



Typology of NAPs based on the description of levels of service and assessment of associated costs and benefits

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Author(s)	Nuno Rodrigues, NDW (NL); Lígia Conceição, ARMIS (PT); Vladimír Faltus, ČVUT (CZ); Holger Drees, BAST (DE); Chrysostomos Mylonas, CERTH (GR); Maria Stavara, CERTH (GR); Evangelos Mitsakis, CERTH (GR); Andras Selmeczy, KOZUT (HU); Benjamin Witsch, AustriaTech (AT); Edmundas Zvirblis, LAKD (LT); João Gabriel Montenegro, ARMIS (PT).
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- For review/ approval by the Core Alignment Team
- For approval by the NAPCORE Steering Committee



Abbreviations

Abbreviation	Meaning
EC	European Commission
CAT	Core Alignment Team
GBFS	General Bikeshare Feed Specification
GTFS	General Transit Feed Specification
MMTIS	Multimodal Travel Information Services
NABSA	North American Bikeshare Association
NAP	National Access Point
NAPCORE	National Access Point Coordination Organisation for Europe
RTTI	Real-Time Traffic Information
SC, SCOM	Steering Committee
SCS	Steering Committee Support
SRTI	Safety Related Traffic Information
SSTP	Safe and Secure Truck Parking
SWG	Sub-working Group
WG	Working Group
WP	Working Programme



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1. Introduction

1.1. Scope & objectives

The second working group of the NAPCORE project (WG2 “Interoperability and level of service of NAPs”) aims to define minimum conditions and coordinate the development and evolution of European National Access Points (NAPs) by enhancing the compatibility and interoperability of their features (including access, management, and look & feel features).

Moreover, it aims at harmonizing the level of service of NAPs considering the currently adopted data standards and NAP architecture while also taking steps towards the maintenance and extension of this architecture. Interoperability demonstrators are also within the scope of WG2 aiming to describe and develop technical solutions enabling increased interoperability and improved NAP level of service. WG2 is structured around four tasks:

- *Task 2.1 “Level of service of NAPs”*: Focuses on the uniform description of NAP level of service.
- *Task 2.2 “Definition of requirements concerning data standards, reference profiles and metadata and support tools”*: Focuses on the improvement of data interoperability by defining common data standards, reference profiles, and metadata (including requirements for them).
- *Task 2.3 “NAP architecture”*: Focuses on the maintenance of NAP reference architecture and the assessment of its interoperability and harmonization needs. It also focuses on the identification of new requirements through the execution of use case analysis to ensure secure and private data exchange for all aspects of interoperability.
- *Task 2.4 “NAP service interoperability demonstrators”*: Aims to showcase experiences from and best approaches/practices on real-world use of NAP reference architecture to support the interoperability and continuity of ITS services.

The current report addresses the first milestone of WG2 - M2.1 “Typology of NAPs based on the description of levels of service and assessment of associated costs and benefits, which is a part of the workload of Task 2.1. Specifically, M2.1 is the main output of Work Item 2.1.2 that aims to provide a comprehensive context and framework for assessing the level of service of a NAP considering its adopted design and development approach and supported features and technical interfaces thereof.

The main outcomes of the Task 2.1 is a uniform description and tool to assess a NAP Level of Service based on a framework of Key Performance Indicators related to the offered interoperability features and services by the NAP. The proposed “NAP LoS KPI Framework tool” (NLKF) is a building block in working towards a common approach for NAP Level of Service and hence support interoperability between NAP.

The NLKF specifically contributes to harmonization of NAP level of service through its use and application by NAP operators as a uniform EU reference in decision-making processes on future developments and investments towards a European NAP reference. Examples of use cases are:

1. **NAP roadmap development and monitoring**: Through periodic (yearly) scoring exercises, it supports the NAP product owner with insights on gaps on new potential features or improvement of existing features LoS, that can be added to its roadmap in order to increase performance to a desired level
2. **Regulations compliance assessment**: Supporting supervising bodies in the assessment of European or national regulations and agreements.
3. **NAP LoS European benchmarking**: Through comparisons with:
 - a. a periodical calculation of a **European benchmark reference** based on the **average** (or other statistic) scores of all Member states.
 - b. A **minimum level of service** defined by the features from a reference architecture



This milestone describes the development of the NKLF as well as the “why”, “for whom” and “how” the NLKF tool can be used in the context of NAPCORE NAP LoS harmonization activities. The milestone takes input from Work Item 2.1.1 the main goal of which was to support the understanding of the current state of play within the European NAP ecosystem as well as the recording of existing best practices and common NAP features. Finally, this milestone sets the basis for the listing of gaps and actions needed towards NAP interoperability and minimum level of service, which is the focal point of Work Item 2.1.3.

1.2. Approach

The current section provides an overview of the methodological approach adopted for the definition of the NLKF - framework supporting NAP level of service assessment.

The first step includes an analysis of the current state of play concerning NAP features. The main source of information for this purpose constitutes a similar endeavor made by the European ITS Platform (EU-EIP) in the past as well as expert judgement and other evidence available in the relevant literature concerning data exchange in general and transport data exchange in particular. Such an analysis enables the definition of a list of NAP features grouped into several categories associated with a different operational dimension of a NAP (refer to Section 2.2).

The second step involves the preparation of a survey to assess whether the features identified and included in this list are supported by European NAPs and, in this respect, their level of commonality. This survey has been prefilled the Member States that are active in Task 2.1 in order to ensure that survey questions are readily understandable and answerable, and that all critical NAP features are taken into consideration.

The third step includes the execution of the survey and the acquisition of information by as many Member States as possible. In total 18 Member States have responded, including at least the ones marked as active in Task 2.1. The survey, which has been prepared in both an on-line and off-line form, enables the participating Member States to provide information in both a quantitative and qualitative manner, state their status and plans, as well as differentiate the provided answers when a different platform is operated for one or more Delegated Regulations supplementing the ITS Directive (2010/40/EC).

The fourth step of the methodological approach includes the analysis of the acquired answers aimed at the definition and qualification of a list of Key Performance Indicators (KPIs) targeting the assessment of the maturity level of a NAP and its level of service thereof. To our understanding, each maturity level is associated with a set of goals/requirements/minimum parameters that once satisfied by a NAP platform we can assume that this platform has accomplished a certain maturity level. These KPIs are grouped into the same categories used for the grouping of NAP features. For each KPI all possible and specific threshold values are pre-determined, with each threshold value being associated with a specific score (or grade of achievement). Furthermore, specific scores are marked as “must have” and “nice to have”. The former qualification resembles a basic/minimum level of service, while the latter a desired level of service.

In the fifth step, we introduce two different NAP types in the assessment framework, namely “data directories” and “data platforms”. This is done to facilitate the next step revolving around the assessment of the relevance of each KPI with different NAP implementation and operational approaches as well as the importance/weight of each KPI towards the assessment of the level of service of a NAP.



Subsequently, another survey is prepared and executed aimed to capture the perceived importance/weight of each KPI by the active participants of Task 2.1. Such a step enables the definition of a level of service quantification methodology that is based on a simple mathematical formula and certain levels of service (ranging from basic to desired) associated with certain score ranges.

The last step of the adopted methodological approach includes the application of the developed KPI framework to the NAPs of various Member States complying to both adopted NAP types. Further details about the followed process and derived results are provided in the following sections.

Recommendations are then proposed for utilization of the NLKF, including, use cases supporting NAP operators in NAP investments decision making and roadmap development, based on benchmarking insights and a method for LoS cost benefit assessment.

Finally, governance recommendations and principles are proposed for using and disclosing of the resulting scores and information, as well as suggested processes for scoring session and analysis of results, and its usefulness for accelerating the interoperability of European NAPs, achieving a high level of operational performance, and setting the basis for a harmonious NAP architecture.



2. NAP features and Level of Service

2.1. EU EIP NAP common features and Level of Service support

The EU ITS Platform (EU EIP) was the place where National Ministries, Road Authorities, Road Operators, and partners from the private and public sectors of almost all EU MS and neighboring countries, cooperated with the aim of fostering, accelerating, and optimizing current and future ITS deployments in Europe in a harmonized way. EU EIP brought together the majority of the European key players in the context of an open "forum", aimed at providing valid contributions for shaping the future strategy of NAPs and policy recommendations for a better development and deployment of ITS services along European road corridors.

EU EIP was the follow up of actions already supported by TEN-T programme (2012-EU-50005-S European ITS Platform and 2013-EU-50001-S European ITS Platform+). The EU EIP run for a six-year period from 2016 to 2021. By monitoring, processing, evaluating, and disseminating results delivered by the ITS Road Corridor projects (co-founded by EC within the CEF MAP ITS Call 2014), the EU EIP Platform was considered as the technical European ITS Knowledge Management Centre, contributing significantly to the most effective use of ITS standards and specifications.

Starting in 2016 the EU EIP has published annual reports about the status of the National Access Points (NAP) across Europe. The annual NAP report 2020 is the final one, describing the deployment status of NAPs in Europe as well as harmonizing work on metadata, **common features**, data standards and common formats, declaration of compliance, and other issues related to the Commission's Delegated Regulations for the priority actions of the ITS Directive.

The task of NAPCORE's WG2 that is addressed by the current report encompasses NAP common features considering that it intends to analyze the so-called NAP level of service (LoS). From the previous EIP and EIP+ projects, it is acknowledged that MS will implement their NAPs using different structures, models, data access/search tools, and data checking methodologies. In this respect, one of the tasks of EU EIP, the outputs of which are reported in the annual NAP reports mentioned above, involved the identification of the various features of NAP implementations. Such a scope did not include a validation of the quality of the content of NAPs or their datasets, since data quality aspects were covered by another task (EU EIP SA 4.1 Task 3). The list of features was developed with the help of EU EIP NAP implementers in 2016. Over the course of the EU EIP project the list was elaborated into a fuller Support Document. This document had undergone several iterations, taking NAP implementers feedback into account and adding additional features as NAPs advanced and more widely operationalized. The derived results provide a set of features intended to support good practice, make National Access Point services available to a wider audience, facilitate data sharing, and promote the discovery of datasets. The features are not mandatory and have no formal link to the Delegated Regulation of the ITS Directive. There are 20 features, grouped into five subsets, as follows:

1. **Access** – six features covering how access is gained to NAPs and their datasets
2. **Communication** – four features covering the engagement of NAPs with data consumers and publishers/providers
3. **Finding datasets** – four features covering how data consumers are facilitated to find datasets they need
4. **Update and maintenance** – three features covering the up-to-dateness of providing and how NAPs are maintained
5. **Dataset information** – three features covering additional dataset information that should be provided by NAPs



The above common features were further elaborated and discussed within WG2 for setting up a basis for assessing NAP LoS.

2.2. Description of NAP features

The National Access Points should fulfil the requirements set by the Delegated Regulations supplementing the ITS Directive (2010/40/EU). Therefore, several NAPs were implemented in Member States in different forms and with different functionalities. A major prerequisite for defining a methodology assessing NAP LoS is to gain a deep understanding of the common features of NAPs. We base this understanding in the formulation of a list of relevant questions to be asked to NAP operator. The elements of this question list are mainly based on the list of NAP common features discussed and briefly presented in Section 2.2. We have also included additional aspects considering available literature evidence and findings from other NAPCORE working groups. The elements of this question list are grouped into seven feature categories/subsets, titled as follows:

1. Access
2. Communication
3. Data Discovery
4. Maintenance and update
5. Dataset Information
6. Interoperability
7. Data exchange and operational policy

The following sections provide an explanation of NAP features assumed in each of the above categories/subsets. The full list of questions asked to NAP operators is provided in Appendix 1.

2.1.1. Access

The first feature of this subset involves the **public availability of NAPs over the web**, enabling its direct use by all interested users without any human intervention. By providing the weblink, each user gains access to the platform immediately without the need of further authentication processes.



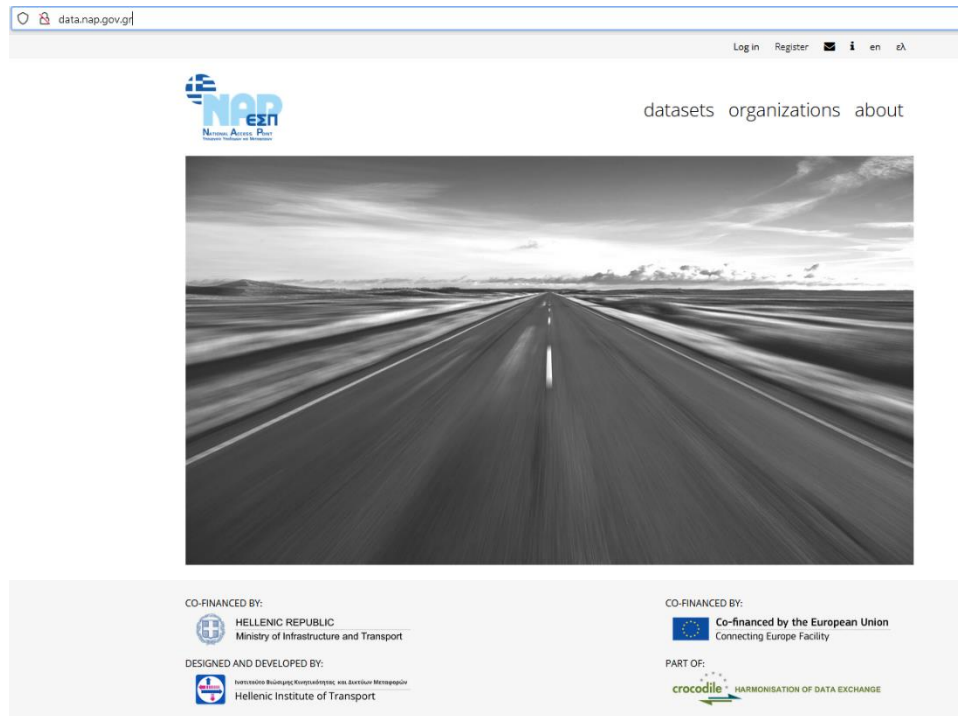


Figure 1- Landing page of the Greek NAP's website - <http://data.nap.gov.gr/>

Another important feature of this subset involves the **NAP compliance to web design standards** and best practices. This refers to concepts, such as simplicity, visual hierarchy, navigability, consistency, responsiveness, accessibility, conventionality, credibility, and user-centricity. In this respect, important properties of NAPs have been deemed: the easiness of getting access to NAP publications and metadata of data resources, the hierarchical arrangement of NAP contents, the existence of functionalities easing navigation, as well as the homogeneity of NAP contents (e.g., control functionalities are located in the same position). The **inclusion of the commonly used language(s) of Member States** apart from the national one is the next important feature of NAP platforms. Providing the NAP services into different languages extends the accessibility of the platform considering that ITS service providers, who can be addressed as the main data consumers of NAPs, may originate from different European countries.

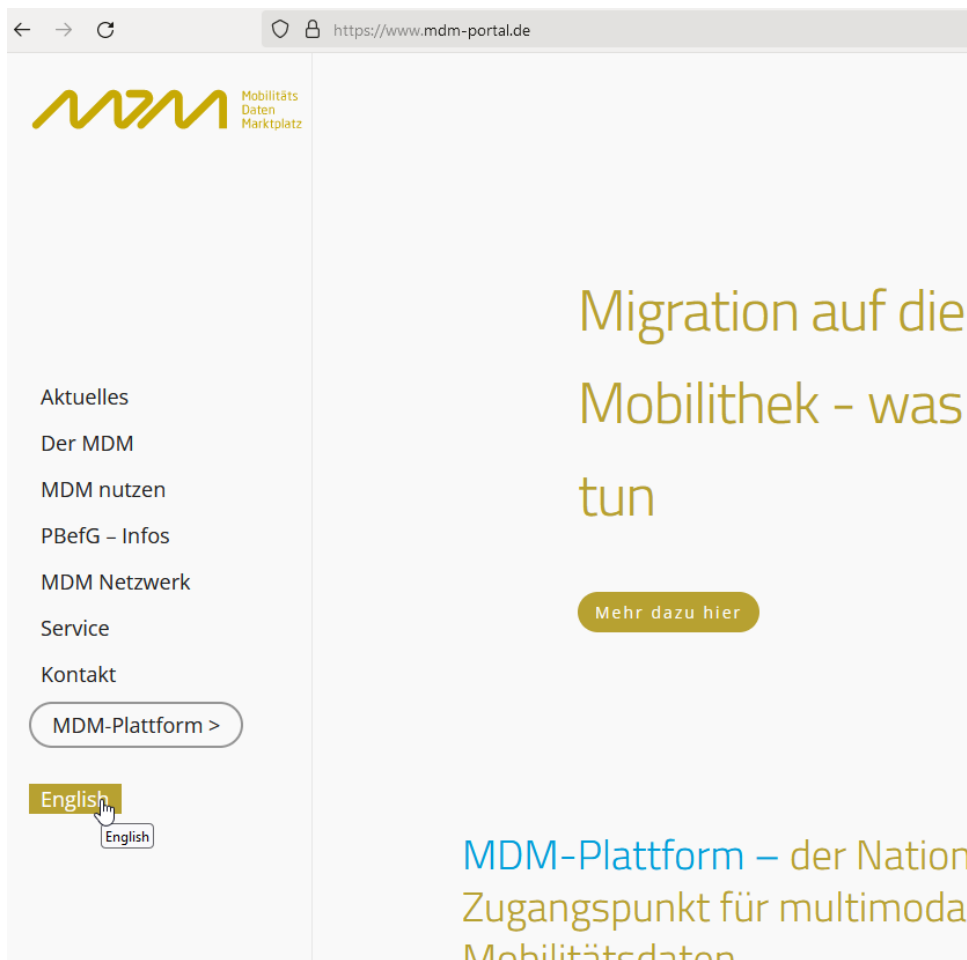


Figure 2: Language selection example from the NAP of Germany - <https://www.mdm-portal.de/>

NAPs should also **follow the EU data protection policies and security standards** to safeguard the included information and stored data (paying increased attention to personal and sensitive data). Another feature is the requirement of the **data publishers to be registered** for adding their datasets. This requirement improves the security of the NAP platforms, facilitates the authentication of data providers, and provides enhanced control to their activity.

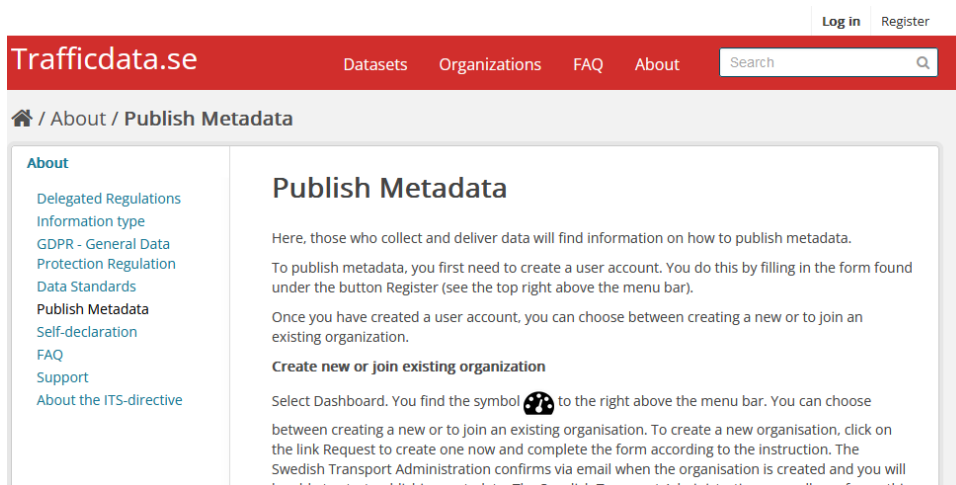


Figure 3: Publishing information on the Swedish NAP - <https://www.trafficdata.se/>



Data consumers need to register to have full access to all features of a NAP platform, they need to be registered. This requirement facilitates the authentication of data consumers, the controlled provision of access to certain resources, and the monitoring of their activity (which may be useful for statistical analysis of the content of NAPs). In addition, through this requirement data consumers can customize the NAP's user experience. It is important to note that this requirement should not necessarily be addressed as mandatory, given that the purpose of several NAPs across Europe may be the sharing/exchange of open data. In this respect, the NAP platform may have been designed utilizing data management systems complying with the open data principles. In any case, the registration of data consumers should be simple and straightforward, making security and privacy policies clear. Moreover, in line with this principle, the provision of access to an open NAP publication might be achievable without registration prerequisites.

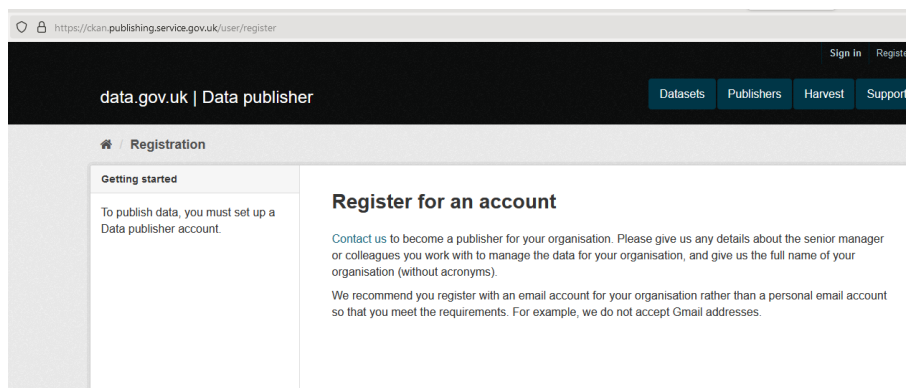


Figure 4: Registration at the UK NAP - <https://ckan.publishing.service.gov.uk>

The next feature classified in the “access” subset involves the **existence of Application Programming Interfaces (APIs)** facilitating automated access and exchange of data. It is considered as an appropriate feature given that it promotes an important property of NAPs, namely machine-to-machine communication, and information exchange. Indeed, through APIs, data consumers can receive dynamic data and information when they become available from their source without human intervention, thus enabling the immediate circulation of information.

The final feature of this subset involves the **visualization functionalities of NAPs**. Visualization allows users to gain insight into the content of the data at a quick manner. In that way and even though visualization cannot be addressed as a NAP's requirement, users can pay increased attention to important - for their purposes - datasets and data areas and easily assess their relevance.

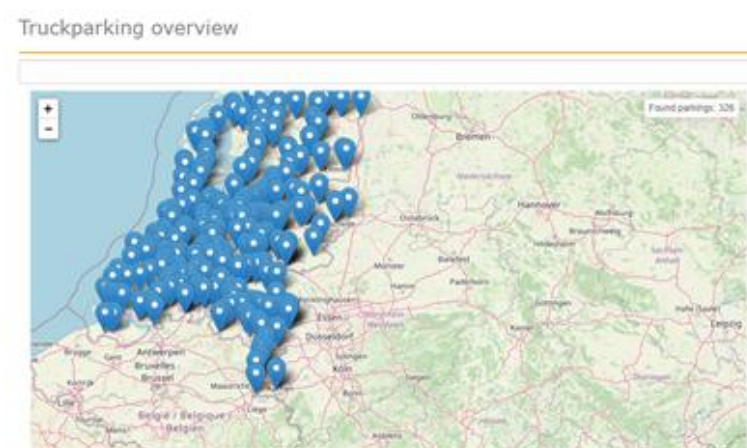


Figure 5: Visualization of data at the Dutch NAP - <https://nt.ndw.nu/#/home>



2.1.2. Communication

The second subset concerns communication features of NAPs. NAPs should **provide help desks, emailing support and messages services** in order to give explanations to data publishers when needed. Through this feature many misunderstandings can be avoided during, for instance, the process of uploading data and metadata.

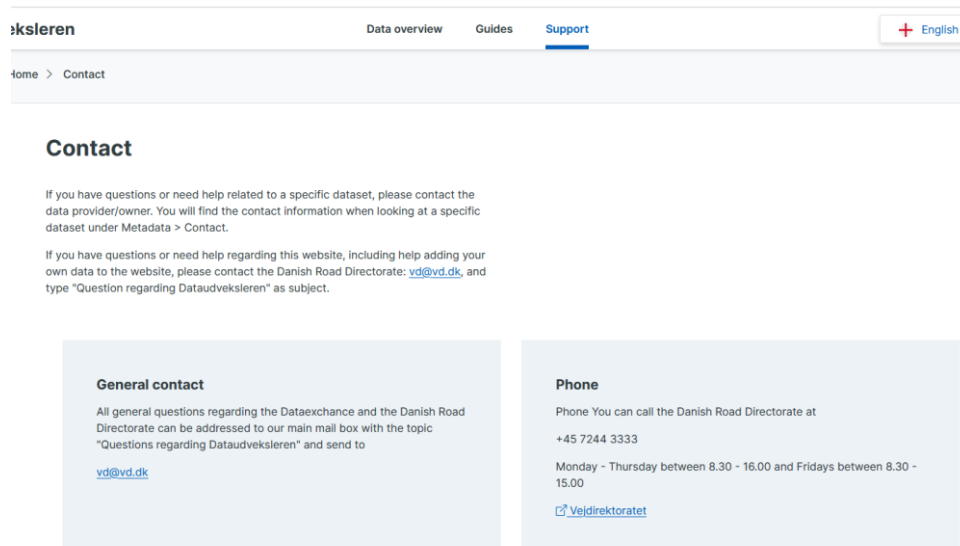


Figure 6: Support contact at the Danish NAP - <https://du-portal-ui.dataudveksler.app.vd.dk>

The **promotion of NAPs** is another important feature. To ensure that NAPs will play a key, impactful, and sustainable role within the ecosystem of Intelligent Transport Systems and the corresponding value chains, they should strive to attract even more data providers and data consumers. In this respect, the promotion of NAPs to several events and initiatives at both a national and international level is considered crucial.

Moreover, the **facilitation of direct communication between data consumers and data providers** is deemed an important feature of NAPs, given that data consumers can efficiently resolve any open issues in collaboration with data providers without the intervention of the NAP operator. This feature also enhances trust between publishers and consumers by showing to the consumers that data publishers care about their needs.

It is also important that **NAP itself can provide mass notifications** to its users (including both data providers and data consumers) about changes in its content, functionalities, operational procedures, and/or data exchange policies. By that means, the users get directly aware and account for these changes.

2.1.3. Data discovery

The first feature of the data discovery subset involves the **traceability of data hosted by/made available through NAPs**. This feature is associated with the **availability of discovery services and searching functionalities**, such as engines and search masks supporting querying and filtering..



French national access point to transport data

Gather all french mobility data

Search data for a region, a city, a network...

ex: Nouvelle-Aquitaine

Figure 7: Data search field at the France French NAP - <https://transport.data.gouv.fr>

Another feature classified in the discoverability subset involves the **provision by a NAP of the appropriate metadata** enabling the exploitation of (any available) discovery services. It should be noted that metadata is an important aspect for the reusability and discoverability of data resources, providing additional information that helps data consumers better understand the meaning of data, its structure, and to clarify other issues, such as usage rights and license terms. If insufficient metadata are provided, the actual data resources would not be easily discoverable and, thus, exploitable by parties other than the data providers.

Another important, not yet mandatory, feature is the **machine readability of metadata enabled** through exportability using certain formats (e.g., XML and RDF DCAT-AP streams). In principle, it should be bear in mind that metadata should facilitate the discovery of data by both human and machines.

Finally, the last feature included in that subset, which can also be addressed as non-mandatory, constitutes **the support for map-based search of datasets**. Web maps can provide a more advanced way of searching, allowing NAP users to search at national, regional and local level, for data elements and resources.

2.1.4. Maintenance and update

The NAP service should be maintained and updated constantly. This can include aspects such as **software maintenance and updates**, backups, and hosting. This feature encompasses the update frequency of information provided by/through NAPs given the evolving and changing over time nature of data. To this end, data providers should check and update their publications, allowing data consumers to be up-to-date.

It is also worth mentioning that NAPs should be **monitored and evaluated** in a periodical basis. This includes several dimensions, such as the usage of data (e.g., downloads, page views, re-use), system performance (e.g., downtime and consequences for other systems), and feedback received by data consumer and providers on the efficient (or not) operation of the platform. Further to the above, it is deemed important for NAP operators to monitor and evaluate the impact of their platform to the development of services and applications by calculating metrics and gathering feedback.

2.1.5. Dataset Information

The features included in this subset revolve around the extent to which **datasets are described** to a satisfactory extent to ensure that data consumers can easily understand and assess whether a dataset is within their interests. This subset also includes the **classification/encoding of NAP datasets**



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according to standard/controlled vocabularies or dictionaries (e.g., DCAT-AP or formal terminology provided by the Delegated Regulations supplementing the ITS Directive) to reduce their ambiguity and promote machine understandability.

2.1.6. Interoperability

Features included under the interoperability subset aim to ensure that NAPs operate in a compliant/common manner and can efficiently communicate with each other as well as exchange information if needed. An example of this feature constitutes the adoption of the so-called **Coordinated Metadata Catalogue**, ensuring a common approach towards the publication of metadata or at least the publication of a common minimum set of metadata. Another example constitutes the **ability of NAPs to harvest and index datasets** from other NAPs. However, the latter should not be addressed as mandatory given that data harvesting presupposes that two NAPs are instances of the same data management/data catalogue systems (e.g., CKAN).

2.1.7. Data exchange and operational policy

The features included in the data exchange and operational policy subset, firstly, aim to ensure that NAPs provide **clear descriptions of the terms and conditions** for data re-use and of their **operational procedures**. Terms and conditions for data re-use set out the ways in which data hosted in/accommodated through NAPs can and cannot be re-used. The clarification of the terms and conditions for data re-use, despite not being directly the responsibility of NAP operators, is deemed important because by that means disputes between data providers and consumers can be avoided and the estimation of the impact of data hosted in/provided through NAPs can be facilitated (e.g., through attribution obligations). In this respect, NAPs should make the best effort to facilitate the clarification of these terms and conditions by providing, for instance, data providers with prespecified licenses to be selected during the publication of a new dataset. On the other hand, the clarification of the operational procedures of a NAP eases the understanding of the role and responsibilities of all actors involved in the NAP ecosystem (i.e., NAP operator, data providers, data consumers). This can be supported, for instance, by the inclusion in the NAP of a brief set of instructions, providing guidelines and explanations on: a) the user types and their access rights, b) how a user can be registered and authenticated, c) how datasets can be published, and d) how often should datasets be updated.



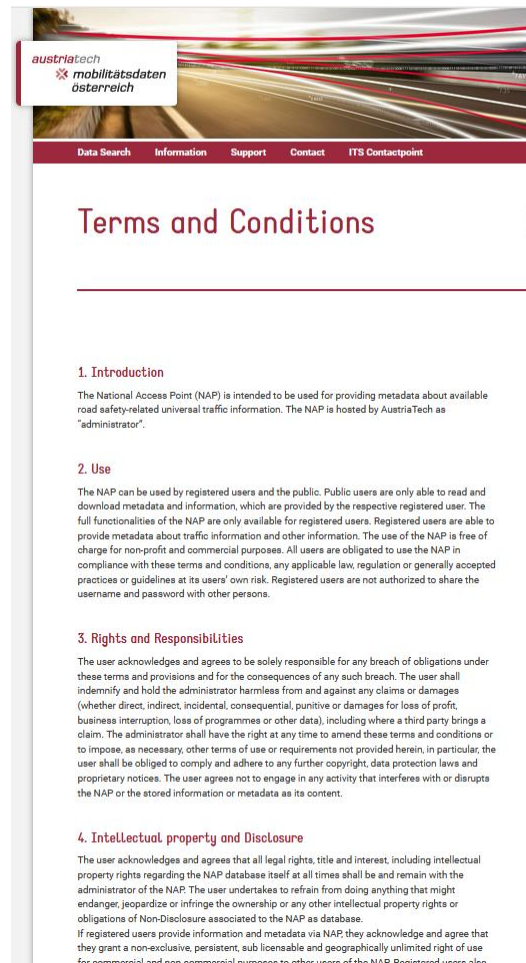


Figure 8: Terms and Conditions of the Austrian NAP's content for reuse at the Austrian NAP - <https://mobilitydata.gv.at/>

The features included in the data exchange and operational policy subset, secondly, aim to ensure that NAPs endorse the provision of high-quality data that simultaneously comply with the requirements set by the Delegated Acts of the ITS Directive. In this respect, it would be beneficial if NAPs enable data providers to **indicate the quality of provided data** or ideally **set quality requirements**. However, the latter feature should not be mandatory given that it most closely resembles digital clearing houses and data marketplaces. Moreover, it would be beneficial if NAPs **promote and monitor the provision of self-declarations** on behalf of data providers, thus facilitating the activities of Nominated Bodies relating to the declaration of compliance of datasets published in the NAPs.

Finally, a desirable property of the NAPs revolves around the consolidated **coverage of data types included in all Delegated Regulations** supplementing the ITS Directive. Through this property NAPs are understood as a single point of access to data resources required to support the uptake of Intelligent Transport System services as well as of newer concepts, such as Mobility as a Service and Urban Vehicle Access Regulations.

2.1.8. NAP features survey and Qualitative Results

The survey was completed by 8 active partners in a draft stage (MS word document). A newer version (0.3) with the same structure was then completed by 18 project partners. The newer version (0.3) revised clarity of the questions where needed and expanded set Yes/No answers by "Other" option where simple Yes/No was no relevant.



The questionnaire contained 30 questions with 4 categories of answers concerning the relationship of each question to RTTI, SRTI, SSTP and MMTI. Each of these 4 categories' answers could be: Yes/No/Other. Subsequently, it was possible to write down the current status and planned features for each topic (question #1-#30). The last special question #31 is about proposal of additional features, any general comments, or some additional information.

Table 1: A short summary of the survey responses

30 questions, 18 project partners	Total	RTTI	SRTI	SSTP	MMTI
Items to Yes/No/Other answer	2160	540	540	540	540
Number of completed Yes/No/Other answers	1958	506	505	446	501
Completeness of Yes/No/Other answers in %	90.6	93.7	93.5	82.6	92.8
Average responses per item	16.3	16.9	16.8	14.9	16.7
Average number of "Yes" answers	8.0	8.4	8.7	7.2	7.8
Average number of "No" answers	6.7	7.5	7.0	5.8	6.6
Average number of "Other" answers	1.6	1.0	1.1	1.9	2.2

The questionnaire is structured into 8 areas (topics) in which there are individual questions. The results in these 8 fields are presented in the following subchapters. For each subchapter the following findings and conclusions were drawn.

- **Access:**

The precondition for good functionality of the NAP is its availability via the Internet. The NAP must meet standards and best practices supporting usability, and also be available in commonly used languages in addition to the national language. Data protection and security is especially necessary if the NAP should contain sensitive personal data (though this raises the question as to whether it is necessary for the NAP to contain such data). The precondition is also the registration of all those who contribute to the data (which ensures possible filtering of unreliable or fake data), as well as registering those who require the collection of special or non-public information, usually the data with higher quality. Registration should not be required for standard data subscribers. The NAP should include an interface for exchanging machine-readable data, ideally in a standardized and interoperable form. In terms of data visualization, it is appropriate to consider at least a geographical map projection of data as a part of NAP outputs.

- **Communication:**

According the answers provided by the partners, we can conclude following conclusions: There is a clear need for user support and has to be implemented in local language and in English. User support should cover everything from registration via the data subscriptions and data upload procedures The promotion of the NAP Portals is currently running and even more efforts will be dedicated to this topic in all of the respondent NAPs members. Is there a minimum amount of promotion / time period necessary to define? WG2 has to decide on a common supporting method (e-mail, contact form, helpdesk) and acceptable lead time for problem-solving. Mass e-mail campaigns have to comply with GDPR regulations. These should be optional when registering and there must be a possibility to unsubscribe.



- **Data discovery:**

Most of the NAPs operated by Member States offer data discovery services and data search functionalities that are based on the metadata and tags of each dataset. However, building upon the received answers, it cannot be fully evaluated whether metadata utilized for, among others, discovery purposes comply with existing harmonization endeavours. The utilization of the dynamic content of data resources as well as APIs for (automated) data search and discovery constitute two identified best practices. Concerning the provision of machine-readable data, the answers vary. Some NAPs choose to follow a proprietary format to provide machine-readable metadata, while other NAPs do so by following standardized formats. Moreover, there is a considerable number of countries that do not provide machine-readable metadata or have planned to do so in the future. In this respect, the provision of metadata following standardized formats can be addressed as a sort of best practice.

- **Update and maintenance:**

Based on the survey, it can be concluded that maintained NAP's services facilitate effective NAP functioning and encourage the confidence of data consumers and data publishers. The majority of the responding MS emphasize the importance of keeping the NAP's data and metadata up to date, which has a direct impact to the correctness of the NAP's content. As usually, the frequency of data updates varies from a few days to several months or on demand. Meanwhile, metadata is usually updated once a year. Regarding the NAP's monitoring and evaluation processes current situation should be increased. Different measures for monitoring and evaluation of the NAP's services for data provision and data consumption should be foreseen.

- **Data set information:**

One-third of the responding countries provide a description to most of the datasets on their homepage. Approximately half of the responding countries have descriptions only of datasets that correspond with the delegated regulations. The answers are probably in correlation with the fact, that only half of the countries answered that the datasets themselves are associated with all delegated regulations

The necessity of a description should be divided if the site a data platform or a data directory

- **Interoperability:**

From the results obtained, it can be stated that data interoperability is still a challenge for most Members States, given that only a minority of them adopts the Coordinated Metadata Catalogue and an even lesser amount is able to support data harvesting from other European NAPs. With respect to future scenarios, although most countries are willing to adapt themselves to the Coordinated Metadata Catalogue, only a few appear to be planning the implementation of measures to support data harvesting from other countries' NAPs, which leads to the conclusion that data interoperability issues in EU may remain unsolved for some time.



- **Data exchange and operational policy:**

Half of the countries provide exact T&C for data reuse; thus the number is higher where a description is provided. These descriptions differ from each other content and structure wise, so it should be defined what is meant under description. On some pages, this information is downloadable in pdf in some it is embedded on the homepage in text. The manner which these descriptions are available should also be standardized. Half of the countries have only licenced regarding the reuse is also not standardized. The validation of the self-declarations is done by the National Body of each Member State. It is obligatory to provide the self-declarations with the data sets due to legal character of the self-declaration. However, around 30% of Member States provides the self-declaration accordingly to the data sets. To cover existing quality descriptions a NAP could have quality indicators that can be used by the data publisher, only 30 % of the asked Member States support their publisher with quality indicators and quality requirements.

- **Other features (& general comments):**

Other features were analyzed, yet are still in discussion with the NAPCORE project members if to be further examined or included in future revisions or updates.



3. KPI Framework for NAP Levels of Service

This chapter provides the first iterations of the “KPI Framework for NAP Level of Service” supporting evaluation of NAP and Levels of Service (LoS) classification. This is the current result of the work performed by the active partners under NAPCORE Work item 2.1 Level of Service.

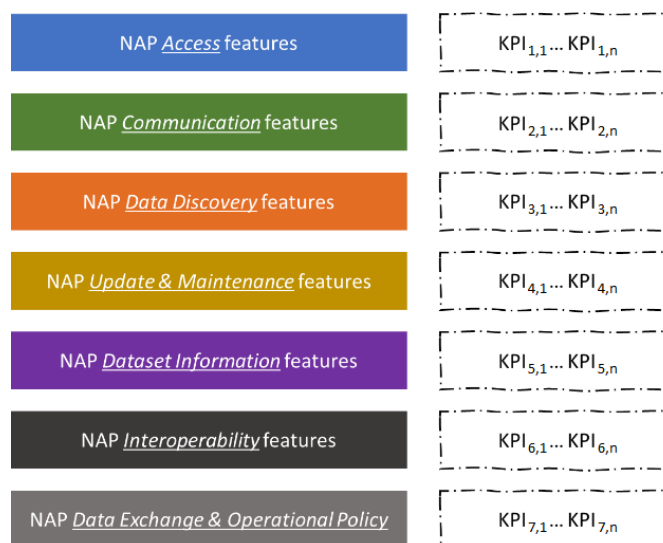
3.1. Approach

To define the LoS in NAPs, the working group proposes to follow the approach of “**Maturity Levels**”. Each maturity level comprises of a set of goals/requirements/minimum parameters that, when satisfied by the NAP, we can assume that NAP has reached at the certain maturity level. Maturity level as a qualitative indicator is obtained from the quantitative indicator “**Grade of Achievement**”, which is the output of the calculations of the chosen approach to scoring in the NAP evaluation.

This chosen approach builds upon the research work developed under EU EIP initiative on “NAP Common features Level of Service” (2020). A set of features (based on NAP best practices) were drafted to support the development and utilization of NAP for information services.

3.1.1. KPI structure

This initial EIP work was complemented with the insights collected by the “NAPCORE NAP features survey” (2022) where the resulting analysis provided a list of features clustered in **7 “Features categories”**, see Chap. 2 above. Each of the features was “translated” into a list of KPIs that enable NAP LoS evaluation and scoring method. The approach and work of the active partners resulted in the current “KPI Framework for NAP Level of Service” for the following 7 Features categories:



Exact KPI parameters are mentioned in the tables in Chap. 3.3 below, according to “Features category” 1 to 7. These tables include indexes, names and definitions of KPIs, definitions of possible values and definitions of the appropriate KPI values or ranges of values that are regarded as Basic (must have) and Complementary (nice to have). These KPI definitions are uniform below, but they can be done separately for the two types of NAP (data web portal/data directory, see Chap. 3.2) where there may be different KPIs, different possible values and/or different values/ranges regarded as Basic and Complementary.

3.1.2. KPI sorts

Each KPI can be one of the following sorts:



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- “binary-like” KPI (i.e., yes/no resp. 1/0),
- KPI as some quantitative value (e.g., time in seconds, number of active features), or
- KPI qualitatively based on a related numbered level scale (e.g., 1: low/2: moderate/3: high performance).

Note 1: Numerical values must always be used in the KPI values definitions so that enable subsequent LoS calculation using Eq. (1) and (2).

3.1.3. Grade of Achievement computation for each Features category

With this “KPI framework”, each NAP can be classified for each “Features category”. Every single Features category has its own **Grade of Achievement** (i.e., scoring norm) defined as a number in the scale from 0 to 100. Higher values means higher LoS in appropriate Features category. The grade contributing to the NAP LoS is for each “Features category” is derived from all relevant KPIs using a universal function processing KPI actual values and other features as the following Eq. (1). In principle, this is a scaled weighted mean of the relative contributions to LoS for individual KPIs (these contributions are indicated by the fraction in the right side of the numerator):

$$G_i = 100 \cdot \frac{\sum_j \left(W_{i,j} \cdot R_{i,j} \cdot M_{i,j} \cdot \frac{ACTUAL_{i,j} - WORST_{i,j}}{BEST_{i,j} - WORST_{i,j}} \right)}{\sum_j (W_{i,j} \cdot R_{i,j})} \quad (1)$$

Where:

- G_i ... Grade of Achievement for i^{th} Features category (classification result for i^{th} Features category defined in scale from 0 to 100)
- i ... Features category index (1 to 7)
- j ... $KPI_{i,j}$ last index – ordinal number (1 to max) for each i^{th} Features category
- $W_{i,j}$... $KPI_{i,j}$ parameter weight across the i^{th} Features category (not necessarily defined as total weight = 1 but can be any other number)
- $R_{i,j}$... $KPI_{i,j}$ relevancy for the assessed NAP – binary value ... “0” for non-relevant (N/A), “1” for relevant
- $M_{i,j}$... $KPI_{i,j}$ value meeting the requirements for the values regarded as Basic or Complementary (see Chap. 3.3) – binary value ... “0” for non-meeting, “1” for meeting (i.e., the $KPI_{i,j}$ value is meeting the criteria for the values regarded as Basic or Complementary, see the 5th and 6th column of the KPI definition tables below)
- $WORST_{i,j}$... $KPI_{i,j}$ value for the minimum contribution to LoS – value defined among $KPI_{i,j}$ possible values which means the worst contribution to LoS, it should be the lowest or highest possible $KPI_{i,j}$ value, depending on the $KPI_{i,j}$ meaning; in the case of tending to infinity, such as delay time, the doubled limit for Basic requirements will be here used (i.e., 50 % contribution to LoS is the result for the limit meeting the basic criteria)
- $BEST_{i,j}$... $KPI_{i,j}$ value for the maximum contribution to LoS – value defined among $KPI_{i,j}$ possible values which means the best contribution to LoS, it should be the highest or lowest possible $KPI_{i,j}$ value, depending on the $KPI_{i,j}$ meaning; in the case of tending to infinity, the doubled limit for Complementary requirements will be here used
- $ACTUAL_{i,j}$... actual value of $KPI_{i,j}$ obtained for the NAP (for definitions, see the 4th column of the KPI definition tables below); if the value is like to be out of the interval $\langle WORST_{i,j}; BEST_{i,j} \rangle$, the nearest value from that interval is used instead (to solve issues with unlimited value definitions)



Note 2: The Eq. (1) works with all the 3 sorts of KPI mentioned above (related with the Note 1 above).

Note 3: If the $KPI_{i,j}$ value does not reach the values regarded for Basic or Complementary requirements (see Chap. 3.3), the evaluation assumes that the KPI has not been met and does not contribute to the improvement of the evaluation although there can be some minimum value reached; this is managed by the $M_{i,j}$ parameter. In all other cases, the fulfilment ratio is considered relative to the best value considered for Complementary requirement.

Note 4: KPI relevancy $R_{i,j}$ may be partially prescribed according to the NAP type (data platform / data directory) and partly also based on the specific NAP under consideration.

Note 5: The $WORST_{i,j}$ and $BEST_{i,j}$ value depend on $KPI_{i,j}$ definition only with no link to the limits for Basic or Complementary requirements.

Note 6: $W_{i,j}$ weight scale is not strictly defined, i.e. the total weight across i^{th} category can be any value depending on the Features category responsible members.

Note 7: Thanks to the fraction used in the numerator in Eq. (1), the calculation is universally applicable both for KPIs where the highest LoS occurs for highest KPI values, and for KPIs where the highest LoS occurs for lowest KPI values (e.g., the time delay).

Note 8: The evaluation model for individual KPIs can be tuned by changing the numeric values defining the KPI values and limits (i.e., the 3rd, 4th and 5th column of the KPI definition tables below). The rating model for each “Features category” can be further tuned by changing the weights $W_{i,j}$ of individual KPIs.

3.1.4. Grade of Achievement computation example

A relevant **calculation example** for 3 KPI parameters from one Features category No. 1:

The first KPI is defined as a binary quantity with the values 0 and 1. The value 1 is required for both the Basic and Complementary levels. The current value of the parameter for the monitored NAP is 1. The second KPI is defined as a time delay in an unbounded interval. For the Basic level, a maximum delay of 4 seconds is required, for the Complementary level, a maximum of 2 seconds is required. The current parameter value for monitored NAP is 1.4 seconds. The third KPI is defined as integer in the interval 1 to 5 (including values 1 and 5). For the Basic level, a value of ≥ 2 is required, for the Complementary level, value ≥ 4 is required. The current parameter value for the tracked NAP is 3. The parameter weights are defined identically, i.e. $W_{1,j} = 1$ for $j = 1$ to 3. All these KPI parameters are relevant from the point of view of the assessed NAP, i.e. $R_{1,j} = 1$ for $j = 1$ to 3.

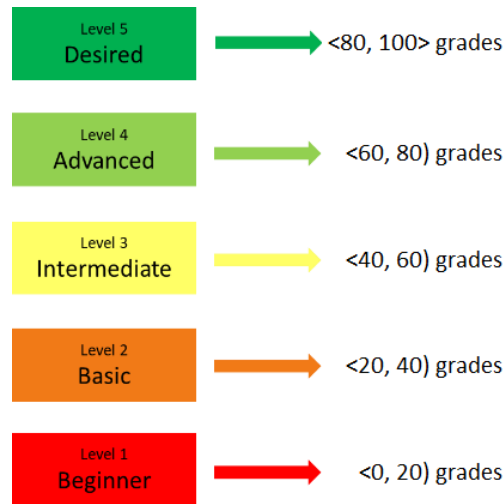
The calculation is as follows:

- $M_{1,j} = 1$ for $j = 1$ to 3, as the KPI values for the NAP meet the requirements for the Basic or Complementary level.
- $ACTUAL_{1,j} = \{1; 1.4; 3\}$ for $j = 1$ to 3 ... currently obtained NAP parameters – KPI values.
- $WORST_{1,j} = \{0; 8; 1\}$ for $j = 1$ to 3 ... according to the parameter definition (see Eq. 1 parameter settings).
- $BEST_{1,j} = \{1; 0; 5\}$ for $j = 1$ to 3 ... according to parameter definition (see Eq. 1 parameter settings).
- The results of the fraction in the numerator in Eq. (1) are as follows: $\{1; 7/8; 1/2\}$ for $j = 1$ to 3, i.e., the individually assessed KPIs by themselves would mean a Grade of Achievement at the level of 100%, 82% and 50%.
- The **Grade of Achievement** is therefore $G_1 = 100/3 \cdot (1 + 7/8 + 1/2) = 77.5$.



3.1.5. Maturity levels

The quantitative result as Grade of Achievement can also be interpreted in a qualitative form as **Maturity Level**. Both the Maturity levels and appropriate Grades of Achievement are depicted in the following picture.



Each “Features category” for the same NAP can be graded at a different maturity level. For example, a NAP can have a Basic maturity level for the “Communication features category” but at the same time an Advanced maturity level for “Interoperability feature category”. The system evaluated in the **previous example** has a Maturity Level at the 4th level, a value of 77.5 grades corresponds to the “Advanced” level.

3.1.6. Total Grade of Achievement computation

For each NAP, a **Total Grade of Achievement** is defined. That means that all grades from the various Features categories are put together (using weighting factors), and a total grade will be calculated. The Total Grade of Achievement is computed as a weighted mean of individual Features categories:

$$TG = \frac{\sum_i (W_i \cdot G_i)}{\sum_i W_i} \quad (2)$$

Where:

- TG ... Total Grade of Achievement (NAP total classification result defined in the scale from 0 to 100)
- i ... Features category index (1 to 7)
- W_i ... Features category weight (not necessarily defined as total weight = 1 but can be any other number)
- G_i ... Grade of Achievement for ith Features category (classification result for ith Features category defined in the scale from 0 to 100)

3.1.7. Total Grade of Achievement computation example

A relevant **example** of NAP LoS evaluation is provided below. The Grades of Achievement (results) are obtained as examples from calculation using Eq. (1) for individual Features categories.



Features category	Grade of Achievement (quantitative result)	Maturity level (qualitative result)
Access features	35	Basic
Communication features	37	Basic
Data Discovery features	76	Advanced
Update & Maintenance features	53	Intermediate
Dataset Information features	12	Beginner
Interoperability features	28	Basic
Data Exchange 7 Operational Policy features	97	Desired
Total Grade of Achievement	48 *)	Intermediate

*) according to Eq. (2) for this example (computation see below)

Assuming that all the Features categories are equally weighted ($W_i = 1$), we can conclude to the following result:

$$\text{Total Grade of Achievement} = (1 \cdot 35 + 1 \cdot 37 + 1 \cdot 76 + 1 \cdot 53 + 1 \cdot 12 + 1 \cdot 28 + 1 \cdot 97) / 7 = \sim 48$$

Total Maturity Level = Intermediate

3.1.8. Further NAP evaluation tuning possibility

Together with the quantification of each Features category, the analysis of the first implementations will also support the further tuning of the KPI framework into a 2nd draft (tuning possibilities are mentioned in “Note 8” in Chap. 3.1.3 for individual KPIs; Features categories weights W_i can also be tuned).

3.2. NAP typology

The following two types of NAP are considered for the evaluation of NAP within the established methodology:

- **Data Platform:** This type of NAP provides real data or data services to data user or data services through the NAP. This could be via download, API or other data transfer channels including data usage contracts.
- **Data Directory:** This type of NAP provides meta data (description of data sets and data sources in a predefined way) to end user or data service provider. The NAP is not involved in the data exchange process between data providers and data consumers.

The reason for distinguishing NAP types is partial difference in the assessment method. It is true that some KPI indicators that relate to working with data relate to the NAP type “Data Platform” only and are irrelevant for the evaluation of “Data Directory” NAP type. Also, the weight (importance) of KPI indicators used in computations depends on the type of NAP and is different if the NAP works with data or metadata only.

3.3. KPI framework

As already discussed, the proposed KPI framework serves as a tool for assessing the level of service of NAPs and classifying them into specific maturity levels. The scope of the current section is to present the content and structure of the proposed KPI framework by providing the definition of the adopted KPIs, the range of their possible values, and the adopted thresholds for assessing the level of service of a NAP.



Considering that the elements of the proposed KPI framework are a product of the analysis of the outcomes of the NAP common features survey, KPIs are grouped into the same categories used for classifying the NAP common features. Furthermore, specific KPI values are marked as basic and complementary ones. Basic values resemble a minimum level of service that a NAP must have (affecting the $M_{i,j}$ parameter in the computation, see Section 3.1), while complementary values declare an increased level of service that a NAP should ideally reach (leading in higher grading, see Section 3.1). These thresholds are determined through extensive discussions among the active participants of WG2, taking also into consideration the results of the NAP common features survey (section 2.1.8). The content and structure of the KPI framework is presented separately for each category in the following Tables 3-9.

Table 3 below presents the KPIs grouped into the “Access” category.

“On-line availability” KPI assesses whether the NAP platform is online or not. In this case, both basic and complementary value is set to 1 to reflect that the on-line availability of a NAP constitutes a fundamental prerequisite.

“Compatibility with web browsers” KPI refers to the compatibility of NAP with different web browsers. The basic KPI value is set to 1 indicating that a NAP platform should be operational with at least one web browser, whereas the complementary KPI value is set to 2 to indicate an increased level of service when a NAP is operational with the most common web browsers. This KPI is closely related to the previous one, considering that its quantification makes sense only when a NAP is available online.

“Compatibility with operating systems/platforms” KPI assesses the compatibility of a NAP with different operating systems. The basic/must-have value is set to 1 indicating that a NAP should at least be compatible with one operating system.

“Responsiveness” KPI examines whether a NAP’s web design is adaptable to different devices and screen sizes. There are three possible values that this KPI may take. A value equal to 0 indicates that there is no responsiveness, a value equal to 1 indicates that a NAP is responsive to different screen sizes and, lastly, a value equal to 2 indicates that a NAP is responsive to both different screen sizes and devices. The minimum level of service is associated, in this case, with the responsivity of a NAP to at least different screen sizes.

“Web performance” KPI is broken down into four separate sub-KPIs, namely **“Web performance – Simplicity/usability”**, **“Web performance – Visual hierarchy/navigability”**, **“Web performance – Consistency”**, and **“Web performance – latency”**. The first one is related to the average number of operations needed to gain access to specific information about a data resource (not necessarily involving the access to data itself). These operations may encompass mouse wheel movements, key presses, or mouse/screen clicks. The basic/must-have value is set to less-than-or-equal-to 10, whereas the nice-to-have value is set to less-than-or-equal-to 5. The second one is related to the existence of a simple structure and the hierarchical arrangement of a NAP’s webpage. A value equal to 0 indicates the absence of a hierarchical arrangement, while a value equal to 1 indicates that a hierarchical arrangement exists. Lastly, a value equal to 2 indicates the existence of both a hierarchical arrangement and a “control page” easing the navigation process. In that case, the minimum level of service is associated with at least the hierarchical arrangement of a NAP’s webpage. The third one assesses the consistency of the layout of a NAP’s website. The adopted parameters for its assessment revolve around the position of menus during navigation, the utilized colors and fonts throughout the site, the availability and position of a search box on each page, as well as the availability and position of a logo that links back to the home page. The value of this KPI is increased by one when a NAP complies with each one of the adopted parameters. It is assumed that a NAP should comply with at least two of the adopted parameters to be addressed as exhibiting a minimum level of service (these



parameters reflect elementary design principles of any web page/platform). The last one assesses the time responsiveness of a NAP's websites by assessing the time needed to react to common NAP user requests (e.g., loading of the homepage/introductory page or list of available datasets).

“Support of commonly used languages” KPI may take four possible values. A value equal to 0 indicates that a NAP supports only the national language. A value equal to 1 indicates that although a NAP supports English, some of its content (e.g., metadata of included publications) is provided only in the national language. On the other hand, a value equal to 2 indicates that a NAP fully supports the English language, while a value equal to 3 indicates that a NAP fully supports the English, French and German languages. It is assumed that a NAP should at least partly supports the English language to achieve a minimum level of service.

“Security – Technical” KPI addresses the existence of security features (i.e., security certificates) and the protection of personal data provided by NAP users. A value equal to 0 points out the absence of any security feature. On the other hand, a value equal to 1 indicates the existence of security certificates in specific parts of a NAP's website, while a value equal to 2 indicates the existence of security certificates throughout the website of a NAP. In that case, a minimum level of service is assumed to be exhibited by a NAP when SSL certificates cover at least the most critical (in terms of data protection) parts of a NAP's website.

“Security – providers verification” KPI assesses the extent to which the authenticity of provided data (e.g., input provided during the registration process) is verified. In case that a self-verification process is in place for data providers, this KPI takes a value equal to 1. On the other hand, when the authenticity of provided, data is doubled checked by both data providers and NAP operator, this KPI gets a value equal to 2.

“Personal data protection” KPI aims to assess whether personal data is stored in a manner compliant to GDPR norms. This KPI is not addressed as affecting the minimum level of service of a NAP; however, the existence of a GDPR-compliant procedure for handling personal data is associated with an increased level of service.

“Procedure for publication of data on the NAP” KPI assesses whether data providers need to register to add data/metadata. It gets a value equal to 0 when data/metadata are uploaded by the NAP operator, equal to 1 when data providers upload data/metadata by themselves, equal to 2 when the uploaded data are verified manually by the NAP operator, as well as equal to 3 when the uploaded data are verified automatically by the NAP. A minimum level of service is associated with possibility on behalf of data providers to upload data/metadata by themselves.

“Metadata access restrictions” KPI assesses whether NAP users/data consumers require to register to access the metadata of a NAP's publications. The indiscriminate need of NAP users/data consumers to access any type of metadata is not addressed as a favorable condition for a NAP's level of service, considering the imposed barrier to a NAP's content discoverability. Therefore, it is assumed that a minimum level of service is associated with the possibility on behalf of NAP users/data consumers to freely access the metadata of publicly available publications.

“Data security and access restrictions for uploading” KPI aims to assess the availability of security mechanisms controlling and restricting the possibility of data uploading. This KPI is addressed as making sense only if a NAP complies with the concept of a data portal. Given that several access and authentication control methods exist, the value of this KPI is increased by 1 when more than one method is applied. The predetermined options include (a) the utilization of the HTTP Strict Transport Security (HSTS) mechanism that enables the interaction of a NAP's server with other machines only through HTTPS connections, (b) the utilization of IP Address Authentication mechanism configuring the



API Gateway of a NAP to allow its interaction with machines the IP address of which is included in the list of accepted IP addresses, (c) the Basic RFC 7617 Authentication mechanism which enforces the transmission of credentials (e.g., username and password) encoded according to Base64, (d) the utilization of the Digest RFC 7617 Authentication which enforces the transmission of credentials and any other requested information in an encrypted form, (e) the authentication by URL parameters enabling the provision of authentication information to a NAP in the form of query string parameters, and (f) authentication through client certificates that allow a machine to communicate with a NAP only when a client certificate (e.g., a PKCS12 file) is loaded onto that machine.

“Data security and access restrictions for uploading” follows the same logic as the previous one with the only difference being that data downloading is in the spotlight (instead of data uploading).

“Indication of data modification” KPI assesses the extent to which the change of a dataset compared to its previous state is indicated by a NAP. Changes encompass both changes in the actual content of a dataset that is stored in a NAP (e.g., static data) and changes in its metadata. In such a case, it is assumed that a minimum level of service is associated with the support by the webserver of a NAP of either “if-modified-since” or “if-none-match” method, while an advanced level of service is associated with the support by the webserver of a NAP of both methods. The former method expresses the ability of a NAP’s webserver to specify the last time a change has been made on a provided content, while the latter expresses the ability of a NAP’s webserver to use ETag headers (the value of which supports the assessment of whether a change has been made or not) and return the changed part of the provided content.

“Data transfer optimization” KPI assesses the extent to which a NAP can optimize data transferring by compressing the requested content. This KPI is addressed as making sense only if a NAP complies with the concept of a data portal, since a data directory is not involved at all in the data transferring process. A value equal to 0 indicates that such a functionality does not exist, while a value equal to 1 indicates that a NAP serving as a data portal can provide either compressed or uncompressed content based on a client’s request.

“API usage for data transfer” KPI investigates whether a NAP is equipped with an Application Programming Interface (API) service that allows clients of data consumers to request and download through external code data and metadata content or other resources matching specific queries. Moreover, it investigates whether such a service allows the clients of data providers to automatically upload and import (through external coding) new data and metadata content but also update it or even delete it. In line with the previous KPI, the current one is addressed as making sense only if a NAP complies with the concept of a data portal, since a data directory is not involved at all in the data transferring process. Given that the focus of NAPs is placed (or at least should be placed) on machine-to-machine communication and data exchange supporting the operation of ITS systems, a minimum level of service is associated with the existence of an API service allowing at least the automated upload of data and metadata content.

“Data visualization” KPI assesses the extent to which a NAP can support the visualization of its exchanged content. Given that specific functionalities cannot be included in the list of a NAP’s functional requirements, it is assumed that a basic level of service is associated with the provision of the required information (e.g., in the metadata of a NAP’s publication) to allow NAP users to perform data visualization at their own. Similarly, a NAP is addressed as exhibiting an advanced level of service, when additional functionalities are included, such as the visualization of the location for which provided information is relevant or the project of time-lapse videos.



Table 2: KPIs grouped into the “Access” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
1.1	Online availability	NAP is available on-line through the web: 0: No; 1: Yes	=1	=1
1.2	Compatibility with web browsers	Is NAP compatible with multiple web browsers? 0: No; 1: Yes, with one or more specific web browsers (e.g., Firefox); 2: Yes, with all of the following 5 browsers: Firefox, Google Chrome, Microsoft Edge, Apple Safari and Opera	=1	=2
1.3	Compatibility with operating systems / platforms	Is NAP compatible with multiple platforms? 0: No; 1: Yes, with one or more operating systems/platforms (e.g., Windows, iOS, Android); 2: Yes, with all of the following 5 operating systems: Microsoft Windows, Apple macOS, Google's Android OS, Apple iOS, Linux	=1	=2
1.4	Responsiveness	Is the NAP web design responsive? 0: No responsive web design; 1: Responsive web design for different screen sizes on PC; 2: Responsive web design for different screen sizes and devices	=1	=2
1.5	Web performance – Simplicity / usability	Average number of operations (e.g., key presses, mouse wheel movements, letters inserting, mouse/screen clicks) required for getting access to a specific information about a data resource (without getting the data itself): 0 to infinity ; Note: Integers are not necessary, i.e., you also can use the number with decimal part	<=10	<=5
1.6	Web performance – Visual hierarchy/ navigability	“Sitemap” structure and design approach: 0: Absence of hierarchical arrangement; 1: Existence of hierarchical arrangement; 2: Existence of hierarchical arrangement and of a “control” page easing navigation	=1	=2
1.7	Web performance – Consistency	Principles of page layout, menu structure: Initial value 0 and then +1 for each of the following options: a. menus are in the same position; b. use of same fonts and colours throughout the site; c. availability of a search box on each page; d. logo links back to the home page	>=2	=4
1.8	Support of commonly used languages	Support of commonly used languages: 0: Supports national language only, other than EN; 1: Supports EN but some content in national language only (other than EN); 2: Supports EN for platform and all content (user interface and all text content); 3: Supports EN+FR+DE for platform and all content (user interface and all text content)	=1	>1
1.9	Security – Technical	Security features to access the NAP web from the user's perspective:	=1	=2



		<p>0: Absence of security certificates (e.g., SSL certificates); 1: Partial existence of security certificates (e.g., in the landing page but not in the elements of the main sitemap); 2: Existence of security certificates in the entirety of the platform's elements</p>		
1.10	Security – providers verification	<p>Is the authenticity of data provider verified?</p> <p>N/A: no data provider can use NAP interface; 0: No; 1: Self-authentication of data providers (e.g., via e-mail); 2: Authentication of data providers is double checked, i.e., by the data provider and approved by the NAP operator</p>	=1	=2
1.11	Personal data protection	<p>If NAP stores personal information about registered users (consumers or providers), is the storage and handling compliant with GDPR?</p> <p>N/A: There is no user data stored at NAP; 0: Non-compliance to GDPR; 1: GDPR compliance at the platform level (i.e., "platform GDPR compliance")</p>	=0	=1
1.12	Procedure for publication of data on the NAP	<p>Data providers need to register to add data/metadata:</p> <p>N/A: No data/metadata provided via NAP interface; 0: Data resource metadata and producers' data is added by site maintainers; 1: The producers are inputting data themselves; 2: The producers are inputting data + the content of the data is verified manually in some random samples by the NAP; 3: The producers are inputting data + content of the data is verified (partially) automatically by the NAP</p>	=1	>=2
1.13	Metadata access restrictions	<p>Do data consumers need to register to search through the metadata information of the NAP?</p> <p>N/A: No metadata provided via NAP interface; 0: Register to view (search/get access to specific metadata) any NAP content; 1: Register to get access to specific metadata of any dataset; 2: Register to get access to specific metadata only for non-publicly available datasets; 3: No registration necessary / full access to search and get all the metadata (voluntary registration for news and updates)</p>	=2	=3
1.14	Data security and access restrictions for uploading	<p>When uploading data as a provider, several security mechanisms could be in place to ensure the trust in the data or restrict the access:</p> <p>N/A: No data can be uploaded via NAP interface; 0: No security or authentication mechanisms in place; Value+1 for each of the following options: a. Transport security (https); b. Authentication by IP filter (access based on IP address of the provider); c. Basic authentication</p>	>=2	>=4



		according to RFC 7617; d. Digest authentication according to RFC 7616; e. Authentication by url parameters; f. Authentication by client certificate		
1.15	Data security and access restrictions for downloading	When accessing data as a consumer, several security mechanisms could be in place to ensure the trust in the data or restrict the access: N/A: No data provided via NAP interface; 0: No security or authentication mechanisms in place; Value+1 for each of the following options: a. Transport security (https); b. Authentication by IP filter (access based on IP address of the consumer); c. Basic authentication according to RFC 7617 (https://tools.ietf.org/html/rfc7617); d. Digest Authentication according to RFC 7616 (https://tools.ietf.org/html/rfc7616); e. Authentication by url parameters; f. Authentication by client certificate (private keys, certificates); Note: For open data access, option (a) is the ideal but for PUSH data you shall need more.	>=2	>=4
1.16	Indication of data modification	When accessing the data stored at NAP (snapshots / static datasets), indication of the change of the dataset in comparison to previous access is needed to save bandwidth: N/A: No data provided via NAP interface resp. no metadata used for the information about data modification; 0: No change/modification information is provided; 1: Webserver uses either if-modified-since or if-none-match (etag) headers; 2: Webserver uses both if-modified-since and if-none-match (etag) headers; Note: information about the data modification can also be as metadata i.e. this KPI could also be applied to the “Data directory” NAP type	=1	=2
1.17	Data transfer optimization	The NAP server can compress the requested content to speed up the transfer: N/A: No data provided via NAP interface; 0: No reaction to client request, data is provided uncompressed form; 1: Data is provided (un)compressed per clients' request	=0	=1
1.18	API usage for data transfer	Does the NAP include Application Programming Interfaces for automated data exchange? N/A: No data provided via NAP interface; 0: No API, just web-based interface used; Value+1 for each of the following options: a. API for upload (data producers); b. API for download (data consumers)	=1	=2
1.19	Web performance – latency	NAP average webpage response/latency time duration in seconds in peak hours (time delay from some stimulus to work with the website to reaction, typically	<=2	<=1



		loading the introductory web page, or loading a subpage) measured from the computer access from the NAP network (no influence by the users' Internet connection quality): 0 to infinity ; Note 1: the value is dependent on the number of active users in any time, i.e. server load; Note 2: No necessity to be measured in the NAP network in most cases – If this parameter is measured at any computer and the KPI value is in appropriate (sufficient) range, the value can be used as a result; Note 3: Integers are not necessary, i.e., you also can use the number with decimal part; Note 4: For the measurement, you can use the development tool in the web browser (Ctrl+Shift+I in Chrome or F12 in Firefox)		
1.20	Data visualization	Does the NAP include data visualization functionalities? N/A: No data provided via NAP interface; 0: No visualization of presented data; Value+1 for each of the following options: a. Data download allowing the user to do some on-line visualization at his side; b. Visualization available as images presented on the web; c. Visualization available projecting a time-lapse video (for a selected time period)	=1	>1

Table 4 below presents the KPIs grouped into the “Communication” category.

“Support to users to register and add data/metadata” KPI assesses whether a NAP provides information to support NAP users to register and (more importantly) to add data, metadata, or both (depending on the type of NAP under evaluation). It is assumed that a NAP shall at minimum provide downloadable support information in the local language. This condition is indicated by a value equal to 1. The value of this KPI is increased by 1, when such information is also available in the English language, when additional support can be provided via contact form and/or e-mail, and, finally, when additional support can be provided directly via telephone.

“Related projects monitoring service” KPI assesses whether there is an implemented service that monitors the external relations of a NAP to indicate its influence on the development and operation of ITS services. This KPI is addressed as complementary and, thus, not associated with any level of service, given that the implementation of such a service cannot be strictly addressed as a NAP’s functional prerequisite.

“Related projects built on the NAP data” KPI is aims to assess how many external projects, platforms, or websites are based and benefited from NAP published in/accommodate through NAPs (irrespective of the utilized monitoring method). It is assumed that at least one project should be based on NAP data for achieving a basic level of service.

“NAP promotion – number of channels” KPI records the number of different official channels, such as conferences, webinars, and social networking, that are used by the NAP operator or national body within the last calendar year for promoting NAP. It is assumed that at least three different channels shall be utilized for achieving a basic level of service.



“NAP promotion – number of publications” KPI records the number of publications made by the NAP operator or national body within the last calendar year. It is assumed that at least three publications shall be made for achieving a basic level of service.

“Contact means” KPI aims to assess whether a NAP provides contact information of the NAP operator and ideally data providers to data consumers. The possible values of this KPI range from 0 to 4 with a value equal to 0 indicating that there are no provided contact means, a value equal to 1 indicating that the contact details of a NAP operator are published through the NAP web page, a value equal to 2 indicating that both contact details of a NAP operator and some data providers are made available through the NAP web page, a value equal to 3 indicating that contact details of a NAP operator and all data providers are published, and, lastly, a value equal to 4 indicating that more than one contact means is provided to data consumers. It is assumed that a NAP shall at least provide contact information of the NAP operator and all data providers for achieving a basic level of service.

“Mass notifications – data providers” and **“Mass notification – data consumers”** KPIs assess whether a NAP can massively notify registered data providers and data consumers, respectively, about the latest updates and changes. Its value ranges from 0 to 3. A value equal to 0 expresses that no mass notification functionality or procedure is in place. A value equal to 1 expresses mass notifications encompassing only legal updates (e.g., changes in terms and conditions of data reuse). A value equal to 2, on the other hand, indicates that mass notifications encompassing both legal and content updates (e.g., new datasets or substantial changes in already published datasets). Finally, a value equal to 3 indicates that mass notifications are tailored to the needs of data providers and consumers, respectively. It is assumed that this KPI does not relate to the basic level of service of a NAP but expresses an advanced level of service when notifications encompass both legal and content updates.

Table 3: KPIs grouped into the “Communication” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
2.1	Support to users to register and add data/metadata	Provision of support to users to register and add data/metadata: 0: No support is available; Value+1: Support information is available: a. on the site or can be downloaded in the local language; b. on the site or can be downloaded in English; c. via contact form and / or E-mail; d. via telephone	=1	=>2
2.2	Related projects monitoring service	Is there a monitoring service of related projects? 0: No; 1: Yes	=0	=1
2.3	Related projects built on the NAP data	Related projects (applications, websites, etc.), that are built on the NAP data within the last calendar year: N/A: the information is not monitored; 0 to infinity; 0: No project is done within the last calendar year; N: number of projects used regularly within the last calendar year	=>1	=>2
2.4	NAP promotion – number of channels	Number of different official channels where the NAP is regularly promoted by the NAP operator and/or national body within the last calendar year (conferences, webinars, social network, homepage, printed media, flyers, etc.): 0 to infinity; 0: No promotion is done within the last calendar year; N:	=>3	=>6



		number of promotion channels used regularly within the last calendar year		
2.5	NAP promotion – number of publications	Promotion of publications made by the NAP operator and/or national body within the last calendar year using the channels mentioned in KPI 2.4: 0 to infinity ; 0 : No promotion is done within the last calendar year; N : number of publications made within the last calendar year	=>3	=>6
2.6	Contact means	Provision of contact means to data consumers on the NAP website: 0 : No contact is available; 1 : Contact details of NAP operator are published; 2 : Contact details of NAP operator and some data providers are published; 3 : Contact details of NAP operator and all data providers are published; 4 : More than one contact means is provided	=3	=>4
2.7	Mass notifications – data providers	Mass notifications available on the NAP website to the registered data providers: N/A : No data providers accounts / no registrations; 0 : Mass notifications are not possible to registered providers; 1 : Mass notifications are possible only for legal (T&C) updates; 2 : Mass notifications are possible for legal and content updates, news; 3 : Mass notifications are tailored according to the data provider's needs	=>0	=>2
2.8	Mass notifications – data consumers	Mass notifications available on the NAP website to the registered data consumers: N/A : No data consumers user accounts / no registrations; 0 : Mass notifications are not possible to registered users; 1 : Mass notifications are possible only for legal (T&C) updates; 2 : Mass notifications are possible for legal and content updates, news; 3 : Mass notifications are tailored according to the data consumer's needs	=>0	=>2

Table 5 below presents the KPIs grouped into the “Search functionalities” category.

“**Search functionalities**” KPI assesses whether dataset discovery services are incorporated into a NAP. It is assumed that the existence of such services is associated with a basic level of service, irrespective of the extent to which these services rely on the use of harmonized/coordinated metadata records. Provided that harmonized/coordinated metadata records are used, there are several additional parameters through which the maturity of these services can be judged. Depending on whether existing services comply with those parameters, the value of the current KPI is increased by one. The first two parameters relate to the possibility of searching the dataset by using free-text or proposed keywords that are both based on harmonized metadata records. The third parameter involves the possibility of including wildcard characters—or other expressions limiting the search results as required—in the search queries logical operators. The next parameter involves search options based on enumeration values. The final two parameters involve map- or location-based search functionalities as well as the possibility to save search patterns and settings.

“**Search results**” KPI aims to assess the performance of a NAP in terms of presenting and further analyzing search results. Foreseen possibilities include the listing of search results, their further



filtering and sorting, or even their visualization (e.g., in the form of a map). It is assumed that a simple listing of search results constitutes a basic operational prerequisite of a NAP.

“**Machine – readable metadata**” KPI aims to assess the machine readability of a NAP’s metadata. A value equal to 1 indicates that metadata are machine readable and can be represented in a common self-describing format (e.g., JSON, XML), while a value equal to 2 indicates that metadata comply to a harmonized application profile and can be represented in a common format promoting the concept of Linked Data (e.g., RDF).

Table 4: KPIs grouped into the “Search functionalities” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
3.1	Search functionalities	Search functionalities: 0 : Not available discovery services; 1 : Available discovery services not necessarily based on harmonized metadata; Value+1 for each of the following options: a. text search based on harmonized metadata (free text); b. text search based on harmonized metadata (proposed keywords); c. search options AND, OR, wildcard (*), range (from... to...) available; d. enumeration search based on harmonized metadata; e. map-based search; f. other location-based search (e.g., NUTS-Code); g. option to save search pattern or settings	=1	>1
3.2	Search results	Display of search results: 0 : No display of search results; 1 : List of search results; Value+1 for each of the following options: a. Options to filter and sort search results; b. Map-based presentation of search results	=1	=>2
3.3	Machine-readable metadata	Provision of machine-readable metadata: 0 : Not available machine-readable metadata; 1 : Provision of machine-readable metadata in a self-describing format (JSON, XML, ...); 2 : Provision of machine-readable metadata as Linked Data (“RDF” that also can be expressed in JSON-LD, ...) in a self-describing format according to harmonized metadata application profile	=>0	=>2

Table 6 below presents the KPIs grouped into the “Update and maintenance” category.

“**IT services**” KPI assesses whether there are established responsibilities for resolving as quickly as possible technical issues that may affect the operation of a NAP (both software- and hardware-related issues are encompassed). A value equal to 1 indicates that there are established agreements for the provision of relevant IT services, while a value equal to 2 indicates that there are also established measures assuring the operational continuity of NAP services that can be financially supported in the long run. It is assumed that a basic level of service is associated with the existence of established agreements for the provision of IT services.

“**Content and metadata**” KPI assesses the existence of predetermined processes and responsibilities among NAP operators, data suppliers, and data publishers for controlling the quality and maintaining up to date NAP datasets on a regular basis. The difference between the values that the specific KPI may obtain relates to the frequency with which the quality of data and metadata are evaluated.



“Monitoring and evaluation” KPI assesses whether a NAP has defined procedures for monitoring and evaluating its content. The value of this KPI is increased by 1, when a NAP complies with each one of the following parameters. The first parameter involves the monitoring of the visibility of a NAP web page and the number of subscribers. The second one involves the collection of statistics regarding the visibility and usage of the datasets. The third one involves the measurement of the performance of the system (e.g., downtime, consequences for other systems, etc.), while the final one involves the assessment of the usefulness of a NAP (e.g., qualitative feedback, re-use rating of quality, surveys, etc.). It is assumed that the current KPI is not related to the basic level of service of a NAP.

Table 5: KPIs grouped into the “Update and maintenance” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
4.1	IT services	NAP IT services: 0 : Not established responsibilities for the NAP services (system, software and hardware) maintenance and updates, backups, and hosting; 1 : Established common responsibilities (signed SLA with IT company(s)) for the NAP services (system, software and hardware) maintenance and updates, backups, and hosting; 2 : Measures for the NAP services continuity in the long term and subsequent funding are foreseen	=1	=2
4.2	Content and metadata	NAP content and metadata: 0 : Not established processes for maintenance data and metadata on a regular basis and checking links; 1 : Established common responsibilities and procedures for the NAP content and metadata maintaining and up to dating on a regular basis between NAP operators, data suppliers and data publishers: Keeping the data up-to date by systematically assessing data quality. For static data – once a year , dynamic data – on demand , metadata – once a year ; checking the functioning of links (from and to datasets) once per six months ; 2 : Established common responsibilities and procedures for the NAP content and metadata maintaining and up to dating on a regular basis between NAP operators, data suppliers and data publishers: Keeping the data up-to date by systematically assessing data quality for static data – every six months , dynamic data – continuously , metadata – once per six months ; checking the functioning of links (from and to datasets) – once per three months	=1	=2
4.3	Monitoring and evaluation	NAP monitoring and evaluation: 0 : Not established procedures for the NAP monitoring and evaluation; Value+1 for each of the following options: Established procedures for monitoring and evaluation the success and impact of the NAP by: a. counting of the access to the NAP or subscribers; b. collecting statistics on the consumption of datasets (e.g., downloads, page views, re-use); c. measuring performance of the system (e.g., downtime, consequences for other systems, etc.); d. measuring usefulness of the NAP (e.g., qualitative feedback, re-use rating of quality, surveys, etc.)	=>0	=>2



Table 7 presents the KPIs grouped into the “Dataset information” category.

“**Documentation & description of datasets**” KPI assesses whether the datasets of a NAP are accompanied by supporting material, such as documentation, high-level descriptions (included in a metadata filed), or even explanatory links providing further information (e.g., schemas). The minimum level of service is associated with a high-level description of datasets on the platform. In case there are available links with additional information about datasets, an advanced level of service is assumed.

“**Classification of datasets**” is the second KPI grouped into this category. Dataset classification can be based either on custom parameters such as parameters indicating the type of network or on formal terminology and coordinated metadata. A classification based on the former parameters is associated with a basic level of service, while a classification based on the latter parameters is associated with a complementary state/advanced level of service.

Table 6: KPIs grouped into the “Dataset information” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
5.1	Documentation & description of datasets	Documentation & description of datasets: 0: Lack of dataset documentation and description; 1: High-level description of datasets on the platform (e.g., in the metadata page); 2: Availability of links and supporting material (e.g., schemas), where necessary	=1	=>2
5.2	Classification of datasets	Classification of datasets based on standard/controlled vocabularies: 0: Lack of dataset classification; 1: Classification of datasets based on custom parameters (e.g., transport mode/network covered); 2: Classification of datasets based on formal terminology and coordinated metadata	=1	=>2

Table 8 below presents the KPIs grouped into the “Interoperability” category.

“**Metadata Catalogue (CMC)**” KPI indicates whether a NAP’s metadata follow the specifications set by the CMC (or not). It gets a value equal to 0 when there is lack of CMC adoption, a value equal to 1 when metadata slightly deviates from CMC’s specifications, and a value equal to 2 when metadata are completely compliant with CMC. It is assumed that a NAP shall have at least partially adopted the CMC for achieving a basic/minimum level of service.

“**Harvesting functionalities**” KPI aims to assess the potential of a NAP to index datasets of other data portals and platforms and the potential of its datasets to be indexed in other portals or platforms as well (i.e., data harvesting). A value equal to 0 points out the absence of any harvesting functionalities. On the other hand, a value equal to 1 indicates the support of one-way harvesting functionalities, while a value equal to 2 indicates the support of two-way harvesting functionalities. Although this KPI is not associated with the minimum level of service of a NAP, the existence of harvesting functionalities declares an advanced level of service.



Table 7: KPIs grouped into the “Interoperability” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
6.1	Metadata Catalogue	Adoption of Coordinated Metadata Catalogue: 0: No adoption; 1: Partial adoption (e.g., available metadata deviate to some extent from the suggestions of CMC); 2: Full adoption and compliance	=1	=>2
6.2	Harvesting functionalities	Support of harvesting functionalities: 0: Absence of harvesting functionalities; 1: Support of harvesting functionalities (e.g., the NAP can index datasets of other data portals and platforms); 2: Support of two-way harvesting functionalities (e.g., the NAP can index datasets of other data portals and platforms AND the datasets of the same NAP can be indexed in other portals or platforms)	=>0	=>1

Table 9 below presents the KPIs grouped into the “Data Exchange and Operational Policy” category.

“**Data reuse**” KPI can be assessed from the perspective of a NAP operator or data provider. In both cases, this KPI aims to assess whether a data provider/NAP operator provides descriptive/detailed information about the terms and conditions for data reuse (or not). A value equal to 0 points out an absence of such a provision, a value equal to 1 indicates that there is a descriptive provision, while a value equal to 2 indicates that there is a detailed provision through sample contracts or standardized data licensing frameworks. It is assumed that a NAP should at least provide descriptive information about the terms and conditions for data reuse.

“**Operational procedure information**” KPI assesses whether a NAP includes guidelines about the operational procedures that need to be followed for becoming a data provider of a NAP or, in general, who is responsible for doing what. In this case, the basic/must-have value is set to 1 reflecting that NAPs shall provide such guidelines.

“**Dataset indicators**” KPI examines whether a NAP provides information about the compliance of its datasets with the requirements set by the Delegated Regulations supplementing the ITS Directive (e.g., regarding the quality, accessibility, exchange timeframe, re-use, and update of the provided data). A value equal to 1 indicates that a NAP provides information about whether a self-declaration form has been submitted by the provider of a dataset, while a value equal to 2 indicates that a NAP provides information about the results of the compliance assessment process (if any). However, this KPI is assumed as not relating to the basic/minimum level of service of a NAP.

“**Compliance assessment**” KPI assesses whether a NAP facilitates the procedure of compliance assessment by providing self-declaration templates or by enabling data providers to submit self-declarations (to National Bodies). In the first case, the KPI is equal to 1, whereas in the second one the KPI is equal to 2. This KPI is once again assumed as not relating to the basic/minimum level of service of a NAP.

“**Association of published datasets with DRs**” KPI assesses whether the metadata provided by a NAP can indicate the relevance of its datasets with the Delegated Regulations supplementing the ITS Directive. Both basic and complementary value is set to 1, reflecting that such an association is necessary.



“Quality indicators for datasets” KPI assesses the extent to which a NAP provides insight into the quality of the provided data/metadata. There are four possible values that this KPI may take. A value equal to 1 indicates that a NAP includes a description of the quality of the provided metadata (e.g., based on a pre-established metadata quality assessment scheme). A value equal to 2 indicates that a NAP provides a description of general quality definitions to support its users to self-assess the quality of utilized data or high-level quality assessment statements in the metadata of hosted publications. On the other hand, a value equal to 3 indicates that a more detailed data quality description is provided in the metadata of hosted publications; however, provided details and values do not cover the entirety of quality fields that may relate to the nature of exchanged data. Finally, a value equal to 4 indicates that there is a solid description of all fields. It is assumed that a NAP shall at least provide metadata quality descriptions for achieving a basic level of service.

Table 8: KPIs grouped into the “Data Exchange and Operational Policy” category

KPI #	KPI name	KPI definition + possible values	Values regarded as BASIC (Must have)	Values regarded as Complementary (Nice to have)
7.1	Data reuse – NAP	Provision of Terms and Conditions for data reuse by the NAP: 0: No provision; 1: Descriptive (brief text description); 2: Detailed (where necessary – full sample contract conditions and/or standardized licenses framework)	=>1	=2
7.2	Data reuse – data provider	Possibility of NAP to provide Terms and Conditions for data reuse defined by the data provider: 0: No provision; 1: Descriptive (brief text description); 2: Detailed (where necessary – full sample contract conditions and/or standardized licenses framework); Note: i.e., terms and conditions that depend on data provider who is the data owner	=>1	=2
7.3	Operational procedure information	Provision of operational procedure information (information about the processes in the NAP, e.g., how a potential data provider/consumer becomes accredited, the compliance assessment, how the data is provided, what is a contact point where to discuss the technical issues etc.): 0: No; 1: Yes	=1	=1
7.4	Dataset indicators	Provision of dataset indicators related to declaration of compliance: 0: No; 1: Provision of information about whether a self-declaration has been provided; 2: Provision of information about whether a positive compliance assessment has been executed	=>0	=>1
7.5	Compliance assessment	Facilitation of compliance assessment procedure: 0: No; 1: NAP provides self-declaration forms/templates; 2: NAP facilitates the submission of self-declarations	=0	=>1



7.6	Association of published datasets with DRs	Association of published datasets with DRs supplementing the ITS Directive: 0: No; 1: Yes	=1	=1
7.7	Quality indicators for datasets	Established quality indicators for datasets: 0: No; 1: Yes, description of metadata quality; 2: Yes, description of general quality definitions; 3: Yes, description of some of datasets (fields) quality; 4: Yes, description of all datasets (fields) quality	=1	=>2

The possible values (column 3) and the limits of acceptable values for Basic and Complementary level (columns 4 and 5) in the tables with KPI definitions above are set as a first version and further may be tuned according to the **Note 8** in Chap. 3.1.3 and according to Chap. 3.1.8.

3.4. Categories and KPI weighting

The weights of individual KPIs, as well as the weights of Feature categories, used in the calculations in the chosen methodology (see Chap 3.1), were determined for the initial version of the calculation using a questionnaire within the Task 2.1 active partners.

These partners had the opportunity to evaluate the importance of Feature categories and separate KPIs using a classification scale of 1 to 5. KPIs were assessed with regard to the type of NAP according to Chap. 3.2. At the same time, it was possible to mark which parameters are not relevant for assessing NAPs of the “Data directory” type (setting the answer to zero).

The following images take a view to the questionnaire running in Google Forms environment:

Please, rate the importance of feature categories from 1 to 5 based on your personal estimation (1: Very low importance, ..., 5: Very high importance). *

	1	2	3	4	5
Access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data discovery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please, rate the importance of each KPI element from 0 to 5 based on your personal estimation (**NAP considered as data platform**) (0: Irrelevant for this typology, 1: Very low importance, ..., 5: Very high importance). *

	0	1	2	3	4	5
On-line availability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compatibility with web browsers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compatibility with operating systems / platforms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 9: Example Images from the questionnaire in Google Forms

The scale <1;5> derived from the classification scale of importance used in the questionnaire was subsequently transformed into the scale <0;1> for a clearer interpretation of the weight. The arithmetic mean of the significance ratings from individual raters was used. The relevance of the parameters was agreed upon during the project meeting.

The following figures show an overview for determining the weights of Feature categories, as well as the weights and relevance of individual KPIs. MS Excel environment is used. Columns marked with numbers from #1 to #7 mean the individual results from the evaluators (project team members) from the questionnaire. Columns including weights (W_i resp. $W_{i,j}$) include arithmetic mean of individual results transformed into the scale <0;1>. Regarding Data directory NAP type, for 5 non-relevant KPIs (see the “Initial relevancy” column with “0” value cases), the weight is not necessary to be computed.

NAP Levels of Service computation - weights setting		Index							Weight	
Features category	i	#1	#2	#3	#4	#5	#6	#7	W_i	
Access	1	5	5	5	5	5	5	3	0.93	
Communication	2	3	4	4	4	3	5	2	0.64	
Data discovery	3	4	4	5	4	5	5	4	0.86	
Update and maintenance	4	4	4	5	4	2	5	3	0.71	
Dataset information	5	4	4	4	4	4	5	4	0.79	
Interoperability	6	5	5	4	5	2	5	2	0.75	
Data exchange and operational policy	7	4	4	5	4	1	5	2	0.64	

Figure 10: Overview of the weights of Feature categories

In the case of individual KPI parameters, the procedure was followed separately for both types of NAP according to Chap. 3.2. The following figure contains a part – KPIs from 1.1 to 2.4. The same procedure applies to the rest.

KPI	Index i,j	Data platform							Initial relevancy	Data directory							Initial relevancy		
		#1	#2	#3	#4	#5	#6	#7		$W_{i,j}$	#1	#2	#3	#4	#5	#6		#7	$W_{i,j}$
On-line availability	1.1	5	5	4	5	5	5	5	0.96	1	5	5	3	5	5	5	5	0.93	1
Compatibility with web browsers	1.2	5	5	5	5	2	5	3	0.82	1	4	5	5	2	5	3	3	0.79	1
Compatibility with operating systems / platforms	1.3	4	5	5	5	2	3	3	0.71	1	4	5	5	5	2	5	3	0.79	1
Responsiveness	1.4	5	4	4	4	2	2	1	0.54	1	5	4	5	4	2	3	1	0.61	1
Web performance – Simplicity / usability	1.5	4	4	4	4	3	5	2	0.68	1	4	5	5	4	3	5	2	0.75	1
Web performance – Visual hierarchy / navigability	1.6	4	3	4	4	3	3	1	0.54	1	4	2	5	4	3	3	1	0.54	1
Web performance – Consistency	1.7	4	4	4	4	3	3	3	0.64	1	4	3	5	4	3	3	3	0.64	1
Support of commonly used languages	1.8	4	4	3	4	3	5	2	0.64	1	3	4	4	4	3	5	2	0.64	1
Security – Technical	1.9	3	5	5	5	2	5	5	0.82	1	4	4	3	4	2	5	5	0.71	1
Security – Providers verification	1.10	3	4	5	5	2	5	5	0.79	1	3	4	3	4	2	5	5	0.68	1
Personal data protection	1.11	4	5	5	5	1	5	2	0.71	1	4	5	5	5	1	5	2	0.71	1
Procedure for publication of data on the NAP	1.12	3	4	5	4	4	4	3	0.71	1	3	4	5	4	4	5	3	0.75	1
Metadata access restrictions	1.13	3	4	3	4	4	1	4	0.57	1	3	4	4	4	4	1	4	0.61	1
Data security and access restrictions for uploading	1.14	3	4	5	4	4	5	3	0.75	1	4	5	0	4	0	5	3	---	0
Data security and access restrictions for downloading	1.15	3	4	5	4	4	1	2	0.57	1	4	3	0	4	0	1	2	---	0
Indication of data modification	1.16	2	2	3	2	4	3	1	0.36	1	4	2	3	2	0	4	1	0.42	1
Data transfer optimization	1.17	3	3	3	3	3	1	1	0.36	1	4	2	0	2	0	4	1	---	0
API usage for data transfer	1.18	2	3	3	3	4	3	2	0.46	1	5	2	0	2	0	5	2	---	0
Web performance – latency	1.19	4	4	4	4	2	2	3	0.57	1	5	3	3	3	2	4	3	0.57	1
Data visualization	1.20	2	1	1	1	5	1	3	0.25	1	2	0	1	1	0	3	3	---	0
Support to users to register and add data/metadata	2.1	3	3	3	3	4	5	3	0.61	1	5	4	4	4	0	5	3	0.79	1
Related projects monitoring service	2.2	4	1	3	1	1	3	1	0.25	1	2	0	3	1	0	3	1	0.25	1
Related projects built on the NAP data	2.3	4	1	3	1	1	3	1	0.25	1	2	0	3	1	0	3	1	0.25	1
NAP promotion – number of channels	2.4	2	1	3	2	1	1	1	0.14	1	2	0	3	1	1	1	1	0.13	1

Figure 11: Overview of the weights of individual KPI

The weight values for feature categories and for all individual KPIs are shown in the following tables. Weights of the Feature categories are common for both NAP types according to Chap. 3.2, weights of individual KPIs are determined separately.

Table 9: Feature category weight

Feature category index (i)	Feature category name	Feature category weight W_i for both NAP types
1	Access	0.929



2	Communication	0.643
3	Data discovery	0.857
4	Update and maintenance	0.714
5	Dataset information	0.786
6	Interoperability	0.750
7	Data exchange and operational policy	0.643

Table 10: KPI weight per NAP type

KPI index (i,j)	KPI name	KPI weight $W_{i,j}$ for the Data platform NAP type	KPI weight $W_{i,j}$ for the Data directory NAP type
1.1	On-line availability	0.964	0.929
1.2	Compatibility with web browsers	0.821	0.786
1.3	Compatibility with operating systems / platforms	0.714	0.786
1.4	Responsiveness	0.536	0.607
1.5	Web performance – Simplicity / usability	0.679	0.750
1.6	Web performance – Visual hierarchy / navigability	0.536	0.536
1.7	Web performance – Consistency	0.643	0.643
1.8	Support of commonly used languages	0.643	0.643
1.9	Security – Technical	0.821	0.714
1.10	Security – Providers verification	0.786	0.679
1.11	Personal data protection	0.714	0.714
1.12	Procedure for publication of data on the NAP	0.714	0.750
1.13	Metadata access restrictions	0.571	0.607
1.14	Data security and access restrictions for uploading	0.750	---
1.15	Data security and access restrictions for downloading	0.571	---
1.16	Indication of data modification	0.357	0.417
1.17	Data transfer optimization	0.357	---
1.18	API usage for data transfer	0.464	---
1.19	Web performance – latency	0.571	0.571
1.20	Data visualization	0.250	---
2.1	Support to users to register and add data/metadata	0.607	0.792
2.2	Related projects monitoring service	0.250	0.250
2.3	Related projects built on the NAP data	0.250	0.250
2.4	NAP promotion – number of channels	0.143	0.125
2.5	NAP promotion – number of publications	0.143	0.125
2.6	Contact means	0.821	0.750
2.7	Mass notifications – data providers	0.464	0.200
2.8	Mass notifications – data consumers	0.464	0.200
3.1	Search functionalities	0.893	0.893
3.2	Search results	0.857	0.893
3.3	Machine-readable metadata	0.607	0.643
4.1	NAP IT services	0.571	0.429
4.2	NAP content and metadata	0.714	0.643



4.3	NAP monitoring and evaluation	0.536	0.429
5.1	Documentation & description of datasets	0.679	0.750
5.2	Classification of datasets	0.750	0.833
6.1	Metadata Catalogue	0.786	0.821
6.2	Harvesting functionalities	0.429	0.542
7.1	Data reuse – NAP	0.643	0.667
7.1	Data reuse – data provider	0.643	0.667
7.3	Operational procedure information	0.464	0.500
7.4	Dataset indicators	0.500	0.375
7.5	Compliance assessment	0.500	0.375
7.6	Association of published datasets with DRs	0.464	0.500
7.7	Quality indicators for datasets	0.500	0.542

3.5. Fine tuning of KPI setting

The aim of the testing and tuning process is to prepare and test a functional NAP assessment scheme in several countries, which is aimed at **implementation in all 27 member states**. The use of the tool for scoring all 27 NAP member states is proposed to be done in a **separate process (or task)** within WG2 or other NAPCORE WG (to be discussed with WG Leader and SCOM).

The testing consists of using the prepared Excel form (see Chap. 4) for the NAPs in a sample of **8 member states** at the **end of August 2022**. The first version of Excel marked after the correction as “v2” was carried out and the results were available on Friday 26th August. When filling in, it was expected that the evaluators would encounter partial ambiguities in the formulation of the KPIs as evaluation criteria.

Therefore, two meetings took place on 26th and 31st August 2022, focusing on:

- Clarification of wording (substantive and linguistic issues) – often in the form of better text specification;
- Adding KPI parameters where the original parameter introduced multiple variants or differences in understanding;
- Removal of KPI parameters where inclusion of the issue among other KPIs was found;
- Adjusting the limits of acceptable values for Basic and Complementary level.

The result was a continuously corrected “v3” Excel version and “v4” Excel version after incorporating the comments from both meetings at the end of August 2022, which was checked by all eight evaluators. The resulting “v4” version of Excel is presented in the following Chap. 4 and sample KPI values and results from this version are in an unaddressed form presented in Chap. 5.



4. Application of the KPI framework

For the application of the proposed procedure, i.e., for the evaluation of individual NAPs of Member States, the MS Excel environment is prepared. The principle of evaluation consists in **filling in an Excel table, specifically the fields colored in yellow**. A preview of the table for filling is shown in the following image:

	A	B	C	D	E	F	G	H
1		NAP Levels of Service computation using KPI Framework						
2		NAP type:	D	P = data platform; D = data directory				
3		URL:						
4	Index							
5	i,j	KPI name	KPI definition	Possible KPI values	Remark	KPI value for the assessed NAP (use values from column D)	Data platform initial relevancy	Data directory initial relevancy
6	1.1	On-line availability	NAP is available on-line through the web	0: No; 1: Yes			1	1
7	1.2	Compatibility with web browsers	Is NAP compatible with multiple web browsers?	0: No; 1: Yes, with one or more specific web browsers (e.g., Firefox); 2: Yes, with all of the following 5 browsers: Firefox, Google Chrome, Microsoft Edge, Apple Safari and Opera			1	1
8	1.3	Compatibility with operating systems / platforms	Is NAP compatible with multiple platforms?	0: No; 1: Yes, with one or more operating systems/platforms (e.g., Windows, iOS, Android); 2: Yes, with all of the following 5 operating systems: Microsoft Windows, Apple macOS, Google's Android OS, Apple iOS, Linux			1	1
9	1.4	Responsiveness	Is the NAP web design responsive?	0: No responsive web design; 1: Responsive web design for different screen sizes on PC; 2: Responsive web design for different screen sizes and devices			1	1

Figure 12: Preview of the Excel table for filling NAP KPI values

The evaluator (p.e. NAP operators) first fills in cell C2 the **NAP type** according to Chap. 3.2 (letter P or D) and fills cell C3 with a **link to the web page** of the evaluated NAP, if such a link exists.

Subsequently, in lines 6 to 50, the evaluator fills in the **values of the individual KPIs** in the column marked in yellow. The evaluator can choose from a menu of values in the fourth column, where individual values are also explained. The code, name and definition of each KPI is listed in the first three columns.

Typically, a numerical value or “N/A” value can be chosen for the evaluation, according to the menu in the fourth column. For numeric values with a possible decimal part, such values can be applied. In exceptional cases where a particular KPI is not relevant to the NAP being evaluated, a value of “N/A” can be applied even though it is not offered in column D. No value needs to be filled in for KPI parameters that are a priori not relevant for the Data directory NAP type. Information about the relevancy of the KPI parameters is given by the values 1 (relevant) or 0 (irrelevant) in the two columns immediately following on the right side of the yellow column with the filled values.

The table further in other columns on the right side (see the following figure) contains auxiliary values leading to the calculation of the parameter “Grade of Achievement” according to the Eq. (1) mentioned in Chap. 3.1.3. These columns include, among other things, the definition of the limits of acceptable values for Basic and Complementary level according to the tables in Chap. 3.3.

WORST _{i,j}	BEST _{i,j}	ACTUAL _{i,j}	ReqMin	ReqMax	Mi,j	Data platform Ri,j	Data directory Ri,j	Data platform Wi,j	Data directory Wi,j	Numerator fraction in (1)	Numerator bracket in (1)	Denominator bracket in (1)	Index i
0	1	N/A	1	1	0	0	0	0.96	0.93	0.00	0.00	0.00	1
0	2	N/A	1	2	0	0	0	0.82	0.79	0.00	0.00	0.00	1

Figure 13: Auxiliar parameter values for “Grade of Achievement” computation

These values do not need to be changed and are only changed by the project team when tuning the evaluation process. The designation and meaning of these values are explained under Eq. (1) in Chap. 3.1.3.



As mentioned, the evaluator only enters the NAP type (see Chap. 3.1.2) and individual KPI values (see Chap. 3.3). The quantitative (Grade of Achievement, see Chap. 3.1.3 and 3.1.6) and qualitative (Maturity Levels, see Chap. 3.1.5) **evaluations are automatically calculated**. After filling in all the values, the calculation results are available in the lower part of the table on lines 52 to 61 (see the following figure), for each Feature category calculated using Eq. (1) from Chap. 3.1.3, and the resulting total values calculated using Eq. (2) from Chap. 3.1.6.

index	RESULTS	Weight	Grade of Achievement	Maturity Level
i	Features category	Wi	Gi	(LoS)
1	Access	0.93	---	---
2	Communication	0.64	---	---
3	Data discovery	0.86	---	---
4	Update and maintenance	0.71	---	---
5	Dataset information	0.79	---	---
6	Interoperability	0.75	---	---
7	Data exchange and operational policy	0.64	---	---
1-7	TOTAL value	According to (2)	---	---

Figure 14: Preview of calculation results in Excel

Note: All images in this chapter show the blank version of the assessment. After filling in the yellow fields, specific values will be displayed.

5. Example of NAP assessment results and analysis

Once the fine-tuning (see Chap. 3.5) was completed, it became possible to apply the KPI framework with the view to assess the NAPs' LoS. In order to do so, 8 MS were instructed to fill the tables with the values of each KPI element according to the characteristics of their NAPs. The values assessed for the KPIs in each of the 8 NAPs (which are numbered from 1 to 8) are shown in the following table, which exemplifies the NAP KPI LoS Computations.

Table 11: Examples of the 8 NAP KPI values assessed

Index	KPI name	Member State							
		1	2	3	4	5	6	7	8
1.1	On-line availability	1	1	1	1	1	1	1	1
1.2	Compatibility with web browsers	2	1	2	2	1	2	2	1
1.3	Compatibility with operating systems / platforms	2	1	2	2	1	2	2	1
1.4	Responsiveness	2	2	1	2	1	2	2	1
1.5	Web performance – Simplicity / usability	2	1	5	3	5	2	3	2.5
1.6	Web performance – Visual hierarchy / navigability	2	2	2	2	1	1	2	0
1.7	Web performance – Consistency	4	3	4	4	2	2	4	3
1.8	Support of commonly used languages	2	2	1	2	2	0	1	1
1.9	Security – Technical	2	2	2	1	1	1	2	2
1.10	Security – Providers verification	2	N/A	2	2	2	N/A	2	2
1.11	Personal data protection	1	N/A	1	1	1	N/A	0	0
1.12	Procedure for publication of data on the NAP	3	0	1	1	3	0	2	1
1.13	Metadata access restrictions	3	3	2	2	2	N/A	3	3
1.14	Data security and access restrictions for uploading	3	N/A	3	2	0	N/A	2	2
1.15	Data security and access restrictions for downloading	0	N/A	3	2	0	N/A	1	2
1.16	Indication of data modification	0	N/A	1	0	1	N/A	0	0
1.17	Data transfer optimization	0	N/A	1	0	1	N/A	1	0
1.18	API usage for data transfer	N/A	N/A	2	2	0	N/A	0	2
1.19	Web performance – latency	0	0.2	N/A	0.52	1	1	1	1.5
1.20	Data visualization	N/A	N/A	1	2	1	1	1	2
2.1	Support to users to register and add data/metadata	3	1	3	3	1	1	2	3
2.2	Related projects monitoring service	0	0	0	0	1	1	0	0
2.3	Related projects built on the NAP data	2	N/A	2	N/A	3	N/A	N/A	0
2.4	NAP promotion – number of channels	1	0	4	3	3	2	5	0
2.5	NAP promotion – number of publications	3	N/A	3	2	4	2	25	0
2.6	Contact means	3	3	4	2	2	1	2	3
2.7	Mass notifications – data providers	0	N/A	3	0	1	0	0	0
2.8	Mass notifications – data consumers	3	N/A	3	0	1	0	0	0
3.1	Search functionalities	3	2	3	3	1	1	3	4
3.2	Search results	2	1	2	2	1	1	3	2
3.3	Machine-readable metadata	2	0	1	2	0	0	1	1
4.1	NAP IT services	2	0	2	1	1	1	2	0
4.2	NAP content and metadata	2	0	0	1	1	1	0.8	0
4.3	NAP monitoring and evaluation	2	0	3	0	1	0	1	0
5.1	Documentation & description of datasets	2	2	2	2	1	0	2	1
5.2	Classification of datasets	2	2	2	1	1	1	2	2
6.1	Metadata Catalogue	2	1	2	1	1	0	2	1
6.2	Harvesting functionalities	0	0	0	2	1	0	0	0
7.1	Data reuse – NAP	2	2	2	1	2	2	0	0
7.2	Data reuse – data provider	2	2	2	2	1	1	2	1
7.3	Operational procedure information	1	1	1	1	1	1	0	0
7.4	Dataset indicators	0	1	1	1	1	0	0	0
7.5	Compliance assessment	0	0	2	1	1	0	0	0
7.6	Association of published datasets with DRs	1	1	0	1	1	0	1	0
7.7	Quality indicators for datasets	4	1	2	0	1	0	0	2



After completing the survey, the results are automatically generated for each feature category and for the NAP as a whole. The results from the 8 MS who filled the tables were gathered so that the LoS could be assessed. The following graph shows the comparison between the total grade of achievement and level of maturity of the NAPs. It is important to highlight that the NAPs numbered 1, 2, and 7 are for Data Directory, while the ones numbered 3, 4, 5, 6, and 8 are for Data Platform.

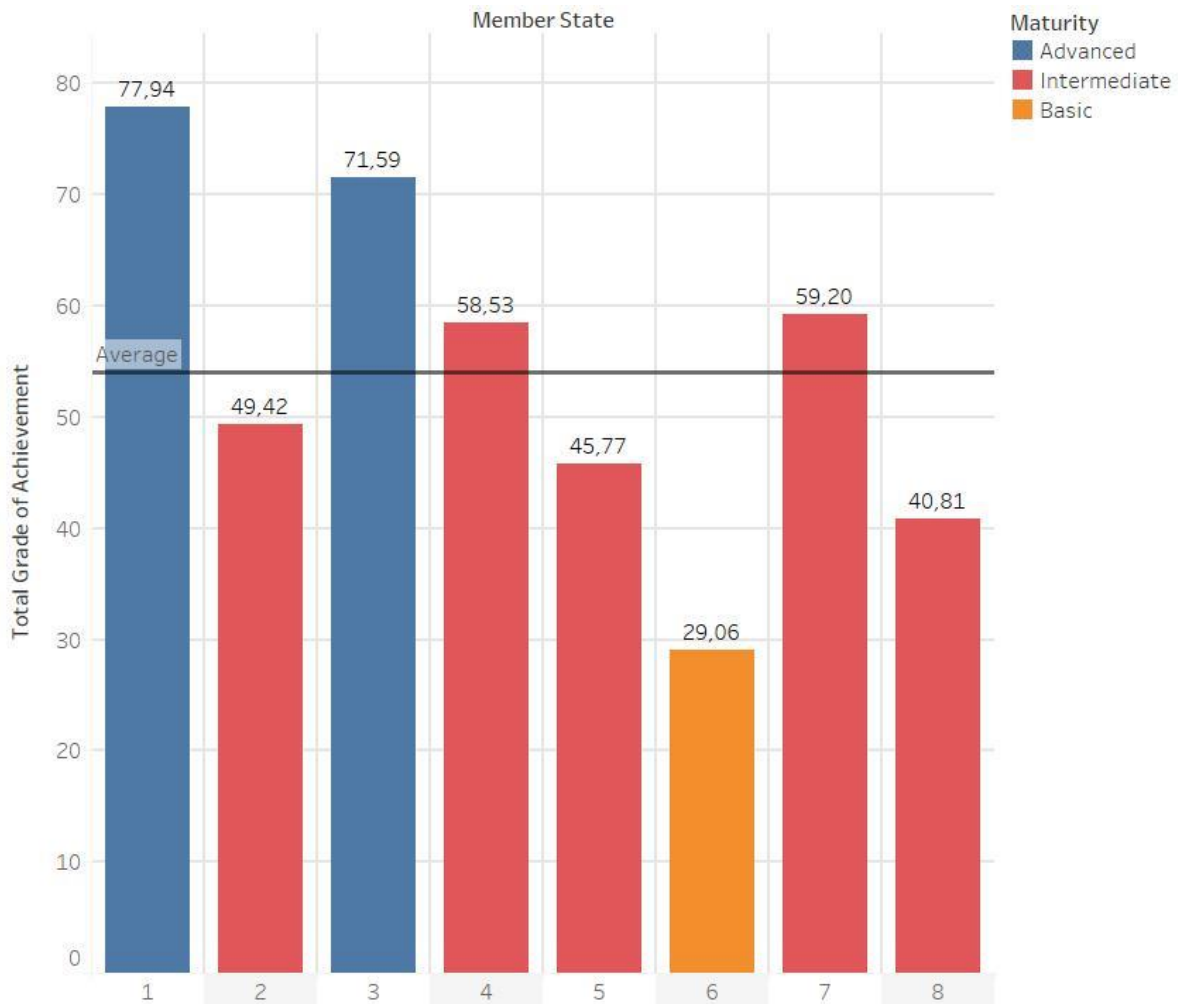


Figure 15: Comparison between the total grade of achievement and level of maturity of the NAPs

It is possible to verify that the general LoS varies a lot within European Member States; after analyzing only 8 countries, several different levels of maturity were observed (from basic to advanced), in which the grades of achievement vary from around 29 to 78. Nevertheless, most countries (7 out of 8) present an intermediate level of maturity or higher, which demonstrates that some progress has already been made in the NAP development across Europe.

A more specific insight can be achieved by analyzing each feature category individually. With that purpose, a graph was built that allows not only the visualization of the average grades of achievement of each category, but also the perception about maximum and minimum values among the 8 analyzed NAPs.

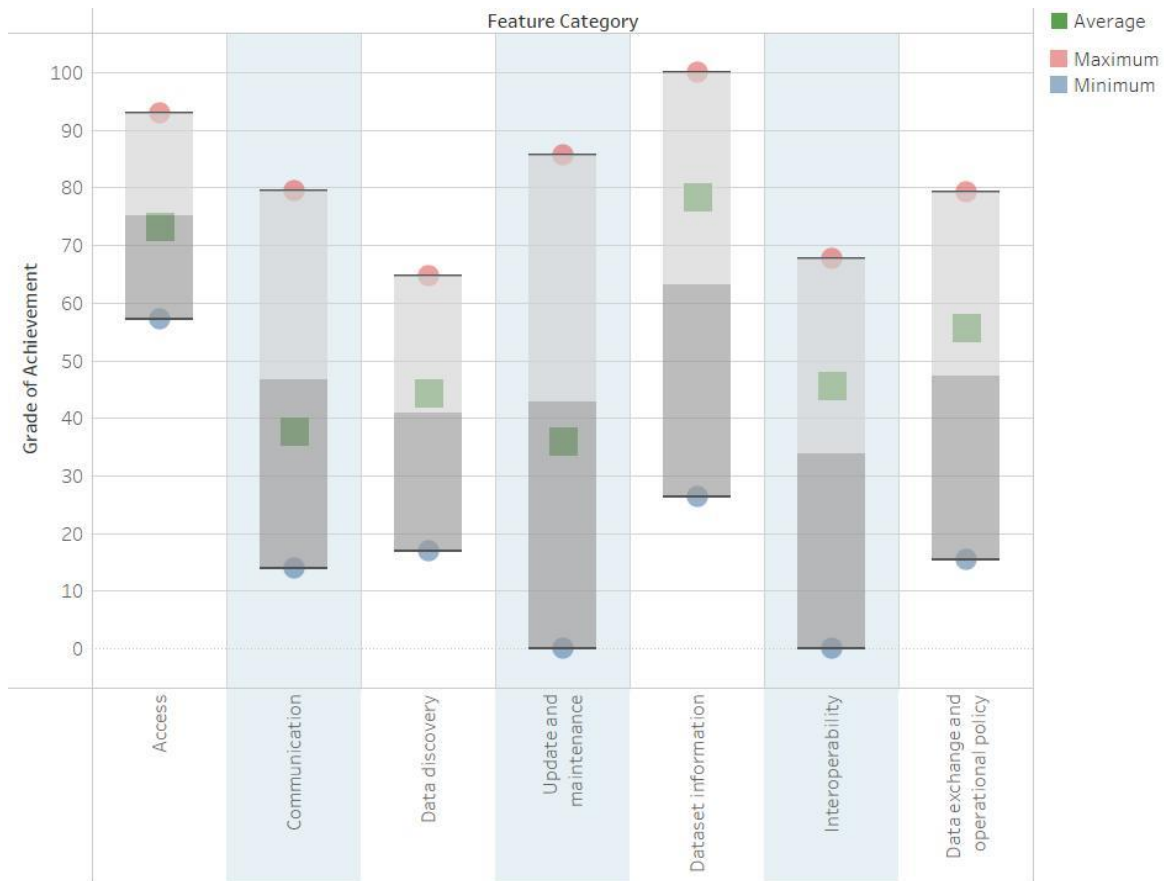


Figure 16: Visualization of the average Grades of Achievement of each category

As can be observed, the categories “Access” and “Dataset information” are the most developed. However, while all countries appear to achieve good LoS on Access, since maximum and minimum values are close to the average, some MS still seem to lack development on Dataset Information, as such category presents considerable variability, even if its average grade is the highest among all the categories (around 80). “Data exchange and operational policy” also presents relatively high grades on average (about 55), although the weight assigned for such a category is the lowest among all (which reduces the impact category in the total Gi).

The remaining categories show slightly less satisfactory grades on average. The average grades of “Communication” and “Update and maintenance” are below 40, that is, values whose levels of maturity are considered as “Basic”. Regarding “Update and maintenance” particularly, variability on LoS of such a category is the highest among all, which demonstrates that, although some countries present great development related to this issue, others still need to provide considerable improvement. Moreover, “Data discovery” and “Interoperability” have intermediate average grades, with values between 40 and 50, being that “Interoperability” presents higher interoperability.

Furthermore, some of the MSs, despite having higher levels of maturity with regard to the NAP as a whole, present beginner or basic maturity levels in one or more categories. Such an issue must be taken into consideration when assessing the Level of Service of a NAP. In order to illustrate that matter, the following graphs compare the total grade of achievement of each MS’s NAP with the grade of each feature category. Graph presented in Figure 17 addresses Data Directory NAPs, while Figure 18 refers to Data Platform.

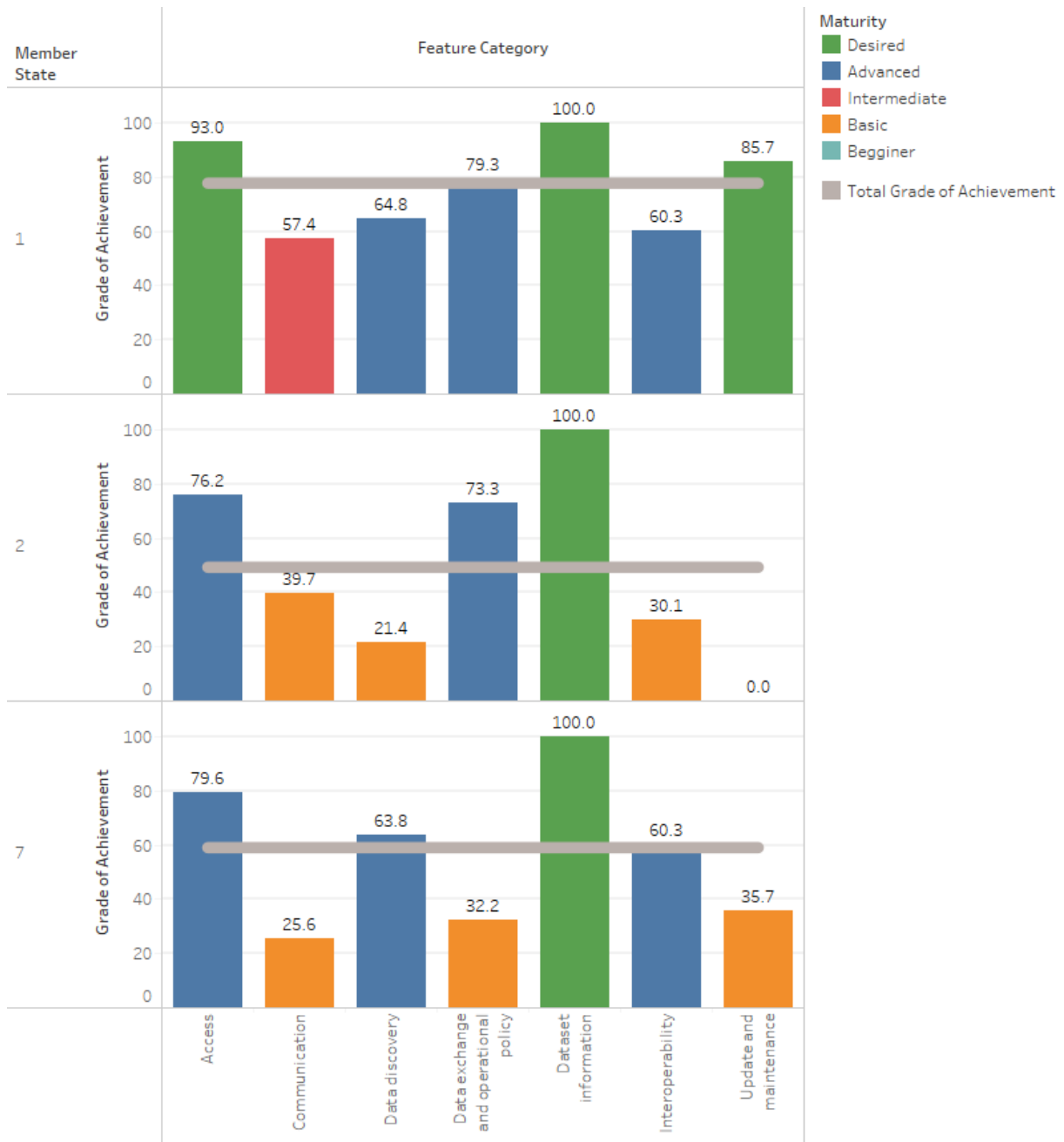


Figure 17: Total Grade of Achievement of each MS's NAP against the grade of each feature category – Data Directory

The NAP of the MS number 7, for instance, achieves a total grade of nearly 60, which grants it a level of maturity close to “advanced”. However, when paying attention to the categories, it is observed that 3 categories present basic maturity levels (“Communication”, “Data exchange and operational policy”, and “Update and Maintenance”).

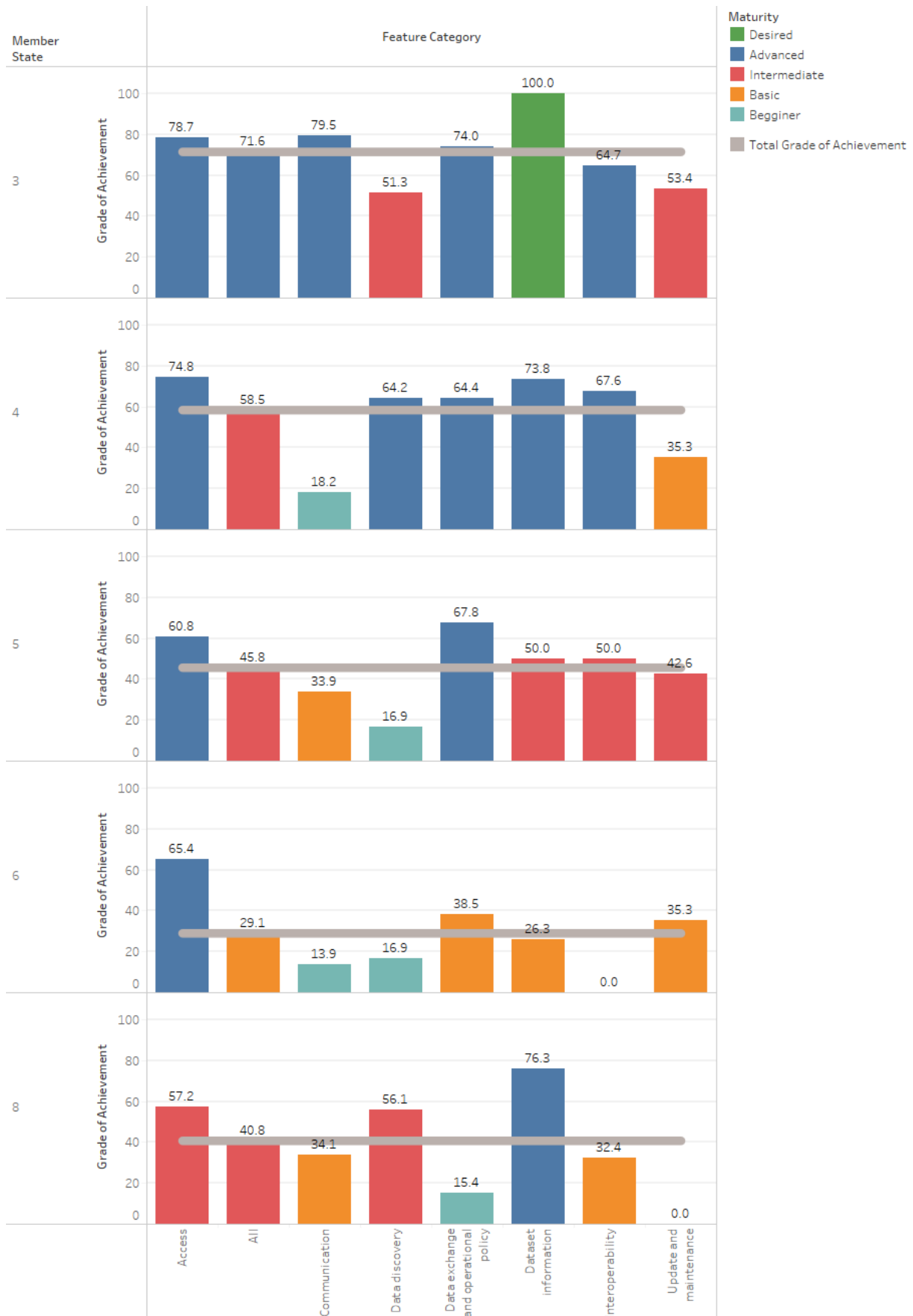


Figure 18: Total Grade of Achievement of each MS's NAP against the grade of each feature category – Data Platform



Similarly, MS number 7 also has a general grade close to 60, although the categories “Communication” and “Update and maintenance” present beginner and basic levels of maturity, respectively. Thus, the contradiction between the maturity levels of the whole NAP and the ones from the individual categories shall be carefully studied in future works, with the view to allow the consideration of such an issue when assessing the general LoS of the NAPs.



6. NLKF use cases supporting NAP LoS harmonization and interoperability

The proposed “NAP LoS KPI Framework tool” (NLKF) is a building block in working towards a common approach for NAP Level of Service and hence support interoperability between NAP.

The NLKF specifically contributes to harmonization of NAP level of service through its use and application by NAP operators as a uniform EU reference in decision-making processes on future developments and investments towards a European NAP reference. Specific examples of NLKF use cases are proposed in the following paragraphs.

6.1. NAP roadmap development and monitoring

The activities of NAP roadmap developments by NAP operators and/or product owners can be supported by the NLKF uniform list of features and associated level of services.

A periodical (yearly) assessment exercise provides examples of new potential features or improvement of existing features that can be added to its roadmap in order to increase NAP performance to a desired level of interoperability. The periodical assessment results can also support the monitoring of the evolution of the NAP Level of Service within a period of time.

The expected positive impact of this use case to improve NAP interoperability is the use of the uniform list of features and related KPI provided by the NLKF. The use of this common reference for developments will promote the use of a common “language” and “development path” allowing potential coordination and harmonization.

6.2. NAP LoS European benchmarking

NAP LoS harmonization can be stimulated based on insights provided through periodical comparisons of (current) NAP Level of Services with a desired European NAP Level of Service. The NLKF provides a uniform definition of Level of Service that allows the definition of the desired state. Such LoS reference can also be defined at the “Category” or “Feature” level of the NLKF.

Besides the NAP operators (or NAP product owners) the primary actors of this use case are (EU) policy makers aiming at the establishment of a European (minimum or basic) Level of Service for NAP.

A pre-condition for this use case of the NLKF is the definition of benchmark reference. Two methods can be applied to define the European references:

1. **European benchmark reference:**
 - a. Defined by the **average** (or other statistic) NAP category of feature LoS .
 - b. To be developed based on a periodical assessment of NAP scores from all (or representative number) Member States.
2. **European minimum Level of Service:**
 - a. Defined by a minimum set of features to be available at a pre-defined minimum KPI value
 - b. To be developed by a NAP reference architecture (as part of NAPCORE Task 2.3)

The expected results of the use case is for each NAP a list of “Gaps” (minimum features missing, or LoS to be achieved) towards a European NAP minimum level of service. For each of the identified “Gaps” a list of “Actions” can be developed to support the achievement of the desired LoS.



This use case and proposed method is planned to be further developed in work item 2.1.3 and in collaboration with tasks 2.3 NAP reference architecture.

6.3. Assessment of NAP Level of Service costs and benefits

NAP's require a sizeable commitment of organizational and technical resources. As a result, there is considerable interest in how the resources and associated cost are justified by the collected benefits. It is challenging to put a "price tag" on the different NAP features and also on the whole NAP implementation, as there is not clear definition of borders of what is (or should have been) part of the NAP cost and what is outside. Having real numbers of the realized investments (procurement tenders) on NAP would help but we would need to differentiate per its functionality, its country of implementation (different price of labor), its way of implementation (open software adaptation or development from "green field").

For the differentiation per functionality the **NLKF** already provides a uniform reference and proposes related KPIs with a level of service qualification. A cost and benefit assessment exercise based on KPIs categories and levels would provide insights on what are the associated costs and possible benefits of going from level to level (p.e "going from red to orange to green).

Proposed method for assessment of cost and benefit using the NLKF:

The goal is to assess in a qualitative way a cost and potential benefit of "going up" the level of service or changing from one type of NAP to another, based on the following:

1. Cost and benefits associated in a qualitative way to NLKF KPIs and its levels can be realized as a scale 1-10 (1= no costs, no benefits; 10=very high costs, very high benefits).
2. -Association of the cost and benefits in a qualitative manner to each KPI and its level could be different when going L0 -> L4 or "just" L3 -> L4, since the gradual implementation is more costly than complete implementation in one step, also going from L3 ->L4 could be way costlier if it means architectural change of existing implementation (10x).
3. If qualitative association to KPI exists we would be able to compare differences between different levels of implementation in a quantitative way, i.e. difference of a sum of cost levels comparing against difference of a sum of benefit levels
4. When assigning cost and benefit levels (a qualitative association 1-10) we would need to deal with a relativity of the costs and benefits, i.e. does the cost level 10 mean some absolute value that could be compared against whole cost of implementation with same meaning across KPIs categories or is it just KPI specific?

Proposed way forward adapting the NLKF :

- Create draft cost and benefits scoring table, i.e. associate each number (1-10) with an explanation and define the cost and benefits overall meaning
- Add 3 additional columns in KPI table with cost and benefit associated per KPI level and note column
- Try to associate costs and benefit levels for small part of KPIs
- Test how to combine the costs and benefits (shall we use weights?)
- Extend cost and benefits to whole KPI table
- Sent out for evaluation

This use case and proposed method is planned to be further developed in follow up NAPCORE workitems as part of Task 2.3 NAP Architecture.



7. Governance principles for NLKF tool

In order to facilitate these use-cases and processes in a responsible manner, a set of governance principles are proposed to be followed, both for the tool and the results of its use.

7.1. Management of the tool

During the NAPCORE project period the tool should be managed by a NAPCORE SCOM nominated (group of) persons (or organizations). A candidate organization for after the project should be identified and prepared for taking the management of the tool and preserve its Governance principles.

7.2. Further tool development and updates:

During the NAPCORE project updated versions of the tool can be developed by partners as they gain experience with the tool; this can include:

- New features and/or categories
- Fine-tuning of parameters (KPI definition values, limits and weights)
- More examples of analysis of results supporting the use cases
- Reference score levels: minimum score per NAP for example based on Reference Architecture (with the collaboration of T2.3? and T2.4?)

7.3. Access to the tool

During the NAPCORE project the tool is accessible to all NAPCORE members via the NAPCORE SharePoint. Each org should nominate 1 contact person that should be available for participation in governance activities (reporting, joint use and feedback sessions).

7.4. Use of the tool

During the NAPCORE project the tool can be used by NAPCORE members:

- NAP operators individually or within own organization
- NAPCORE group sessions: for the development of an average European score for benchmarking: a yearly session can be organized by NAPCORE management where all NAP representatives fill the core at the same time and place facilitated by a host which will take care for a harmonized interpretation of the KPI. This way the average results will be more comparable and with higher quality.

7.5. Governance of results

- NAP LoS calculation results should be managed by the corresponding NAP operator as insight for further decision making,
- NAP LoS calculations of aggregated / average European results should be managed by a NAPCORE SCOM nominated (group of) persons (or organizations),
- Analysis of NAP LoS calculation results should be presented with anonymized respondents and always at least more than 3 results.



1. References

1. European Its Platform. (2021). EU EIP - Annual NAP Report 2020. Retrieved from: <https://www.its-platform.eu/wp-content/uploads/ITS-Platform/AchievementsDocuments/NAP/EU%20EIP%20-%20National%20Access%20Points%20-%20annual%20report%202020.pdf>



2. Appendix 1

This survey is completed by:

Name :
Organization :
Country :
E-mail :
Phone :
Date :

This survey aims to collect information on the features available in the following NAPs:

- SRTI- Safety Related Traffic Information
- RTTI - Real Time Traffic Information
- SSTP - Safe and Secure Truck Parking Areas
- MMTI - Multimodal Travel Information

The features and categories in this survey are mainly based on the “EU EIP NAP Common list of features and LoS” where you can also find descriptions of the features. The list is extended with new features based on the NAPCORE work program and T2.1.1 desk research.

If you miss a relevant feature and or category, please add a new line at the end of the corresponding category with a description.

The survey is targeted at the features of each NAP. However, responders are given the opportunity to provide a different answer per Delegated Regulation, considering that in several countries a different platform may operate for hosting/accommodating data elements mentioned in each Delegated Regulation.

Moreover, given that a positive or negative answer to included questions is not always possible, responders are given the opportunity to select a neutral answer (termed as “other”) and provide further explanations in the included text boxes.



Access

1. Is the NAP available over the internet?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

2. Does the NAP comply to standards and best practices promoting usability and accessibility? Please provide an answer and, if possible, a short indication on what standards and best practices have been utilized during NAP design and development.

Remarks: Standards and best practices promoting usability and accessibility of NAPs may be qualified into web design standards (e.g., W3C recommendations), standardized protocols and interfaces (e.g., RFCs), and user experience guidelines (e.g., simplicity, responsiveness).

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

3. Is the NAP provided in both the national language and commonly used language(s) of Member States?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other



<p>Current:</p> <p>Planned:</p>
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4. Does the NAP follow EU data protection and industry data security standards? Please provide an answer and, if possible, a short indication on which standards are followed.

Remarks: EU data protection standards become applicable only if user data are stored in the NAP. The scope of this involves the extraction of information on how: a) user data are handled by NAPs, b) user authentication is executed, and c) data exchange is protected (e.g., use of SSL certificates).

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

<p>Current:</p> <p>Planned:</p>
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5. Does the NAP require data publishers to register to add their data/metadata? Please provide an answer and, if possible, a short explanation of the required process to become a data provider.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

<p>Current:</p> <p>Planned:</p>
--

6. If the NAP is also a data broker, does it require data consumers to register to gain full access to datasets? Please provide an answer and, if possible, a short explanation of data access and visibility control functionalities of the NAP.



RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

7. Does the NAP include Application Programming Interfaces for automated data exchange?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

8. Does the NAP include data visualization functionalities?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:



Communication

9. Does the NAP provide help to data publishers to register and add data/metadata?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

10. Is the NAP promoted? Please provide an answer and a short description of NAP outreach and dissemination means utilized.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

11. Does the NAP provide means for data consumers to contact NAP operator and/or data providers for assistance?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other



Current:
Planned:

12. Does the NAP provide mass notifications to its users (e.g., via e-mail) regarding updates in its content or operational procedures?

Remark: As operational are understood those procedures that govern the using rights and responsibilities of data providers and consumers.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

Data Discovery

13. Does the NAP provide discovery services? Please provide an answer and a short description of discovery services.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

14. Can datasets be searched using a metadata catalogue?

RTTI Yes No Other

SRTI Yes No Other



SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

15. Does the NAP provide machine readable metadata?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

16. Does the NAP support map-based search of datasets?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

Update & Maintenance

17. Is the NAP service maintained?

RTTI Yes No Other

SRTI Yes No Other



SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

18. Is the NAP content and metadata maintained and up to date? Please provide an answer and a short indication on the average update frequency of NAP datasets.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

19. Are NAP monitoring and evaluation processes undertaken? Please provide an answer and a short description of monitoring and evaluation processes, making, if possible, a distinction on data provision and data consumption.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

Dataset Information

20. Does the NAP provide dataset documentation (or links) where required? Please provide an answer and a short description on how NAP datasets documentation is handled.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

21. Does the NAP classify datasets according to standard/controlled vocabularies?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

Interoperability

22. Is the Coordinated Metadata Catalogue adopted by the NAP and its data providers?

Remark: The latest available version of the Coordinated Metadata Catalogue can be found [here](#).

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other



<p>Current:</p> <p>Planned:</p>
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23. Does the NAP support data harvesting from other European NAPs?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

<p>Current:</p> <p>Planned:</p>
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Data Exchange and Operational Policy

24. Does the NAP provide clarified descriptions of the Terms & Conditions for data re-use?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

<p>Current:</p> <p>Planned:</p>
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25. Does the NAP provide a short description of its operational procedures?

Remark: A description of a NAP’s operational procedures may include a brief explanation of: a) the roles and responsibilities of the NAP operator, data providers and consumers, b) user types and access rights, c) users’ registration and authentication process, d) how can datasets be published, and/or e) how often should datasets be updated.

RTTI Yes No Other

SRTI Yes No Other



SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

26. Does the NAP provides data providers with pre-specified licenses to be selected during the publication of datasets? Please provide an answer and a short indication on which pre-specified licenses are adopted.

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

27. Does the NAP facilitate the provision on behalf of data providers of self-declarations of compliance with the requirements set by the Delegated Regulations supplementing the ITS Directive?

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:

Planned:

28. Does the NAP provide data related to all Delegated Regulations supplementing the ITS Directive? Please provide an answer and, if needed, indicate which platform is meant for which Delegated Regulation.



Yes No Other

Current:
Planned:

29. Does the NAP include quality indicators for its datasets? Please provide an answer and a short description of provided quality indicators (if any).

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

30. Are there any quality requirements for providing data through the NAP? Please provide an answer and a short description of adopted quality requirements (if any).

RTTI Yes No Other

SRTI Yes No Other

SSTP Yes No Other

MMTI Yes No Other

Current:
Planned:

Additional features or comments

31. Please feel free to propose additional features, any general comments, or if you have additional information in the “NAP Features survey” word document.



