DIGIPLAN - Evaluating Spatial Planning Practices with Digital Plan Data

Interim Report

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DIGIPLAN – Evaluating Spatial Planning Practices with Digital Plan Data

Targeted Analysis

Interim Report

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This targeted analysis activity is conducted within the framework of the ESPON 2020 Cooperation Programme.

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Version 27/08/2020

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This document is an interim report.

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The final version of the report will be published as soon as approved.

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1 Introduction and objectives

In the past decade, many European countries have taken significant steps to set up digital plan registers and the digitalization of spatial planning processes. Digital plan data opens a range of new possibilities to get insights into planning practice and the role of planning for spatial change over time. However, evidence on the possibilities offered by digital plan data and their actual use is missing. At the same time, digitalization of plan data can be assumed to have considerable impact on planning practice.

The topic of digitalization of plan data is therefore twofold: (1) a provision/production side, meaning how are plans digitally represented, and (2) a user/consumption side, meaning how are plan data used and influencing planning practice. Digitalization of plans can therefore not be seen isolated from planning practice. The digitalization is based on practice, because that is what it should represent, and practice is influenced by digitalization, because it redefines, changes or introduces terms, standards, procedures, and relevance.

ESPON DIGIPLAN will analyse approaches across different, national planning systems including methods for evaluation with plan data and how planning is actually represented in such data. Based on case studies, the overall objective of this activity is to analyse and compare:

- the scope of digitalisation of plan data – what is digitized and what is it digitized for?
- the organisation and financing of the digitalisation – how is it digitized?
- the current and potential future uses of digital plan data – how is it/can it be used?

More concretely, the objective is to provide both an overview and in depth, practice-oriented knowledge and recommendations on these matters, and to respond to stakeholders' knowledge needs.

ESPON DIGIPLAN will provide an overview on digitalization of plan data in 15 ESPON countries (Task 1) and insight information from case studies in 6 countries (Task 2), including the stakeholder countries of this analysis: Denmark, Norway, and Switzerland.

This interim report shows the current state of the work and preliminary findings and includes two Annexes: Annex 1, which describes the methodological framework, and Annex 2, a collection of 15 country fact sheets.

We are in the middle of our empirical work. Around 40 interviews have been conducted and a few more are to come. The preliminary findings of Task 1 and 2 highlight several interesting topics which are reflected in the suggestions for the five thematic practice papers of Task 3. The forthcoming work will focus on deeper analysis of our material as well as synthesis across it.

2 Concepts and research background

A first overview of literature and useful concepts follows. The research team will continuously elaborate on this part (see also Annex 1), aligning it with our results.

2.1 Digitalization / digitization

Digitalization of workflows and datasets produced both in the private and public sectors has gained momentum (EC, 2017). This process is driven by ideas of efficiency, expressed for example in the ideals of “smart cities” and “digital governance”, ideas of participation, where key aims include the establishment of “open governments” and “open data”, and a hope for new economic growth based on this data (UN, 2017). National as well as international policies as EU’s INSPIRE directive from 2007 or the EU’s strategy for a digital single market are driving this digitalization process. Regarding spatial planning, the Aarhus Convention (UNECE, 1998) constituted more than 20 years ago an overarching reason for improving public accessibility to planning information relevant to the state or development of the environment. Digitalization of plan data as such is not new, but the systematic approach within a whole country and the development towards fully digital plans is.

ESPON’s recent policy brief on the digital transition provides some hints on the current state of digitalisation in spatial planning (Martino et al., 2018). Many cities provide various services around planning, including exploring land use plans with GIS servers and obtaining data online via land registry. On the national level though, the study identifies only few services digitized. However, as shown in our study (section 4), several countries have digital plan registers or are in the making of it. In federal or regionalised countries, many regions have built up similar systems.

2.2 Representation of space

Geodata and plan data are different types of spatial information; "maps" and "plans" are produced and consumed on the basis of different concerns with space, yet they rely on each other and share data. Both regulate the relationship between citizenship and space. An essential difference between them resides in their concern with time and their attribution of rights to the uses of space. Today geodata and plan data blend together through the information flow of increasingly integrated digital systems of data production and consumption. In the widest sense, a spatial plan is the association of a spatial grid with norms and regulations for the attribution and uses of rights (Mazza, 2010). A question, then, is how digital information facilitates the attribution and uses of rights in different national contexts, according to their institutional planning systems, the level of digitalization of public services and plan data, and the culture of spatial planning practice in each case.

In the field of spatial planning the national "owner" of the institutional planning system (often represented by ministerial authorities) seems to be motivated by the possibility of an apparatus capable of aggregating and communicating everything. This aspiration implies a potential conflict of interests regarding the system's performativity. While digitalization may improve the

efficiency of production and consumption of data through planning activities, a plan is, nonetheless, an image; a symbolic form, subject to individual and collective decoding and interpretation (Gabellini, 1996).

The relationship between public sector digitalization agendas (or private developers agendas in some cases, as digital technology providers with public sector clients) and the formation of public awareness of spatial phenomena and processes may then be an issue of concern. Integration of geodata and plan data into common systems of information requires a significant degree of standardization of data and regulation of the information flow, possibly enhancing data accessibility at the expense of the cognitive and structuring role of plans. At stake is an appropriate representation of space in planning and decision-making processes, and the balance between relevant and excessive information. Assessment of the balance between the efficiency of digital plan data and good spatial planning practices requires conceptual clarity on types of spatial information and the regulation of the relation between citizenship and space.

2.3 Digital plan data

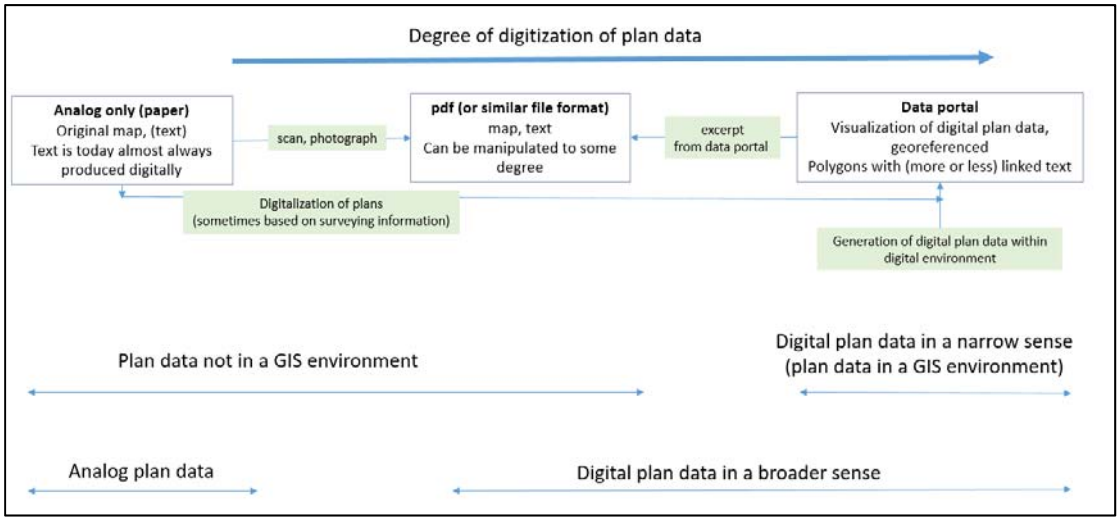
In a narrow sense, plan data can be defined as geodata reflecting planning regulations. Polygons representing a discrete zoning map done by the local planning authority are an example. The data represents e.g. specific usage rights or building restrictions for a specific area, binding for more detailed plans or landowners directly.

On the other side of the scale, there are more visionary and strategic spatial plans, often with fuzzy boundaries and only indications for intended spatial changes (Nadin et al., 2018). Plan data must then be assessed as strategic representations of spatial development, often in the form of spatial grids or diagrammes indicating courses of action, anticipating the making of zoning and regulation. Strategic spatial plans can also be digitized, either only with very basic information or with more details but not standardized across different plans. As planning becomes more strategic at all levels and planning tools more adaptable, it is important to analyse the digitalisation of these types of plans in particular. However, regulatory plans have not disappeared and get new attention with digitalisation. Both types of plan data can be provided at different spatial/policy scales, e.g. on the national, sub-national, and the municipal/local level, as shown in the ESPON Compass project (Nadin et al., 2018)

Knowing the purpose, intentions, and not least the history behind the digitalisation is important to interpret the data correctly. One of the big advantages of digital plan data, being flexible to use, is at the same time its greatest challenge as it can easily be taken out of context or used in contexts not intended to. There are high requirements to the data quality, but at the same time, the (future) requirements might be unclear when plans are digitized. An important characteristic of digital plan data is also, that they are systematically collected for a whole planning system (e.g. of a country). This change of scope is significantly different from earlier approaches.

A central definition in ESPON DIGIPLAN is that of the degree of digitization of plan data, which both relates to technical (e.g. in GIS environment or not) as well as legal issues (which version is binding). Figure 2.1 illustrates that.

Figure 2.1 Degree of digitization of plan data



2.4 Spatial planning systems, practice and digitalization

Comparative analysis requires an understanding of institutional spatial planning systems. This might be a record of how governance is organized in each case, but also, more specifically, the functions that characterize planning, and the existence of instruments allowing the system to perform accordingly. Constants one should be looking for are 1) instruments that structure decision-making, endowing plans with a functional programme (strategy), 2) instruments performing implementation and change (policy, design), and 3) juridical provisions (regulation, guidelines) (Mazza 1996). On this backdrop one can observe how governance systems structure the flow of information relating to the functions and instruments of spatial planning, and assess the role played by digital plan data.

The digitalization of planning has a number of likely but still unknown effects. It is likely for example that digitalization, which itself entails a degree of geometrical, thematically, and technical standardization of workflows to be practically feasible, will lead to more standardization of how to plan – i.e. a standardization of visions for future land use formulated by communities and institutions.

It is also likely that digitally facilitated processes of public participation as well as the presence of wider, online domains for dissemination- and accessibility-processes mean that plans attain new performative roles. Plans may be used outside the expert community where it is produced and that in turn can influence how planners work.

There has been an interest of using digital plan data in the context of Geodesign, defined as a set of concepts and methods used to involve all stakeholders and various professions in

collaboratively designing and realizing the optimal solution for spatial challenges in the built and natural environments, utilizing all available techniques and data in an integrated process (Steinitz, 2012).

2.5 Key terms

Following the literature and our own empirical work, we defined the key terms:

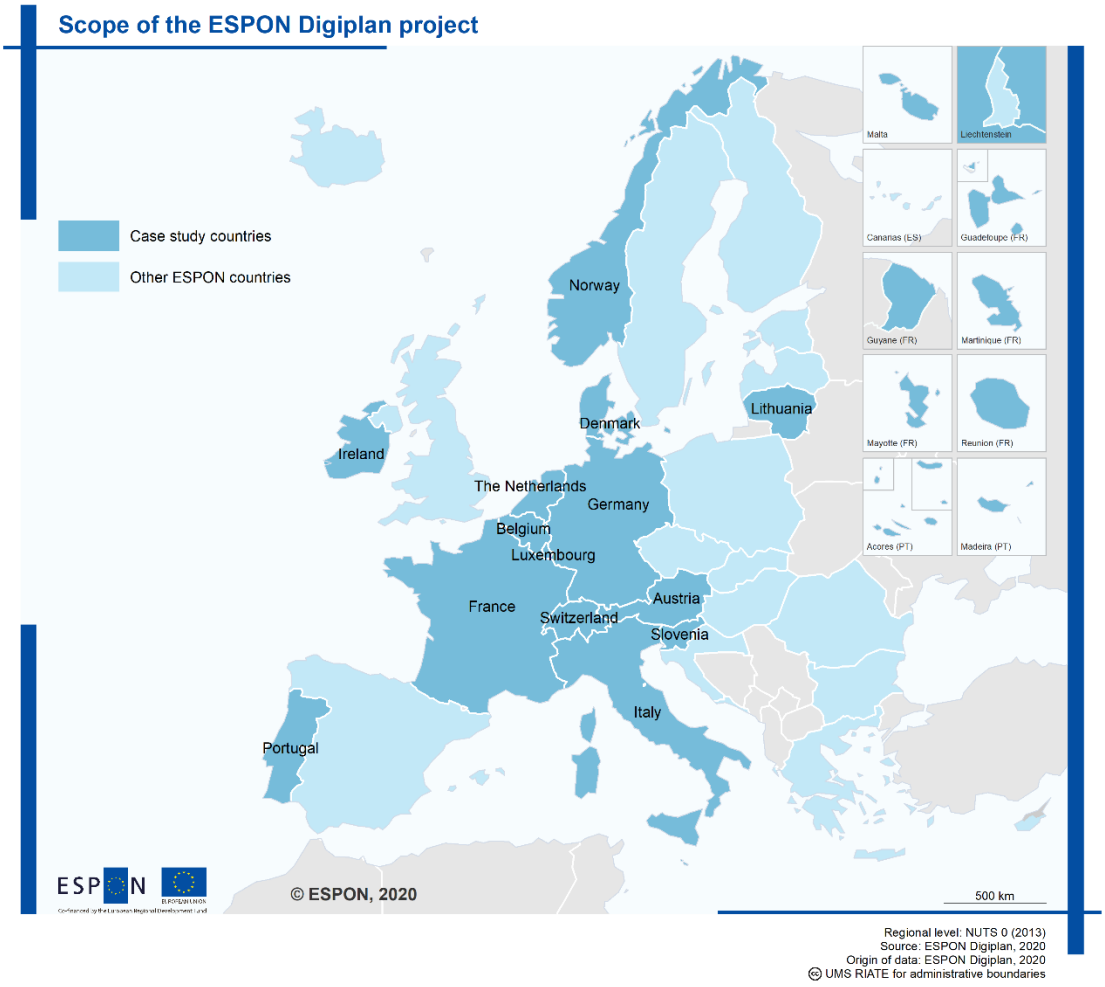
Table 2.1 Key terms

Term	Definition	Notes
Plan data	Showing planning intentions, regulations, and risks and opportunities (in any format, including maps, text, analog, digital etc.). Focus on the attribution of rights to the use of space current and in future.	
Geodata	*Geodata* is digital information about geographic locations that is stored in a format that can be used with a geographic information system (GIS)	Geodata is digital
Spatial data	Spatial data can be mapped (spatially explicit data)	
Digital plan data	Geodata describing planning intentions, regulations, and risks and opportunities – so that means geographic locations with connected metadata	How are elements of the plan that refer to the entire area of the plan digitized? – they also have a geographic reference (e.g. whole municipality) and be can described as geodata
Digital process data	Data about the planning process	E.g. plan status (proposal/adopted…), date of plan being effective
Digitize (Synonym with digitization, digitalization)	Transform from analog to digital format	Key issues: Standardization = setting standards for input data (before primary data production), Harmonization = standardizing existing data for comparison (after primary data production); regulation and visualization (plan symbols)
Planning process	Key steps of plan making and implementation, not necessarily in a linear sequence (workflow)	When in the process is digital plan data created, used, … Interaction with digital portal
Digital portal (prefer “portal” to “platform”, otherwise synonym)	Digital portal is any electronic tool for communication (does not include the database behind) Webgis as most common user interface.	Key functionalities for all: visualize plan data, support analyses, support hearing process, participation, interaction, report errors Key functionalities for professionals: editing, creating
Legal status of digital plan data	Is the digital plan / plan data legally binding?	
Spatial plan	Plans (and other tools) used to mediate and regulate spatial development, usually related to legal planning framework and various planning authorities	Huge variation of definition in different countries. Can be visionary, strategic, framework-setting or regulative in general character (ESPON Compass)
Geodesign	Set of concepts and methods used to involve all stakeholders and various professions in collaboratively designing and realizing optimal solutions for spatial changes in the built and natural environments	The digital system is used as an actual tool in the creative process, not just in the more administrative, legal process
Data user/ consumer, data producer, system developer/ maintainer	Public or private institutions, NGOs, companies, citizens interacting with digital plan data	Who develops the system? Who maintains the system? Who inputs data? Who uses data? (uses a specific plan or uses plan data from various/all plans)
Land registry, land register (cadastre)	Land Registry provides property owners with a land title guaranteed by the government, as well as with a title plan that indicates the property boundaries.	Digital land registries can be the base map for digital plan data
Base map	Plan data is normally mapped onto a base map, which in turn might be based on the land registry	

3 Materials and methods

ESPON DIGIPLAN provides an overview on digitalization of plan data in 15 ESPON countries (Task 1) and insight information from case studies in 6 countries (Task 2), including the stakeholder countries of this analysis: Denmark, Norway, and Switzerland. The selection is based on including a diversity of territorial administration structures (Magone, 2011) and governance levels (Nadin et al., 2018) of countries that have an up and running digital portal that contains plan data. The selection of countries is explained in detail in the Annex 1. Map 1 highlights the selected countries.

Map 1 Case study countries



The overview of the digitalisation of plan data in 15 countries (Task 1) includes a desk research and follow-up phone/online interviews, which were guided by a joint questionnaire. It mainly covers the scope of the digitalisation of plan data (e.g. what kind of plan data has been digitalised in what period of time?) and the current uses of digital plan data (e.g. who has access to the digitalized data?) – the full list of questions can be found in the separate report on the methodology (Annex 1). The results are summarized in a synthetic and up-to-date overview on the digitalisation of plan data in the 15 countries (Section 4) as well as 15 country fact sheets (Annex 2).

Opposite to Task 1, which is mainly descriptive in terms of what is digitized and how, Task 2 goes into depth with trajectories of digitalization in spatial plans and planning practice. Point of departure is still digital plan data (digital version of plans) and the related infrastructure identified in Task 1, not digitization in general. However, this does not exclude more general perspectives related to digital plan data and digital plans.

The case studies are structured broadly into the following sections:

Section 1: Scope of digital plan data – introductory part (based on Task 1)
• The current state of digital plan data • The historical background • Illustration of plan data
Section 2a: Use in planning process and practice How does the availability of digital plan data change collaboration within the administration and between administration and stakeholders? (Does it make it more efficient? Transparent? Does it foster innovation?)
• Use of digital plan data • Digital plan data on different levels • Accessibility • Process change • Purpose / added value • Digital and analogue • Challenges • Future use scenarios
Section 2b: Organisation How does the availability of digital plan data empower different actors (within different levels of administration, between various actors) (Does it increase the power of the private sector? The power of the public? The power of the national administration? The power of the local administration? The power of civil society and pressure groups?)
• Organisation • Financing • The role of different actors in digitization, standardisation… • Relation within different levels of government • Relation between governmental and not-governmental actors
Section 3: Synthesis How does the driver (e.g. efficiency, need for transparency, need for control) and funding source of digital plan data affect planning practice? (Does it affect power relations? Does it affect innovation, efficiency and transparency? Does it have an influence on the legal status of digital plan data?)
• Can we identify typical trajectories? • “Pattern recognition”: drivers, orientation, rational, spatial representation, certification method…

We will mainly focus how digitalization is reflected in and impacting municipal plans and planning processes. We will trace the impact of digitalization in deliberative processes of spatial planning. Besides the planning documents, the main source of information are interviews with key stakeholders in each Task 2 case (see guiding questions above). Furthermore, we discuss simple indicators based on digital plan data.

4 Task 1 – Scope and use of digital plan data in 15 countries

This synthetic and up-to-date overview of the digitalisation of plan data in fifteen European countries (Task 1) aims at describing the key similarities and differences in the digitalisation process of plan data as well as their current uses and foreseen developments. This overview is the result of a desk research and qualitative structured interviews and should be seen as an explorative study on the digitalisation process of plan data across Europe. The desk research aimed at providing background information on the planning system and the planning instruments, which would contribute at getting a better understanding of the context of the digitalisation of plan data (e.g. main actors in spatial planning, type of planning instruments, etc.) before performing the interviews. The desk research can be seen as a preparatory enhancing a better discussion during the interviews.

The qualitative exploration of the digitalisation of plan data in a selected number of experiences across Europe highlighted the following key findings:

- The eagerness of spatial planning actors to provide harmonised and standardised plan data on a digital and open platfrom from the 2010s onwards.
- An improved workflow and planning practices contributing to cost-reduction.
- Differences in the organisation and publication of digital plan data reflect differences in spatial planning traditions and competences.
- Collecting information on the type and number of users can be done in different ways and is not an easy task.
- Digital plan data, that have been harmonised and standardised, allows for innovative practises.
- Foreseen developments of the digitalisation of plan data might be affected by relocation of priorities and budget due to the COVID-19 pandemic.

A questionnaire, based on the list of themes and questions included in the Terms of Reference and the project application, has been elaborated for the structured interviews (see Annex 1). That means that the questions were planned and created prior to the actual interviews for facilitating the cross-case analysis since all the interviewees answer the same questions which eliminate potential interviewer bias. An advanced draft version of the questionnaire has been tested with Danish and Swiss interviewees, which allowed to fine-tune the phrasing and the order of the questions before finalising the questionnaire. The final version of the questionnaire has been sent to the interviewees prior to the actual interview to give the possibility to the respondents to get familiar with the questions. The majority of the interviewees have been conducted online, whereas a limited number have been face-to-face. Each interview lasted between one and two hours. Follow-up questions were sent by e-mail.

The selected interviewees correspond to a national, regional, or local contact person in charge of spatial planning and knowledgeable with the digitalisation process, the uses and the foreseen developments of digital plan data at a specific territorial level depending on territorial administration structure in each case. In short, a national stakeholder was the main source of

information in centralised and decentralised countries, whereas a regional (and/or local) stakeholder was the main source of information in federal and regionalised countries (e.g. Wallonia in the case of Belgium).

The qualitative exploration of European experiences in the digitalisation of plan data tackles several challenges. The main challenges identified are:

- The diversity of the spatial planning contexts in the fifteen selected countries and regions. It is not the aim of this task to provide in-depth information on these contexts. Other publications provide such background; see for instance the publication of the ESPON COMPASS project (Nadin et al., 2018).
- The diversity of the level of digitalisation in the fifteen selected countries. The interviews provide a snapshot of the digitalisation process and the use of plan data as of spring 2020 where the selected countries and regions are at different stages of their overall digitalisation strategy, which affects the stage of advancement in their digitalisation of plan data.
- Inputs from the interviews provide a clear overview and precious information for this study. However, it should be kept in mind that the collected information might not always provide an exhaustive picture of the context. The results of Task 1 should therefore rather be considered as results of an explorative approach of the digitalisation process and the use of digital plan data in fifteen countries and regions across Europe.
- The nature of structured interviews contributes at getting rather clear answers, which provides a good basis for a cross-case analysis. However, it can limit the level of details; or the time constraint of the interviewees did not allow the discussion to go in-depth for each single question. Indeed, structured interviews do not allow to fully explore individual perspectives and circumstances, leading to patchy information.
- The majority of the interviews have been conducted and reported in English. A definition for a couple of key concepts have been provided by the research team when starting the interviews (e.g. plan data and digital plan data). However, the respondents may have slightly different interpretation of the questions, especially when not in their native language and this may result in a small variation in types of responses.

The remaining of this section highlights the most common answers collected during the interviews. Detailed information for each selected country[1] and regions were summarised in factsheets which can be found in Annex 2.

4.1 The digitalisation process of plan data

This section presents the main results from the desk study and the interviews about the main purpose, the added values, the main drivers, the main obstacles, and the standards and methods of the digitalisation process of plan data. Each sub-section provides a summary of the main patterns identified among the fifteen cases. Examples of specific cases are also included for illustrative purpose.

4.1.1 Two main purposes

The digitalisation process of plan data takes place within different contexts of both digitalisation achievement and spatial planning traditions. However, the answers to the question “What is the main purpose behind the digitalisation of plan data?” reveals clear similarities among the interviewed cases. Overall, the main purpose of this process can be summarized as follow: to ease the access of high quality and comparable plan data through digital format on a single portal.

Two main purposes were identified across the case studies. The most commonly mentioned main purpose of the digitalisation process, mentioned in twelve cases, is to provide planning data with easy access and high level of transparency to everyone. It was expressed in different ways in the interviews by notions such as open data, open governance, provide transparency, and easy access to data and metadata. For instance, transparency of governmental processes is the main purpose in the Netherlands. The provision of transparency, including accessibility to metadata, has also been mentioned as one of the main purposes in both Denmark and the region of Tyrol in Austria.

The other main purpose that corresponds to the eagerness to create a nation-wide (or region-wide) digital portal, containing harmonised plan data or plan data with better quality that the non-digital format. It has been mentioned as one of the main purposes of the digitisation process of plan data in nine out of the fifteen cases[2]. For instance, the main purpose of the digitalisation of plan data in Luxembourg is to increase the homogeneity and the quality of the plan data.

[1] Inputs about Italy will be added in the final delivery. The reporting of the interviews was not finalised when submitting the interim delivery.

[2] The creation of a nation-wide digital portal was mentioned as one of the main drivers in Germany, Ireland, Lithuania and Slovenia. This information is reported in this sub-section on main purpose to make the overview clearer.

Apart from the two main purposes identified above, two countries identified different main purposes of their digitalisation process of plan data. One of the main purposes in Norway has to do with “an effective and democratic planning processes with the possibility of further involvement, both from the public and from sector authorities”, whereas in Portugal it responds “to an increasing demand of geographical and territorial information from administration, government, institutions (…), universities, private companies, and the general public”.

4.1.2 Added values

The possibility to produce national or regional-wide analyses, improved workflow and planning practices, and cost reduction are the most common added-values of the digitalisation process of plan data mentioned by the interviewees.

The possibility to produce national or regional-wide analyses was explicitly mentioned as an added-value in eleven instances. It is closely linked to the main purpose of the digitalisation process, i.e. to create a nation-wide digital interface, containing standardised and harmonised plan data, which does not only provide a larger coverage of plan data, but also harmonised plan data that can be used for different types of analyses for an entire country or region. In Ireland, such national wide harmonised datasets allow data analysis of land use zoning data, which was not possible before the digitalisation process where the quality of plan data greatly varied between local authorities. In a similar way, the use of the harmonised digital plan data in Malta allows the planning authority to analyse, for instance, the amount of developments proposed or carried out outside development zones within a specific period of time or the footprint of certain types of areas and their changes over time. The standardisation of plan data in municipal plans was also mentioned as an added value in Slovenia.

Improved workflow and planning practices were mentioned in nine instances. This improvement mostly concerns the municipal level. For instance, the digital submission of plans to the State is simpler for municipalities in Denmark than the previous analogue submission. Similarly, municipalities in Luxembourg do not have to manually extract plan data to prepare requested planning reports for parcels located on their municipal territory. Such reports can now be auto-generated through the national-wide geoportal, contributing at lowering the workload of municipalities. The automation of planning permit processes also contributes at improving both the workflow and the planning practices. This improvement of workflow was explicitly connected to cost reduction in five cases, due to faster processes (e.g. Bavaria in Germany), digital publications being cheaper and easier to store than paper publications (e.g. France), etc.

4.1.3 Main drivers

Three main drivers in the digitalisation of plan data were identified. They correspond to top-down process lead by national/regional planning actors, the INSPIRE Directive and the general digitalisation process and technological development.

The mentioned top-down processes lead by national or regional planning actors correspond to either the active role of the Ministry or Authority responsible for spatial planning or new spatial planning laws. The pro-active role of the national or regional authority responsible for spatial planning was also a key driver in Wallonia (Belgium), Lithuania, Luxembourg, Norway, Portugal, Slovenia, and Switzerland. For instance, the Ministry of the Interior is the clear driving force in Luxembourg. So was the Ministry of the Environment and Spatial Planning in Slovenia which combined all the plan data provided by the municipalities. In Switzerland, it is the regional actors, the Cantons, which demand digital plan data from the municipalities. The recent development in the legislation affecting spatial planning requires that a number of authorities have to publish plan data in a digital format were mentioned as main drivers in the cases of Tyrol (Austria), Bavaria (Germany), Switzerland, and the Netherlands. It was for instance the case in the region of Tyrol where the 2011 spatial planning law was changed and forced the land-use plans to be published online since 2013. In Bavaria, the amendment of the Building Code in 2017 had the consequence that the municipalities should publish their land use plans on a central internet portal of the state.

The INSPIRE Directive (INfrastructure for SPatial InfoRmation in Europe) is an initiative of the European Union which aims at establishing an infrastructure for spatial information in Europe that is geared to help to make geographical information more accessible and interoperable for a wide range of purposes supporting sustainable development[3]. Even though the Directive does not mandate the digitalisation of data, it has been clearly connected to the digitalisation process of plan data as the two processes run in parallel. The Directive contributed to make the authorities in charge of plan data think about the digitalisation of their data. INSPIRE has been mentioned in seven cases (e.g. Austria, Wallonia in Belgium) as either one of the main drivers in the beginning of the digitalisation process of plan data or at later stage in the process.

The general digitalisation process and technologic developments have also been clearly stated as being key drivers in the digitalisation process of plan data in the cases of Luxembourg, Malta and Switzerland. New possibilities thanks to new technologies contributing at producing better data quality as well as more efficient integration of data into one system and communications between geographic information systems were mentioned in the case of Malta.

Other drivers were also mentioned, but for a more limited number of countries, e.g. improving the application process for building permits in Malta and Slovenia.

[3] The Directive provides guidelines for already digitised data. It came into force on May 15th, 2007 and will be implemented in various stages, with full implementation required by 2021. https://inspire.ec.europa.eu/about-inspire/563

4.1.4 Main obstacles

The three most common obstacles in the digitalisation process of plan data mentioned by the interviewees are the lack of experience and technical expertise, the low quality of the input data, and the lack of financial resources.

The lack of experience with the digitalisation of plan data and the required technical expertise was one of the main initial, and sometimes still ongoing, obstacles as it is often the case in new processes. This obstacle was mentioned in seven instances and does concern both the public authorities and the private consultancies. For instance, private actors in Luxembourg lacked knowledge on transforming plan data in the new GML/XSD model which was requested by the ministerial regulation. In France, this new process raised questions such as the privacy of data when creating new public-private partnerships.

The low quality of the input data was mentioned in five countries: Germany, Ireland, Lithuania, Malta, and Portugal. The digitalisation processes in these cases required: vectorizing complete datasets, creation of new standards, poor resolution, incomplete information, mismatching data specifications, gathering plan data from various sources, submission of incorrect locations; all of them making the process timely and resource intensive.

The lack of financial resources was mentioned in five interviews. For several cases, this was mostly a problem at the initial phase of the overall digitalisation process, in which the plan data was part of. The lack of financial resources at that time was mostly due to a rather initial low priority of the overall digitalisation process. In other cases, the lack reflects the limited financial resources allocated for municipalities. These limited resources also result in a limited number of human resources; as for instance in Slovenia where the limited number of employees is one of the main reasons explaining that about 15% of the municipalities have not yet adopted the new digital plan standard which is in place since 2008. Similarly, capacity limits were an obstacle in private consultancies making plans for local and regional authorities in the Netherlands due to the challenging timeframe of five years to digitalise all 70,000 plans.

Table 4.1 summarises the main findings from the interviews in fifteen European countries and regions on their digitalisation process of plan data from the previous 4 sub-sections.

Table 4.1 Overview of the digitalisation process of plan data in fifteen cases across Europe

Country / region	Main purposes			Added-values				Main drivers				Main obstacles			
	Easy and open access	One single portal	Other	National /regional wide analysis	Improved workflow and planning practices	Cost reduction	Other	INSPIRE directive	Overall digitalisation process & techn. dev.	Top-down process	Other	Lack of experience	Low data quality	Lack of ressources	Other
Austria (Tyrol)	■	■			■	■		■		■					
Belgium (Wallonia)	■	■		■	■		■	■		■				■	
Denmark	■			■	■		■				■				
France*	■			■	■	■	■	■		■		■		■	
Germany*	■				■	■	■	■		■		■	■	■	
Ireland	■	■		■							■		■		
Italy**															
Lithuania		■		■						■		■	■	■	
Luxembourg	■	■		■	■			■	■	■		■			
Malta	■	■		■					■	■	■		■		
Norway*		■	■	■	■	■	■			■		■		■	
Portugal	■		■	■	■		■			■			■		
Slovenia	■	■		■						■	■	■			
Switzerland *	■			■	■		■	■	■	■					
The Netherlands	■	■				■		■		■		■			

*Interviews have been conducted at several geographical levels in these countries. The table here indicates the information collected for the national level in unitary countries and regional level in federal countries. **data to be added in the next delivery.

Note: the information included in this table corresponds to information collected through the qualitative interviews and do only reflect the digitalisation process of plan data for the digital portal(s) as communicated by the informant. The table does not aim to provide a complete overview of the digitalisation process of plan data in each country; it rather provides results of an exploration based on specific digital portals containing plan data. Further details can be found in the factsheet (see Annex 2)

4.1.5 Standards and methods

The majority of the methods used to enter the digital plan data are country-specific, with some degrees of similarity with INSPIRE (e.g. Belgium/Wallonia and Germany/Baden-Wurttemberg). The digital plan data is usually entered by the data owner, often being the planning authority in charge of the data (e.g. municipal, regional and national levels). Municipalities in several countries often rely on the expertise of external service providers to help them with the delivery of digital plan data (e.g. in Austria, France, Lithuania, Luxembourg, Norway, among others). In the case of the Netherlands, the external service provider can prepare the plan data, but it is the responsible authorities to upload the plan data on the digital portal. In fact, the authorities only have one person with an electronic signature.

Standards are developed by different planning actors at the national level (e.g. national cadastral agency, federal planning council, Ministry in charge on planning) and are either on

the production of digital plan data or on its delivery. They can be transcribed into a law as for instance the Tyrolian spatial planning law from the 1990s and the 2011 law for symbology in municipal planning in Luxembourg. An exception is Denmark where there are no standards on symbols. A similar situation is found in Ireland where there are no national standards on zoning uses; a generalised zone type transcribing local zoning classifications into national classification has been created instead.

Assessments on the digital plan data are common. They mostly corresponded to automated checks on submitted digital plan data to verify if the symbology elements (e.g. geometries, no overlaps) are conformed to the standards. There is no automated assessment on the "quality" of the plan data (e.g. should this parcel be classified as industrial zone) though. That remains a competence of the planners in charge of the plan data to be done manually, as it used to be done (or still done) for the publication of analogue plan data.

4.2 The uses of digital plan data

4.2.1 Type of digital plan data

In order to identify the types of digital plan data included in the geoportals, the interviewees were asked which planning instruments had been digitalized at the time of the interview. In addition, a desk research was carried out to complement the information on what types of digital plan data are available in each case study.

The analysis highlights that the type of digital plan data available in each country reflects the competences in planning of the different administrative levels in each country as well as the nature of the planning instrument. Digital plan data at national level is available in all unitary countries[4] (with the exception of Ireland) while for federal countries[5], digital plan data is usually available at the sub-national level (e.g. Belgium) but not necessary at the national level. As it can be seen in Table 4.2, there exist different country profiles based on the availability of digital plan data. Out of the 15 countries analysed, 6 provide digital plan data at all levels (Austria, France, Lithuania, Netherlands, Norway, and Portugal), 4 provide digital plan data at the national and local level (Denmark, Luxembourg, Slovenia, and Switzerland), 2 provide digital plan data at the sub-national and local level (Belgium and Germany), 1 at the national level (Malta), and 1 at the local level (Ireland).

Table 4.2 lists the planning instruments digitally available in each investigated country by the administrative level at which they are implemented. Digital plan data is often connected to either national or local planning instruments, respectively in 11 and 13 of the fifteen cases. In contrast, digital plan data at sub-national level (whose definition includes federal, regional, and inter-

[4] These include Denmark, France, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, and Slovenia.

[5] These include Austria, Belgium, Germany, and Switzerland.

municipal agencies or structures) is less commonly found, due to the generally weak role in planning of regions in unitary countries and the limited number of federal states across the 15 countries investigated in this study.

Table 4.2 Planning instruments included in the digital portals

	National level	Sub-national level	Local level
Austria		Regional development programs	Municipal land use plans
Belgium		Sectoral plan, regional planning framework	Communal development scheme, local orientation scheme, and municipal planning framework
Switzerland	Sectoral plans	Cantonal comprehensive plans	Land use plans
Denmark	National planning directives		Municipal strategies for planning, municipal, and local plans
France	Planning regulations, territorial planning directive, and operation of national interest	Safeguarding and enhancement plan	Territorial coherence scheme and local urban plans
Germany		State and regional development plans at sub-national level	Land use plans
Ireland			Zoning plans
Lithuania	National planning framework	Regional spatial and economic strategies	Development and local area plans
Luxembourg	Sectoral and land use plans		Municipal and partial land use plans
Malta	Strategic plan for the environment and development and local plans		
Netherlands	Zoning plan	Zoning plans	Zoning plans
Norway	Planning guidelines, planning provisions, and zoning plans	Regional plans	Community, land use, area zoning, detailed zoning plans
Portugal	Sectoral plans, coastal areas spatial plan, protected areas spatial plan, public water reserves spatial plan, and estuaries spatial plan	Regional and intermunicipal spatial plans	Municipal, urbanisation, and detailed plans
Slovenia	Spatial plans		Spatial plans

4.2.2 Legal status of digital plan data

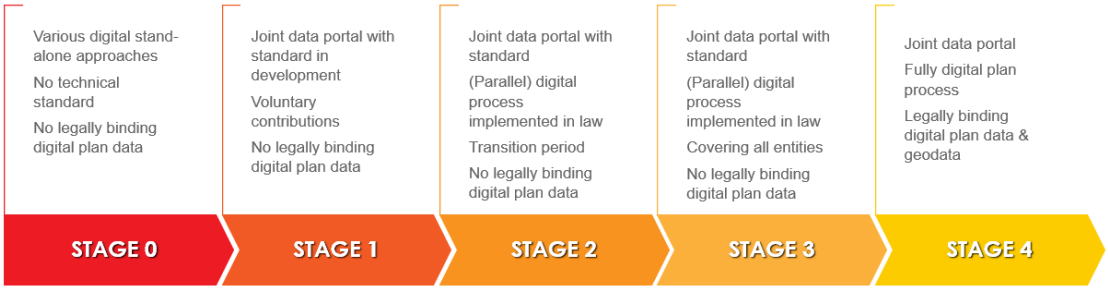
One important concern regarding the legal status of digital plan data is that, in most cases, the plan data available in the geoportal is legally binding only de facto but not de jure. That means that the digital plan data is not legally binding insofar as it is a representation of the actual plan

data. Therefore, although the quality standards of the digital plan data are very high, these data cannot be used as legally binding documents.

In most of the cases examined, the legal status of the plan data included in the geoportal is not legally binding. The digital plan data stored in the geoportal is the representation of the physical plan. This is because the legally binding plan data is either in paper form as it happens in Slovenia, Norway, France, Luxembourg, and all cases in Germany or in PDF version like in Denmark and Austria. In some cases, like the Netherlands and Portugal, the digital plan data is legally binding but only after having been approved by the authorities, either the public administration or local councils. In Portugal, for example, the digital plan data is drafted by the local council and then published on the Official Journal of Portugal, which is the main source for legislation in the country. Once it is published there, the digital plan data becomes legally binding and it can be published in the geoportal.

In some cases, like Tyrol (Austria), the rigidity of the legislation related to plan data becomes an obstacle insofar it limits in many ways the manipulation of the data, including its digitalization. For instance, the Tyrolean spatial information system fully supports the legal steps in the planning process, which is an added value of the digital plan data because it improves the data flow. However, there are barriers, stemming from the governing competences regarding digital plan data. While municipalities create the legally binding digital plans in their PDF version, the state publishing itcation in the geoportal. There is an ongoing debate in Tyrol about the legal status of geodata there. Figure 4.1 illustrates simplified stages towards legally binding digital plan data, based cases.

Figure 4.1 Simplified stages towards legally binding digital plan data



4.2.3 Type of users

There are three important aspects when it comes to the type of users of digital plan data in each of the case studies: the profiles of users, the monitoring of users, and the permissions given to use digital plan data. There are five groups of users mentioned recurrently in the questionnaires. These are: planners, public authorities, researchers, companies, and individuals. Other groups mentioned are notaries, who use the plan data to check the existence of any pre-emptive rights, land registries, or architects who need the plan data to list all the planning related rules for a parcel. These groups are mostly the same as the ones who use(d) analogue plan data before the digitalisation processes were started. In most cases, digital plan

data is publicly accessible, due to EU's INSPIRE directive, which is followed by most of cases investigated in this analysis. However, planners and local or regional authorities remain the most common users in almost all cases. These actors, for example, may use the digital plan data to create reports on planning permits and regional administration to assess municipal and private plans.

The results from questionnaires reveal that few of the case studies examined have a reliable way to monitor who uses their digital plan data. For example, Denmark, Slovenia, Norway, Austria/Tyrol, Belgium/Wallonia, Bavaria, Baden-Württemberg, and the Swiss Federal Office for Spatial Development, state they lack of a way to monitor their users. Nonetheless, in some of these cases they can offer assumptions based on communications through the channels between users and the portal such as contact forms or emails, or even statistics. It is the case of Norway where they can identify planners and architects, public authorities, and the general public as users of their portal through the statistics for internal use they collect. The cases of Bavaria and Baden-Württemberg also state that they do not monitor their users. However, they define their users based on who their target groups are such as planners, the administration, or the general public.

Monitoring of users can be related to the permissions given from the digital plan data managers to the users. There are different models for regulating who can access the data. For instance, in France, different licenses are issued to users: anonymous, service provider, delegated, local authority, and local administrator. Anonymous users can see and collect data but not to modify any of it. Service providers are professionals who can check the data and validate it or not. Delegated users are professionals who got the rights to send planning documents on behalf of a local authority. Finally, the local administrator profile has the technical licenses. In St. Gallen (Switzerland) and Austria, internal and external users are distinguished. While internal users are those operating on the municipal administration, external users comprise planners or interested citizens.

4.2.4 Number of users

The measurement of digital plan data usage is an underdeveloped aspect mainly because few case studies collect information but also because there are many ways to measure the use of a website. On the one hand, Tyrol (Austria), Denmark, Baden-Württemberg (Germany), ROPLAMO (Germany), Malta, Norway, Slovenia, and FOSD (Switzerland) do not collect data on the use of digital plan data. On the other hand, the case studies measure the use of digital plan data by at least three parameters such as visitors, users, and requests. Nonetheless, the numbers reported cannot be used to make comparisons between the countries because the geoportals are built in different ways. Wallonia (Belgium), Ireland, Luxemburg and Portugal report the use of digital plan data by visitors, but their numbers offer a wide range from 500 monthly visitors in the case of Ireland to 44.500 monthly visitors in Belgium. Finally, RISBY (Bavaria, Germany), Lithuania, the Public Law Restrictions Cadastre (Switzerland), and St.

Gallen (Switzerland) report by requests for digital plan data which range from 7.000 monthly requests in Bavaria to more than 330.000 monthly requests in Lithuania.

4.2.5 Examples of evaluation of planning practices or innovative practices

Several case studies present examples of evaluation of planning practices or innovative practice carried out by policymakers. In Ireland, for instance, evaluation was the initial purpose of collecting plan data. The goal is to evaluate planning purposes and carry out analysis on land use zoning and whether the correct amount of land is being zoned or not. This evaluative practice turned to be useful because it gave the planning authorities an oversight of the status of land use at local level in a time the planning authorities needed to plan for the development of residential areas. Luxembourg is also an example where digital plan data has been used to calculate the share of constructible areas which might be of interest for ministries such as Home Affairs, Spatial Planning, or Housing, as well as for the private sector. Portugal is an example where planning practices (territorial dynamics, spatial planning, and urban planning) are permanently assessed by the General Directorate of Territory. In addition, they are developing an online portal where indicators in time series and real time will be published and freely accessible to external evaluators. Switzerland, Slovenia, and Norway are examples of digital plan data being used, rather than evaluated, by policymakers to develop territorial development. For example, the City of St. Gallen (Switzerland) uses their 3D city model internally (stakeholders and city councillors) for visualization and participation for building permits or large planning procedures. In the Swiss case, furthermore, notaries often provide a cadastre excerpt to guarantee the legality of transactions carried out by real estate businesses when registering land.

In terms of innovative practices, several examples are also found among the countries. In Denmark, for example, where several major companies are recipient of all plans, a major supermarket chain uses digital plan data as they are is interested in where new residential and commercial areas will be developed and has therefor subscribed to get information on all new plans in Denmark. Something similar goes on in the Netherlands, where certain retail companies use the digitised data to explore potential locations for their stores. In France, an innovative use for digital plan data has been the measurement of heat from the soil or of sun exposition in order to install solar panels. Also, in France there is a simulation of the potential for constructability in a parcel through 3D representations of the maximum volume within the parcel. Similarly, in Luxembourg there is an on-going programme by the solar cadastral aiming at identifying the solar potential by using digital plan data, and more precisely by looking at information on roofs in the local plan (PAG) sub-section on the geoportal. In Malta too, digital plan data is used for the creation of heat maps. In Ireland, small organizations use the planning application in the Irish geoportal to set up alert systems to inform them of when a planning application is happening somewhere. Finally, the Swiss canton of Geneva has launched a pilot project for 3D planning data (land use planning). The canton is also developing an algorithm

that can automatically read the legal regulations (building regulations). The regulations are intended to become readable for machines.

4.3 Foreseen developments

Foreseen developments have been divided in the questionnaires in short-term (2 years) and long-term (5 years) developments.

In the short-term, all countries, except for Austria and Denmark, aim to implement reforms in several ways. Most of the actions aim to improve the existing data systems and/or to improve how digital plan data is used. Regarding the improvement of existing data systems, the most common foreseen developments include improving the collection of data (both increasing the number of plan data to be digitalised and including more municipalities or regions to the geoportal), digitalisation, and the adaptation to new requirements and standards. For example, Wallonia, France, Lithuania, Norway, and the Swiss City of St. Gallen aim to digitalise all their plan data still in paper format. In addition, Portugal, aims to digitalise the special juridical regimes for the ecological and agricultural reserves, and the Swiss Federal Office for Spatial Development will digitalise the cantonal comprehensive plan on the federal level.

Cases where the aim is to expand the available data in the geoportals include Wallonia (Belgium), France, Luxembourg, and the Swiss Public Law Restriction Cadastre. Nonetheless, different types of plan data remain to be included in the geoportal. While in Wallonia municipal and regional plans are to be included in the geoportal, the focus in France is on local urban plans and territorial coherence schemes.

Adaptation to new requirements and standards is a goal in Germany, Ireland, Netherlands, and Slovenia. The motivations for these actions are different in each of these countries. For example, the German planning authorities aim to introduce the national data model XPlanung[6] by 2022 in their geoportals as a way to increase the efficiency of data exchange between the actors involved in spatial planning processes. In Ireland, the objective is to produce and make the data more easily available. In the Netherlands, the new standards will be designed to accommodate the new Environmental and Planning Act (Omgevingswet[7]), to be adopted in 2021, with which the government wants to combine and simplify the regulations for spatial projects. The aim is to make it easier to start up projects. For example, the construction of housing on former business parks, or the building of wind farms. Finally, Slovenia will implement ePlan with the objective to ensure greater transparency and efficiency in spatial planning. ePlan will allow to prepare, accept, and enforce spatial planning acts as well as to establish electronic procedures to obtain building permits.

[6] https://inspire.ec.europa.eu/sites/default/files/presentations/0945_20180919_xplanbox_torstenfriebe.pdf

[7] https://www.government.nl/topics/spatial-planning-and-infrastructure/revision-of-environment-planning-laws

Other ways to improve the existing data systems include the attempts in Wallonia to facilitate the entry of digital plan data or to make crowdsourcing and editing available through the geoportal. Another example is the maltese initiative to launch a new base map that includes polygons, height reading, 3D models and spatial analysis. In this line, too, Norway aims to provide 3D planning, to visualize plans in 3D, and to make available a snapshot of plan data to show what applies to a specific property.

In the long-term, most of the countries do not have specific plans. Austria, France, Germany (Stuttgart), Norway, Portugal, and Switzerland (FOSD) are the exception. Among these, the foreseen developments are varied but mirror, to some extent, the foreseen developments on the short-term previously described. For example, France aims to add smartness and structuration to its geoportal, to link automated processes with simulation possibilities, and to artificialize the land and to measure the ecological impact. While the first goal could be considered as an attempt to improve the existing data systems, the two latter goals point towards the operationalisation of digital plan data to produce analysis. In a similar vein, Austria aims to automatically assess the impact analysis of their digital plans. Also, foreseen developments in Switzerland (FOSD) are oriented towards the operationalisation of digital plan data. In this case, the goal is to implement the project Bundling Infrastructure which supports the relief of the landscape due to an improved data basis with mergeable infrastructures. On the other hand, Germany, Norway, and Portugal look forward to improving their existing data systems. While Germany will focus on including plan data for all municipalities in the XPlanung format, Norway will integrate plan regulations and will increase participation from non-traditional users. Portugal will also include regulations on land use, policy instruments, and landscape management programs.

Finally, as the interviews were conducted in spring 2020 amid the COVID-19 pandemic, many respondents acknowledged some uncertainty in the short and mid-term regarding future developments on digitalisation of plan data.

5 Task 2 – State of the six in-depth case studies

5.1 Switzerland

The Swiss case study focuses on the Cadastre of Public-law Restrictions on landownership (PLR-cadastre) and the cantonal comprehensive plans. We are interested in the impact of the PLR-cadastre and the related digitisation of plan data on planning practice. For this purpose, different levels (federal office and cantons) were interviewed. In addition, interviews were conducted with the Federal Office for Spatial Development (FOSD) for a general overview of Switzerland and also with a canton with cross-border projects.

Table 5.1 List of interviews (Switzerland)

Sub-case	**Position**	**Status**
FOSD	GIS Department	Interview held
General	Spatial planner, Office for Spatial Development; EspaceSuisse, Association for Spatial Planning	Interview held
Planning across borders	Canton of Basel-Stadt, Urban development and architecture, planning department	Interview held
PLR	swisstopo	Interview held
PLR	Canton of Thurgau, Department of Geoinformation	Interview held
PLR	Canton of Neuenburg, Cadastral survey and responsible for PLR cadastre	Interview held

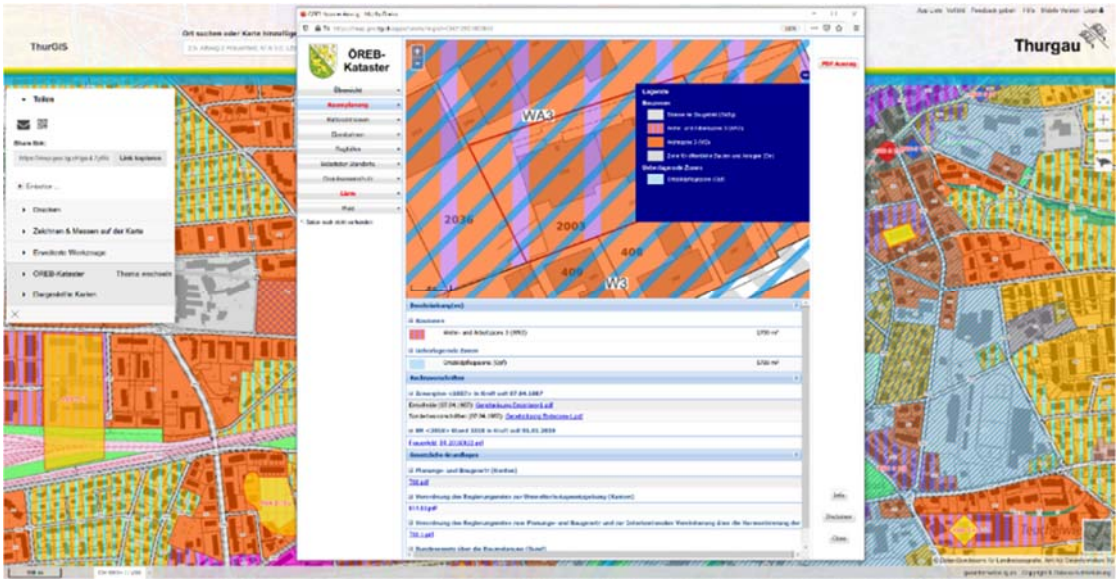
5.1.1 Scope of digital plan data

The purpose of the PLR-cadastre is to provide the public with up-to-date and reliable information on public-law restrictions on ownership. The implementation of the PLR-cadastre is anchored in the Geoinformation Act, which was passed in 2007 and has been in force since October 2009. The cantons are responsible for maintaining the cadastre, which is why the information is published on cantonal geoportals. An excerpt from the PLR for a particular property can therefore be obtained from the portal provided by the cantons. Framework models have been developed for the digitisation of various themes for the implementation of the PLR, which are intended to harmonise the themes across cantons. Of the 17 themes in the PLR-cadastre, one major theme is municipal land use planning.

By the end of 2019, all cantons should have had put the PLR-cadastre into operation and make it available via a cantonal portal. There is some delay in some cantons but this will be completed in the next few years[8]. In the canton of Thurgau, for example, all 80 municipalities have digitised their land use plans and made them available in the PLR-cadastre (**Error! Reference source not found.**). However, the geodata shown are not legally binding and differ from the legally valid stamped analogue plan. In comparison, the geodata in the PLR-cadastre in the Canton of Basel-Stadt are legally binding.

[8] The current status of the PLR cadastre can be viewed here: https://www.cadastre.ch/en/oereb/result.html

Figure 5.1 PLR-cadastre in the canton of Thurgau. The public law restrictions on ownership of the specific parcel are shown in the middle window. https://oereb.tg.ch/



The canton of Thurgau had already developed a cantonal model for land use planning before the Geoinformation Act. The canton encouraged the municipalities responsible for land use planning to digitize the plan data. This was then implemented by about 80% of the municipalities in Thurgau. In the meantime, the land use plans of all Thurgau municipalities can be found in the PLR-cadastre. The canton ensures that the information from the cantonal model is transferred to the federal minimum geodata model, which were developed on the basis of the Geoinformation Act to provide the basic geodata in a common standard. An experienced spatial planner noted that the public authorities have been perceived as a strong leading player in the standardization of geodata. The digitization of plan data required standardization and minimal geodata models.

5.1.2 Organisation digital plan data

The interviews showed that the digitisation of plan data as well as the collection of digital plan data is mostly financed by the data owners. The canton of Neuchâtel was an exception to this, as it was the canton that carried out the digitisation of municipal land use planning and not the municipalities.

Several experts mentioned that the relationship between the various authorities and the public has not changed much as a result of digitisation. As the plan data is publicly accessible, especially the land use planning within the PLR-cadastre, everyone has the same information basis. However, the publication of the plan data increases the presence of the authorities.

5.1.3 Use of plan data in the planning process

Cooperation within the authorities has become closer in the canton of Thurgau due to digitisation. Due to the common tasks, there is a greater need to interact with each other and in some cases to resolve discrepancies. Thanks to digitisation, the data is more accessible and can also be sent more easily, which can make cooperation easier. However, this can also mean that less communication takes place and human cooperation is reduced, which was mentioned in two interviews. The PLR-cadastre was carried out as a joint task of the federal government and the cantons, which required intensive cooperation. There are annual working group meetings and information events where the national and cantonal authorities meet to discuss current issues relating to the PLR-cadastre.

In an interview with swisstopo it emerged that there is no link between the digitisation of PLR topics and the cantonal structure plans. This is due to the fact that the PLRs are parcel-specific and binding on owners, whereas the cantonal structure plans are not parcel-specific and binding on the authorities.

In the canton of Thurgau, for example, there are still different formats used in the development of a land use plan. The municipalities provide the data to the canton as an analogue dossier for review. Recently, these documents have been sent digitally to the various departments in the canton for examination. So far, the planning processes in the canton of Thurgau and also in the canton of Basel-Stadt have not changed much due to the digitisation of plan data. In order to achieve the planned increase in efficiency due to the digitisation of plan data, a project is currently in progress in the canton of Thurgau. This project aims to optimise processes, but also to make digital plan data (geodata) legally binding. In addition, the transparency of the planning processes should also be improved.

5.1.4 Preliminary conclusions

In several interviews it was mentioned that certain individuals have significantly advanced digitisation in the municipality/canton. The persons involved and their professional background should be taken into account in the digitisation of plan data and its impact on planning practice. In addition, it was found that due to the digitisation of plan data and the new technical possibilities, the demands to include more information are increasing.

5.2 Germany

For Germany the relation between standardisation and the federal structure is be crucial. The standard XPlanung, which was adopted by the IT Planning Council in 2017 and is now being implemented in the states and municipalities, plays an important role for the plan data. In this case, the focus will be on the standard for all involved stakeholders, how it was defined and how the stakeholders are motivated to achieve it. Therefore, interviews with experts from the XPlanung coordination office and working group were conducted for a general view of

Germany. Individual states or municipalities may be interviewed for a closer look. In addition, an international stakeholder was interviewed to learn more about the exchange of digital plan data in different countries.

Table 5.2 List of interviews (Germany)

Theme	Position	Status
XPlanung Coordination Office and municipal land use plan Hamburg	XPlanung Coordination Office	Interview held
XPlanung City of Stuttgart	XPlanung Working Group	Interview held
Planning across borders	GeoRhena	Interview held
GDI-DE	Geodata infrastructure Germany	Interview held
Municipal land use plan	Municipal authority	Interview planned

5.2.1 Scope of digital plan data

Within the framework of the 2000s there were several e-government projects in Germany, also in the field of geodata. Surveys conducted in German municipalities showed the necessity of exchange standards for municipal land-use plans. Based on an amendment to the German constitution in 2010, the IT Planning Council was established. This in turn decided in 2017 to introduce XPlanung as an exchange format for plan data in Germany, which is to be implemented by 2022. As a result, the coordination center for XPlanung was established, which is responsible for the maintenance of both standards XPlanung and XBau. Within the framework of XPlanung there are two approaches to digitise plan data. On the one hand, there is the full vector digitisation of plan data, on the other hand there is the raster-ring scenario, where the perimeter of a land-use plan is recorded and a scan of the original plan is attached.

Figure 5.2 Full vector data set of the land-use plans in Hamburg, showing the textual determinations for a specific plot (marked red). https://geoportal-hamburg.de/geo-online

The City of Hamburg has already participated in the model project XPlanung in the years 2006 to 2007. The land-use plans were digitally captured for a second time in the standard XPlanung format, including all textual specifications. The full vector data set enables evaluations of the

entire area, which is not achievable in the raster ring scenario. In the city of Stuttgart, the entire plan archive was scanned in 2003. In the future the development plans are supposed to be produced fully vectorially there according to the standard of XPlanung in cooperation with planning offices. This requires a rethinking from CAD construction to the generation of geospatially similar plan data.

5.2.2 Organisation digital plan data

The INSPIRE Directive and the standard XPlanung specify how digital plan data should be presented. The INSPIRE Directive has been legally implemented by the Federal Government and the states. As the states interpret the INSPIRE Directive in various ways, the municipalities are affected differently for the provision of the land-use plans. Since the municipalities have the planning sovereignty over land-use planning, they are responsible for financing the digitisation of their plan data. In some states there are also funding programmes or support within the spatial data infrastructure to implement the land-use planning in XPlanung.

The digital publication of the plan data and the public display on the internet makes the planning process more transparent and the population has a better access. This makes it much easier for people to join in the participation phase of the planning process. However, experience in Stuttgart has shown that the degree of participation has not changed substantially with digitisation. Rather, the content of the planning project determines the degree of participation by private individuals. In Hamburg it is difficult to assess whether the level of participation by the population has changed as a result of digitisation.

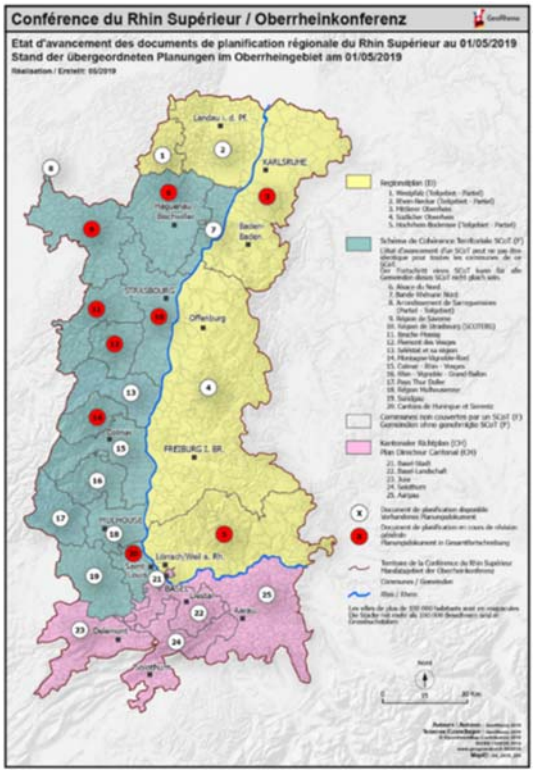
In Stuttgart, digitisation has not resulted in the empowerment of a particular stakeholder. The digitisation and publication of the plan data simply made the processes and the urban land use planning more transparent. However, this has not affected the framework of relationships directly so far.

5.2.3 Use of plan data in the planning process

When introducing the XPlaning standard, it should be noted that this is initially costly. Due to the attribution of the individual plan elements before the effective construction as well as the defined plan elements by XPlanung, more time is needed for the plan production. In the following planning processes, in turn, time can be reduced, for example in the exchange of plan data. Thus, an overall increase in efficiency is expected through the digitisation of plan data.

GeoRhena is responsible for cross-border cooperation in the Upper Rhine Conference area. A geoportal has been in place since 2017, which is used to publish cross-border geodata in this area. In order to improve the cooperation of the three countries in national planning, there is a map showing the current status of planning in the Upper Rhine area. Thus, the neighbours can be informed or involved in a planning process.

Figure 5.3 Illustration of the current status of planning in France, Germany and Switzerland in the Upper Rhine area. The plan data can be obtained from the respective authorities in the individual countries.[9]



The planning processes themselves have not changed in Stuttgart due to digitisation, as these single process steps are required by law (Baugesetzbuch). In the planning processes, however, the medium has changed, from analogue to digital.

5.2.4 Preliminary conclusions

There is a trend that larger cities and municipalities tend to use XPlaning in a fully vectorial approach rather than small municipalities. This may be due to the possibility that small municipalities have an easier overview of their area and therefore the need for automatic evaluations using full vectorial data is not as high. In large municipalities and cities, however, there is a greater necessity for evaluation options. Nevertheless, the coordination center of XPlanung recommends that all municipalities digitise and capture their plan data in full vectorial form.

5.3 Norway

5.3.1 Scope of digital plan data

The Norwegian planning system is characterised by the relationship between the state framework and extensive municipal authority on service provision and land-use, with a regional level providing large scale services like transportation and councelling on such issues as place-

[9] https://www.georhena.eu/sites/default/files/Cartes/04_2019_269.pdf
https://www.georhena.eu/fr/Cartotheque_OCS

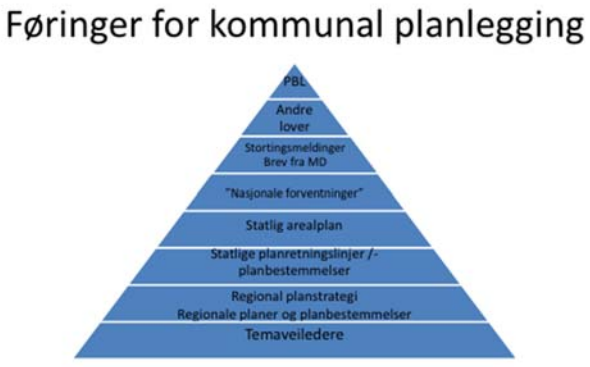
making and regional development. This characteristic of strong local authority has given Norwegian municipalities a prominent role in the development of plan data infrastructure. The process has been characterised by initiatives from both top and bottom, developing a system of network collaboration around the producing and sharing of digital geodata and plan data, relying on the coordinating role of the national map authority, as well as standards and product specifications.

Table 5.3 List of interviews (Norway)

Theme	Position	Status
Geodata in digital plans	Land-use thematic data provider, The Norwegian Water Resources and Energy Directorate (NVE)	Planned for Sep
Plan data	Software development consultancy, product responsible	Planned for Sep
Practice	County geodata consultant, Viken County	Planned for Sep
Practice	Coordinator for digitalisation of major consultancy firm Asplan VIAK	Planned for Sep
Practice	Project leader municipal land-use plan Bærum	Planned for Sep
Practice	Project leader municipal land-use plan Oslo	Planned for Sep

To sum up some features drawn from Task 1, digitalisation of plan data in Norway seems to be a technology driven process, oriented towards production and consumption of plan data. This feature generates an infrastructure based on supply and demand, and a market principle for the circulation – or transaction – of data. Production orientedness also characterises the plan data as representation of space, with online viewers and integration of plan data that provides continuity in time and space, and a "real-time" representation of the territory as it produces, consumes and transforms. Certification of plan data relies on a network of data producing and consuming actors, with its interdependencies to each other their common infrastructure, and extensive standardisation of plan data.

Figure 5.4 The central role of the municipal land-use plan in contextualising policies and regulations in the spatial dimension of localities.

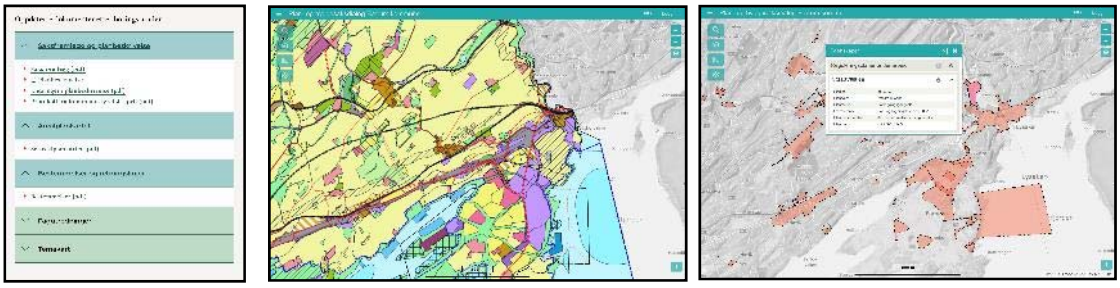


5.3.2 Municipal land-use plan for Bærum

For the purpose of comparison, we will shead light on the Norwegian context by studying the municipal land-use plan for Bærum in the metropolitan area of Oslo. Kommuneplanens arealdel (KPA) is a Norwegian municipal zoning plan, guaranteeing the full coverage of the national

territory with juridical land-use control. The combination with the kommuneplanens samfunnsdel (the community plan) represents a joint strategic tool for the municipality. The KPA is constituted by three statutory components: the plan description, the land-use map, and the zoning provisions. It is preceded by a municipal planning instruments that should be taken into account when studying a KPA, primarily the municipal planning strategy (kommunal planstrategi), mainly a programme for municipal planning activities, and a programme structuring content and decisions related to the planning process (planprogram), which is mandatory for the production of any statutory plan. The KPA for Bærum (approved in 2017) covers the most highly populated municipality in Oslo's periphery, with its 120.000 inhabitants, reaching from sea to forest, with a predominantly suburban built-up pattern, and yet some of the most thriving business areas in the country. The KPA is made available as a number of joint documents on the municipality's own web page, but also through a viewer where regulations and various geodata themes may be combined with the various sources of the Norwegian public map base (Det offentlige kartgrunnlaget – DOK).

Figure 5.5 Plan portal of Bærum municipality



The web portal of Bærum municipality makes the KPA available as a number of downloadable documents, but also allows for a "plan dialogue" service where plan data may be mixed in a cartographic viewer with vairous types of geodata, also representing ongoing planning and building processes.

5.3.3 Preliminary conclusions

For the Norwegian case we may recognize a distinct pattern related to the modality in which plan data is produced, where the national scope of digitalisation is reflected in spatial planning practice. When looking into the documents and their representation in digital portals, there is an ongoing dematerialisation of plans taking place, leading to a reorganisation of traditional components into different categories of web page information. In order to generate hypotheses on the possible impact on spatial planning practice, we propose a specific trajectory analysis, which consists of studying two previous versions of the same planning instrument for the chosen area. The question here is how the technological possibilities of the data infrastructure is progressively exploited, and how the practical uses of these possibilities may feed back to the evolution of the national data infrastructure.

5.4 France

5.4.1 Scope of digital plan data

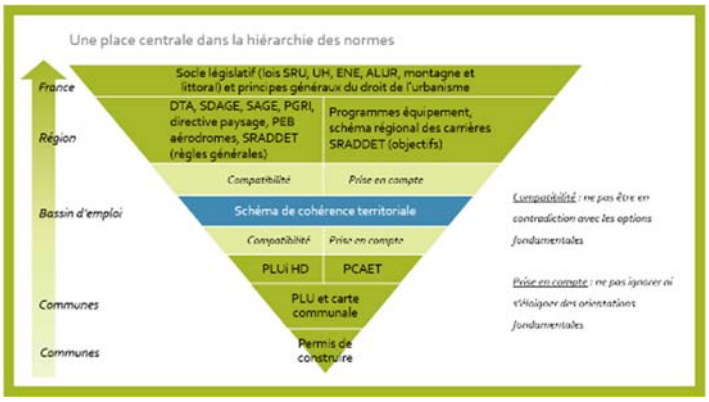
In France the interaction between the planning system and state digitisation agendas is decentralised. The French geodata system is based on a main Geoportal, allowing the global diffusion of geodata. Managed by the IGN (National Institute of Geographic and Forest Information), this main database is referencing every geodata available to the public, with many tools and possibilities of utilisation. This is illustrating what is called the Etat Plateforme (E-government), a deeper national digitisation dynamic of all public services. From this main portal, users can access different dedicated sub-geoportals and applications: one of them is the Geoportail de l'urbanisme (GPU), dedicated to digital plan data from public authorities.

Table 5.4 List of interviews (France)

Theme	Position	Status
Geodata in digital plans	Project leader, SRADDET Brezh Cop, (regional plan for the Bretagne region).	Planned for Sep
Plan data	Geoportail de l'urbanisme, portal responsible	Planned for Sep
Practice	Project leader, planning consultancy firm	Planned for Sep
Practice	Project leader SCoT Le Pays de Rennes	Planned for Sep
Practice	Project leader PLUi de Rennes	Planned for Sep
Practice	Responsible for the PLU minor municipality in the Rennes agglomeration	Planned for Sep

The French process of digitalisation is politically driven, oriented towards a high resolution and full account of the inventory of the territory. This feature underpins a traditional French concern with state sovereignty, reflected in terms of certified and precise description of the physicality of the territory, as well as a univoquous representation of current goals and regulations. Inventory orientedness characterises the representation of space as a territory populated by objects. The certification of plan data follows a different method than what is the case in Norway, relying on authorised professionals at the service of public authority.

Figure 5.6 The central place occupied by the SCoT in the French planning system



5.4.2 SCoT and a PLUi of Rennes metropolitan area

The French context will be explored on the basis of a metropolitan plan, which is strategic and structural, and an intermunicipal plan which is local and regulatory; the SCoT and a PLUi of

Rennes metropolitan area. A SCoT is a statutory French planning instrument designating a scheme for territorial coherence, typically at the level of metropolitan areas or other urban agglomerations at a scale that exceeds the single municipality. The SCoT Le Pays de Rennes (approved in 2015) mainly deals with a number of sectoral policies, from housing, mobility and business development to the environment and landscape, with the aim of making them coherent at the scale of several intermunicipal units. The public entity behind the plan is a syndicate composed by 76 municipalities who are organised in 4 intercommunalities (EPCI): Cormier communauté, Pays de Châteaugiron communauté, Rennes Métropole et Val d'Ille - Aubigné. The content of the plan is organised in 4 components:

- A presentation report (rapport de présentation) which explains the choices that are made in order to establish the project (about 300 pages).
- The project for the sustainable development of the territory (Projet d'aménagement et de développement durable – PADD), a mandatory document wich fixes the objectives of the plan and alligns it with principles of sustainable principles (68 pages).
- A document presenting the goals and orientations (Document d'orientation et d'objectifs – DOO), which explains how to implement and put the goals of the PADD into practice (88 pages including the main strategic map).
- A business development plan (Document d'aménagement commercial – DAC) which clarifies the sustainable development orientations of the DOO in business areas (44 pages).

A PLU is a statutory plan "local city plan" providing zoning for each municipality (plan local d'urbanisme). In larger agglomerations municipalities may organise and provide a PLUi, an intermunicipal local city plan (plan local d'urbanisme intercommunal), with the same provisions and status as a PLU, but with a collaboration of municipal authorities behind it. The PLUi de Rennes, ville et métropole (effective since 4 February 2020) is a coordination of plans for 42 municipalities in the metropolitan area. It integrates the PADD, which defines the political ambition of sustainable development towards 2030, found in the SCoT, and provides it with a zoning instrument on a local level of governance. Indeed, the PLUi must be in conformity with plans that are hierarchically superior, leading to document attachments such as the PLUi HD (habitat et déplacement), coordinating land-use, housing and transportation. The PLUi contains a large number of technical documents, in the form of local zoning plans, in accordance with planning and programming orientations (orientations d'aménagement et de programmation – OAP), a component which highlights certain sectors on a municipal basis.

Figure 5.7 The French Géoportail de l'urbanisme, with display of current plans organised in interactive layers, and the logic of downloadable documents on the webpages of the SCoT and the PLUi.

5.4.3 Preliminary conclusions

We may recognize a distinct pattern that characterises the underlying rationale of digitalisation within the organisational and institutional structure of the French case. The hierarchy of norms opens for more variation of formal types of digital plan data in approved plans, loosening up the more strict distinction between uses of formal and informal, and thus preformatted and customised spatial representation (standards, mandatory use, the circulation of analogue plan data in the information loops). This may be a concern to look into in the comparative analysis, since it might say something about innovation and inertia in spatial planning practice in relation to digitalisation agendas. Comparison of approved plans, their confection (organisation of its components in a material or immaterial document, a web portal or a combination of document and web viewer), and modes of representing goals, current regulations, actions and interactions may indicate virtuouse paths to follow.

5.5 Denmark

The Danish case focuses on the development around the digital plan register Plandata.dk. We work with two sub-cases to illustrate different aspects: (1) The progress towards a digital municipal plan and a digital local plan and (2) the digital planning process for the “Green map of Denmark”, part of the municipal plan. Furthermore, we will report on the current development of the Danish Marine Spatial Plan, the first fully digital plan in Denmark.

Table 5.5 List of interviews (Denmark)

Sub-case	**Position**	**Status**
Plandata.dk	Planner from national planning authority (ERST), responsible for digital plan register	Interview held
Digital municipal and local plan	Municipal planner from sub-urban municipality	Interview held
	Former municipal planner, now private consultant. Developed a digital solution for local plans	Interview held
	Expert from Danish municipalities‘ association (KL)	Planned for Aug
Green map of Denmark	Municipal planner from sub-urban municipality	Interview held
	Municipal planner from rural municipality	Interview held
	Expert from Environment Agency	Planned for Sep
Marine Spatial Plan	Expert for the Marine Spatial Plan, first fully digital plan in Denmark	Planned for Sep

5.5.1 Scope of digital plan data in Denmark

In Denmark, the 98 municipalities are the main planning authorities. This is regulated in the planning act. The national level is responsible for national legislation and for spatial planning policies of specific topics, e.g. coastal protection. All plans done in the framework of the planning act have to be registered in the publicly available digital plan register “Plandata.dk”. The nation-wide digitalisation of plan data has sped up in the past 10 years with new legislation and data systems. Most recent changes (2017) in legislation were driven by the planned use of data by the tax authority (“property tax valuation”). This required a (re)digitalisation effort of all local development plans by the state to increase quality and ensure full coverage (Larsen, 2018).

5.5.2 Use in planning process and practice

The two main planning instruments at the municipal level, the municipal plan (a land use plan for the whole municipality done every 4 years) and the local plan (a development plan for a smaller area, project-driven), also imply different challenges for digitalization. Parts of the municipal plan, the zoning regulations (‘kommuneplanrammer’), are typically done fully digital – often through a specific software solution which also communicates with the state’s Plandata.dk – in many municipalities. The practice regarding local plans is more diverse. Various private companies offer solutions, but many municipalities use simple text processing software and work with their own templates.

While the systems are rather advanced, standardization has not been actively pushed, resulting in very diverse data entries. This however might change with integration and new uses of the data. In turn, this digitalisation can and already have altered planning. A major concern is currently the use of plan data as input for a new assessment of property values by the Danish tax authority. Plan data (e.g. density allowances) is disagreegated to single parcels, which is often not directly forseen in plans as well as it is not possible to account for many side conditions..

Another example is the "Green map of Denmark” (MIM, 2017). A fully digital planning instrument intended to deliver a seamless national scale map of priority zones for nature conservation. Plan elements were produced individually in each municipality, i.e. in a decentral manner, based on common frameworks and criteria. Currently, municipalities have developed widely varying plans based on the same criteria, using the same tools and processes.

Implementation of the GMD planning framework was done locally in each of the Danish municipalities, on the basis of digital platforms, datasets and guidelines designed by national authorities. In this context it was made a mandatory element in the planning process to (1) Use digital land use suitability and biodiversity maps prepared at a national scale as input to the planning process, (2) Ensure coordination of plans across municipal boundaries using a range of digitally mediated processes, and (3) Report data digitally to a national data storage and

visualization platform, creating a seamless national map from municipal scale data. Some of the elements of digitalization, like for example the use of a national scale digital baseline dataset, had never been tried before at the time. The new datasets were seen as a necessary supplement to the local knowledge and locally produced data of the municipalities, but was also intended explicitly to provide an outset for later auditing and analysis of the way local planning was done. As such, the use of digital platforms and datasets was seen both as a means to mediate between various competencies and knowledge types, but also as a way to evaluate these. The digital plans exhibit a wide range of variation with respect to geometric characteristics (Figure 5.8), thematic characteristics, and performative characteristics, reflecting various ways of relating to the data.

Figure 5.8 Geometric characteristics of the "green map of Denmark" in three municipalities (same scale)

5.5.3 Organisation

A specific focus of the case will be a voluntary collaboration between The Danish Business Authority, municipalities and other stakeholders, e.g. public agencies and third-party developers, where they discuss, among other things, current deficiencies in the system as well as aspirations for future digitization of municipal and local plans. There are four aspects to the collaboration:

- User Interests: use of Plandata.dk, what is the need for digitalization in the municipalities
- Legalization: what will it take to make digital plan data legally binding?
- Standardization: agreement on future standardization of digital plan data
- Fast track: necessary corrections in order for the current system to improve, such as changes to the data model.

Despite the developments with Plandata.dk, the legally binding plans are still the pdf-version, not the geodata (Baaner et al., 2019). However, even if plan data on Plandata.dk becomes legally binding, the system is essentially a system for documentation, a public information portal. It does not support the actual planning process, hearing or communication between actors or the implementation. This is deliberate, as it is not seen as the state's task to provide such a solution on behalf of the municipalities.

In 2021, Denmark will have its first maritime spatial plan. It will become a legally binding digital map – the first of its kind in Denmark. The legally binding text and the regulating geography will be shown together, which will mean that the user does not first have to read the legal text and subsequently orientate himself on a separate map. In addition, the plan will have a specific digital hearing/participation element (Skovmark, 2020). As the maritime spatial plan has not yet been implemented, we cannot use it as a case, but a closer look will provide relevant perspectives for the future of legal digital maps in Denmark.

5.5.4 Preliminary conclusions

During the interviews so far, it has been expressed that the municipalities essentially are interested in digital plan data and digital planning processes. However, as Plandata.dk is implemented today, municipalities must register their plans in a system that is not directly supporting the planning process, but rather collecting information for various uses, as e.g. the tax authority. Municipalities are concerned that the implementation of fully digital plans in such a system would limit their planning options and processes with municipal and local plans. For the municipalities it is important that the digital planning process will still be within the framework in the planning act, a frame that today is very wide. In the future digitization of plan data and planning in Denmark, the balance between digital plan data and freedom of planning will therefore play a major role.

5.6 Austria

Austria is a federal republic with 9 federal states (‘Bundesland’) and more than 2000 municipalities (‘Gemeinde’). Planning legislation is done by the states, i.e. each state has its own spatial planning law. The municipalities are the local planning authorities, under supervision of the respective state. The case will focus on the work towards a digital land use plan (‘Flächenwidmungsplan’) in the states of Tyrol (750,000 inhabitants, 279 municipalities) and Upper Austria (1.5 m inhabitants, 438 municipalities).

Table 5.6 List of interviews (Austria)

Theme	Position	Status
Overview	2 Experts from ÖROK, Austrian spatial planning conference	Interview held
Plan data	Expert from TIRIS – Tyrolean spatial information system	Interview held
Plan data	Expert from DORIS, spatial information system of Upper Austria	Interview held
Practice	Planner from private planning consultancy	Planned for Sep
Practice	Expert from Planning Software provider	Planned for Sep

5.6.1 Scope of digital plan data

Each Austrian federal state has a geographic information system, typically a database with different layers of geodata with an internal and an external (public) access part. Usually they have a specific part dealing with plan data (Table 5.7). As planning legislation is in the competence of the 9 states, plan regulations are different.

Table 5.7 Geodata portals of the nine Austrian federal states

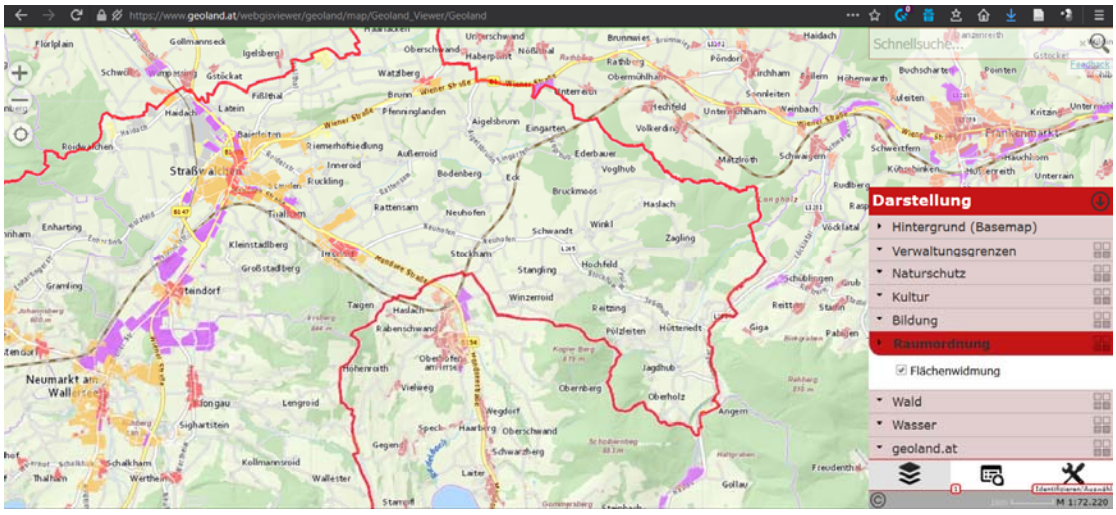
Bundesland (federal state)	Link to portal (if possible, directly to land use plan data)
Burgenland	https://gis.bgld.gv.at/WebGIS/synserver
Carynthia	https://gis.ktn.gv.at/atlas/(S(dxqxjnboiz31o4ljkazkmrpp))/init.aspx?karte=ka_ro
Lower Austria	https://atlas.noe.gv.at/webgisatlas/(S(echvotwhsp3pznnemszmbinu))/init.aspx?karte=atlas_flaechenwidmung&cms=atlas_raumordnung
Salzburg	https://www.salzburg.gv.at/sagisonline_flaechenwidmung
Styria	https://gis.stmk.gv.at/arcgis/services/OGD/flaewi/MapServer/WMSServer?request=GetCapabilities&service=WMS
Tyrol	https://maps.tirol.gv.at/externalcall.jsp?project=tmap_master&user=guest&view=ro_flaewi&x=79500&y=237000&scale=128000
Upper Austria	https://www.doris.at/viewer/(S(51wmbgrvxwvzbbnvji0iqszc))/init.aspx?karte=flaewi
Vienna	https://www.wien.gv.at/flaechenwidmung/public/
Vorarlberg	http://vogis.cnv.at/atlas/init.aspx?karte=planung_und_kataster
Joint portal	https://www.geoland.at/webgisviewer/geoland/map/Geoland_Viewer/Geoland

The states' spatial planning laws define plan symbols/legend/scales etc. which means that standardization is not a topic, but the actual visualisation of formally analogue plans in a digital form is – e.g. regarding the accuracy of plans ("Plangenauigkeit"), typically attached to fixed scales (Kanonier & Weninger, 2019). The main change for digitisation of plans was therefore usually a change of the planning law, requiring municipalities to deliver their plan digital.

In Tyrol the spatial planning law (Raumordnungsgesetz) was changed in 2011. Since 2013, land use plans (Flächenwidmungspläne) have to be announced electronically over TIRIS. However, it took several years to get all municipalities digital. Today all municipalities except for Innsbruck are in the system. In Upper Austria the requirement for digital data was implemented in the law in 2008. Also, here a transition period of several years was necessary. Since 2017, all municipalities are included.

The states' joint portal "geoland.at" shows land use plan data from all 9 states in a harmonized way (see Figure 5.9). This is however only for information purposes. The Austrian Spatial Planning Conference, a coordinating institution, is using it for general analysis (ÖROK, 2020).

Figure 5.9 Geoland.at viewer, showing land use plan data in Salzburg (west) and Upper Austria (east)



5.6.2 Use in planning process and practice

The Tyrolean system TIRIS supports the formal planning process of the municipal land use plan. Participation process are not facilitated, but documented in the system (at least the formal ones). The legally binding plan version is a PDF which is generated out of TIRIS. Due to legislation saying that local planning is in the competence of the municipalities, official announcement of the plans happens still through the municipalities, not through the system.

In Upper Austria, municipalities have to submit a digital as well as an analogue version. The digital version goes through a range of technical checks, while the analogue version is the basis for the contextual assessment. Only when the plan is validated from both sides, it can be approved and saved on a special 'law'-server.

In both cases, as in most other states, only the municipal land use plan is digital. Other municipal planning instruments are seen as not appropriate for a digitalization as symbols are too fuzzy (e.g. arrows showing broad development) and they are not of further interest for the state as they concern primarily local issues, as the Local regulatory plans/Building up plan (Bebauungsplan)-

The use of plan data is not monitored. However, internal use is increasing as data becomes more complete. In Upper Austria it was not possible to provide an overview of reserveres of building land until recently. Analyses are first now beginning, but might play a bigger role in the future (Interview AT3). Also the analyses of ÖROK shown above (Figure 5.9) is something which is unique. In Tyrol, TIRIS offers a lot of functionality to combine and analyse plan data with other data. In the future data on e.g. risk zones might be used to provide automatic information in case on conflicts when uploading plan data (Interview AT2).

5.6.3 Organisation

The state, as the legislative authority in planning, are the main actor in the state-wide digitalisation of plan data. The development and maintenance is financed by the states. However, the municipalities are the main data providers. The main transition period in both Tyrol and Upper Austria was mainly caused by the structure of the municipalities. Land use plans only have to be updated every 12 years when there are no changes, which was the case for several small municipalities. More recently also INSPIRE drives the process, requiring certain data and data formats. In Upper Austria this also motivated the municipalities to provide data to the state which in return provides the INSPIRE services. This would otherwise need to be done by each municipality separately.

In the actual planning process, private planning offices play an important role. When a private consultancy produces a plan for a municipality, they have to be certified as "Ziviltechniker für Raumplanung" – there are about 30 certified offices in Austria. Small municipalities have often worked with the same planning consultant over many years. However, the digitalisation led to a market shakeout. Some small offices were not able to adapt to the new requirements

regarding GIS-data and either dropped out or sub-contracted other consultance to overtake this part (Interview AT3). On the other hand, providers of planning specific software gained importance, although there are only very few companies serving the majority of the planning offices.

5.6.4 Preliminary conclusions

The digitalisation of plans has not affected the smaller municipalities, as they are served by private planning consultance. However, it has led to a market shakeout in the consultancy sector as well as the increase role of a few software providers. The full impacts are not yet clear due to a long transition period and in several states a parallel system of both analogue and digital plans because of the legal status of digital plan data. However, some states as Tyrol have implemented a fully digital process, with the only remaining analogue part being the official announcement of the plan by the municipality.

5.7 Indicators

As seen from the case studies, digitalisation of plan data is very different. Indicators can reflect the digitalisation process, show the diversity of planning in the cases, or also be input for the evaluation of planning practice. However, because of these clear differences we will focus on the discussion of the feasibility of indicators: Are they technically possible with the current data and can they be used reasonable for a comparative perspective? The indicators will be discussed with the steering committee at the meeting in September. For the final report we suggest a table like Table 5.8.

Table 5.8 Potential indicators from digital plan data (draft)

		Feasibility and reasonability					
Indicator	Reflection	AT	CH	DE	DK	FR	NO
% of local authorities providing digital plans to a public digital register	How comprehensive is the digitalisation in terms of geographical coverage or types of territory?						
Share of plans by plan type	What kind of plans are digitized? (e.g. following the ESPON COMPASS typology)						
Share of different zoning categories per county/local authorities	Which zoning categories are more prominent than others? Where are certain zoning categories more prominent?						
Age of plans, number of plans per year	How often are new plans made, old plans changed, updated etc.?						
Population and zoning	Simple efficiency ratios, e.g. zoned land per inhabitant, could be calculated.						

As example, Table 5.9 shows data for zoned building land per inhabitant for Austria, Denmark and Switzerland. Data for Austria is from ÖROK (2020), data for Switzerland from ARE (2017) and data for Denmark was downloaded (2020) from the plan data register plandata.dk. Population data was derived from Eurostat for the respective years.

Table 5.9 Building land per inhabitant in Austria, Denmark, and Switzerland.

NUTS2	Name	Zoned building land (ha)	m2 per inh.	Difference from national avg.
AT	Austria (2019)	318.927	360	100
AT11	Burgenland (AT)	22.595	770	214
AT12	Niederösterreich	89.879	536	149
AT13	Wien	14.845	78	22
AT21	Kärnten	29.057	518	144
AT22	Steiermark	54.479	438	122
AT31	Oberösterreich	61.143	413	115
AT32	Salzburg	14.333	258	72
AT33	Tirol	21.188	281	78
AT34	Vorarlberg	11.408	289	80
DK	Denmark (2020)	390.941	671	100
DK01	Hovedstaden	59.815	324	48
DK02	Sjælland	67.804	810	121
DK03	Syddanmark	98.634	806	120
DK04	Midtjylland	107.850	813	121
DK05	Nordjylland	56.838	963	144

CH	Switzerland (2017)	232.038	276	100
CH01	Région lémanique	48.181	299	108
CH02	Espace Mittelland	54.960	296	107
CH03	Nordwestschweiz	29.777	261	95
CH04	Zürich	30.420	204	74
CH05	Ostschweiz	38.300	329	120
CH06	Zentralschweiz	19.255	241	87
CH07	Ticino	11.145	315	114

The table shows that Denmark has, compared to Austria and Switzerland, a much higher average of square metres building land per person. This can indicate a different planning practice in the countries, but it might be as well caused by differences in the planning system, the digitalisation and the definition of categories (e.g. if transport or summer house areas are included or not). Within countries the context would be similar, still, planning practice and even regulations (as e.g. in Austria) can be different.

Finally, some data is not available for all case countries. E.g. in Germany no country-wide database regarding the percentage of digitally available land use plans exists and in Norway data is not freely available.

6 Task 3 – State of Thematic Papers

The thematic practice papers will be based on material and findings from the 15 countries overview and the 6 in-depth case studies. The scope of the thematic papers has been discussed with the stakeholders on several occasions. Following our preliminary findings and discussions with the DIGIPLAN stakeholders we suggest the following five themes:

6.1 What is digital plan data?

The drivers of digitalisation introduce new rationales to spatial planning practice, leading to a concern for two particular qualities: the performative quality of digital plan data, considered according to the rationalities of the planning system, on the one hand, and the substantial quality of the data itself, raising issues of formatting, standards, and certification, on the other hand. Current definitions of the digital plan data are characterised by the functional concerns of particular institutions (cf. Norwegian maps and plans norms). Practice is in a different position than those institutions, concerned with multiple functions involved in the phenomenon. Therefore a broader descriptive and explicative definition is needed to support a self aware and reflexive practice. With this paper we present three issues related to functional aspects of digital plan data, as a necessary support for a definition of the emerging phenomenon, i.e. its role in the system within which it operates, possibly representing a new condition for spatial planning practice: (A) Conflicting rationalities, (B) Incompatible methods of data certification and (C) Techniques of "plan drafting" – the pre-formatted and the virtuoso. We will highlight why these issues are worth being aware of, especially among spatial planning practitioners. Awareness of these issues may also help developing good practices, and also informing the institutional integration of the digital in the further evolutions of national spatial planning systems.

6.2 The digitalisation process of plan data

This thematic paper aims at providing insight to practitioners on the recent digitalisation process of plan data across Europe countries and regions. It starts by highlighting the main patterns of this process by presenting general findings on the main purposes, added values, and the main drivers based on the qualitative exploration of fifteen countries and regions. The paper then focus on two main added values of this digitalisation process. The first one corresponds to the possibility to produce national or regional-wide analyses, thanks to nation or region-wide portals containing harmonised plan data at different levels. The second added value corresponds to the improved workflow and planning practices. That is especially the case for municipalities for which the digitalisation of plan data is synonym to lower workload, cost reduction, and faster planning processes; and for users of digital plan data to get their requested data almost instantly. We include cases from ESPON DIGIPLAN to provide concrete examples on the benefit of the digitalisation process for practitioners at different administrative levels as well as user of such data.

6.3 Accessibility and use of digital plan data and changing relationship between actors

Our preliminary results show that there are several types of users of digital plan data including planners, public authorities, researchers, companies, and individuals. In most cases, digital plan data is publicly accessible however planners and local or regional authorities remain the most common users in almost all cases. The thematic paper will focus on accessibility and use of plan data in terms of prerequisites and potentials of different forms of accessibility for diverse user categories. Furthermore, it will explore the changes in planning practice through digital plan data and the influence of availability of digital plan data on empowerment of the different actors and changes in collaboration within the administration and between administration and stakeholders, e.g. regarding efficiency, transparency and innovation.

6.4 Legally binding digital plan data – from pdfs to geodata

In many countries, detailed digital plan data is available. However, in most cases, the plan data available in the geoportal is legally binding only de facto but not de jure. That means that the digital plan data is not legally binding insofar as it is a representation of the actual plan data. The legally binding plan is very often still the printed paper version of a plan available at the municipal office, although the plan itself was of course produced digitally. In some countries, the PDF is legally binding, but the digital plan data is not. Therefore, although the quality standards of the digital plan data are very high, these data cannot be used as legally binding documents. In the planning process, often parallel processes of digital and analogue (e.g. parts of Austria) or of plan as pdf and plan as digital plan data (e.g. Denmark) are established. An important factor for the digitalisation of plan data and its possibility of becoming legally binding, at least if this should be done similar over the whole country, is also the definition of plan symbols (e.g Austria, Norway). If they are not defined by law, a certain standardization is necessary to meet technical conditions. There regulative and standardized plan instruments might be the ones most obvious to implement binding as fully digital plans.

6.5 Future technical development and possibilities

The digitisation of plan data and planning processes has only just begun in some locations and is in full progress in all places. This study simply shows a snapshot of the digital developments to the present, as well as the planned and targeted developments or technologies. As it turns out, there is no end of the digitisation of plan data and planning processes in sight, but there is still a lot of potential in the improvement of the technology, but also of the work processes and the collaboration of the different actors. This thematic paper presents some of the more advanced technologies, processes or projects in the digitisation of plan data from the case studies examined, which could be inspiring for other authorities and countries. In addition, the associated opportunities and challenges are also discussed.

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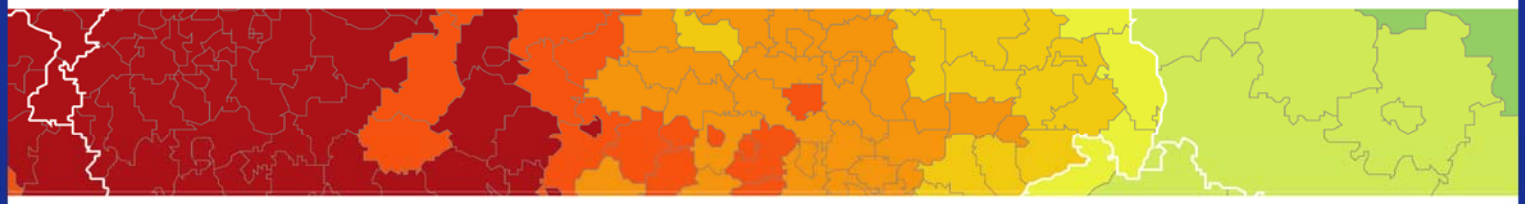

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