JRC TECHNICAL REPORTS

Danube Region Data Projects

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Abstract

The Danube Reference Data and Services Infrastructure (DRDSI) project currently provides access to more than 6,700 datasets, relevant for one or more Priority Areas of the EU Strategy for the Danube Region (EUSDR). These datasets can act as a solid foundation for integration of scientific knowledge into the policy making process on different levels (local, regional and international). From the perspective of macro-regional strategies, this would only be possible if data can be used across borders and domains, and put in the right context.

Projects at regional, national, cross-border and macro-regional levels present a useful container to uncover stakeholders, expertise and data creation/sharing capacity for policy-making and research. This JRC technical report investigates the existing project databases and similar resources related to the EUSDR that describe such projects, as well as how this information may be presented in the DRDSI platform.

1. Introduction

The Danube Reference Data and Services Infrastructure (DRDSI) is helping to create a data-sharing infrastructure in support of the EU Strategy for the Danube Region (EUSDR) [1]. Launched in June 2011, the EUSDR aims to boost the development of the Danube Region. The macro-regional strategy relies on an integrated approach to encourage better policy development and the alignment of funding and resources through concrete actions and projects, resulting in a more efficient and better-balanced implementation of the EU's overall objectives under Europe 2020.

For the DRDSI, this involves both supporting the creation and evolution of an open data platform and the organisational context of stakeholders in the region to populate and use the platform. Since 2014, a series of activities were initiated to help develop the open source platform and fill it with initial content from the Danube region. A key feature has been the creation of an open data catalogue that is, in itself, already a useful product of the DRDSI project, covering over 6,700 datasets originating from research projects, the work of other JRC Nexi supporting the EUSDR, accessing the official records created under open data and INSPIRE initiatives and data sources from the EC and other international initiatives. A great deal of this work has been supported by the Danube_NET, a group of experts working in the Danube Region with the DRDSI to identifying stakeholders organisations and provided the initial metadata records that point to the datasets the platform is now accessing.

As the dataflows from Danube_NET, the Nexi and other partners are becoming more mature, the work of the DRDSI has started to explore what other content could potentially be shared through the platform. From the work of the Danube_Net, in particular, it became clear that projects are a key vehicle for data creation, management and dissemination. These include both pure research projects and the work of public sector organisations and their partners. From the perspective of e-infrastructures, being able to identify projects that create data within the region not only offer new dataset records for the DRDSI's metadata catalogue but also a means to understand where there is capacity in the region to create such data, where there is expertise in certain fields and where there may be gaps in data provision either geographically or thematically.

Stakeholders have, therefore, identified details about projects as a new element the platform could potentially host, including information about project partners, the tools that have been involved in create and sharing data and good practices in data management that may occur in the region. The aim of this report, therefore, is to further define what information can be readily found related to the Danube Region that could be included in the DRDSI platform. This has included a review of existing information sources that help to define the scope of this work (Section 2). The report also includes details from a pilot exercise with Danube_NET experts while looking for data-related records and work on the platform's collaborative tools to see how project-related information could be shared (Section 3). The notion of helping people to establish new projects to tackle data gaps should also be considered as part of the collaborative/community platform development. This is followed by an identification of issues and gaps that this initial analysis has provided to highlight key trends (Section 4), before making recommendations that future work could consider should project-related information be included further in the DRDSI platform (Section 5).

2. Existing information sources and EUSDR Projects

2.1 Details about projects and CERIF

Projects have been recognised as useful containers for a lot of research and public policy work. A consistent view of project-related information is often required by standardised project management methods and the creation of common work package structures. This, however, does not mean that there is a common way to describe projects, especially as project-related information may be dealt with in different ways for different purposes.

Specifically, there are a number of emerging standards related to project metadata in the research domain. This includes the Common European Research Information Format (CERIF)[1] which represents both research entities and their relationships (See Fig. 1).
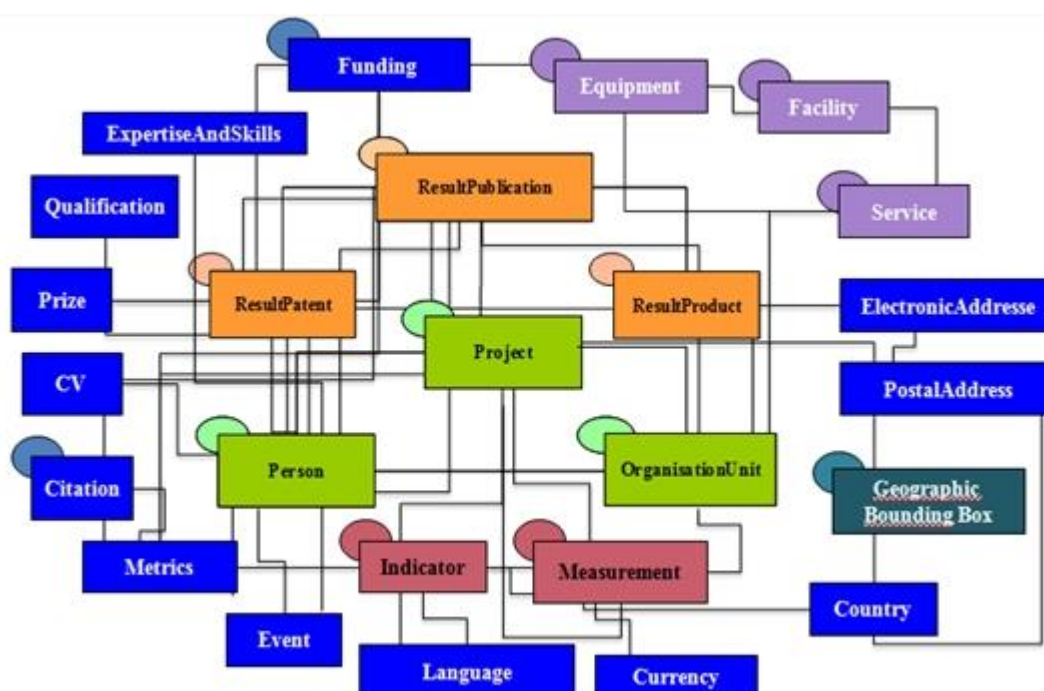

Figure 1: CERIF v1.6 Data Model, Source: Common European Research Information Format[1]

It is clear from the model that the entity of "Project" plays a central role in this information model, linking to organisations and individuals. Arguably, there is a focus on the organisational context of research in this case rather than the details of project outputs, although the "Result/Product" element provides a means to link to associated data. The model is intended for Current Research Information Systems (CRIS) and access to heterogeneous data sources as part of the European Research Area. Its developments related to the CKAN data portal software[2] that the DRDSI platform is also built on and its interest in the data catalogue (DCAT) are also noteworthy, given related work in the JRC.

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[1] See http://eurocris.org/cerif/main-features-cerif
[2] http://ckan.org/

Given the broad research and policy scope of the DRDSI, however, there is not yet a ready means to reuse existing databases of projects from different sectors and sources relevant to the EUSDR in an easily implemented way for the timeline of the project. The DRDSI, therefore, would need a core set of metadata elements related to projects (in general) with a specific extension to cover the details required about data, including its creation, lineage and long-term access.

Specifically, such metadata should allow the platform to link projects to their composite organisations and the datasets they (currently) produce and use. This concept is partially covered by the User Stories of the platform that could be extended further to filter by specific projects.

2.2 Existing data sources and filtering

In the course of this work several data sources have been explored that describe recent projects, particularly at the European level. This includes EC sources such as KEEP, the *InfoRegio* list of projects, CORDIS Projects, the PNF Database and the Danube Region INCO.NET project. Details about the content of each of these sources are explored below.

2.2.1 The KEEP Database

One notable source related to the EUSDR is the Knowledge and Expertise in European Programmes (KEEP) project database [3] of DG REGIO [4]. This database has been established under INTERACT, a hub for exchanging information and best practices among EU cooperation programmes and, importantly, the macro-regional strategies. Overall, KEEP contains details of Territorial Cooperation programmes, projects and partners. The database currently covers details from 2000-2006 and 2007-2013, with plans to include details for the 2014-2020 period.

The data in KEEP operates at programme level but, more importantly for the DRDSI, contains the following:

Project level data:

- project name,
- description,
- start and end dates,
- total budget,
- EU-funding allocated to the project,
- list of partners
- web address

Partner level data:

- Project partner's name
- Address (and map location)
- Contact details for the lead partner.

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[3] http://www.keep.eu/keep/
[4] http://www.interact-eu.net/keep_database/keep_territorial_cooperation_programmes_projects_and_partners_in_one_database/594/17595

More specifically, searching the database (exportable in Excel) produces project details with the following fields:

- Programme
- Project Acronym
- Project Name
- Project Partner
- Lead Partner
- (Address information)
- Budget
- EU Funding

- Website
- Theme
- Keyword1, 2 & 3
- Description
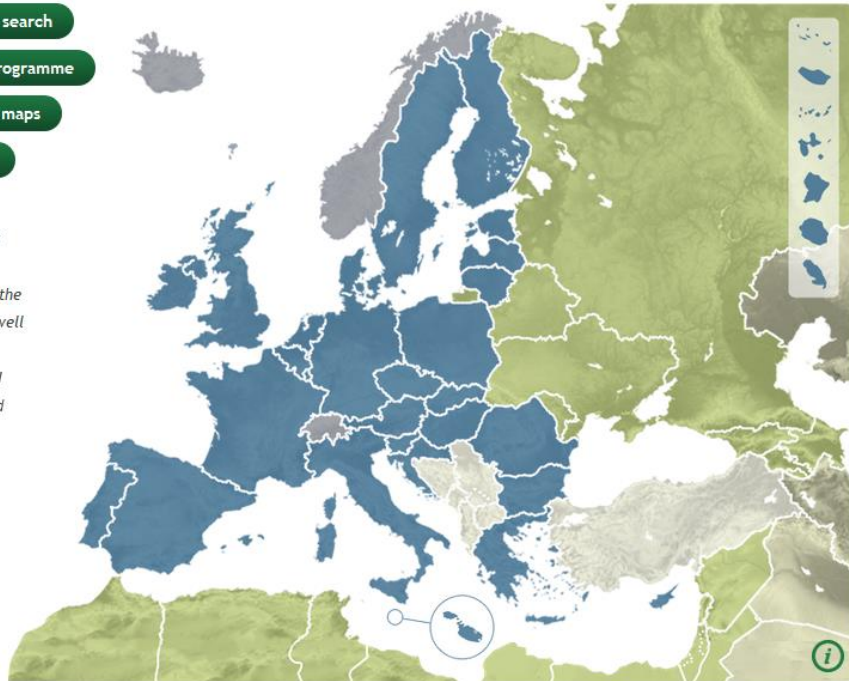- Expected Results
- Achievements
- Project start and end

In addition, for the Baltic Region, details of the EUSBSR Priority Area and degree of compliance are mentioned (See Figure 2).

Figure 2: Keep Database

From a sample of 192 records relating to the "Danube" in the database covering projects from the last 15 years, around 13% are led by organisations outside of the region. The remaining projects are composed of the following countries (See Figure 3) and topics (Figure 4).
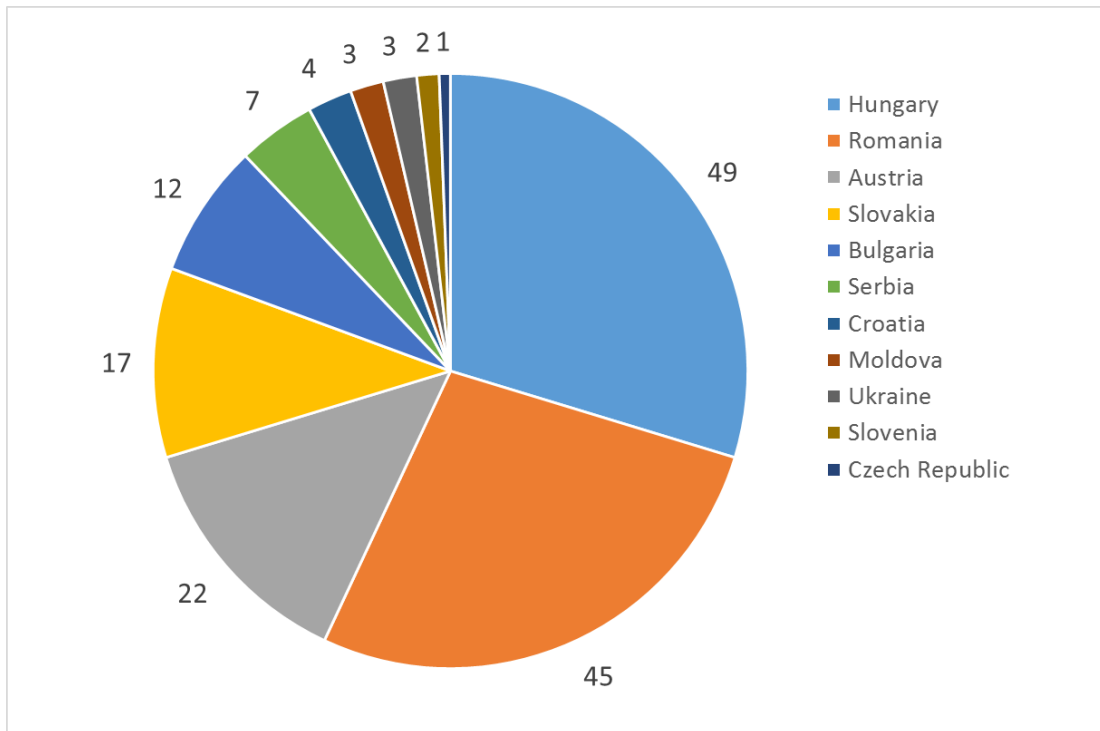
Figure 3: Sample of Projects in the KEEP Database from Danube Countries (based on "Danube" keyword search)

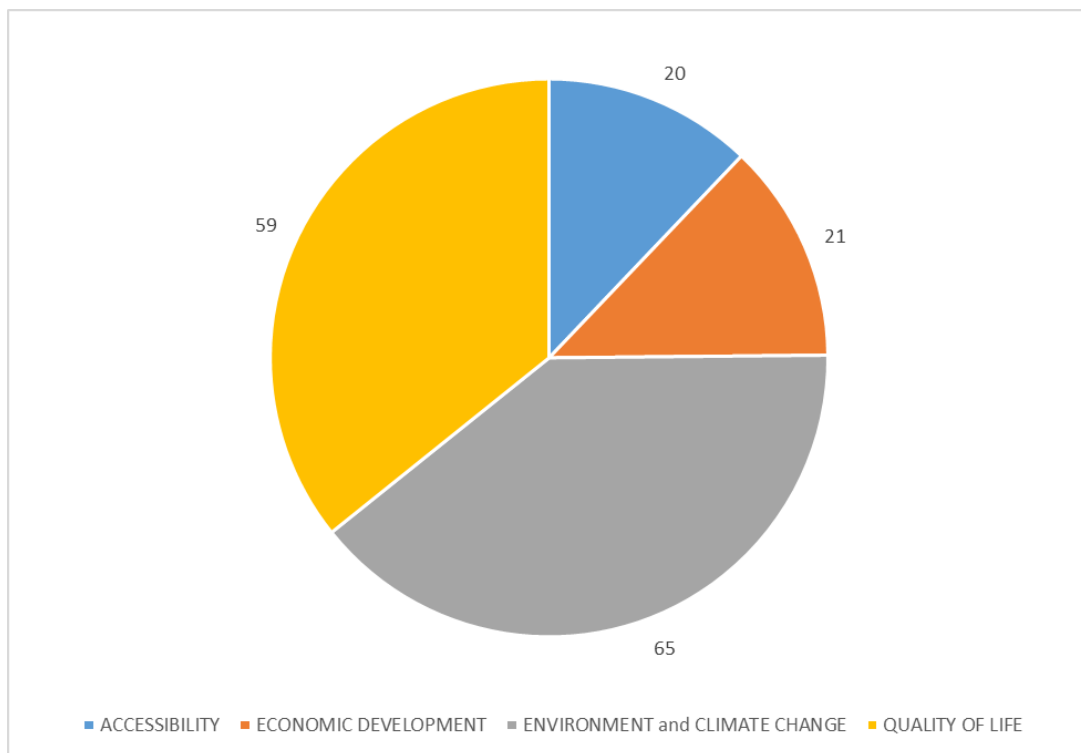*Figure 4: Sample of Projects in the KEEP Database by theme (based on "Danube" keyword search)*

These results show that there is already quite a lot of variation in the participation of regional cooperation in terms of projects. Almost three quarters of the sample is made up of projects involving Hungary, Romania and Austria, with several countries involved in less than ten projects.

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In comparison, the projects in the region are evenly split between the environment and quality of life projects (that could map to the Protecting the Environment and Building Prosperity pillars of the EUSDR), alongside those of accessibility and economic development (that may relate to the Connect the region and, again, Building Prosperity pillars).

It is also likely that there are many other projects taking place at a national or subnational level that may also be providing useful data for the EUSDR as well as identifying skills of interest to those wanting to create new data to fill gaps in key data topics/themes.

A more detailed analysis would be needed to identify projects using or creating data of use to the EUSDR. An indication of topics that could be explored further can be seen from the mapping of KEEP keywords to the EUSDR structures (see Table 1). It should be noted that projects can have multiple objectives covering several keywords; and that the mapping is only illustrative and would require further details based on project descriptions if it were to be used in the DRDSI platform.

Table 1: Mapping of EUSDR to KEEP Keywords

EUSDR Pillar	Priority Areas	KEEP Keywords
Connect the Region	PA1: Mobility and Multimodality	Transport and mobility (10) Multimodal transport (2) Logistics and freight transport (2) Improving transport connections (5)
	PA2: Sustainable Energy	Renewable energy (3) Energy efficiency (2)
	PA3: Culture and Tourism, People to People	Tourism (40) Cultural heritage and arts (11) Community integration and common identity (9)
Protecting the environment	PA4: Water Quality	Waterways, lakes and rivers (41) Water management (11) Coastal management and maritime issues (7)
	PA5: Environmental Risks	Waste and pollution (15) Managing natural and man-made threats, risk management (33)
	PA6: Biodiversity, landscapes, air and soil quality	Sustainable management of natural resources (26) Soil and air quality (5) Climate change and biodiversity (19) Agriculture and fisheries and forestry (10)

EUSDR Pillar	Priority Areas	KEEP Keywords
Building Prosperity	PA7: Knowledge Society	Scientific cooperation (1)
		Knowledge and technology transfer (1)
		ICT and digital society (12)
	PA8: Competitiveness	SME and entrepreneurship (13)
		New products and services (7)
		Innovation capacity and awareness-raising (5)
		Green technologies (6)
		Clustering and economic cooperation (12)
	PA9: People and skills	Social inclusion and equal opportunities (2)
		Labour market and employment (2)
		Education and training (14)
Strengthening the Region	PA10: Institutional Capacity and Cooperation	Institutional cooperation and cooperation networks (26)
		Governance, partnership (9)
		Evaluation systems and results (10)
	PA11: Security	Safety (2)
		Cooperation between emergency services (3)
OTHER (not directly related to the pillars or priority areas but of interest to the EUSDR as a whole)		Urban development (5)
		Rural and peripheral development (7)
		Regional planning and development (9)
		Infrastructure (14)
		Health and social services (1)
		Construction and renovation (3)

Overall, the KEEP database can help us to identify topics that are active in the regional investment activities of DG REGIO that may provide existing data to the DRDSI. If content should be reused from this source, then regular extracts and updates would be needed if a more dynamic approach is needed rather than Excel downloads. In addition, a more detailed analysis by country (i.e. not using the "Danube" keyword) may provide more specific details. This effort, however, was not possible in the scope of the current work.

2.2.2 InfoRegio Projects

DG REGIO has also explored how 600 of its major projects (>50 million Euros) in the Member States under European Regional Development Fund and Cohesion funding from 2007-2013. This information could be represented on maps, in particular in relation to NUTS regions but also at a local scale such as certain municipalities, as well as transport networks. Projects have been classified into energy, environment (e.g. waste, waste water treatment, drinking water etc.), transport (road, rail and port developments), research and development and "other".

The outputs are available through the InfoRegio website[5] that provides an overview of the projects as well as some overview maps (See Fig 5).

Figure 5: InfoRegio Homepage

Some of the following statistics from the InfoRegio database (See Figure 6) include some multiple counts as the entries are per region and some of the projects cover more than one region (or even more than one country), although this is rare.
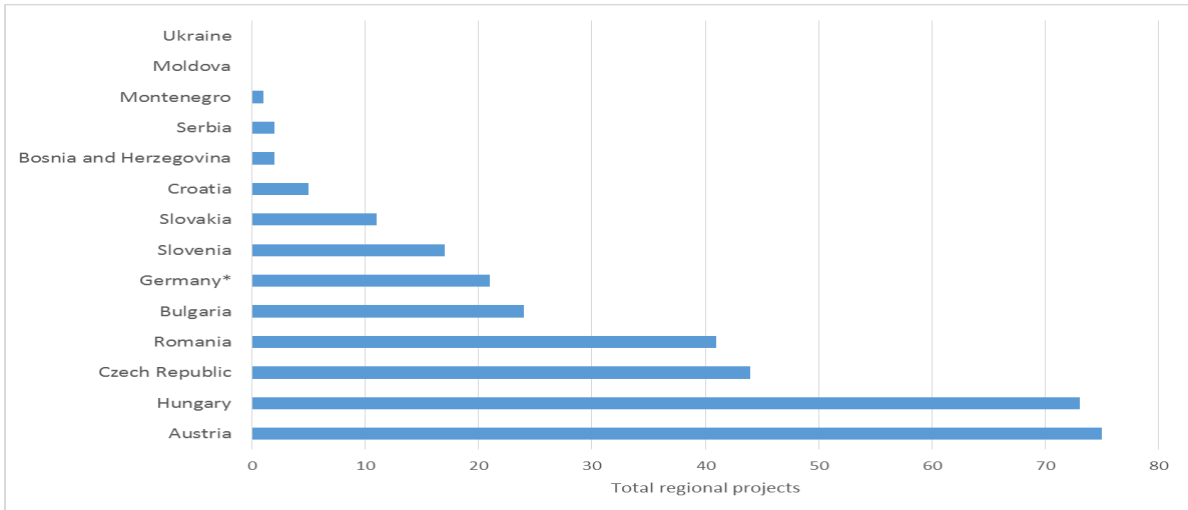
Figure 6: InfoRegio project records recorded by region (*Germany records only include the details for the Danube regions of Baden-Württemberg and Bavaria/Bayern)

The topics covered in the database related to countries of the Danube region also map well to some of the PAs of the EUSDR, namely Employment and labour market (3%), Energy (20%) and Environment (including Air Quality; 39%). Around 37% of the records also include "Business Support" as a category that may relate to PA8: Competitiveness but more details would be needed to make such a mapping.

One of the most interesting aspects of this dataset is its sub-national dimension and the fact that several cases exist where different regions have worked on the same projects, including in different countries. In addition, the fact that the data has been geo-referenced in several cases could make it interesting information to actually display directly in the DRDSI, including a selection of funded projects, provided the content is reusable through services or downloadable (see Fig. 7).
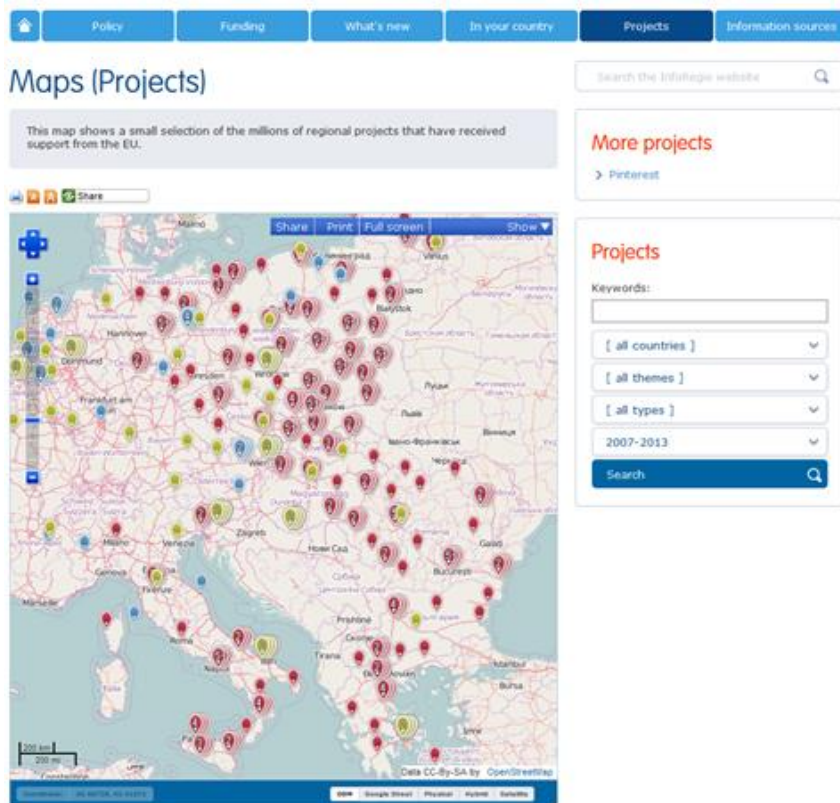
Figure 7: InfoRegio funded projects

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In these examples, the objective of the projects is not to create data but a more detailed analysis could establish more information about topics where data could be used, reused or needed to support activities relevant to the EUSDR.

2.2.3 CORDIS

In the course of exploring this topic, the Seventh Framework Programme (FP7) catalogue of research projects in CORDIS[6] (as an open dataset) was explored, covering a total of over 25,000 projects.

As well as reference codes the dataset includes the following details:

- Project acronym
- Status
- programme
- topics (call-relate code)
- Framework Programme
- Maximum EC Contribution
- Call
- Funding Scheme
- Coordinator

- Project title
- Start and End Dates
- Project URL
- Objective
- Total Cost
- Coordinator Country
- List of project participants
- List of Participant Countries
- List of Subjects (code)

Within this large dataset there are 21 projects that include "Danube" as a keyword, where Danube Region INCO-NET and DANube macroregion are directly related to the EUSDR and where EnviroGrids already has provided its data services to the DRDSI platform (See Table 2).

Again, it should be noted that this is a sample of what could be some of the most directly involved projects in activities related to the EUSDR but it remains a sample and it is also likely there are participating organisations from the Danube countries working on these and some of the missing PAs.

Table 2: Mapping of EUSDR to "Danube" projects in the CORDIS Database

EUSDR Pillar	Priority Areas	CORDIS
Connect the Region	PA1: Mobility and Multimodality	Development of a Next generation European Inland Waterway Ship and logistics system
		Towards an Intermodal Transport Network through innovative research-driven clusters in Regions of organised and competitive knowledge
		RIS services for improving the integration of inland waterway transports into intermodal chains
		Platform for the implementation of NAIADES

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[6] https://open-data.europa.eu/en/data/dataset/cordisfp7projects

EUSDR Pillar	Priority Areas	CORDIS
	PA2: Sustainable Energy	
	PA3: Culture and Tourism, People to People	TECHNOLOGY OF THE LAST FORAGERS AND FIRST FARMERS IN THE BALKANS
Protecting the environment	PA4: Water Quality	Solutions for present and future emerging pollutants in land and water resources management
		"DANube macroregion: Capacity building and Excellence in River Systems (basin, delta and sea)"
		"Enhancing research potential by strengthening a local network of laboratories for studying wetland ecosystems functioning, restoration and management"
		Managing Aquatic ecosystems and water Resources under multiple Stress
	PA5: Environmental Risks	Numerical Simulation Tools for Protection of Coasts against Flooding and Erosion
		Environmentally Friendly Coastal Protection in a Changing Climate
	PA6: Biodiversity, landscapes, air and soil quality	
Building Prosperity	PA7: Knowledge Society	EnviroGrids: Building Capacity for a Black Sea Catchment Observation and Assessment System supporting Sustainable Development
		Best-Reliable Ambient Intelligent Nano Sensor Systems
	PA8: Competitiveness	Conference WIRE 2012. Delivering the Innovation Union at Regional Level
	PA9: People and skills	
Strengthening the Region	PA10: Institutional Capacity and Cooperation	UP-GRADE BLACK SEA SCIENTIFIC NETWORK
		Danube Region INCO-NET
		Western Balkan Countries INCO-NET
	PA11: Security	Establishment of a Research and Training Centre in Urban Security and Facility Management

EUSDR Pillar	Priority Areas	CORDIS
OTHER (not directly related to the pillars or priority areas but of interest to the EUSDR as a whole)		Spectrum and energy efficiency through multi-band Cognitive Radio
		Towards 0.7 Terahertz Silicon Germanium Heterojunction Bipolar Technology
		"Securing Europe, Fighting its Enemies: The making of a security culture in Europe and beyond, 1815-1914"

The CORDIS database also records the country of the coordinating organisation and the countries of participating organisations in FP7 projects.

An overall view on research in the region can be seen in terms of coordinators and participants, as well as the amount of internal collaboration reflected by cases where there is a participant in a project from the same country as the coordinator. This is presented in the following graph that covers all research across FP7 (See Fig. 8). In this case, Germany has been analysed as a whole but further work could be done to select projects based in the two Danube German states.
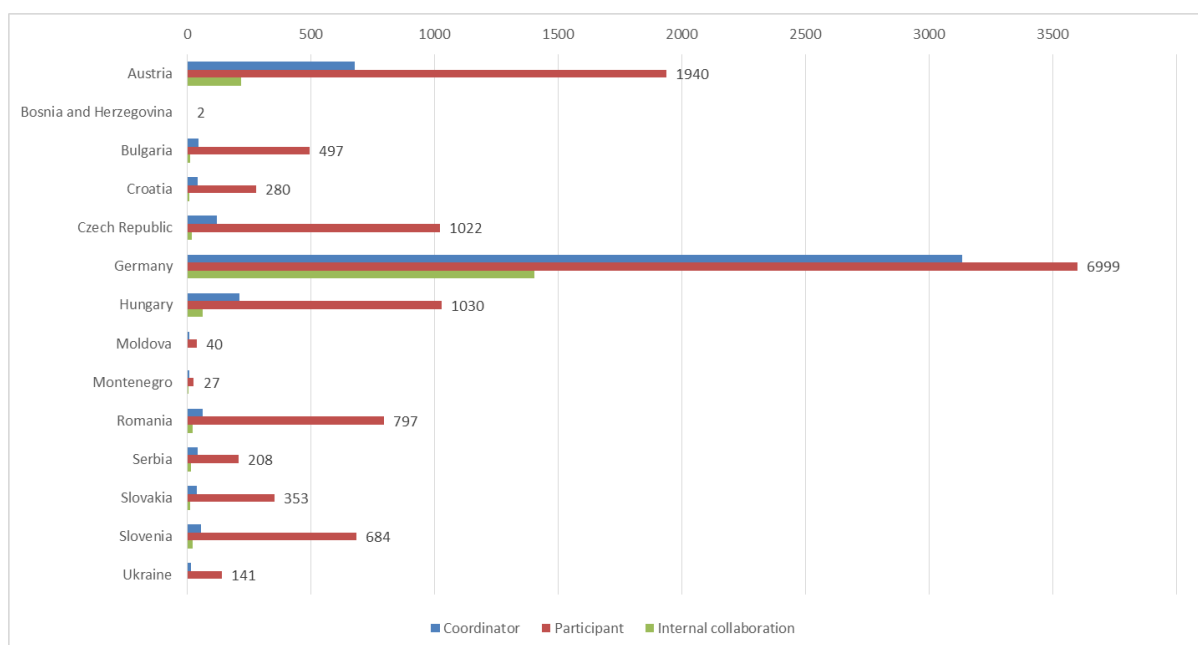
Figure 8: All FP7 Projects in the Danube Countries (n.b. the larger number of German projects)

2.2.4 PNF Database

Previous work has also taken place in the southern half of the Danube region (and extending to neighbouring sea areas) related to geospatial data projects through the Permanent Networking Facility (PNF [7]) for networks of actors involved in Earth Observation (EO). This activity is tied to the work of the Group on Earth Observations (GEO) and its Global Earth Observation System of Systems (GEOSS).

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[7] http://balkangeonet.unist.hr/

Led by researchers in Serbia and Croatia, the PNF database is part of the FP7-funded Balkan GeoNet and allows users to search for EO players and activities, as well as GEOSS components such as data, metadata, models, services, applications and products. In terms of data, the database includes satellite images, aerial photographs, telemetry/remote sensing data, in situ measurements, GIS vector maps, charts and digital models.

The web interface (see Fig. 9) contains a ready means to use keywords to access content but it is harder to take a bulk download of the content or connect to it. With detailed work, it would be possible to identify specific topics and technical capacity in the region to handle data, create new data products and potential fill data gaps, either in the DRDSI platform or for actual coverage in certain countries for particular topics. Adding additional information to these data sources (e.g. relevant PA) could make them useful for the DRDSI.
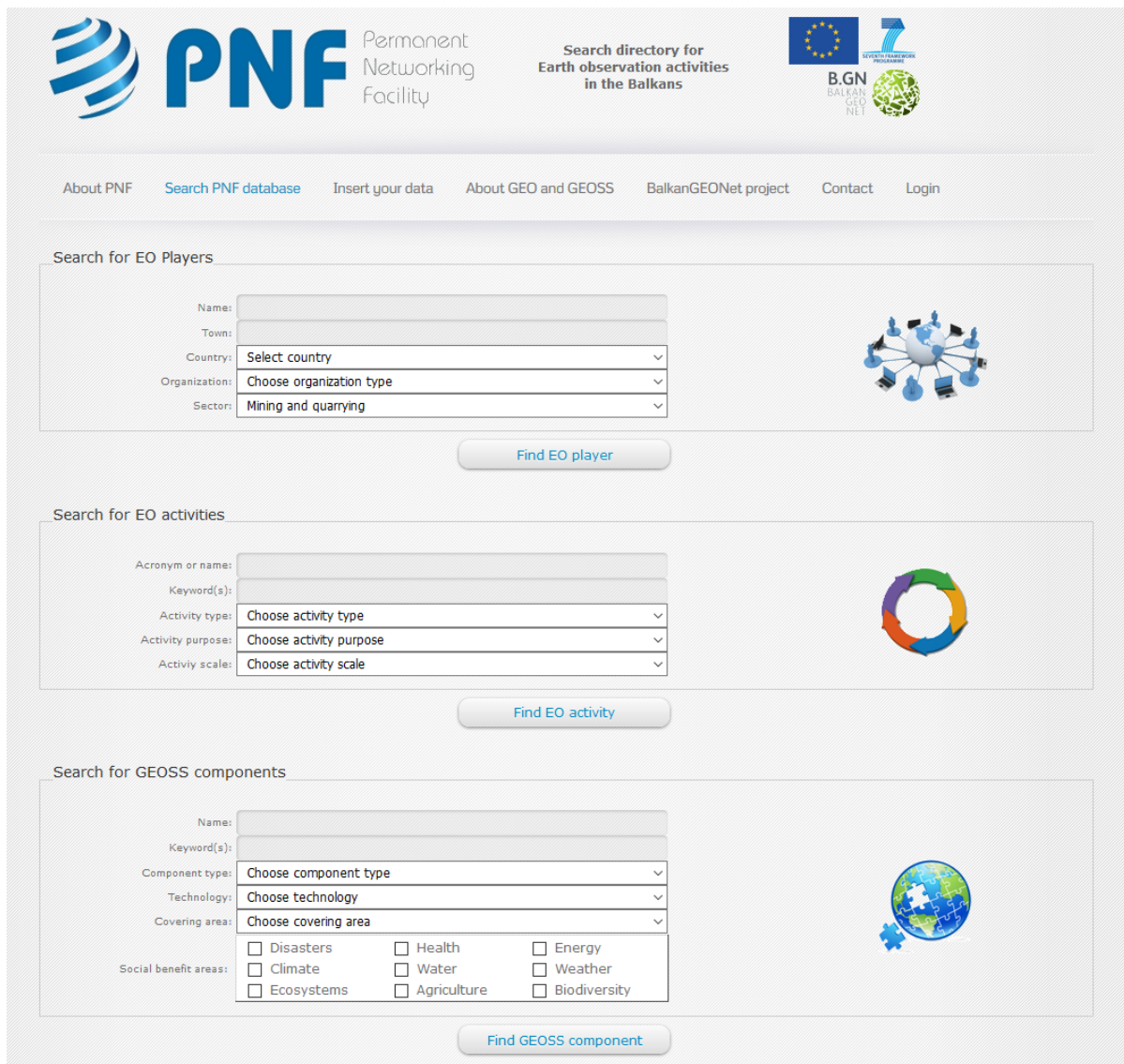

Figure 9: PNF Database user interface

2.2.5 Danube Region INCO.NET

As noted above, the Danube Region INCO.NET is a FP7 funded project running until the end of 2016 and acting as a coordination and support action for the EUSDR (especially PA7 and PA8). The project aims to support the policy dialogue, especially for the EU 2020's Innovation Union[8] and the European Research Area (ERA) Framework[9].

A thematic focus involves energy efficiency and renewable energy in a bio-based economy, alongside monitoring innovation and competition barriers. This is related to other JRC Nexi work on smart specialisation strategies.

A key output of this project has been an analysis of research and innovation projects in the region[10]. The report examines in detail projects related to innovation in the region.

This includes the following funding sources and key projects of interest to the DRDSI:

- South East Europe Transnational Cooperation Programme (18 Projects)
  - o FORSEE- Regional ICT Foresight exercise for South European countries
  - o Boosting innovation through capacity building and networking of science centres in the SEE region
- Central Europe Transnational Cooperation Programme (21 Projects)
  - o CentraLab- Central European Living Lab for Territorial Innovation
  - o IDEA- Innovative Development of European Areas by Fostering Transnational Knowledge Development
- FP7 (32 Projects)
  - o BERST- Bioeconomy Regional Strategy Toolkit
  - o BIOCLUS- Developing innovation and research environment in five European regions in the field of sustainable use of biomass resources
  - o EFFECTS+- European Framework for Future Internet- Compliance, Trust, Security and Privacy through effective clustering
  - o ICT2B- Bridging the Entrepreneurial Gap: Transforming European ICT Research into Investment Opportunities
  - o ICT Venturegate- Innovative solutions for enabling efficient interactions between SMEs in ICT projects and innovation investors
  - o INSITE- The innovation Society, Sustainability and ICT
  - o KNOWBRIDGE- The cross border knowledge bridge in the renewable energy sources cluster in the Eastern Slovakia and North Hungary

Although not focussed on data creation *per se*, such projects may act as access points to other projects and collaborations that could provide data for the DRDSI platform. The report importantly concludes that in investigating this work the results of project are not available shortly after project closure. A more sustainable approach is being put in place in some EU-funded activities, requiring longer-term maintenance of results or sharing through repositories. In an ideal situation, the DRDSI platform could act as a means to promote research-related results for reuse, including in new topics or products, complementing DANUBE-INCO.NET's promotional work.

Overall, their evidence can be summarised in the following table (see Table 3).

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[8] http://ec.europa.eu/research/innovation-union/index_en.cfm
[9] http://ec.europa.eu/research/era/framework-conditions_en.htm
[10] http://danube-inco.net/object/document/15279

Table 3: Danube Region INCO.NET's Analysed Projects

Country	Projects reviewed
Austria	34
Bosnia and Herzegovina	6
Bulgaria	18
Czech Republic	20
Germany	42
Croatia	12
Hungary	44
Romania	18
Moldova	5
Montenegro	6
Serbia	13
Slovenia	38
Slovakia	21
Ukraine	5

Among lists of databases, good practices and related resources, a final useful assessment provided by this project has been a review of existing platforms in the region. They include:

- Collaborative platform on innovation and smart specialisation policies and policy measures (ClusterPoliSEE / SEE)
- Collaborative platform which facilitates the interaction of researchers, companies and evaluation experts (INTERVALUE / SEE)
- Virtual platform for cooperation of SEE Science Centres (SEE Science/SEE)
- Transnational Innovation Platform (FORT/CE)
- Transnational Innovation Network (FORT/CE)
- InoPlaCe Platform (InoPlaCe /CE)
- European Cluster map elaborated under ASPICE (ASPCE/FP7)
- ICT VENTURGATE platform (ICT VENTURGAE/FP7)
- Lightjumps Community (LIGHTJUMPS/FP7)
- Partnership Opportunities Database (Enterprise Europe Network/CIP)
- European Cluster Collaboration Platform (PRO INNO/CIP)

Contacting these platforms for mutual promotion with appropriate communities could help to reinforce the work of the DRDSI as well as extend into areas related to innovation. It is also important to note that DRDSI must aim to complement this work with data-related activities. A subset of these examples could be explored to check the validity of the approach and it would be important to understand what INCO.NET will plan to achieve it in its final year.

3. Danube_NET Projects

3.1 Background to Danube_NET investigations

DRDSI is supported by a network of experts, Danube_NET, representing most of the Danube countries, including members from outside of the EU[11]. Their backgrounds mainly include research on spatial data infrastructures and the implementation of INSPIRE but the group is composed of researchers based in public research bodies and universities as well as staff from public sector bodies who are data providers to the DRDSI and others with business and innovation experience. This mix of expertise has allowed the platform to gain over 6,700 records since its launch and make connections with data providers in the region. It has also been a chance to explore the topic of project information sharing and identify a range of activities of interest to the PAs of the EUSDR.

This approach is, again, a sample and the projects identified by the experts also indicate the extent to which there are activities in the region that can be built upon and shared, as well as potentially targeting a new group of stakeholders for the platform. It should also be noted, however, that the type of projects emerging are also multi-disciplinary, meaning that a single project does not match well to one sole PA and that some relevant projects may not be easy to associate with any particular PA. The analysis is also partial due to missing information in some cases and is only a sample in terms of recent and active projects in each country.

Although, therefore, somewhat subjective the examples provide an indication of where DRDSI could focus next and how some research-based organisations are active in certain areas relevant to the EUSDR.

The experts were asked to provide details of key research organisations in their country that could be linked to work in the EUSDR and to identify projects, with the following results for each PA (See Figs. 10-18). The experts were not able to identify projects for three Priority Areas (PA9: *People and skills*, PA10: *Institutional Capacity and Cooperation* and PA11: *Security*), although some elements of these PAs appear in cross-cutting examples. In addition, the details from Slovenia were not readily available as there was no common list of projects to draw on, although many research institutions have been involved in European projects, in part creating the demand for this work in the DRDSI.

3.2 Results of project-based investigations

In total, the sample contained details of 16 projects in PA1. Some of these examples include broad projects also covering several countries reported in the Austrian case, such as the South East Transport Axis (SETA) and the Network of Danube Waterway Administrations (NEWADA), offering potential access to reusable data and expertise, respectively. Such projects could offer information of interest to, for example, the modal shift research of the JRC's Air Quality Nexus.
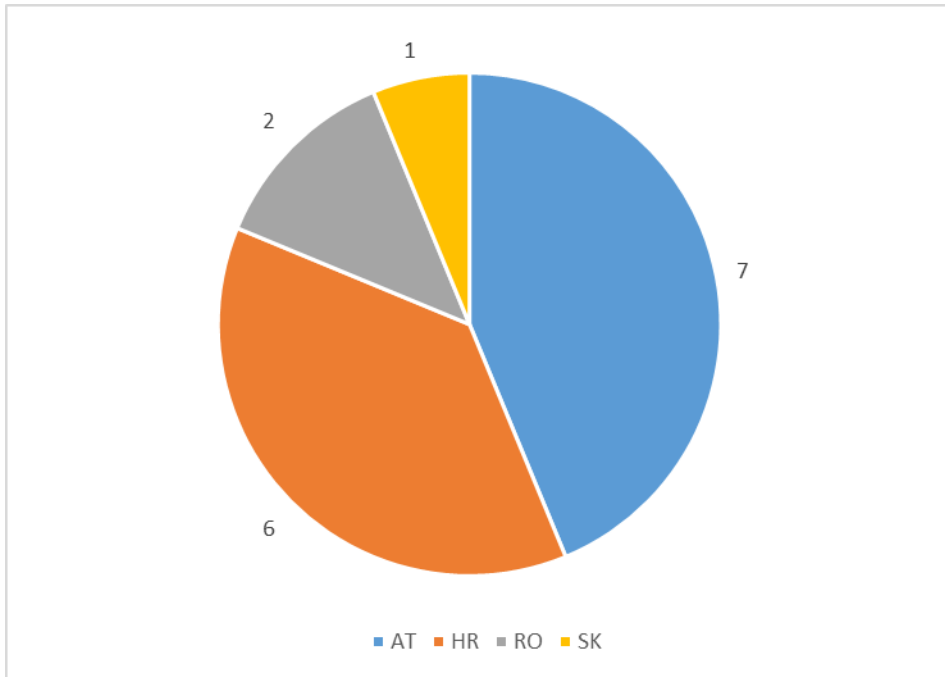
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[11] http://drdsi.jrc.ec.europa.eu/danube-net

Figure 10: PA1: Mobility and Multimodality projects in Austria, Croatia, Romania and Slovakia
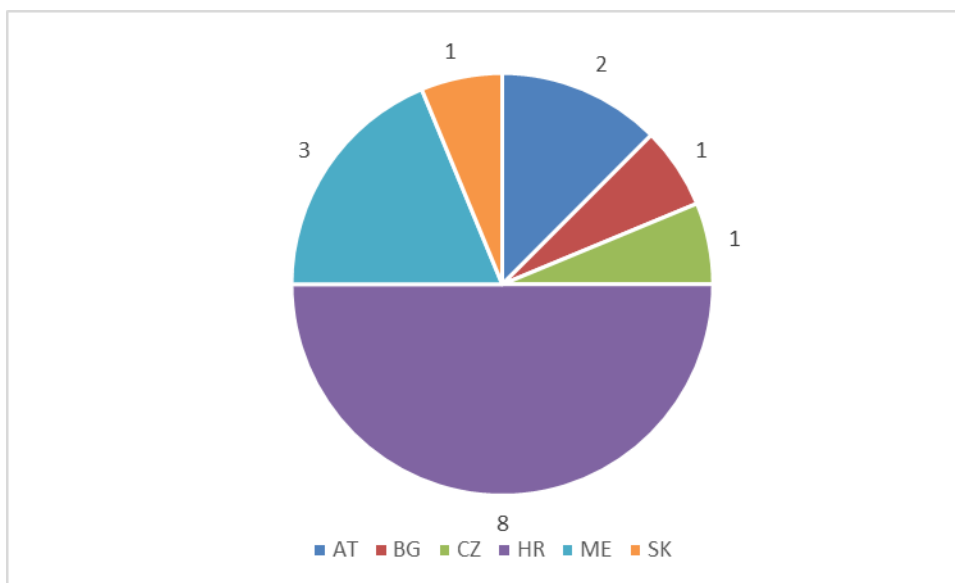

Figure 11: PA2: Sustainable Energy projects in Austria, Bulgaria, Croatia, Romania and Slovakia

In total 16 projects could be related to PA2, covering several topics such as new technologies for regional energy systems and biofuels for mobility in Croatia that potential link to other PAs such as PA8 on competitiveness and PA1 on mobility, respectively. Such work may be of interest to the JRC's Bioenergy and Air Quality Nexi. Similarly, the Montenegrin case involves Energy efficiency, renewable energy sources and environmental impacts (ENERESE) that could also be linked to PA5 on environmental risk. Again, examples may cover the whole region and link to networking, such as the Sustainable Networks for the Energetic Use of Lignocellulosic Biomass in South East Europe (FOROPA) project cited by Austria.
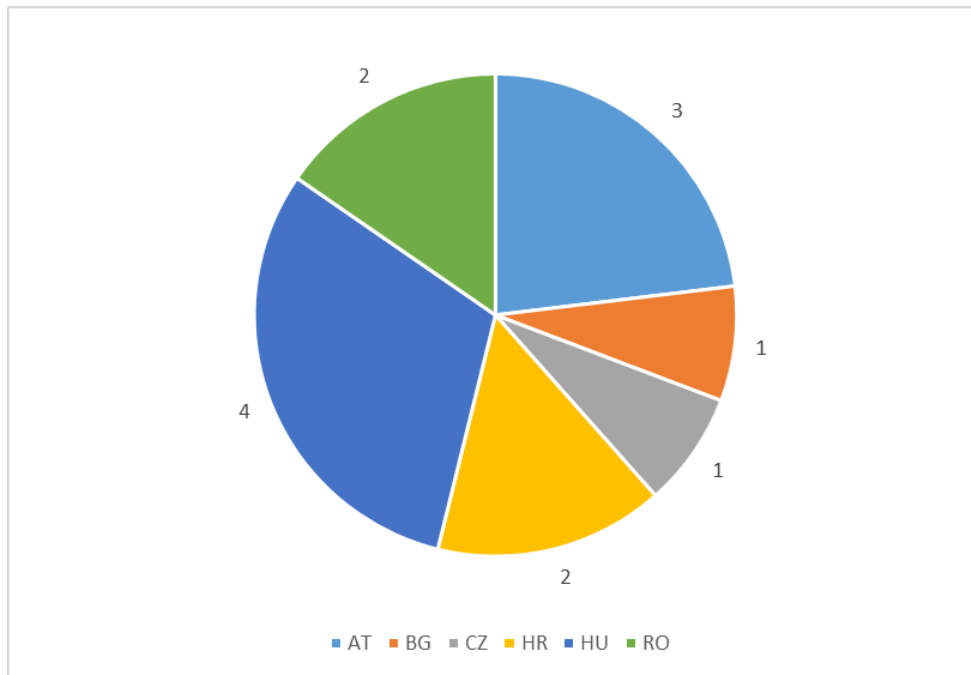
Figure 12: PA3: Culture and Tourism, People to People in Austria, Bulgaria, Czech Republic, Hungary and Romania

In total 13 projects could be related to PA3. Some of these projects relate to archaeology and include cross-border examples such as Pottery production in prehistoric cultures, especially Hallstatt culture, of Croatian and Austrian Danube regions reported in the Croatian data. Some of the examples are also more closely tied to data, such as a National GIS for protecting monuments and sites (eGISpat) in Romania. Again, the links to other PAs can be found, including the Sustainable Mobility and Tourism in Sensitive Areas of the Alps and the Carpathians (ACCESS2MOUNTAIN) project, which brings together environmental and transport issues with tourism.

This also highlights the difficulty of simple labels to classify any project and the potential data it could, therefore, contain. Another important European source mentioned in this context is the Europeana portal[12] of cultural/art collections around Europe that was reported by Hungary and clearly covers details from the whole region. Although it is not envisaged to be a direct resource in the DRDSI it is worth highlighting as a source for this PA and a potential facility for some of its outputs.

The co-promotion of such platforms may be an importune step to take in further implementing the DRDSI. In general, although cultural heritage has not been a focus of DRDSI's work, it is also clear that a lot of information about the region has a spatial characteristic and could be shared and further explored by the project.
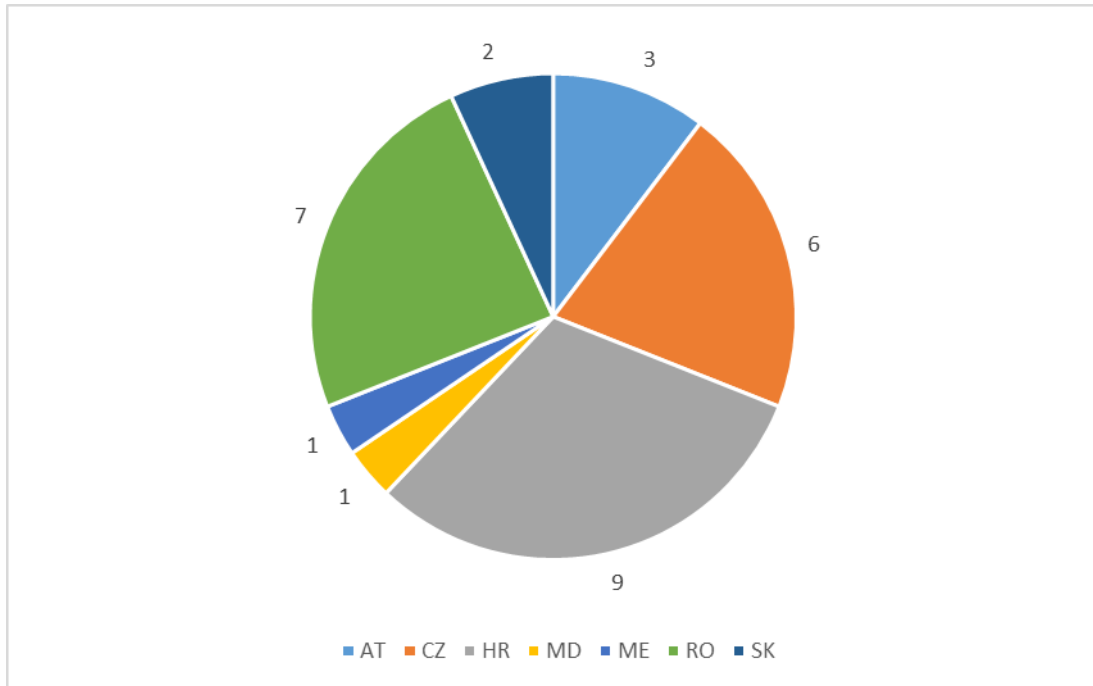
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[12] http://www.europeana.eu

Figure 13: PA4: Water Quality in Austria, Czech Republic, Croatia, Moldova, Montenegro, Romania and Slovakia

In total 29 projects could be related to PA4. This is to be expected given the environmental focus of the PA and the need to share geospatial data within the expertise and sometimes daily work of the Danube_NET members, as well as the JRC's work in the Water Nexus. An example of a cross-cutting project mentioned by several of the experts was Waste Management for Inland Navigation on the Danube (WANDA) which may have both water-based mobility data in its analyses as well as details about the impact of waste on water quality on the Danube, as well as proposals for how to deal with it. More traditional water management projects also exist, such as the Study on reducing pollution Sava River Basin mentioned by Croatia, although it is not clear if this is a cross-border project. Water quality examples have also been included on a broad base, taking into consideration the Water Framework Directive, and examples include Managing Aquatic ecosystems and water Resources under multiple Stress (MARS) mentioned by Romania that may also link to PA6 on biodiversity.
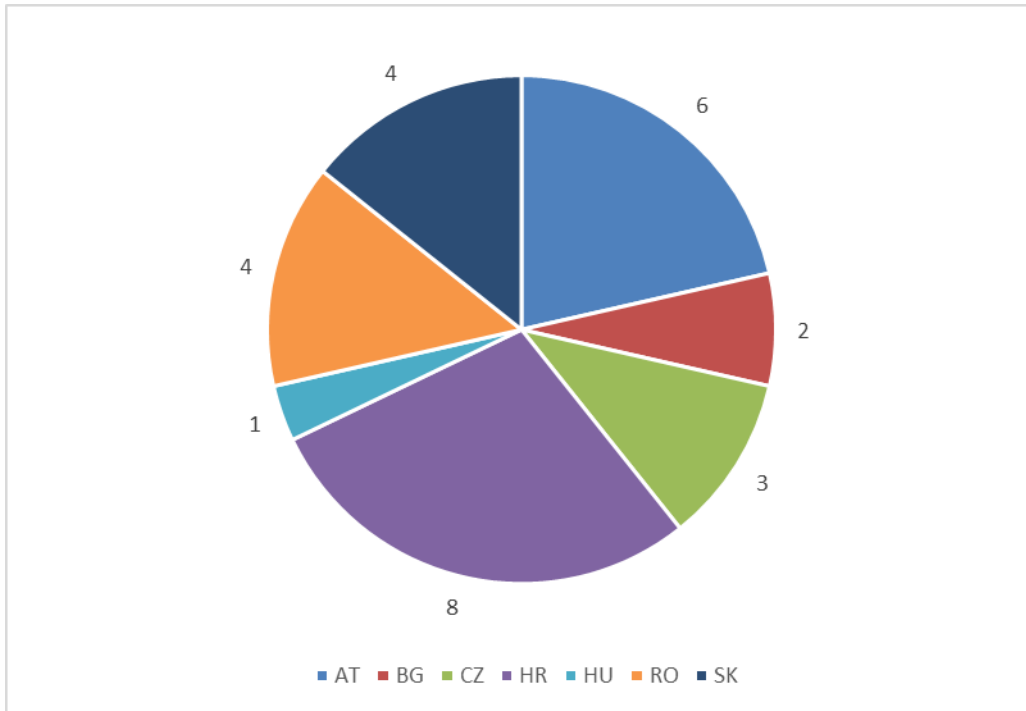
Figure 14: PA5: Environmental Risks in Austria, Czech Republic, Croatia, Moldova, Montenegro, Romania and Slovakia

In total 28 projects could be related to PA5. This includes national and European projects related to flooding and risk in general, including examples involved in water quantity modelling. A key example is the SEERisk project [13] with partners in most Danube Countries focussing on joint disaster management, risk assessment and preparedness in the macro-region. Similarly, the Danube Floodrisk project[14] was mentioned by more than one expert.

Other projects cover more related work such as the creation of a GIS for environmental health or an analysis of economically important pest species which can help monitor environmental risks. Much of the data used in risk assessment not only involves maps of the topic at risk but also maps of the areas being impacted, either as human health, populations at risk or properties. Such processes require good access to standardised (geospatial) data and environmental risk in general could potentially be an important producer and consumer of DRDSI platform content.

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[13] http://www.seeriskproject.eu/seerisk/#main

[14] See e.g. http://www.oerok-projektdatenbank.at/Projektdetail.asp?nProjektID=206
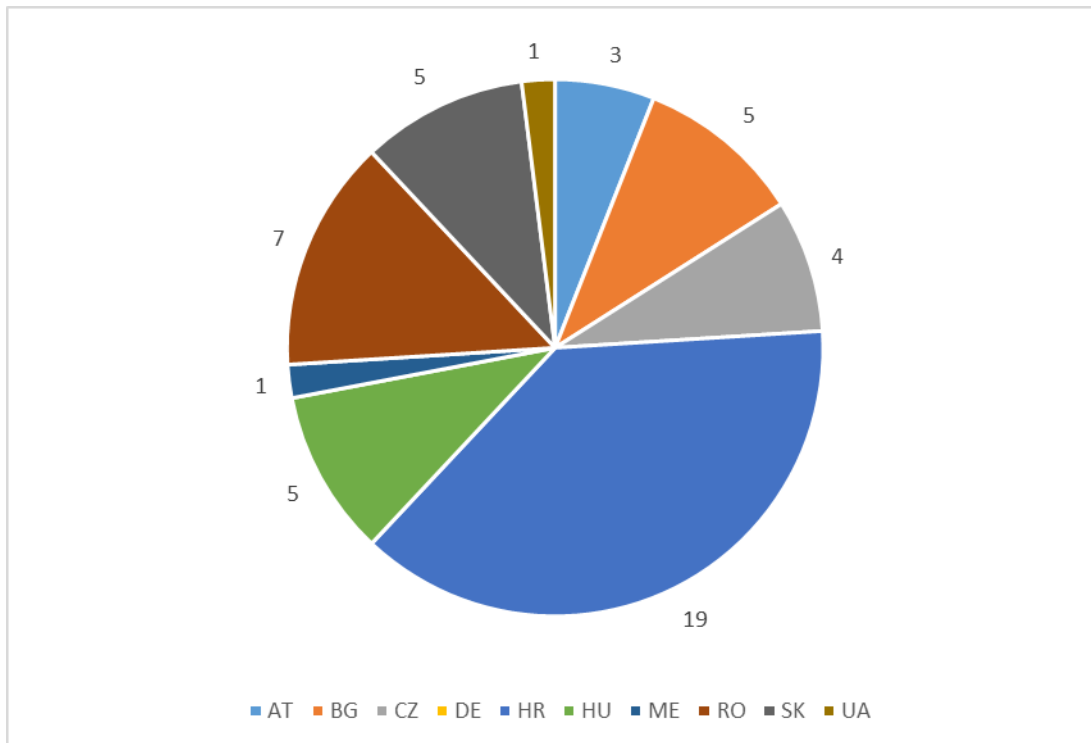
Figure 15: PA6: Biodiversity, landscapes, air and soil quality in Austria, Bulgaria, Czech Republic, Croatia, Germany, Hungary, Montenegro, Romania, Slovakia and Ukraine

In total 50 projects could be related to PA6, the largest group from the identified projects by Danube_NET. Part of this large number is related to the efforts in Croatia to identify such work (19 projects) but this is also likely to reflect the sorts of data that are being shared as part of the INSPIRE Directive and other EU environmental legislation such as the Habitats Directive. The European Biodiversity Observation Network (EBONE[15]) was recognised by more than one expert as an important activity in the region. Several of the examples are closely related to soil databases (including the work of the JRC Soil Nexus) and silviculture and forest management, such as the First National Forest Inventory of Montenegro and the European mixed forests (EuMIXFOR) project, identified in Romania, which is linking scientific knowledge in Sustainable Forest Management.

Such resource management projects could also offer data on sustainable energy resources for PA2 and the Bioenergy Nexus. Overall, the breadth of the topics covered, the identification of projects supporting JRC activities in the countries (such as the soil databases) and that several countries are represented in this PA may indicate the representative nature of this topic and that such data and project details could be readily available to further support this PA.
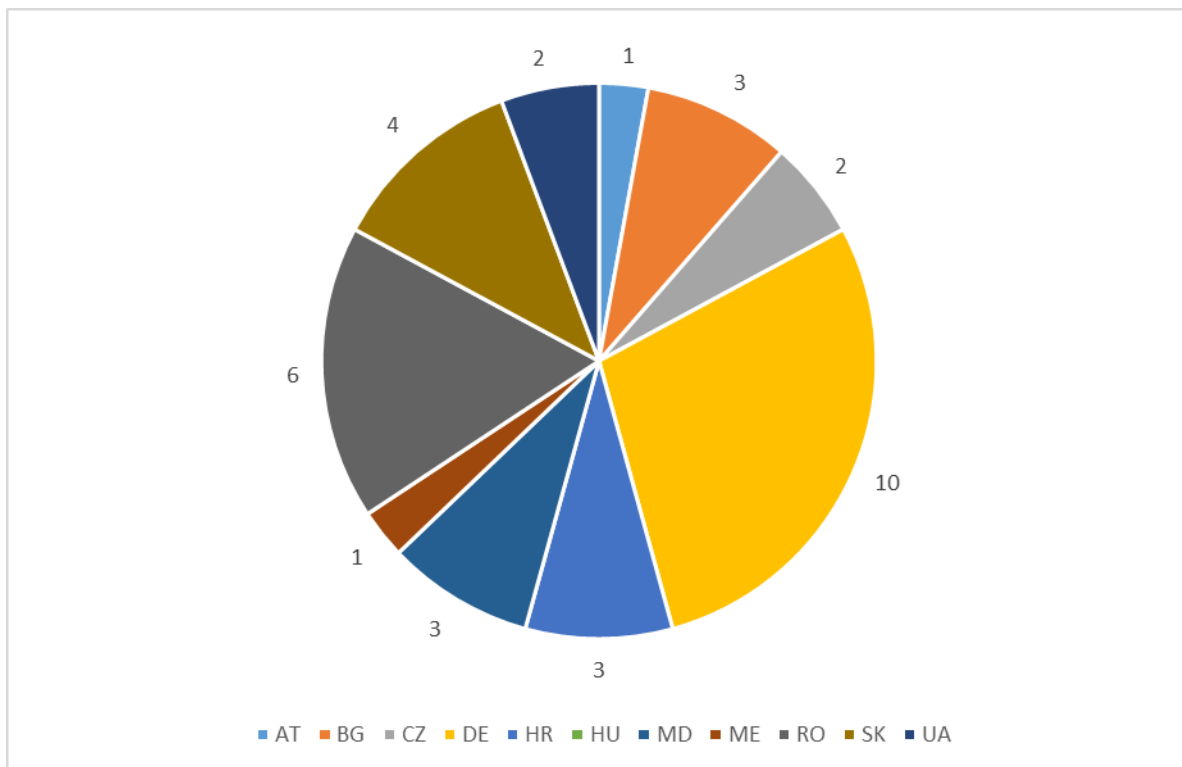
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[15] http://www.eubon.eu/

Figure 16: PA7: Knowledge Society in Austria, Bulgaria, Czech Republic, Croatia, Germany, Hungary, Moldova, Montenegro, Romania, Slovakia and Ukraine

In total, 35 projects could be related to PA7, the PA most closely related to the DRDSI. The sample has a strong representation from Germany as the expert focussed on SDI-related topics but the development of spatial data sharing, GIS-related training and capacity building in Earth Observation technologies have also been classified in this group. Projects have included work on the Standardization and Inter-Operability of Geographical Information and Semantic enrichment of 3D city models for sustainable urban development in Slovakia. Geospatial data, however, is not the only focus and Austria has identified other ICT-related activities including key infrastructure projects such as South East Europe improved virtual accessibility through joint initiatives facilitating the rollout of broadband networks (SIVA) as part of the South-East Europe Programme. Capacity building in ICT/GIS skills was also identified, such as the work in Bulgaria on Building Capacity of NGOs, Youths and Citizens for Use of GIS and Strengthening the Monitoring Skills and Advocacy of Policies for Regional Sustainable Development, a topic potentially related to PA10.

Importantly, the experts also identified the EnviroGrids project that is already delivering data about the region to the DRDSI platform. Other examples include work on more specific SDI developments, including research in Ukraine to create geoportals for the Research institute on geodesy and cartography State Enterprise and one on the Administrative-territorial structure of Ukraine, alongside less recent but important European network projects such as European Network on Geographic Information Enrichment and Reuse (eSDI-NET+[16]). Other examples also focus on important asset management projects, such as the Romanian project VIrtual Registry of the under-above-on GrOund Infrastructures (VIRGO).
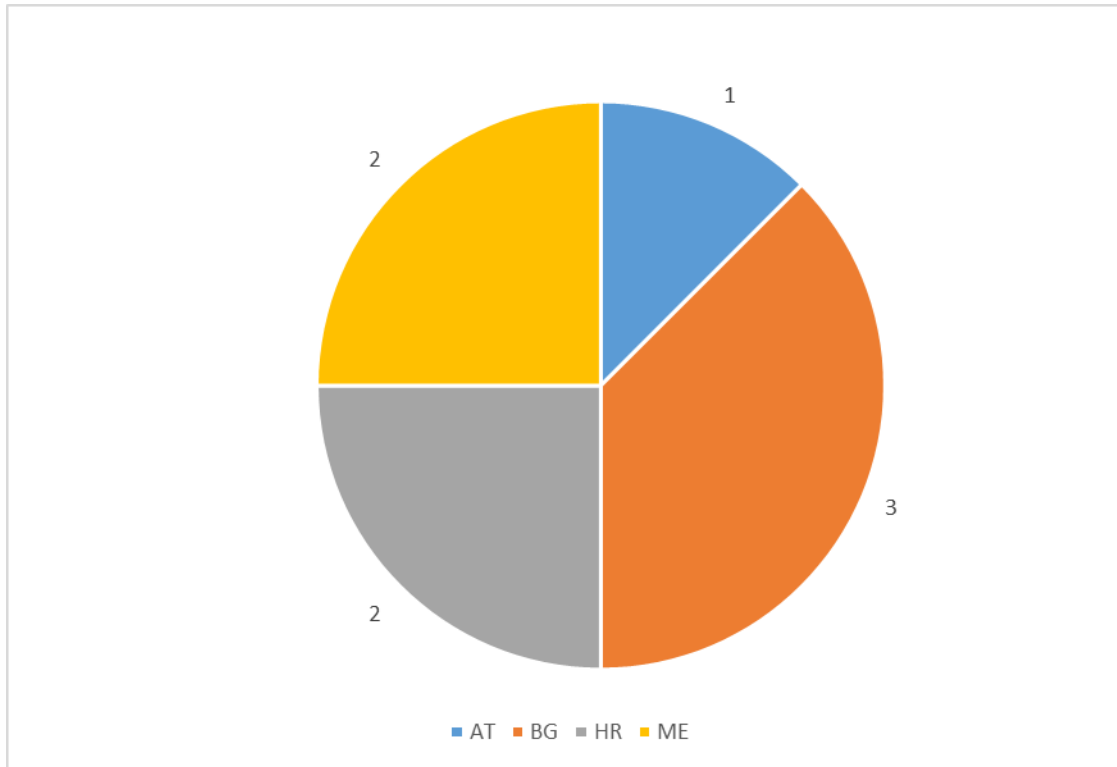
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[16] http://www.esdinetplus.eu/

Figure 17: PA8: Competitiveness in Austria, Bulgaria, Croatia and Montenegro

In total, 8 projects could be related to PA8, a topic that is somewhat further from DRDSI's focus on data-sharing. In this case, however, projects which focussed on innovation were included in this topic, as they are felt to lead to improved competitiveness. Examples include the project Mechanism for fostering innovation in South East Europe (FINNO), alongside those crossing several topics such as the FP7-funded Towards an Intermodal Transport Network through innovative research-driven clusters in Regions of organised and competitive knowledge (INTRAREGIO) or Smart and Green technologies for innovative and sustainable societies in Western Balkans (Green-Tech-WB), identified by Montenegro.

Given the potential to generate economic growth through ICTs in the region, as discussed in DRDSI stakeholder workshops [17], the topics of competitiveness and innovation, alongside the knowledge transfer work of the Danube Innovation Partnership Nexus.

It is also important to mention the projects the experts mentioned but which were harder to classify, especially projects creating reference data. This can be seen in the first case in terms of the work in each country, where the examples from the Czech Republic were not well reflected in the above analysis as the data provided was pointing to online repositories of project information.

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[17] For example, see https://ec.europa.eu/jrc/en/event/workshop/data-infrastructures-sustainable-growth
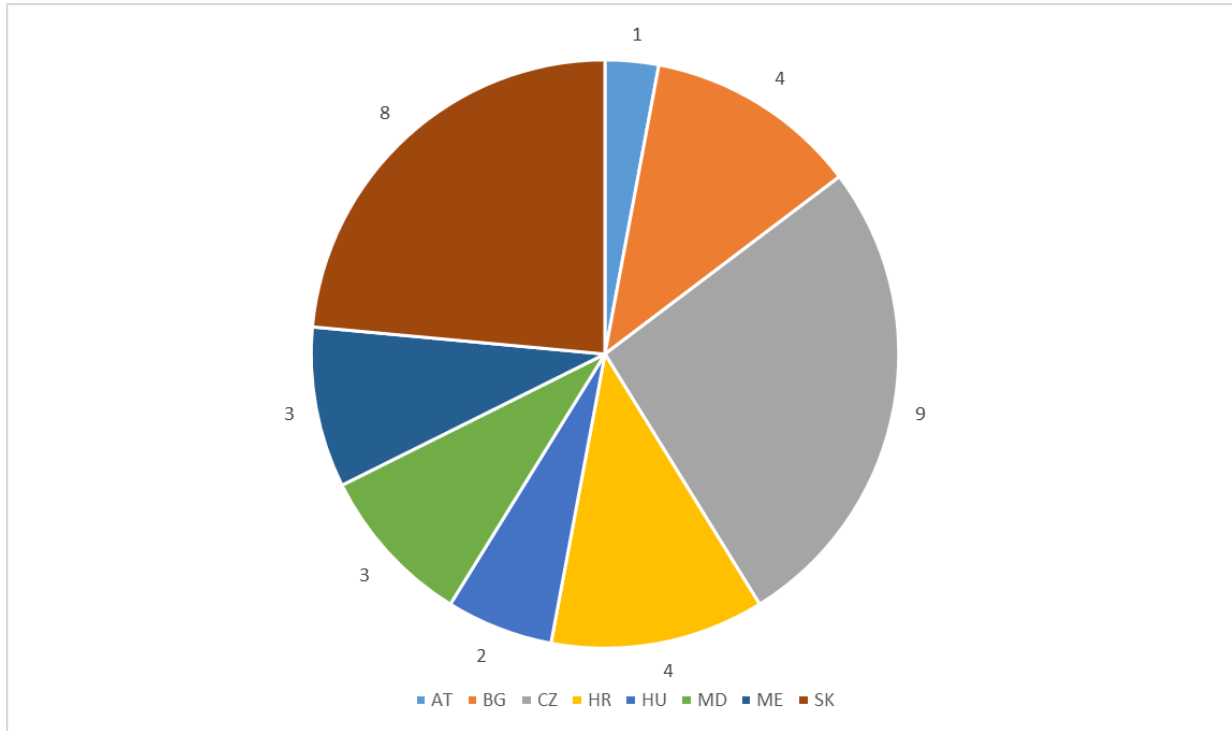
Figure 18: Other identified projects in Danube countries not directly linked to PAs

Several of these examples include European projects on geology reference data, including OneGeology Europe[18] and Minerals4EU[19], where the former already provides data to the DRDSI Platform, or the more specific Sustainable Aggregates Planning in South East Europe (SNAP-SEE) project. Other related examples include Assessing European capacity for geological storage of carbon dioxide (EU GEOCAPACITY[20]), as identified by Croatia but coordinated by a Danish partner.

This raises another issue about projects involving activity outside the region but with Danube country partners that are maybe not being readily covered by this investigation or potentially the work of other EUSDR activities. Another key example related to reference data that has difficulty to make direct links to the PAs is urban and regional planning, partly as the topic is, itself, cross-cutting.

A key example is Project SPATIAL. Funded under European Territorial Cooperation 2007-2013 the project already provides harmonised cross-border data to the DRDSI platform about their work on a Common Strategy for Sustainable Territorial Development of the cross-border area Romania-Bulgaria. Other examples related to agriculture that SPATIAL partly draws on have also been included in this group in the analysis, where the Montenegrin example Lifelong learning for sustainable agriculture in Alps-Danube-Adriatic Region (LIFEADA) not only shows links to skills and training but also the links that can be made across macro-regions.

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4. Overview of issues faced in exploring projects

This work points to a range of issues in handling data about projects and using projects as a means to involve more stakeholders in the platform.

The first issue relates to the fact that there is indeed a missing unique resource to cover all the topics of interest to the EUSDR in terms of current and ongoing projects that could provide data to the region, for both the current strategy but also sustainable activities stemming from it. The extent to which DRDSI can fully take on such a task must be evaluated. The DRDSI project could take such work forward in terms of better technical and organisational connections to project owners in the region, especially those with a research base, for example through the Danube_NET experts' sample.

On a more technical level, the fact that there are so many different resources that can be investigated to create a more complete picture raises the issue of duplicate or multiple records from different sources, including the governance mechanisms needed to share any content. FP7-funded projects appeared in several sources the DRDSI has explored, including the case of EnviroGrids which is already providing a collection of data services for the DRDSI platform. The issue in accessing and maintaining project information from several sources is not trivial, including cases where project-related information may have copyright or other rules for reuse.

This also raises issues about a more standardised way of presenting project-related information online, especially when tied to research infrastructures or the interest in understanding a project's relationship to policy objectives. The creation of such content could be linked to the work of CERIF but this standard may only be readily accepted by research projects and less, for example, for data projects in the public sector.

Another element to consider is the role of projects in also illustrating the skills-base and capacity of actors in the region to fill gaps in data. This investigation has identified a range of topics that are taking place, often with multiple partners in cross-border or macro-regional studies. How to readily codify such information would require further work.

Another area of concern for the DRDSI is scope and the purpose of the project-related work. As seen in the case of the Danube_NET, in general few projects have been found related to capacity-building, people and skills and security as their main focus and few in general related to economic issues such as competitiveness. In part this can be related to the types of project of interest, where capacity building projects, for example, related to GIS were more readily classified under PA7, although they also relate clearly to people and skills from a longer-term perspective. What this, therefore, is likely to mean is that projects could be roughly split into those that perform a support function in the EUSDR and those that are directing addressing particular topics or themes, often of interest to more than one PA.

Again, on a technical level, this introduces another concern related to the classification of the information gathered on projects and how to share this on a broad base for potential widespread use or even reuse in systems in the future. In nearly all cases, except the work directly stemming from the EUSDR, subjective judgements were needed to associate a project with a 'lead' PA. Project owners, if required to register projects, may not easily map their projects or the data they contain to PAs. This may be problematic when project data could be of relevance to the EUSDR, including help for ex-ante and ex-post assessments related to, for example, regional development funding.

In the short-term, the use of the PAs as a classification/label for projects should be considered but the ability to make a more semantically rich view of projects may prove to be a more sustainable approach. This could be considered in the context of Linked Data and the W3C's Resource Description Framework (RDF) standard that allow web-

based content to be associated and processed based on its semantic relationships. A simple example could be defining project content in terms of its relationship to entities: that a project is led by a certain organisation, that another organisation is a partner of that project, that the project is using a particular technology to share data and that the project is producing data according to a particular element of interest. Using such Linked Data technologies is an emerging reality in e-government contexts and relies on good governance approaches to create and publish well-maintained content. This topic in itself could be explored further as another research project.

A related piece of work has already taken place in the DRDSI as preparation for a possible implementation, with a focus on reusing open data. The example comes from the CORDIS database cited above, where the DRDSI team explored how to map and harvest the CORDIS records and store them in the platform's CKAN technology. CORDIS contains a series of code lists including the programme that records belong to, the scientific subjects being covered and the participant countries (as shown above). At least for European-funded projects, a standardised approach to using such database fields should be encouraged so that data from different sources can be explored, again with the work of CERIF in mind. Conceptually, the mapping from CORDIS to CKAN would allow such content to be stored and displayed in the DRDSI platform (see Fig. 18).
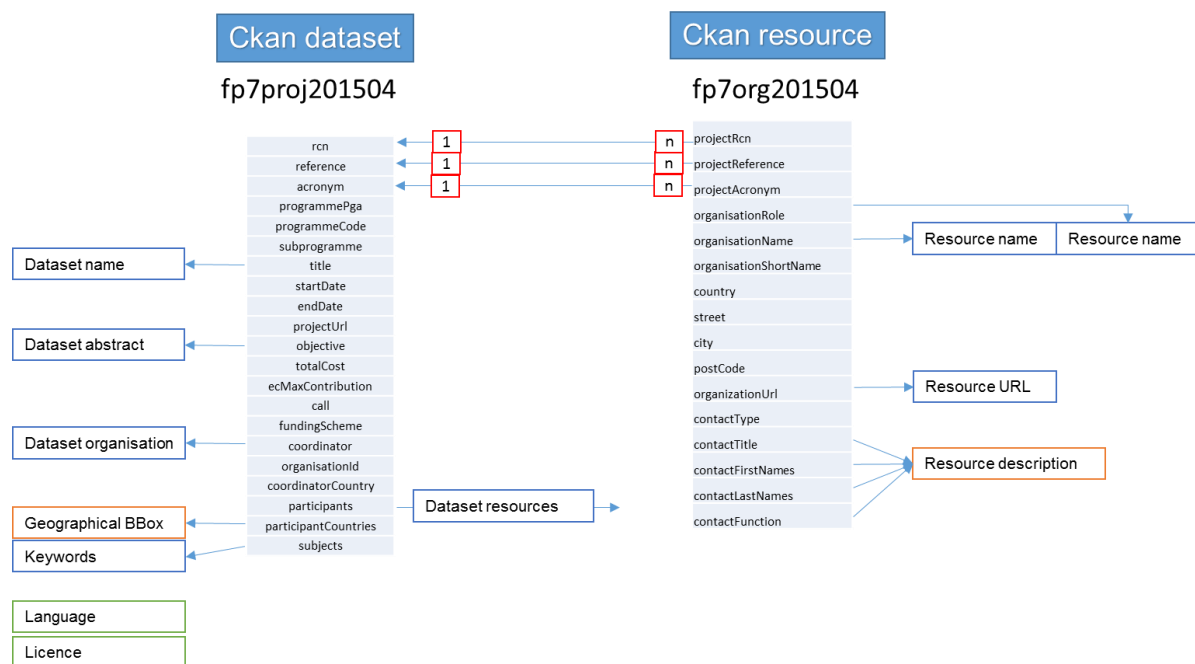

Figure 19: Mapping between CORDIS and the DRDSI CKAN instance

One of the potential contributions that DRDSI could explore in this case is how geospatial data related to projects could be displayed in CKAN in terms of the location of participating countries and the reference to organisations associated with a resource. Some conceptual mapping already offers some opportunity for further exploration but the creation of the physical content in practice would require specific work to further develop the platform.

Addressing these issues in the DRDSI project can be seen to have led to some development of this topic and how to possibly implement such content but the creation of information in the platform needs to be decided in consultation with Danube_NET and other stakeholders. Some possible approaches are outlined below.

5. Possible solutions

Already the work with key projects can be established in the DRDIS platform by registering them as data sources but the desire to have a discrete list of projects and have project owners engage with the platform requires further work.

5.1 Linking existing websites and platforms

An initial step in this context could already involve the co-promotion of EUSDR-related projects through their specific platforms and websites. The simplest step is to create a generic template about key projects, including those of the JRC, to circulate to website owners so that a virtual network of projects is created almost automatically. Support for such activity should come from appropriate bodies and the role of DG REGIO in facilitating such work should be explored from the outset. Connections have already been made with partners in PA7, such as Danube INCO.NET, and the role of the DRDSI project sharing details of the other Nexi's data as user stories (See Fig. 19) can be seen as a development in the JRC worth building upon.
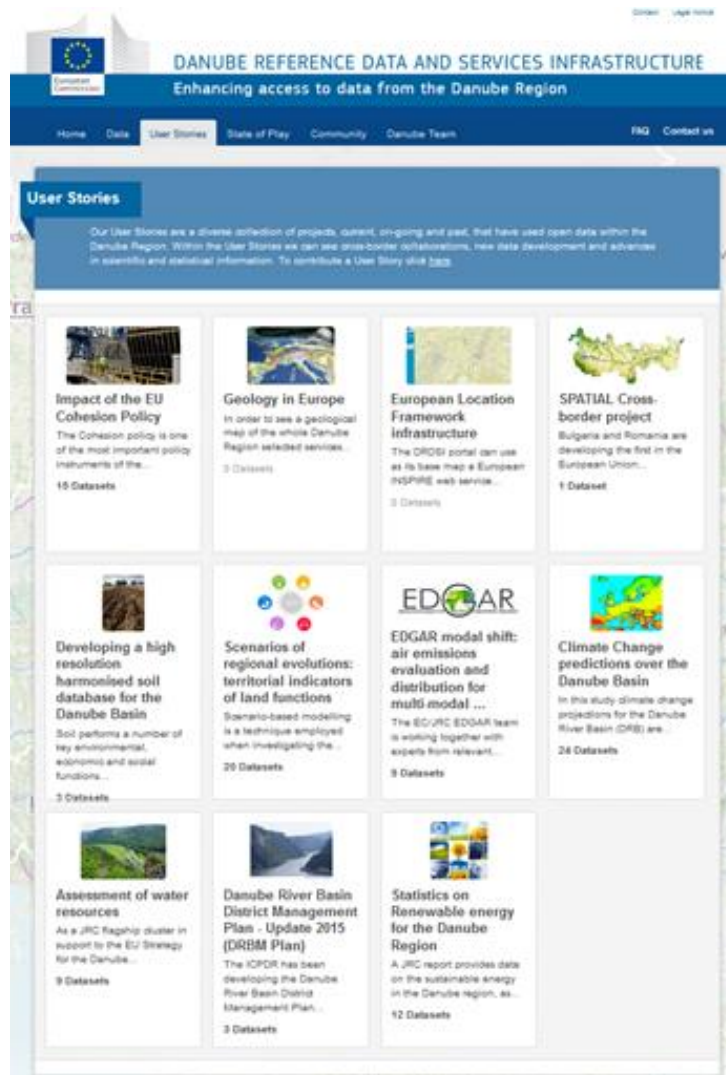
Figure 20: DRDSI Platform User Stories including JRC Nexi examples

5.2 Developing a prototype inventory of stakeholders and projects

One of the challenges identified above is the heterogeneity of data sources related to projects. Although semi-automatic processes could be sought in the longer term, more manual processes can be adopted to create platform-related content, as already undertaken by the Danube_NET. With this in mind the DRDSI could establish an online inventory of stakeholders and projects focussing on those creating and sharing data, the tools they are using, any emerging good practices and the key link to datasets supporting macro-regional analysis.

The opportunity to create such an inventory also means that new forms of data visualisation could be added to the platform to display different types of content and not only details of the projects, datasets and stakeholders. Work would be needed to design and structure such a database, further assess existing data sources in terms of mapping common data structures to a common representation of projects for use in CKAN and to evaluate any further technical developments needed.

Ideally, such work should also involve end-users of the platform so that the visualisations of platform content could also provide support to particular activities. The development of on-the-fly infographics is one area that could be particularly useful, as

the investments made by the project could create reusable tools and approaches for others where open source software would be used. Inputs to this work might include examples from libraries such as the well-established JavaScript library - D3[21] (See Fig. 20).

Figure 201: Sample Visualisations, based on the D3 JavaScript library

The new content in the platform could also be partly driven by geospatial data, as seen by the examples of projects presented in the case of the InfoRegio website (shown above) and reuse the location of projects partners (at city level) that is being recorded in databases such as CORDIS or the PNF. An important element to consider in such work is how the geographical coverage of any project would also be represented, given the above findings about the role of actors not based in the Danube region and that study sites may be quite specific (e.g. a national park or cross-border area) and benefit from direct representation in the platform (e.g. study sites could be presented as reference geographic layers if they relate to protected sites, administrative boundaries or similar INSPIRE-related themes). The geographical representation of a project is not trivial.

In addition, both projects and, where possible, related datasets should be classified according to EUSDR PAs. Similarly, the types of stakeholders involved in relevant projects should also be typified to understand where there is particular expertise in certain locations, such as such as recording details of the project coordinator (as in CORDIS) as well as partners who are data producers, data analysts/users and, potentially, software solution provider.

In general, it may also be useful to record the sector project partners belong to: public, private, academic/research, NGO or other, as Danube_NET members have already explored. It may also be useful to consider the intended audience for the project outputs

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[21] http://d3js.org/

as this may also indicate the nature of the data involved, including the same categories as the project partners. An additional element that could be explored in these cases is the role of citizens or their representative groups in creating and consuming data.

As well as designing the structure of an underlying database and its visualisation, work would also be needed to gather content for the project inventory with a population plan to fix a scope and realistic targets for its creation. This could also be seen as a promotional activity for the DRDSI with such project owners, including raising awareness about DRDSI's overall aims, the benefits of sharing project details and, fundamentally, data.

An example of such a benefit could be cases where projects are coming to an end and where the DRDIS could help sustain their lifespan through reuse of the results in further activities, a barrier identified by the Danube INCO.NET project in investigating innovation in the region. The population plan should take into consideration the reuse of the existing inventories identified above and define strategies to gather further content from emerging stakeholders not included in these sources, as well as getting feedback from the projects to ensure that outputs are creating the desired benefits.

Some work on using RDF for web-based data interchange could also be undertaken in this context. This could include using the DCAT application profile for metadata in open data portals that the JRC has been supporting in the development of its geospatial extension, GeoDCAT-AP[22].

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[22] https://joinup.ec.europa.eu/node/139283

6. Conclusion

This report has highlighted some of the existing information resources that relate to projects in the Danube region, focussing on those examples where reusable reference data may be available. Arguably, these resources are fit-for-purposes in promoting the activities and results of these projects but there is clearly a number of issues in reusing and harmonising content from these sources. Certainly, a more standardised way of presenting and using project information as a mechanism for engagement and promotion could be needed. The work of the Danube_NET experts has already provided useful evidence showing the range of projects that could be associated with each PA and where there appear to be some gaps in our coverage.

A short-term solution for the work in the DRDSI platform could be to simply list the relevant projects and to contact project owners to make them aware of the work of the DRDSI and its Danube_NET experts in each country. This can also be related to a more strategic role in engagement, communication and capacity building that the DRDSI project is already active in pursuing. In particular, the work of the DRDSI project's own pilots is providing useful evidence about how to describe projects. The documentation of these examples as User Stories in the platform will already deliver some evidence on this topic next year. In addition, the collaborative tools the overall platform is hosting can help to collect more evidence on projects and bring project owners closer to DRDSI processes. To make such work more effective, however, the project needs to be clear what the benefits of engagement and providing details would be, such as the promotion of people's expertise and finding partners to help fill gaps or harmonise data across borders. Also, within the context of platform's developments, it is possible for users to state they have a project of interest to the platform. Although this has been implemented for some time, awareness-raising could still be worthwhile, as well as getting feedback from existing platform users about the benefits of this other approach.

Another area that could be relatively easily explored is the inter-linking key projects in the EUSDR. This includes the flagship projects that some PAs have highlighted on their websites, the individual sites of such projects and the websites and other platforms that the JRC is providing as its scientific support to the EUSDR. The Smart Specialisation platform and DRDSI, for example, could both provide links to these sites as part of a virtual network and this could be discussed with the other Nexi at the start of 2016.

Medium-term solutions for engaging with projects and recording their details could also be explored, including the design of a project inventory and the promotion of standardised descriptions of, at least European projects, for reuse in not only the DRDSI platform but also any website wanting to consume and present such information. The work of the CORDIS database is a key example of this, where authentic information about projects is well organised and made freely available and similar approaches could be encouraged across the platforms (or their successors that this report has identified).

As far as research projects are concerned, such issues may also have a research focus in themselves, including the standardised descriptions of projects and related assets that the CERIF standard is promoting, alongside other emerging standards for describing other information such as the ISA Programme's Asset Description Metadata Schema for software tools (and other interoperability assets) and their Data Catalog Application Profile (DCAT-AP) for documenting metadata for open datasets. In turn, this introduces a number of important governance issues about how such unique building blocks can be encoded (e.g. by using linked data technologies like RDF) and how the unique identifiers for projects are created and governed to have distinct references to a given project, particularly where there are different funding organisations and countries involved.

The work on the DRDSI has allow us to address some of these topics and it will be important to better understand user demand for such information before further investments are made.

References

[1] Scientific Support to the Danube Strategy, Concept paper,
https://ec.europa.eu/jrc/sites/default/files/jrc-scientific-support-danube-strategy-
concept-paper.pdf

[2] Directive 2007/2/EC of the European Parliament and of the Council of 14 March
2007 establishing an Infrastructure for Spatial Information in the European
Community (INSPIRE) (*OJ L 108, 25.4.2007, p. 1–14*), http://eur-
lex.europa.eu/LexUriServ/LexUriServ.do?
uri=CELEX:32007L0002:EN:NOT

[3] EU Strategy for the Danube Region
http://ec.europa.eu/regional_policy/cooperate/danube/index_en.cfm

List of abbreviations and definitions

CERIF: Common European Research Information Format

CORDIS: Community Research and Development Information Service

DANUBE_NET: network of experts from the 14 countries/regions supported by the European Union Strategy for the Danube Region

DCAT: Data Catalogue Vocabulary

DRDSI: Danube Reference Data and Services Infrastructure

EO: Earth Observation

ERA: European Research Area

EU: European Union

EUSDR: European Union Strategy for the Danube Region

FORAPA: Sustainable Networks for the Energetic Use of Lignocellulosic Biomass in South East Europe

FP: Framework Programme

GEO: Group on Earth Observation

GEOSS: Global Earth Observation System of Systems

JRC: Joint Research Centre

KEEP: Knowledge and Expertise in European Programmes

NEWADA: Network of Danube Waterway Administrations

PA: Priority Area

PNF: Permanent Networking Facility

NUTS: Nomenclature of territorial units for statistics

REGIO: Directorate-General for Regional and Urban Policy

SETA: South East Transport Axis

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