research Laboratories - is an international association comprising over thirty national research and technical institutes, including members throughout the EU members states, EFTA countries and Eastern European countries, but also, Israel and the USA.

FEHRL is governed by a General Assembly (FGA) from whom a President and Vice-President(s) are elected to serve for three years. The Board meets at least twice a year to conduct FEHRL business and to ensure that the objectives are being vigorously pursued.

FEHRL's mission is to promote and facilitate collaboration on road research and provide high-quality information and advice on technologies and policies related to roads, with staff from the national institutes providing the technical input for all projects. FEHRL's objectives are, through the specification and delivery of research to:

- Provide scientific input to European and national government policy on highway engineering and road transport matters;
- Create and maintain an efficient and safe road and infrastructure network;
- Increase innovation in road and infrastructure construction and related industries;
- Improve the energy efficiency of road and infrastructure engineering and operations;
- Protect the environment and improve the quality of life.



5.4 **ECTRI**

The European Conference of Transport Research Institutes (ECTRI) is an international non-profit association that was founded in April 2003 by 15 national transport research institutes and universities of 13 European countries, as a non-profit association registered in France and governed by French law. It is the first attempt to unite the forces of the foremost multimodal transport research centres across Europe and to thereby promote the excellence of European transport research.

Today, it includes 27 major transport research institutes or universities from 19 European countries. Together, they account for more than 4,000 European scientific and research staff in the field of transport.

ECTRI as the leading European research association for sustainable and multimodal mobility is committed to provide the scientifically based competence, knowledge and advice to move towards a green, safe, efficient, and inclusive transport for people and goods.

ECTRI is pushing for green, safe, efficient and inclusive transport for people and goods by:

- Promoting transport research and enhancing its scientific quality and effectiveness
- Providing independent, evidence-based advice to decision makers in Europe
- Incorporating and representing the foremost European transport research institutes and universities

5.5 Analysis of OS in European Transport Research Organizations

In general, there is a shared aspiration of promoting Open Science protocols and procedures. Even though being an umbrella organisation might mean that there are no specific policies in place regarding OS, all three associations (EATEO, FEHRL and ECTRI) have been, in one way or another, enabling its members to become more "Open". EATEO believes that "through synergies achieved amongst actors and stakeholders within a specific sector, the outcome would be the one most beneficial for the entire sector". FEHRL's policy, which was defined since its creation, mentions that part of its mission is "to provide opportunities for identifying research priorities and to create a positive climate for cooperation". ECTRI has set strategic objectives such as "to disseminate research results" and is taking actions towards the realisation of that goal. Jointly approved frameworks and/or regulations are just an example of what could be achieved with the consensus of all actors within a sector.

In order to facilitate communication between the various members of each research organisation, meetings are being held on an annual or biannual basis with a thematic agenda that derives from current needs and identified gaps. Those meetings offer the opportunity to any interested member to express their concerns, problems, practises and ideas for enhancing their capabilities. Usually, the outcome of the meeting is summarised and presented in a white paper, which is also circulated to relative and relevant organisations, associations and authority bodies, informing them for what was discussed and agreed during the meeting. Reduction of cost in general and striking a balance between maintaining and enhancing the quality, safety and level of services provided, and maintaining, or even reducing, the costs of providing those services, are usually some common topics across the cases observed. These meetings are being organised so that important intelligence can be diffused across the heterogeneous organisations that serve as actors of the sector. This diffusion of information is on

its own promoting open science processes, as stakeholders will share and receive knowledge that could help all the involved actors.

Open publications are often found to be of poor quality and, at the moment, there is the feeling that it is not quite working ("Publications are of dubious quality", "Open publications should often get double-checked to validate their content", "open data are not necessarily validated, so they are simply not trusted to be used"). At least not in an optimal way, or in a way that stands to provide more benefits to the actors involved. However, it was generally agreed that the existing status of open publications should pose neither as an excuse nor as a barrier into pursuing, and hopefully achieving, openness in an intra-organisational level ("Openness in publication should not be tied with openness in an organisational level"). It seems easier for established journals to become more open rather than new journals emerging and offering open access to publications. However, the absence of the desired level of openness in publications is expected to cause new trends and business models to come to surface. Already, there are examples of "subscription-based scholarly journals which have converted to open access" as stated by ECTRI. FEHRL believes that "the new trend will come partly as a result of the younger generation coming into the scene, who are more open to the idea of sharing (in general)". Changes will occur incrementally, and those changes can be facilitated by the support of third parties/funders such as Industry, Governments and the EU so that "(it) eventually will progress to an open, transparent, and participatory process beyond the traditional academic 'paper'".

Even though GDPR has been admitted being one of the main barriers towards the adoption of OPENness and FAIRness in data, there is the feeling that the already open data available have not been exploited as much as possible. Further involvement would, most of the time, require evidence that would prove the benefit of sharing data openly. Therefore, it seems that higher levels of openness in data could be achieved either through a regulatory obligation, or by showcasing results that can stand as proof that open data policy has positive impact, could reduce duplicating research, save costs and have high Return of Investment (RoI) in general. Nevertheless, EATEO states that "there is a big amount of publicly available data regarding the aviation sector that seem to remain unused", and FEHRL that "there is a lot of data out there, but the main problem has always been about quality." suggesting accountability of the data owner as a way of improving data quality. On the same matter ECTRI adds that "(in order) to increase the use of open data, one would need to guarantee their quality" and "accuracy/quality, novelties, availability and cost of open data are major elements for increasing their use". Another identified issue is that, in many occasions, the open data available are not gathered in the first place with the scope of solving the particular problem that the researcher using this data is tackling, and therefore might not fit the needs of the task in hand.

In the observed cases it has been noticed that in spite of having a positive mentality and predisposition to making their data publicly available and share them openly, the choice of action is to make available only what they are obliged to and, in some cases, what they are certain that can have no negative impact on them, competitive-wise. FEHRL and ECTRI both make related publications available on their website and are heavily involved in research projects, whereas EATEO has a smaller involvement. However, all three associations are aiming at making their data OPEN, excluding, of course, personal and sensitive data. An example of the quantity of data publicly available is the one of several mobile applications which are showing in (near) real-time the air traffic worldwide, providing information such as airport of origin and destination, flight number, estimated time of arrival and type of aircraft among others.



More specifically:

- EATEO uses three pillars to increase the uptake of Open Science:
 - a. **Knowledge exchange** EATEO is organising a yearly summit with the participation of all member organisations and relevant stakeholders, where the agenda for discussion consists of issues that derive from the present needs of the member organisations and the Aviation sector as a whole.
 - b. **Publicly available data** EATEO and its member organisations are openly providing a majority of data concerning the Aviation sector, such as flight number, airport of departure/destination, flight status etc.
 - c. **Research trends and needs** Through synergies between Academia and Industry, EATEO aims at providing clearly identified research topics that match the sector's needs.
- FEHRL uses four pillars to increase the uptake of Open Science:
 - a. **Knowledge exchange** FEHRL organises two Research Coordinators' (RC) meetings every year. Each member organisation nominates a Research Coordinator to FEHRL who coordinates research activities within his/her organisation. The RC platform is used in knowledge exchange and has been instrumental in increasing open science (informing others of the work being done in each organization, avoiding duplication of research, bringing together researchers for joint work etc.)
 - b. **Exchange of testing facilities** FEHRL operates a Facilities database where soft and hard infrastructure for testing/research are collected. This has been in operation for many years and currently includes thousands of testing facilities from member organisations.
 - c. **Partner's database** This partner database was set up by FEHRL to facilitate the search for partners for collaborating on transport infrastructure and similar projects.
 - d. **People database** The aim of this database is to enable FEHRL members to search for and find experts with specific expertise in various fields of transport infrastructure.
- ECTRI uses three pillars to increase the uptake of Open Science
 - a. European Transport Research Review Journal ECTRI created and sponsors (since 2009) the European Transport Research Review (ETRR), an Open Access journal published by Springer and indexed by Thomson Reuters. The ETRR is a multidisciplinary scientific journal dedicated to transport and covering all fields of transport. Its aims are the publication of high-quality scientific papers, dissemination of new ideas and developments, publication of information papers, books and conference reviews. <u>https://etrr.springeropen.com/</u>
 - **b.** Catalogue of research capabilities and infrastructure As a service to its members, ECTRI keeps an updated (internal) catalogue of its members' research capabilities and infrastructures, to increase possible sharing and use within the ECTRI community.
 - c. **Participation in EC funded projects** As an umbrella organisation, ECTRI supports Open Science via the BE OPEN project in which they also are the dissemination leader. ECTRI also encourages its members and project coordinators to publish the result from their EC funded project research into ETRR.

Last, but definitely not least, it has been noticed that the majority of the workforce in the transport sector (the "on-site" personnel) have passed rigorous and lengthy - time-wise - training but have no



academic equivalent to show for their expertise. In the attempt to bridge the gap between academia and industry, the possibility of "translating" whatever certificates with ECTS (European Credit Transfer and Accumulation System) credits is being explored.

This would, of course, mean that academics would have to find a way and transform the training modules into course modules. It is expected that this could be one way of motivating the workforce to pursue academic progress which could result in researchers that are specifically oriented towards sector needs and augmented service provision from the employee's side.

In pursuance of a common front, where Academia and Industry are working together side-by-side, what is important is bringing the two worlds closer. Such an endeavour could be achieved by finding a "common language" to communicate in, as it has often been proven that both Academia and Industry are tackling the same issue in a way that is "incomprehensible" by the other, with one side having an approach evolving around the research of the issue whereas, the other side, has a more hands-on approaching trying to deal directly with the issue arose.

Concluding, what points out is the need for common synergies that will lead to common goals which, when achieved, will result in a positive impact. All cases observed are associations which, more or less, came into existence upon the conception of such a need. They aspire to be the glue that will hold together in one piece all heterogeneous actors on a specific field, bridging the gap between theory and practise, blending together the scientific with the industrial community, and producing, ultimately, beneficial results for everyone involved, more significantly for the public and society.

5.6 Input to EOSC

Some of the observed cases are more involved than others, but all have general knowledge about the European Open Science Cloud (EOSC). Listed in bulleted form are the expectations for further contribution in relation to research:

- Data sharing all parties should be made aware of the benefits linked to it.
- Secure and safe environment it is important the organisations involved feel that they transact in a secure environment.
- **Easy navigation** information (datasets) available have to be easy to find.
- **Availability of knowledge** either by promotion or by any other means would lead to the desired outcome, there should be a variety of knowledge available.
- **Standardisation** standardise the data structure, but also the processes involved.

As already mentioned, the aim to get the various stakeholders more aware and, ultimately, more involved in Open Science, research must be made, and concrete facts have to be presented that will showcase how someone could stand to benefit from engaging and assuming Open Science protocols. Especially when talking about the industrial community, showing someone a way that could be profitable for them is the most certain way to prompt them to action.



6 General analysis

6.1 Twelve key findings for EOSC

According to the findings in D2.2, the main barriers for producing open data are related to GDPR, cost/time and competitiveness of the organization. This is also the main barriers for sharing infrastructure. In this section we have discussed these problems further based on the findings of the case studies and interviews with the European Transport organizations. Problems and solutions related to GDPR, cost/time and competitiveness and nine other findings, related to Open Science, as depicted in figure 11, have been pointed out based on feedback from the interviews and document studies.

	 Knowledge and awareness
	 GDPR and data ownership
	Competitiveness
	Cost and time
	 Broad generation of data outside research
Key	 Standardisation and quality
findings	Openness Vs National/local sustainability
U	• Security
	Open publication and Coalition S.
	Practical expectations for the cloud
	Marketing
	Common vocabulary

Figure 11: Key findings for EOSC implementation about Transport Research

1. Knowledge and awareness. Our case studies suggest that it is up to the research institutes to choose what data they think is relevant to share. This might inhibit data sharing, as different researchers and different research fields might not have the knowledge on what other researchers find interesting. Data ownership is a key issue in the debate regarding data-sharing and the exactitude and reliability of data. To avoid individual researchers "thinking that they own their data" as we found to be the case in D2.1, The Norwegian Research Council state the importance that the institutes takes a lead in having good internal procedures to change this culture. In terms of knowledge and awareness there is also a need to train researchers on Open Science in general. In Greece, the **Department of Transparency & Open Data** is officially responsible for raising awareness about Open Access and open data. It aims to inform decentralised areas in Greece and it also focuses on schools in order to enhance culture in Open Science by informing both teachers and students. In addition, it offers awareness to public organisations in order to inform and incentivise them to open the datasets they own. Training could



also support specialized awareness (i.e. GDPR, data management etc.) and several meetings and training sessions are organized. This is a good governance example of how to focus increased knowledge on Open Science.

2. GDPR and data ownership. Even if an institute creates a culture of sharing data, a lot of institutes are more afraid of GDPR than they should be, probably because of the very high cost of not complying with the GDPR. When it comes to transport research, GDPR should not be as problematic as e.g. health research where data is much more sensitive. Given that some existing health-analysis platforms indeed have solved GDPR issues, these issues should be solvable in large parts of transport research as well. However, as pointed out in interviews with transport research organizations, some case-by-case GDPR interpretation issues remain, suggesting that there is a need for GDPR education among transportation researchers.

3. Competitiveness. In terms of competiveness on the institute level there seems to be some cultural variations across fields of research. Climate research has a long-standing culture for sharing and using data, but climate research is also not possible with local data only. In the transport sector a lot of the data comes from companies that are not willing to share data openly to everyone due to competitive advantages, and also a lot of data collected by institutes on their own can be used as a competitive advantage to gain new projects. Interviews with the transport organizations mention that Return of Investment (RoI) is often seen as a threat to make data open, as there seems to be more possibilities for a competitor to gain advantage rather than the organisation benefiting somehow from making some of their data open. As mentioned in the Belgium case a governance framework for open data needs to be defined through which public transport operators (PTO) and public transport authorities (PTA) can disseminate their data and at the same time preserve data which are key for their own business model (e.g. commercial data, expertise, industrial know-how). Also, public companies may be willing to share data with researchers, but the recently announced EU rules concerning nondiscriminatory data sharing seem to imply that should a public undertaking such as Ruter (the Norwegian PTO) or STIB/MIVB (the Belgian PTO) decide to share specific data for research, they cannot discriminate between research institutions and commercial actors. A potential consequence is increased lock-in of data, because it could prompt Ruter or STIB/MIVB to implement even stricter datasharing policies. If this indeed proves to be the case, there are good reasons to revisit the rules in order to strike a better balance between the interests of scientific research and commercial actors.

4. Cost and time. Cost and time were also mentioned in D2.2 as problematic in terms of sharing. This was also mentioned in the case studies from both public transport companies producing a lot of transport data. From its raw form, data needs to be shaped, processed and interpreted to either provide added value or be used in the decision-making process. Storage, maintaining, ensuring data quality as well security and privacy implies a cost as well. The question of the responsibility for bearing this cost, and/or for sharing needs to be addressed and considered when data is sold or exchange. In Greece, in an attempt to address the constraint of financial barriers, a dedicated project is planned with the aim to monitor how open data are re-used for public bodies. Results from this project might give further guidelines to dealing with this issue.

5. Broad generation of data outside research. Transport data is to a considerable extent generated through public and private companies outside of research, and they might have restrictive sharing policies. The above assessment of Ruter, Norway's largest PTA, illustrates this potential barrier.

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Although Ruter's present willingness to share data with researchers and scientific institutions is admirable, the situation is fragile: Researchers' access to Ruter data hinges entirely on the company's willingness to share. Hence, access to data can be cut off in accordance with data-sharing policy fluctuations in Ruter. Given the seemingly broad political consensus in favour of increased data sharing, it appears that policy makers should consider measures such as one proposed by the expert group appointed by the Ministry of Transport: That private companies' licences to operate are made conditional on them making data available (within the limitations of relevant legal frameworks, such as the GDPR). Moreover, it may be worth considering making PTAs such as Ruter obligated to make data available, within limitations that policy-makers deed necessary.

6. Standardisation and quality. In terms of using open data, reliability, relevance and accessibility of the material is the main barrier according to finding in D2.2. We found in the case studies that there is a problem regarding diversity of standards and formats in the public transport world. This is both in regard to the data structure, but also the process involved. Different local, national and international regulatory frameworks impact the exchange and release of data. This applies to the exchange between PTO and PTA but also for the sharing between the transport sector and other sectors. There is also a gap between academia and industry, as mentioned by the transport organizations. Academia and industry are two different worlds that often collide. But the collision is unsupervised and often does not lead to a united effort. Should the two communities work together and come closer one to the other, more applied research can be achieved. Making a standard for sharing, quality control and data formats for sharing it would be possible to increase the reliability of the material and making it more accessible for other researchers across fields. The transport research organisations state that there is also a lot of open data available, but due to poor quality it is not being used. Standardisation and quality control could also increase use of otherwise unused available data.

7. Openness Vs. national/local sustainability. There might be a dilemma between maximizing openness to increase innovation and the possibility that global companies which do not pay any taxes locally gain profit of locally produced data without giving anything back. This problem is also relevant in terms of competition from private companies locally, which may not have the same goals as public transport operators in terms of customer satisfaction and local sustainability. There seems to be little regulation that target such behaviour. Because solutions to this dilemma have implications well beyond the realm of scientific research, we refrain from advising policy makers on this matter.

8. Security. Sharing transport data is potentially a security issue. The potential consequences of sharing must be mapped and analysed to find solutions that ensure substantial openness without entailing societal risk.

9. Open publication and Coalition S. The European Transport organizations state that open publications are often found to be of poor quality and, at the moment, there is the feeling that it is not quite working. Norway is as mentioned very far ahead in making publishing more open, and is part of the Coalition S. The STIM-OA solution, where 50% of the APC is financed by the Research Council if published in accepted (DOAJ) open access journals, to increase publishing in open journals may be a good motivation to publish openly. And to solve the problem with limited publishing opportunities in open journals that researchers prefer in terms of quality, Norway was the first country in Europe that managed to get an agreement with the major publishing houses to get their papers published openly without additional costs. However, there are costs for the institutions in terms of joining the

agreement, which may make it more difficult for institutes in with financial limitations to join. On a higher geographical level such agreements require financial investments that may restrict countries with limited resources joining, making research less open and more skewed in terms of non-equal publishing opportunities. Therefore, it's important to ask the question if the Norwegian case a good governance model of increasing open publication, or is it destroying the concept with buying them self out of the problem? Another question that is relevant, is that OA journals for transport are of quite low quality, which can have negative effects on the society if 'low-quality science' is more available for policy makers and the general public.

10. Practical expectations for the cloud. The practical expectations for the EOSC Cloud is quite similar among the research community and transport organisations. A **secure and safe environment** for transaction of data is important. The possibility of doing analysis in a secure environment is also mentioned. As shown in D2.2 the main reason for not using open software is the low security, which could potentially be solved by EOSC, if the possibility of doing analysis inside the cloud system will be a reality. **Easy navigation** where information (datasets) available are easy to find. **Availability of knowledge** - either by promotion or by any other means would lead to the desired outcome, there should be a variety of knowledge available. **Standardisation** - Being a guider for how rules and regulations should be. The cloud should also **promote how open data is beneficiary.**

11. Marketing. The knowledge about EOSC in the European Transport Organizations seems to be good, even though the involvement differs. In case studies the knowledge about EOSC is a bit mixed, and among transport researchers the knowledge about EOSC is very limited (reflection after promotion of the project). This seems to imply that EOSC need to focus on marketing to be able to make this a functional cloud system for sharing. In Norway the PTO did not have any knowledge about EOSC, which also suggest that EOSC need to marked outside of the research community as well. Especially since transport data is often generated outside the research community.

12. Common vocabulary. Using the transport research organisations to increase positive attitudes towards open science and sharing a data, open publications and infrastructure seems to be a possible way to increase involvement in the transport sector. Good examples are FEHRL's testing facility, ECTRI's open journal and EATEO's work towards merging the gap between industry and research. EOSC should therefore be collaborating closely with the transport research organisations to build on the work that they already do to promote Open Science. As such, a common vocabulary is required in order to understand and formalize the relevant information and related attributes that can contribute to create useful and measurable information by combining, integrating and linking data from various sources.

6.2 Governance and operational/business models for Open Science in European Transport Research with EOSC

In the field of Open Science in transport research, a successful business model for the TOPOS forum and observatory will start defining objectives, users and funding mechanisms based on the feedback by the 3 case studies as well as by transport research representatives of Technology Platforms (i.e. DLR and HUMANIST) that stand for Industry sector, of main influential Research Organizations (i.e. FEHRL, EATEO, WEGEMT, EURNEX, ECTRI) and of public authorities (i.e. UITP) that participate in the BE OPEN project.



Business Model

- **Objectives:** provide financing models to ensure the development and implementation of offered services.
- **Users:** involve both individuals and organizations. In more detail, organizations could be either private or public and there are 3 main different categories which represent industry, research community and society as depicted in Figure 11.



Figure 12: Different categories of end users

• Funding mechanisms: TOPOS development constitutes the first initiative to support Open Science in European Transport Research and EU funds will be used as BE OPEN receives direct funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 824323. However, a further analysis is needed to envisage how a funding and payment model should be structured within the second phase of TOPOS implementation and expansion.

The role and funding of National Open Access Desks should be studied as well as the proposed business plan of EOSC²⁶. The latter reveals that three different models have been proposed:

- The Direct Support Model in which a grant from a funding entity has been received to build/operate the resource and make it available to other grantees of the funding entity and enables certain researchers to access these resources.
- The Cloud Coin Model which is based on a certification programme for commercial and non-commercial providers of scientifically useful services and accepts specific financial "cloud-coins" in payments.
- The Hybrid Model which is a combination of Direct support Model and Cloud Coin Model.

²⁶ <u>https://op.europa.eu/en/publication-detail/-/publication/5253a1af-ee10-11e8-b690-01aa75ed71a1/language-en/format-PDF/source-80622260</u>



As TOPOS is based on EOSC and is building upon the offered services, a Cloud Coin Model could be used within the second phase of TOPOS implementation. Even though it is complicated to be implemented and requires external support, it could enforce important services which are supported by users and increase the level of innovation in the services offered. To this end, the Governance model will support the second phase of TOPOS implementation and representatives of transport research that have significant experience and expertise could provide directions to ensure sustainability.

Governance Model

The governance of European Transport Research should be aligned to the end users' (Figure 11) needs and objectives and two main aspects should be covered, i.e. development and operation. As such, the proposed governance model is needed to both develop the TOPOS tool and implement it supporting transport research. It will aim to cover the needs of both organizations and individuals considering also the European and national initiatives. Figure 13 depicts the proposed governance model for "Organizations" users which is the most critical part for the TOPOS development and implementation. The aforementioned key findings (Figure 13) will be covered as the executive board will encompass the management of strategic issues and the thematic groups will deal with operational opportunities and threats.

- The **executive board** will be responsible for strategic decisions and will therefore include representatives of all transport modes and from different categories to represent industry, research community and society. It is the liaison between the Transport Research Community and the EOSC Board and the members of the executive board are responsible for the overall management procedures. Their role is also to provide support to EOSC Board regarding transport sector and ensure that all major perspectives will be covered.
- The different **thematic groups** represent every transport mode from all over Europe and they are empowered to report their aspects and positions to the executive board in an attempt to propose modifications to the TOPOS tool when it is necessary.





Figure 13: Governance model



7 Conclusions

In order improve open science and make it the common way of doing research we need to have good governance and business models in place all over Europe. In regards to the findings in the general analysis our suggestions are as following:

- Increasing knowledge by taking Open Science into the educational system. The Greek case is
 an example of how this is already done today. It is strongly suggested that Open Science is
 taken into all fields of transport related education and not as a separate education this will
 ensure to close the gap between different part of the transport sector and making it easier to
 have a common understanding of Open Science and common standards.
- Look at i.e. health research as a best praxis in terms of solving GDPR issues and knowledge transfer to the transport sector, as this is a field of research that has come far and has a lot of experience of dealing with sensitive data. EOSC will have the advantage of knowing what kind of solutions different fields of research have for sharing of data. This gives them an overview of best practice. They therefore should work as a knowledge provider for fields where openness is less developed.
- To ensure protection of competitive advances in the transport sector, the Norwegian SAGA (producing road data) is planning to give different rights to different types of companies in order to use their data and give researchers more detailed information than i.e. consultant companies. This is a good business model for ensuring protection of both competitiveness of other companies and also protecting local sustainability, possibly making sharing of data more attractive for businesses like Ruter or STIB/MIVB. However, this model might be affected by the PSI directive, which we suggest is revisited to ensure that the non-discrimination rule does not work against openness in terms of data sharing within the transport sector.
- The European Transport Research Organisations need to increase their involvement in open science to make sure that specific transport research barriers are taken into consideration when forming new laws and directives. Especially in regard to the dilemmas in relation to data production outside the research sector, as this is very much the case in transport research.
- Cost and time are problematic issues for both institutes and other data producers outside of the research institutes. These are issues that need further study, and as mentioned above, the Greek project is examining financial barriers with the aim at monitoring how open data could be re-used for public bodies. Results from this project might give further guidelines to dealing with these issues. At an operational level, the proposed model could require private actors to deliver data when given license to operate in the transport sector, as mentioned by the expert group looking at the Norwegian transport sector. However, such an obligation to share data must be consistent with the GDPR.
- As demonstrated by the case study above, Norway ensures that it complies with Coalition S by striking "special agreements" with publishing houses. Is that a good and viable governance strategy for all of Europe? Or is Norway just buying them self out of the situation mentioned by the European Transport Organizations with poor quality on open journals. This problem needs to be addressed further.
- For ensuring adaptability of OS initiatives in transport research organizations, a common vocabulary is required in order to understand and formalize the relevant information and

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related attributes that can contribute to create useful and measurable information by combining, integrating and linking data from various sources.

- The proposed business model for the TOPOS forum and observatory requires a further analysis about funding mechanisms for sustainable future implementation taking into account the role and funding of National Open Access Desks and the EOCS business plan.
- The proposed governance model for the TOPOS forum and observatory attempts to cover the needs of both organizations and individuals of the research community. The executive board will encompass the management of strategic issues and the thematic groups will deal with operational opportunities and threats



8 References

- <u>https://openaccess.be/</u>
- <u>https://www.openaire.eu/item/belgium</u>
- BELSPO Open Research Data mandate, December 2019, <u>http://www.belspo.be/belspo/openscience/doc/ORD_Policy_Dec2019.pdf</u>
- BE OPEN (2019), Open access publications and the performance of the European transport research, June 2019, <u>https://beopen-project.eu/storage/files/beopen-d21-open-access-publications-and-the-performance-of-the-european-transport-research.pdf</u>
- DCC (2019), An analysis of Open Science Policies in Europe. <u>http://www.dcc.ac.uk/blog/analysis-open-science-policies-europe-new-report-dcc-and-sparc-europe</u>
- UITP (2018), Action Points The Value of Data for the Public Transport Sector. https://www.uitp.org/action-points-value-data-public-transport-sector
- UITP (2014), Action Points The Benefits of Open Data. <u>https://www.uitp.org/action-points-benefits-open-data</u>
- Ekspertutvalget (2019) Teknologi for bærekraftig bevegelsesfrihet og mobilitet (Technology for sustainable mobility). Report from Ekspertutvalget. <u>https://www.regjeringen.no/contentassets/ccdc68196014468696acac6e5cc4f0e7/rapportteknologiutvalget_web.pdf</u>
- Ministry of Education and Research (2017). National strategy on access to and sharing of research data. Downloaded from: <u>https://www.regjeringen.no/no/dokumenter/nasjonalstrategi-for-tilgjengeliggjoring-og-deling-av-forskningsdata/id2582412/</u>
- <u>https://www.unit.no/vitenarkiv-i-bragekonsortiet</u>
- EU RDA Growth 2020, accessed 03 March 2020,
- <u>https://datastudio.google.com/u/0/reporting/1luM7Jx_wgdqoGfyf1oFpsIMWaaRMbu1x/pag</u>
 <u>e/JweZ</u>
- European Data Portal 2019, accessed 12 February 2020, https://www.europeandataportal.eu/en/dashboard#2019
- G. Yannis, M. Böhm, J. R. Franklin, S. Jones, T. Kovacikova, K. Nowicka, K. Folla (2019) Ανοικτή Επιστήμη στην Έρευνα των Μεταφορών. 9th International Congress on Transportation Research, 24th-25th October, Athens, Greece.
- OpenAIRE 2020, accessed 12 February 2020, <u>https://www.openaire.eu/item/greece</u>.



9 Annex

Semi-structured interview guide for research councils, public/private transport actors or governmental departments.

QUESTIONS RELATED TO OPEN SCIENCE IN GENERAL

1. How does your organization (i.e. The Norwegian Research Council) relate to Open Science? Do you fund, create, support or use OS research?

2. What are your policies regarding Open Science?

3. Do you have any incentive schemes to stimulate open science?

a) Do you have any incentive schemes to stimulate development of sharing data or infrastructure?

b) Do you have any incentive schemes to stimulate publishing in open access journals?

c) Have you defined any policy for the dissemination of and open access to scientific publications resulting from publicly-funded research?

4. Through what mechanisms does your organization picture open access publishing to become a reality? Do you picture established journals to become open or that new journals will emerge and become dominating?

5. What do you consider to be the most important steps to increase research based on open data? And in what way could your organization help increase the amount of research based on open data? (based on the survey – most research not based on open data)

6. Do you mandate software sharing under open licenses? Do you have/follow a policy for personal and/or sensitive data protection? Do you have/follow a policy for information and data security?

The main barriers for producing open data are related to GDPR, cost/time and competitiveness of the organization. In what why could your organization reduce some of these barriers? (based on survey)

QUESTIONS RELATED TO EOSC

7. Are you familiar with the EOSC?

8. Would your organization fund Open Science through the EOSC?

If no:

- 9. What could make your organization more likely to fund Open Science through EOSC?
- 10. What do you expect from EOSC?



QUESTIONS RELATED TO TRC (Transport Research Cloud)

11. Which are the main barriers in relation to making a functional TRC?

Semi-structured interview guide for transport research associations

1. In what way does your organization work to increase open science in transport research (internal repository, institutional data repository, shared repository – multiple organizations in the same country, journal/conference publishing system, CRIS "Current Research Information System")?

2. In general, what do you think are the main barriers to open science?

If need be, list these alternatives:

a) Institutions' fear of competitiveness loss

b) Cost/benefit calculations by institutions (i.e., institutions have no incentive to provide data for free, even if they do not fear competitiveness loss)

c) GDPR

d) Not familiar with the concept of FAIR (Findable, Accessible, Interoperable, Reusable) data

12. What do you consider to be the most important steps to increase research based on Open or FAIR data? And in what way could your organization help increase the amount of research based on Open or FAIR data? (based on the survey – most research not based on Open data)

13. How can EOSC encourage use of open-source software?

Questions related to TRC:

[info on TRC]

In general, are the members of your association likely to share research assets (for instance data) through the TRC?

How much OPEN or FAIR data for transport research?

Which potential services of TRC would benefit the users in your organization?

According to previous research conducted by our project team, data quality is the single most important barrier to using open data.

- In what sense do you think data quality is a problem?
- How do you think data quality can be improved, in order to increase use of such data?