ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

TARGETED ANALYSIS //

DIGIPLAN – Digital plans and plan data in Austria

Annex 3 of final report

Final report // June 2021

This Targeted analysis was conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States, the United Kingdom and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

This deliverable does not necessarily reflect the opinions of members of the ESPON 2020 Monitoring Committee.

Coordination and Outreach
Christian Fertner, University of Copenhagen and Piera Petruzzi, ESPON EGTC

Authors
University of Copenhagen (Denmark): Christian Fertner, Sara Folvig

Cite as
ESPON DIGIPLAN (2021) DIGIPLAN – Digital plans and plan data in Austria. Annex 3 of final report. https://www.espon.eu/digiplan.

Advisory group
Stakeholders: Ole Pagh Schlegel and Bent Lindhardt Andersen, Danish Housing and Planning Authority, DK | Hilde Johansen Bakken, Ministry of Local Government and Modernisation, NO | Silvia Jost, Yves Maurer and Marc Pfister, Swiss Federal Office of Spatial Development, CH

ESPON EGTC: Piera Petruzzi (Senior Project Expert), György Alföldy (Financial expert)

Acknowledgements
We would like to thank the experts for participating in the interviews.

Information on ESPON and its projects can be found at www.espon.eu.
The website provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

ISBN: 978-2-919795-63-5

Published in June 2021

Graphic design by BGRAPHIC, Denmark

Contact: info@espon.eu

ESPON
EUROPEAN UNION
Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

TARGETED ANALYSIS //

DIGIPLAN – Digital plans and plan data in Austria

Annex 3 of final report

Final report // June 2021

Table of contents

List of maps, figures, charts and tables

List of maps

List of figures

List of tables

Abbreviations

DORIS	Digitales Oberösterreichisches Raum-Informations-System (Digital spatial information system of Upper Austria)
ÖROK	Österreichische Raumordnungskonference (Austrian Spatial Planning Conference), a joint secretary to coordinate spatial planning across the country)
TIRIS	Tiroler Raum-Informations-System (Tyrolean spatial information system)

Foreword by the research team

In the DIGIPLAN project, we explored the development and state of digital plans and plan data in several European countries. It is the first of its kind; no similar research has been conducted before and the topic of inquiry was spanning wide from the beginning. An explorative approach was necessary to shed light on more or less advanced digital practices in different spatial planning contexts. However, we also present an early systematisation of general concepts, key terms and approaches, describing emerging digital plans and plan data and related practices. Although there is a huge diversity across the cases, they all have in common that there are high ambitions and continuous development in the field of digital plans and plan data. Although a targeted analysis for stakeholders from Denmark, Norway and Switzerland, DIGIPLAN findings can inspire a wider professional audience.

This report is one out of six in-depth case studies, presenting findings from Austria. No Austrian stakeholder was connected to the DIGIPLAN project, but several interviews with practitioners from different levels of governance provided insights into various aspects of digital planning practices. As with the other case studies, we do not aim at giving a full picture of digitalisation of plans and plan data in Austria. This would go far beyond the scope of DIGIPLAN. Instead, we provide insights from different places in the planning system and in the country on current developments and challenges.

In terms of digitisation of spatial plans, Austria presents a wide diversity. Spatial planning legislation and supervision is in the competency of the nine federal states. Each state has its own approach, priorities and solutions. The spectrum of digital plans on the states' plan data portals ranges from scanned and georeferenced images of plans to very advanced fully digital plans and processes. Transition periods have been (or still are) very long, challenged by judicial requirements on plan accessibility and traditional perspectives on how a plan should look like. However, several portals have greatly enhanced accessibility to plans and plan data and functionality is continuously improved.

Enjoy reading!

Christian Fertner, Sara Folvig

University of Copenhagen

1 Introduction and data

ESPON DIGIPLAN provides an overview on digitalization of plan data in 15 ESPON countries, insight information from case studies in 6 countries and five thematic practice papers, synthesizing the state of the art in topics related to digital plan data and digital plans. This Annex reports on Austria, one of the 6 in-depth case studies. The methodological framework for the case studies is described in Annex 1. The federal structure of Austria made necessary to focus on some states only, however, references to the whole country are given when possible.

Written material describing or discussing the development in Austria is rare. A few reports (Auer, 2008; Gruber et al., 2018; Kanonier and Weninger, 2019; Lehner and Dorffner, 2020), short communications or conference presentations (Jakob and Niedertscheider, 2018; Klotz and Marth, 2000; Niedertscheider, 2017, 2020; Riedl, 2003; Riedler, 2016) and technical descriptions (Aufhauser-Pinz OG, 2009; Birngruber and Sykora, 2008) have been found and used. The main empirical material for the case study are information from the plan data portals and interviews with experts in the field. Six interviews with seven persons were conducted, each lasting for about one hour. Four interviews were recorded and transcribed. Recording was not possible for the other two due to technical problems, but notes were taken. There was short written contact with another planner. The interviewees represent persons from the state's planning authorities as well as planning practitioners and software providers. Relevant persons were identified because some written material on the theme authored by them was found beforehand. Based on the snowball method, further interviewees were identified. Information from interviews in the text are referenced to by (AT01) to (AT07), referring to an internal interview reference table. All interviews except for one were conducted in German. Citations are own translations, if necessary, based on transcription.

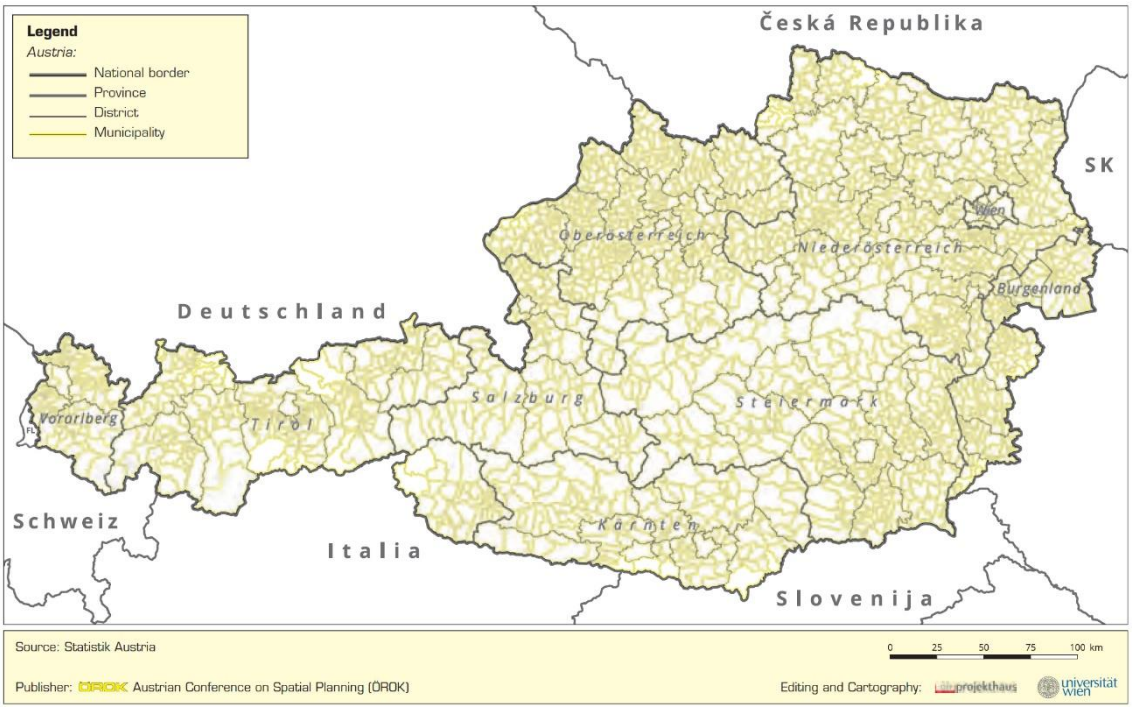
Table 1.1
Interviews held

Affiliation	Position
Government of Tyrol	Expert from Tyrolean spatial information system
Government of Upper Austria	Expert from spatial information system of Upper Austria
Private planning consultancy	Planner and software provider, experience from Lower Austria
Private planning consultancy	Planner, experience from Lower Austria/Burgenland (only written contact)
Private planning software provider	Expert
ÖROK	2 experts from the Austrian spatial planning conference
Vienna University of Technology	Researcher in planning law and geodata

1.1 The Austrian planning system and the land use plan

Austria is a federal republic with 9 federal states (Bundesland) and more than 2000 municipalities (Gemeinde). Legislation and implementation of spatial planning is done by the nine states. Each state has its own spatial planning law, and plan regulations are therefore different. However, the difference is often in detail, while the main pillars like the type of plans and its content are very similar.

Map 1.1
Administrative division of Austria



"Province" in the figure refers to the 9 federal states of Austria, simply called "state" in this report
Source: ÖROK, in Gruber et al. (2018)

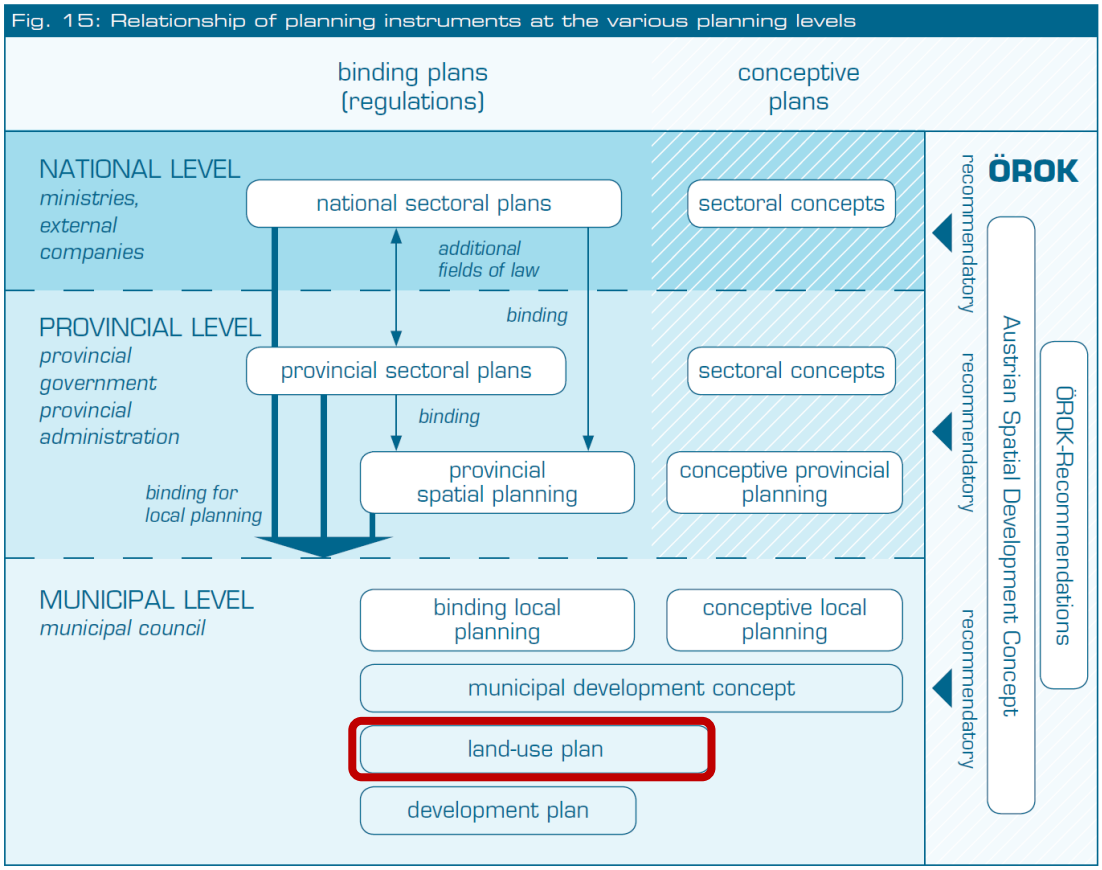
For spatial planning at the level of the municipalities ("Örtliche Raumplanung") there are 3 planning instruments in almost all federal states according to the respective spatial planning law:

(1) The municipal development concept ("örtliches Entwicklungskonzept"), which is mainly a strategic instrument. Sub-ordinated to it

(2) the land use plan ("Flächenwidmungsplan", sometimes also translated as zoning plan) as the central regulatory instrument and finally, sub-ordinated to the land use plan,

(3) the local development plan ("Bebauungsplan", sometimes also called local regulatory plan or building-up plan), which defines concrete structures (Gruber et al., 2018).

Figure 1.1
Planning instruments in Austria, with the land use plan highlighted



"Province" in the figure refers to the 9 federal states of Austria, simply called "state" in this report.
Source: Gruber et al. (2018)

Based on provision in the planning laws, the land use plan is usually drafted on a 1:5000 scale. Its basis map is the cadastre / land register, and zones drawn in the plan need to be related correctly to the cadastre. Uniform formal rules for notation, drawing and units used in the plan are defined in all planning laws of the nine states. In many states, the submission of the plans from the municipalities (or their planning consultancy) to the state's planning authority is done in paper and digital form (Gruber et al., 2018). How often land use plans have to be renewed differs between the states and can vary from 5 to 15 years or it is not defined at all. Some state require that land use plans need to be adjusted if the planning law (e.g. certain notations) changes.

2 Scope of digital plan data

2.1 The current state 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. These systems all have a specific part dealing with plan data (see Table 2.1).

Table 2.1
Geodata portals with plan data of the federal states

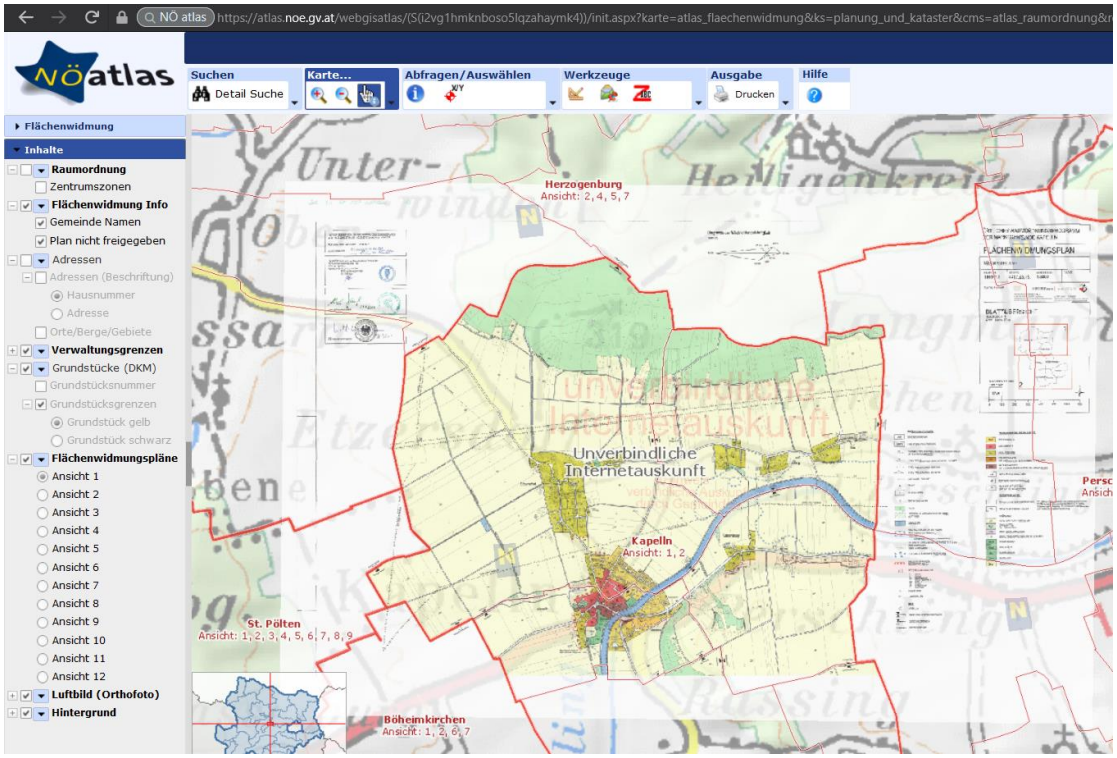
Federal state	Name of portal	Direct link to land use plan data
Burgenland	GeoDaten Burgenland	https://geodaten.bgld.gv.at/nc/de/transport.html?project=GeoDaten&view=Flaewi_cache
Carinthia	KAGIS	https://gis.ktn.gv.at/webgisviewer/atlas-mobile/map/Raumordnung/Raumordnung
Lower Austria	NÖ Atlas	https://atlas.noe.gv.at/webgisatlas/init.aspx?karte=atlas_flaechenwidmung&cms=atlas_raumordnung
Salzburg	SAGIS	https://www.salzburg.gv.at/sagisonline_flaechenwidmung
Styria	Digitaler Atlas Steiermark	https://gis.stmk.gv.at/atlas2/landesplanung.asp?typ=f
Tyrol	tirisMaps	https://maps.tirol.gv.at/externalcall.jsp?project=tmap_master&user=guest&view=ro_flaewi
Upper Austria	DORIS	https://www.doris.at/viewer/init.aspx?karte=flaewi
Vienna	Vienna GIS	https://www.wien.gv.at/flaechenwidmung/public/
Vorarlberg	VOGIS	http://vogis.cnv.at/atlas/init.aspx?karte=planung_und_kataster
Joint viewer	Geoland	https://www.geoland.at/webgisviewer/geoland/map/Geoland_Viewer/Geoland
Joint open gov data portal	Open Data Österreich	https://www.data.gv.at/suche/?searchterm=fl%C3%A4chenwidmung
Joint open geodata	INSPIRE Österreich	https://www.inspire.gv.at

Accessed 22 December 2020

All portals include the municipal land use plans. How land use plans are shown on the digital portals can be very different and related to requirements for plan submission (from the municipalities/their planners to the state) as well as the legal status of digital plans. In most states, the analogue (printed) version of the land use plan is the legally binding version.

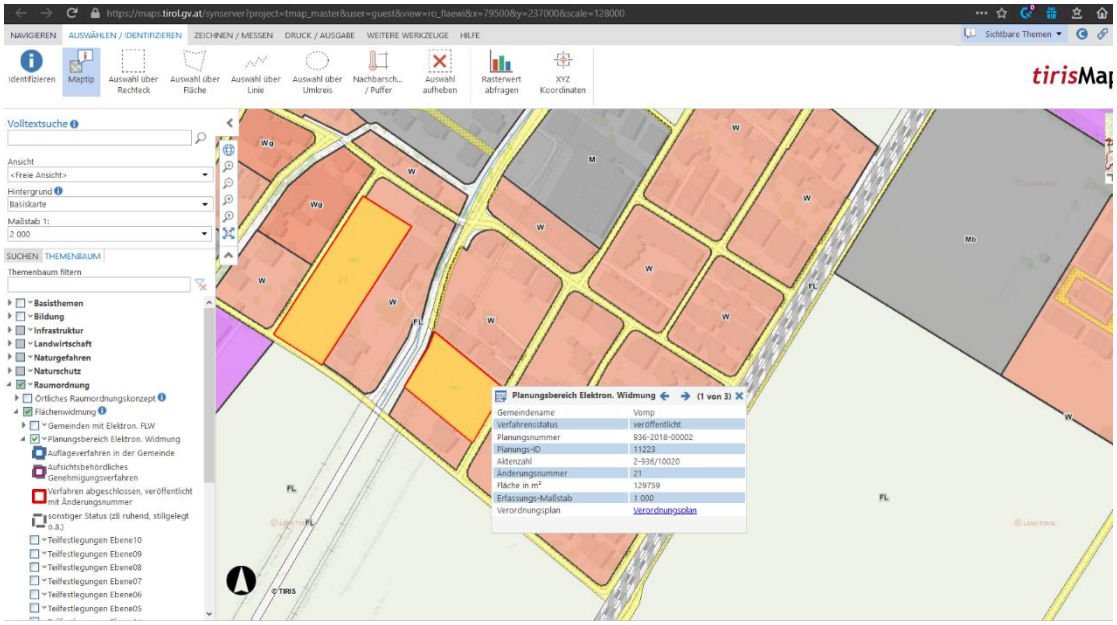
Figure 2.1 and Figure 2.2 show screenshots from the viewers from Lower Austria and Tyrol. In Lower Austria, land use plans are shown as the image of the printed plan, scanned and georeferenced. Land use plans from neighbouring municipalities cannot be shown at the same time as this would provide overlaps in the paper version on the screen. In Tyrol, the digital plans are legally binding. Land use plans are shown as vector data and information on regulations can be retrieved interactively in the portal.

Figure 2.1
Screenshot of land use plan view in NÖ Atlas (Geoportal of Lower Austria)



Source: https://atlas.noe.gv.at/webgisatlas/init.aspx?karte=atlas_flaechenwidmung&cms=atlas_raumordnung, accessed 16 October 2020

Figure 2.2
Screenshot of land use plan view in tirisMaps (Geoportal of Tyrol)



Source: https://maps.tirol.gv.at/externalcall.jsp?project=tmap_master&user=guest&view=ro_flaewi, accessed 16 October 2020

Other planning instruments from different levels are sometimes included. As example, Table 2.2 shows the instruments included in the Tyrolean geoportal tirisMaps, which includes plans from sub-national as well as local level. In the geoportals of the other states, often fewer plans are shown, sometimes only the land use plan. On the other hand, in Salzburg's portal even land use plan data from neighbouring villages in Southern Bavaria, Germany, is accessible (though not updated).

Table 2.2
Planning instruments included in tirisMaps, the Tyrolean geoportal

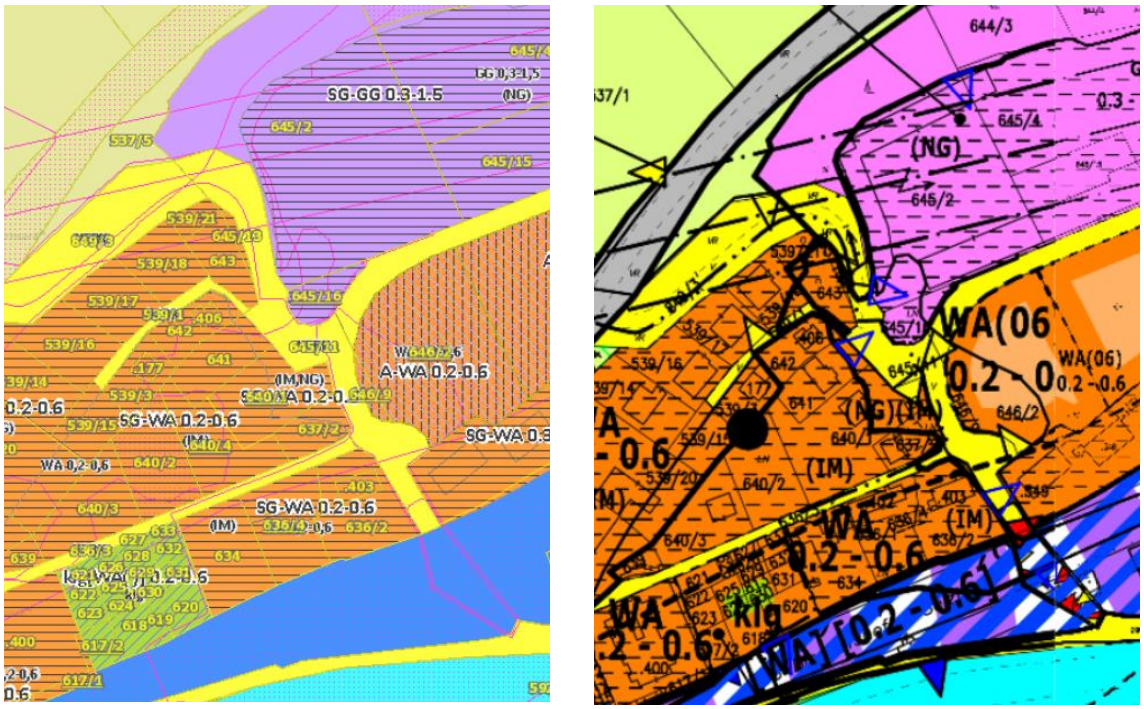
Level	Name	English translation	in tirisMaps
National	Österreichisches Raumentwicklungskonzept (ÖREK)	Austrian Spatial Development Concept	No, the Tyrolean portal only includes plans from Tyrol and its local authorities
	Fachplanungen des Bundes	Federal sectoral plans with major spatial implications (transport, mining, forestry, water, energy…)	
Sub-national (Tyrol)	Raumordnungsprogramme oder -pläne	State development programmes or plans	Partially: Full plan (PDF report) not directly accessible, but specific GIS-themes of the plans are integrated
	Regionalprogramme oder -pläne für Planungsgebiete	Regional development programmes or plans	
	Raumordnungsrogramme oder -pläne für Fachthemen	Sectoral programmes or plans (e.g. nature conservation)	
Local (municipality)	Örtliches Raumordnungskonzept	Municipal development concept	Yes
	Flächenwidmungsplan	Land use plan	Yes
	Bebauungsplan	Local development plan	No

Source: Own elaboration, based on Gruber et al. (2018)

The digital land use plans should include all regulations, similar to the analogue plan. However, because in most states, the digital plans are not legally binding, and they have more the status of a (though very handy) supplement, there can be differences in the visualizations which can have an impact on readability and even interpretation. Figure 2.3 shows the view of a land use plan from Schladming, city in Styria, in the Styrian geoportal and in the municipality's geoportal. Besides the differences in layouting, we can also see that some information is on one but not the other plan and there are even different notations for some areas. Some of it may relate to view settings, which can be changed in the Styrian geoportal. In any case, this can be confusing for users.

Figure 2.3

Land use plan from a part of the city of Schladming – left: Geoportal of the state, right: Geoportal of the municipality



Source: Auer (2008), screenshot updated, accessed 22 December 2020 from https://gis.stmk.gv.at/atlas2/landesplanung.asp?typ=f and https://map.geoportal.at/PSC/synserver?project=Schladming_FWP

2.2 The historical background

Similar to the development in other countries, digital tools for plan making and administration have been used in the sector for many years, and several states started experimenting with digital plan data in the 1990s (Klotz and Marth, 2000). Lower Austria was one of the first to establish a standard for digital plans in 1996, which got adopted in 1999 (AT04). Nevertheless, implementation was not successful at that time. Many states adapted their planning laws during the 2000s and 2010s, requiring the submission of digital plans, often parallel with printed plans. The changes in law were often followed by long transition periods and several follow-up adaptations of the planning law. In Table 2.3 we identify three phases of the digitalisation of land use plans in Austria. In the 1990s digital plan data, as well as geodata in general, became established in public administrations and online geodata platforms made their first appearances. In the 2000s, many states worked on guidelines and adaptation of the planning laws and not least the digital interfaces. Portals for internal as well as external use were developed. In the 2010s digital plans have been implemented in many states, though accompanied by considerable transition periods. Technology, data availability and planning process and laws were continuously elaborated on further.

Table 2.3
Phases and milestones in digital plans in the Austrian states

Time	Main activities	Examples
1990s	First experiments with digital plan data in administration, first WebGIS platforms online	1995: Pilot project using digital plan data for citizen communication (Vienna) 1998: tirisMaps online (Tyrol)
2000s	Development of guidelines, incentives, changes of planning laws, development of external (internet) and internal (intranet) portals	1999: Guideline for digital plans (Lower Austria) 2000-2004: Funding scheme for digitalisation (Lower Austria) 2004: Cooperation geoland.at gets established (all states) 2008: Digital plans implemented in law (Upper Austria) 2011: Digital plans implemented in law (Tyrol)
2010s	Implementation (takeover of digital plans), transition period and adaptation of sector, continuous development (technical, planning process and planning law related), external access and use	2008-2017: Transition period (Upper Austria) 2010: Harmonized urban land use plan data available in geoland.at viewer across Austria 2012: Open Data Austria (data.gv.at) started 2013-2019: Transition period (Tyrol) 2017: Full digital land use plan (Tyrol) 2017: ÖROK publishes first analysis based on land use plan data across Austria 2020: Viewer with simplified user interface for mobile and desktop added (Upper Austria)

Source: Own work

3 Organisation of digital plan data

3.1 The state as legislative and superior planning authority

Spatial planning legislation is in the competence of the nine federal states. All states have planning laws and they are the supervision authority for land use planning done by the municipalities. Regulations on notations, symbols, legends, scales etc. are described either directly in planning laws or in specific laws for that. These regulations are very detailed and many include specification for the digital plan data (see example in Figure 3.1).

Figure 3.1
Clip from regulation on plan notation from Styrian planning law

GRAFISCHE DARSTELLUNG

I. Vom Gemeinderat festzulegende NUTZUNGSARTEN
I. A. BAULAND
I. A. (1) VOLLWERTIGES BAULAND

Grafik - Darstellung mit RGB-Farbwert	Grafik - Beschreibung mit ACI-Farbwert in ( )	Schnittstellenbeschreibung Ebenen-Nr.	Widmung	BEDEUTUNG
a) WR 255 - 191 - 0	Vollflächig ohne Randlinie, Dunkelgelb (40), Text mittig in Fläche, [strichlierte Begrenzung 0,4 schwarz nur bei Unterscheidungsbedarf]	1 35	WR	REINE WOHNGEBIETE
b) WA 255 - 127 - 0	Vollflächig ohne Randlinie, Zinnoberrot (30), Text mittig in Fläche, [strichlierte Begrenzung 0,4 schwarz nur bei Unterscheidungsbedarf]	1 35	WA	ALLGEMEINE WOHNGEBIETE
c) KG 255 - 0 - 0	Vollflächig ohne Randlinie, Edelrot (10), Text mittig in Fläche, [strichlierte Begrenzung 0,4 schwarz nur bei Unterscheidungsbedarf]	1 35	KG	KERNGEBIETE
d) (EA)	Randlinie schwarz strichliert 0,7 und Text mittig	2	(EA)	EINKAUFSZENTREN - AUSSCHLUSSBEREICHE in Kerngebieten
e) (E1-A)	Randlinie schwarz strichliert 0,7	2	(E1-A)	EINKAUFSZENTREN 1 - AUSSCHLUSSBEREICHE

Example on land use notations, including RGB colour-code

SCHNITTSTELLENBESCHREIBUNG

1. NUTZ_F
Ebenenname: nutz_f
Struktur: Polygon

Item-Name	Length	Precision	Scale	Type
WIDMUNG	25	-	-	C
ZSW	25	-	-	C
MIND	-	6	2	F
MAXD	-	6	2	F
MAXH	-	3	-	I

C=Character, F=Float, I=Integer, ZSW=Zusatzwidmung, MIND=Mindestdichte, MAXD=Maximaldichte, MAXH=Maximale Höhe

WIDMUNG	ZSW	Nr. Planzeichen	Beschreibung	Beschriftung Plan
WR	-	I.A.(1) a	Reine Wohngebiete	WR
WA	-	I.A.(1) b	Allgemeine Wohngebiete	WA
KG	-	I.A.(1) c	Kerngebiete	KG
GG	-	I.A.(1) g	Gerwerbegebiete	GG
I1	-	I.A.(1) i	Industriegebiet 1	I1
I2	-	I.A.(1) j	Industriegebiet 2	I2
DO	-	I.A.(1) l	Dorfgebiete	DO
KU	-	I.A.(1) m	Kurgebiete	KU
EH	-	I.A.(1) n	Erholungsgebiete	EH
E1	-	I.A.(1) p	Gebiet für Einkaufszentren 1	E1
E2	-	I.A.(1) q	Gebiet für Einkaufszentren 2	E2
FW	-	I.A.(1) s	Ferienwohngebiete	FW

Example of description of digital data format

Source: PZVO 2016 Anlage 2 Flächenwidmungsplan, Bebauungsplanzonierungsplan, Ergänzungspläne, https://www.landesentwicklung.steiermark.at/cms/beitrag/12656273/143651453/

Besides adopting planning legislation and being the supervisory authority for municipal planning, the states have established plan data portals and databases, driven by ideas on, primarily, efficiency, as well as modernisation of administration, innovation, or service orientation (offer data).

> *"… I think in general, it is more that [the federal states] strive for increasing the efficiency of the administration as the main driver in implementing the digitalization process. From my point of view, but perhaps I am wrong, the main driver did not come from those in the administrations who were responsible for the content of the plans. It was more an administrative, legally driven approach, at least from my perspective." (AT01)*

Finally, the federal states also do planning themselves on regional scale by preparing development plans for the whole state or specific parts and various sector plans. Those plans (or part of them) are also sometime available on the digital portals, but we have not looked closer at these instruments. Our focus was on the municipal plan types, mainly the land use plan.

3.2 Municipalities and planning consultancies

The municipalities are responsible for local planning and the official publisher of legally binding local plans. Many of the more than 2,000 municipalities in Austria are rather small. They are dependent on private planning consultancies to prepare plans and conduct planning processes for them. Only certified offices (being

civil engineer for spatial planning - “Ziviltechniker für Raumplanung”) may produce an official plan for a municipality. There are about 30 certified offices in Austria today. Small municipalities have often worked with the same planning consultant over many years. However, digitalisation led to a market shakeout. Some small consultancies were not able to adapt to the new requirements regarding GIS-data and either dropped out or sub-contracted other consultancies to overtake this part (AT03).

The states involve municipalities or planning consultancies on the development of the digital plan data in different degree. In Lower Austria, a private planning consultancy was asked to provide guidelines for digital plans already in the 1990s. In Upper Austria, the state involved planning consultancies and software developers in several discussion rounds before the planning law was adapted in 2008, which included the requirement for digital plan submissions.

3.3 Other actors

Besides the states, municipalities and private planning consultancies, a range of other actors are relevant in the development of digital plans and plan data:

- Planning software providers – providing special software for and services based on digital plans. Providers of planning specific software gained importance, but there is competition. Today there are only very few companies serving the majority of the planning offices (AT03). There are also some planning offices or big municipalities which have their own software solutions.
- Citizens – main interest in specific information on new and existing plans.

The national state has no specific planning competence. However, policies on digitalisation on the national (or supra-national) level can drive processes in the states. In addition, some national institutions are relevant to mention:

- Federal Office of Metrology and Surveying (BEV / Bundesamt für Eich- und Vermessungswesen), provides the cadastre map. The cadastre map is a pay-service and an income for BEV. However, states and municipalities can get the data rather cheaply. As the local plans need to relate to the cadastre map, there can be issues regarding its timely update as well as occasional updates by the BEV, affecting plan-cadastre relations.
- ÖROK, the Austrian spatial planning conference, which is a collaboration between the national state, the federal states and representative organisation of the municipalities to coordinate planning related issues, develop a not binding joint spatial perspective as well as provide analysis on the development of spatial planning in Austria. ÖROK also coordinates regular meetings between its stakeholders.

3.4 Relations within different levels of government

Digital plans and plan data have certainly increased the role of the federal states in planning. Federal states adapted their planning laws, which require municipalities to deliver digital data. The data provides new opportunities for overview and insight (and control) for the states, although it was not stated in the interviews that this was a specific aim or is done. However, future automatic checks of some content of digital plans (besides the technical checks which are in place already now) might come, or at least in the form of automatic information during submission. These potentials have however not been realised (yet), probably caused by long transition periods, limited resources or different political priorities (AT04, AT05)

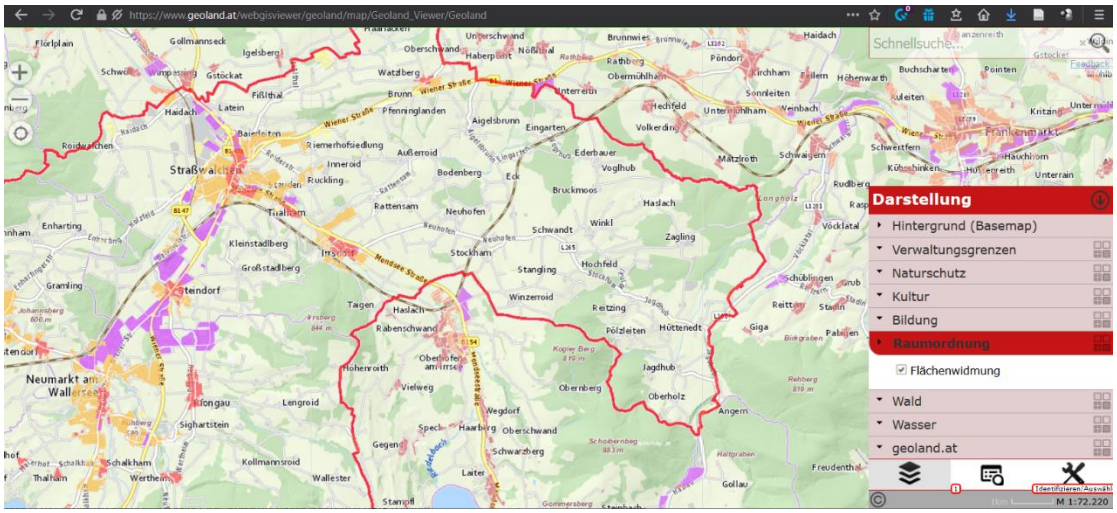
Municipalities also see the benefits of digital plan data, e.g. regarding the quick information on planning restrictions on a specific plot (AT04). Often, however, they are not concerned, as private planning consultancies organise the communication with the other planning authorities. In Vorarlberg, the state even overtook the technical implementation of the land use plans:

> *“[The state of Vorarlberg] supports the communities in their process of setting up the digital plans. Vorarlberg is a region with only some 79 local communities. They have a very close cooperation between the regional governmental administration and the communities. And I think they have found an agreement where the [state] does the digital planning for the communities in order to ease their lives, to centralize the technical planning work at the level of the [state]. (AT01)*

Despite the fragmentation of spatial planning competences between the states, digitalisation has also led to new initiatives between them. In 2004, geoland.at, a joint geodata viewer was established, accessing geodata from all nine states and making them available in a joint viewer. Since 2010, data from land use plans are included. The data for urban land uses is taken form the states' geoportal and harmonized for visualisation (Figure 3.2). It provides a unique overview of land use planning across the whole of Austria. ÖROK, the Austrian spatial planning conference, also coordinated regular meetings between the regions around different themes. This involves also, e.g., the coordinators of the GIS systems. (AT01). However, the main purpose of Geoland is coordination and knowledge exchange.

"That is great in Austria, that we have many contacts with the other states in the field of GIS and exchange and meet also over Geoland." (AT03, 1:07)

Figure 3.2
Geoland.at viewer, showing harmonized land use plan data in Salzburg (west of red line) and Upper Austria (east)



Source: geoland.at, accessed 22 December 2020

3.5 Relation between governmental and not-governmental actors

The digitalisation of plans has added transparency and accessibility of plan information. Access to the portals includes a majority of external users, and increasing in number (AT01). However, some portals can be very complex and confusing for non-experts (AT06). Furthermore, the discrepancy between digital plans and the analogue plans, as shown with the example from Schladming in Figure 2.3, confuses. In general, the state governments do not have specific information on the use of the data, nor if it is used specifically in participation processes or for public awareness, as these activities are mainly conducted by the municipalities. However, the possibility to access plan information for a specific plot has been mentioned as a benefit for citizens, and more and more municipalities want to have that functionality in their software (AT04). For trained or expert users the share of governmental data, as plan data, has been a huge improvement (AT06).

3.6 Financing

The development and maintenance of the portals are financed by the states. The municipalities are the main data providers or pay planning consultancies to do it for them.

In Lower Austria, the state provided a co-funding scheme for municipalities or consultancies for the transition to digital plans in the early 2000s. However, the scheme did not lead to the expected results. Data quality did not satisfy the requirements of the state. Extensive post-processing was stopped because of costs and

digitalisation halted. Similar efforts in the other federal states came much later, which probably went along with a higher acceptance of all actors to digitalisation at that time (AT04).

However, even though both Tyrol and Upper Austria started the process later, a transition period of many years was necessary. A reason for that might be the requirement that land use plans only have to be updated about every 10-15 years when there are no changes, which can easily be the case for small municipalities. (AT03).

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, that means e.g. providing WMS or WFS access to land use plan data as well as description of metadata. This would otherwise need to be done by each municipality separately (AT03).

Access to data is free; however, local plans need to refer to the cadastre map. The digital cadastre map is produced by the Federal Office of Metrology and Surveying, which requires payment to access the data. Public authorities can have a rather cheap access to a digital dataset, which typically is updated every 6 months. Receiving more frequent updates is possible, but more expensive (AT03).

4 Use of digital plan data

4.1 Use of digital plan data in the formal part of the planning process

The Tyrolean system TIRIS (and its viewer tirisMaps) supports the formal planning process of the municipal land use plan. Participation processes are not facilitated, but documented in the system (at least the formal ones). Formal objections, comments etc. during the planning process are documented and integrated in the system. PDFs of current plan regulations can be generated in real time in the portal. Official announcement of the plans happens still through the municipalities, not through the system. This has legal reasons.

> *"In Tyrol [..] the municipalities have to submit electronically and [the plans] will be announced over a server of the state. This was a problem for the Constitutional Court, because it interferes in the competency of the municipalities. The municipalities have to announce, no matter where it is saved. This has, first of all, nothing to do with technical issues." (AT06, 0:05)*

In Upper Austria, similar to e.g. Burgenland, 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.

> *"If [the municipalities] do not deliver, or deliver correct, [the digital plan data] it is a reason for denying approval. That means the municipality cannot zone, if they do not deliver the digital plan." (AT03, 0:29)*

In Lower Austria, no digital plan data is submitted. Instead, the submitted analogue plans are scanned and georeferenced.

> *„Planned was a central database… there was resistance… efforts stopped since 2008… we decided to scan at least all plans… so citizens can see at least the same, with all legends, what they see when going to the town hall " (AT04)*

Since 2007, the building zone boundaries are digitized, also to be used for INSPIRE. However, they do not play a role in the formal planning process. Sometimes even numbers from other sources are used instead of their own.

> *"The numbers for the building zone boundaries are used, but not much. Usually they still rely on unrealistic numbers from the Austrian Environment Agency or from an insurance. The own numbers are winked at." (AT04, 0:34)*

4.2 Use of digital plan data beyond the formal planning process

The use of plan data is not monitored. However, internal use (by municipalities and the states) is increasing, as data becomes more complete (AT02). A very common way to use plan data is for the calculation of building land statistics ('Baulandbilanz'). Planning software solutions used by planners and municipalities often have basic analysis functionality, e.g. to calculate obligatory building land statistics for municipalities (AT07). However, with digital plan data it is now possible to do that on state level as well. A recent report of the Environment Agency Austria (2019) says that 3 out of the 6 states which were studied, have already implemented such calculations. Often, it is not done every year, because some still include manual work based on orthophotos. In Upper Austria, it was not possible to provide an overview of building land for the whole state until 3 years ago. Analysis of the development of building land and building land reserves are now done annually, with an automated procedure including different registers, by the administration.

"This is very useful for politicians, with the possibility to countersteer. It is exciting to have data, which we can actually work with. Because before, we had nothing." (AT03, 0:45).

Figure 4.1 shows a table from the recent land information report of Upper Austria, showing reserves of building land for different land use categories. About 20 % of the building land are unbuilt reserves.

Figure 4.1
Building land zoning and reserves in Upper Austria 2019

Baulandwidmungen und -reserven in Oberösterreich 2019

Widmung	Widmung 2019 (in ha)	Reserven 2019 (in ha)	Reserven 2019 (in %)
Dorfgebiet	10.635	1.578	15
Zweitwohngebiet	215	50	23
Wohngebiet	28.231	5.843	21
Reines Wohngebiet	403	72	18
Wohngebiet für förderb. mehrgesch. Wohnbauten od. Geb. in verdichteter Flachbauweise	50	27	53
Wohngebiet für mehrgesch. förderb. Wohnbauten – Bestand	1	0	0
Wohngebiet für förderb. Gebäude in verdichteter Flachbauweise – Bestand	5	1	13
Bestehende Wohngebäude im Grünland	1.479	0	0
Widmungen Wohnen	**41.019**	**7.569**	**18**
Gemischtes Baugebiet	3.035	447	15
Eingeschränktes gemischtes Baugebiet	2.088	774	37
Betriebsbaugebiet	8.348	2.616	31
Industriebaugebiet	1.595	226	14
Ländefläche	62	6	10
Widmungen Betriebe/Industrie	**15.128**	**4.069**	**27**
Kerngebiet	1.913	169	9
Geschäftsgebiete Bestand – mit überwiegend Lebens- und Genussmitteln	10	0	1
Geschäftsgebiete Bestand – mit gemischtem Warenangebot	120	8	7
Geschäftsgebiete Bestand – ohne Lebens- und Genussmittel (Fachmärkte)	99	3	3
Geschäftsgebiete neu – Gemeinde	227	43	19
Geschäftsgebiete neu – Raumordnungsprogramm (ROP)	185	29	16
Sondergebiete des Baulandes	2.208	429	19
Kurgebiet	93	19	21
Sonstige Widmungen	**4.855**	**700**	**14**
Gesamt	61.002	12.338	20

Quelle: Auswertung der digitalen Flächenwidmungspläne und Berechnung der Baulandreserven durch das Land Oberösterreich DORIS-Systemgruppe und Abteilung Raumordnung, März 2019

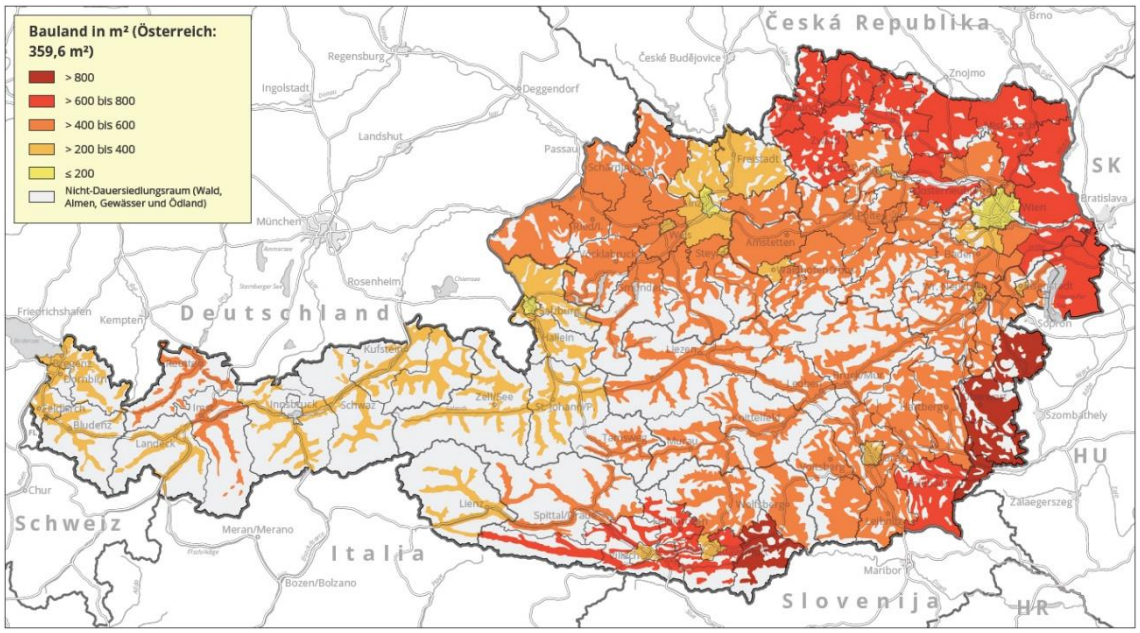
The table shows the current zoning for different land use categories in Upper Austria in 2019
Widmung = Zoning / land use category
Reserven = Building land reserves, i.e. unbuilt, but zoned land
The yellow row sum-up for residential zones ("Widmungen Wohnen"), business / industrial zones ("Widmungen Betriebe/Industrie") and others ("Sonstige Widmungen")
Source: Administration of Upper Austria (2020)

In Lower Austria, data on building land reserves, based on land use plan data and data from the building and residential register, has been available for several years, but not used yet by the state's planning authority. More rough and several years old data from, e.g. from the national environment agency, is used instead (AT04). In the annual statistical yearbook of Lower Austria (Administration of Lower Austria, 2020), which has almost 400 pages, development of land use or building land (reserves) are not addressed at all.

The states' joint portal "geoland.at" shows land use plan data from all 9 states in a harmonized way (see Figure 3.2). This is however only for information purposes. ÖROK, the Austrian Spatial Planning Conference,

is using the same data for general analysis on building land (Map 4.1). The collection of this data is done manually within the geoland.at network and a reference table to generalise land use categories from all nine states into five categories is used.

Map 4.1
Zoned building land per inhabitant, per district, 2020



Source: ÖROK (2020)

Historical plan data also gets more important, e.g. excerpts on the valid zoning ("Widmungsauskunft") now and previously, after tax laws regarding the tax on property sales changed (AT04). The sale of properties is taxed with 27%. However, different rates are applicable for properties, which have been building land to a certain time and bought to a certain time.

> *"There are thousands of transition rules. The time of zoning plays a crucial role – if I pay 20 % or only 4% tax is crucial for the seller." (AT04, 0:55)*

4.3 Accessibility

As shown in Table 2.1, all states have their own geoportals. Each is accessible online to the public. The portals provide though different functionality and some functions or data are only available on restricted access or even only internally.

> *"Some regions have a very, I would say, state of the art online GIS system where you can as a user, not only view all the different issues, not only spatial planning, but also environmental planning and other issues, […but] also download data. In some regions you have maybe a viewer, but have very limited access to the data. And it might also be the case that some regions have way more information, but they don't publish it on their public online GIS systems." (AT01)*

> *"[In Styria] as a technical consultancy you get special access where you can download all the data you need for local land use planning." (AT01)*

There is also, in some regions, still a big gap of data available internal or for expert users, and data accessible over the public portals.

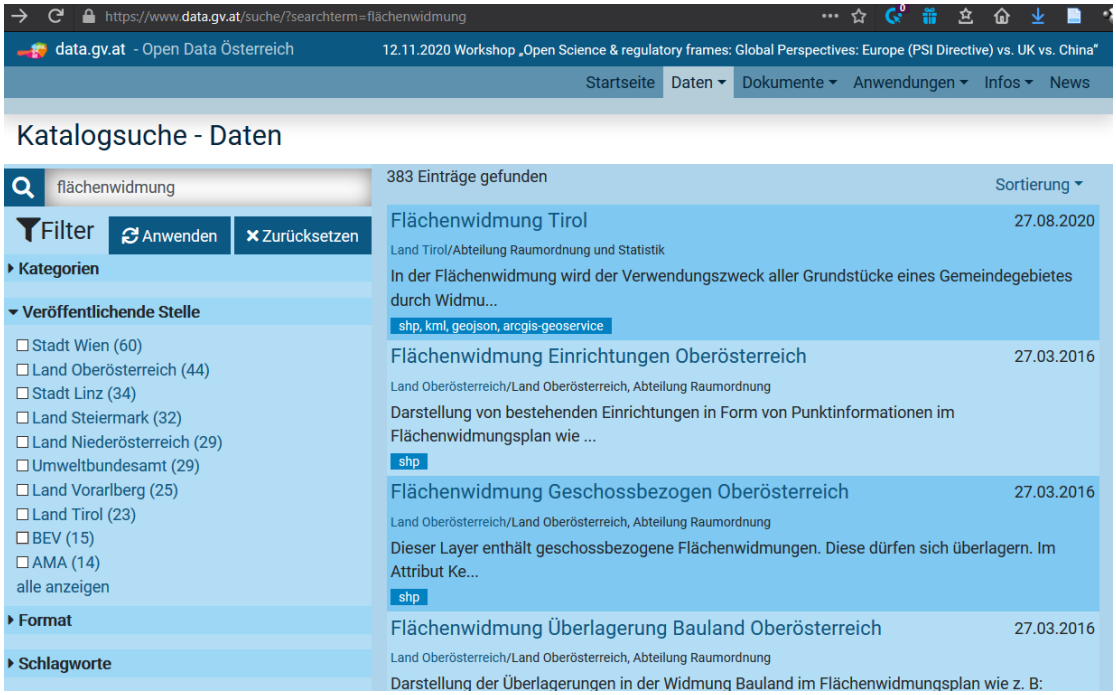
> *"… each of the [states], they have a quite sophisticated GIS system with a lot of data and where they have also already implemented a lot of internal processes which are supported by the GIS systems, but not everything of that is really publicly accessible in the web." (AT01)*

Upper Austria has just (December 2020) released an update of their portal DORIS, which is now available in two versions: the so-called "Core" version which includes all functionality for desktop computer access and a version called "Flex" with a simplified user interface for desktop as well as mobile access.

Austrian wide, Geoland.at (see Figure 3.2) is providing data based on the land use plans. However, other plans are neither included in Geoland nor in the ÖROK Atlas (2020), because the planning instruments are too diverse between the states (AT01).

However, the states are providing metadata (and sometimes download links) to several plan topics to the Austria open government data platform data.gv.at (Figure 4.2). A search for land use / zoning ('Flächenwidmung') resulted in 383 datasets from all states and some other authorities. Similar metadata and download links are also published in the Austrian INSPIRE portal (https://www.inspire.gv.at)

Figure 4.2
Data sets on data.gv.at - Example with search term "Flächenwidmung"



Source: https://www.data.gv.at/suche/?searchterm=fl%C3%A4chenwidmung

4.4 Purpose, added value and challenges

Several interviewee have mentioned an increase in efficiency in the management of plans, especially to former manual data collection, which was very time-consuming. Regarding an upcoming change in the way plans have to be uploaded, where changes from the previous plan have to be marked so the review process can be accelerated, an expert said: *„Then our necessary effort is reduced, that's the idea." (AT03, own translation)*

It was mentioned that during the COVID-19 crisis planning departments with a high degree of digitalisation had an advantage in regards of workflows, especially when people have to work from home and need to have access to plans:

> *"I think really also in the current crisis, makes [the digitisation of planning] even more a topic because I think also the way how planning processes are digitalised have a huge influence on how planning departments can work right now. So some of them, I think they have almost no technical issues. But some of them have for sure very large challenges when it comes to data accessibility. And also here a future development into more or less digital processes can be very helpful for future crises." (AT01, 0:52)*

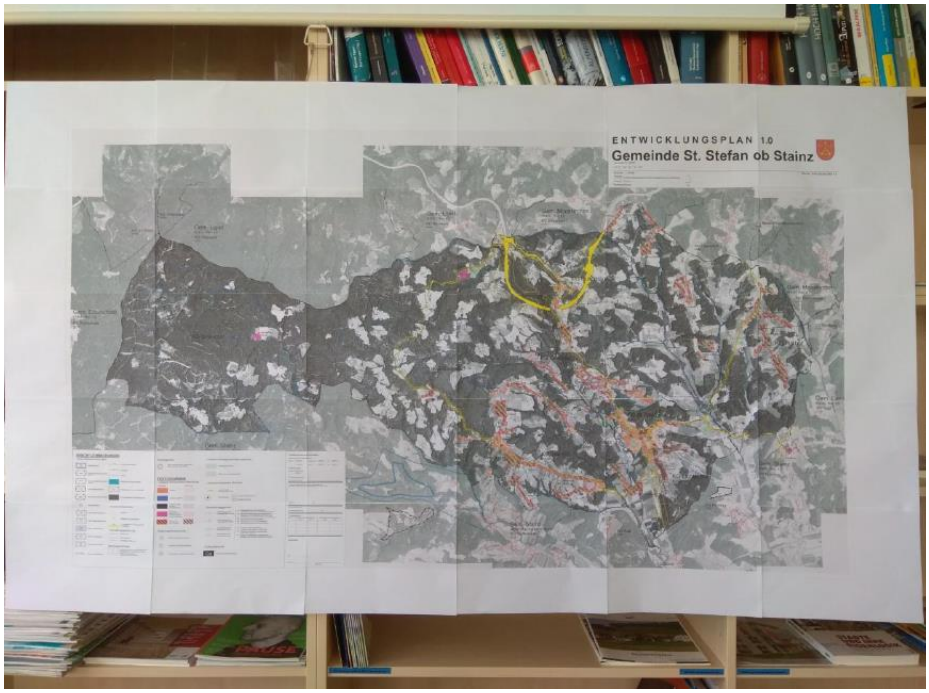
The digital requirements can though also mean an extra work for planners. An interviewee said, that planners need to work "extremely precise" (AT05) for the digital submission. This is no issue when looking at the plan at the scale it was made for (e.g. 1:5000 for the land use plan), but the technical requirements and the systems do not allow for any inaccuracies.

Several interviewees have also mentioned the possibility of using plan data for evaluation (see also section 4.2) as an added value. Much of it is currently only in development because data have not been available that long yet. In Salzburg, core-indicators for spatial development are under development, some of them using data from the digital land use plans (Riedler, 2016).

4.5 Digital and analogue

Although many states and municipalities in Austria provide plan and plan data digital, land use plans still need to be available analogue at the town hall. This is through the physical availability of printed plans to view, as well as through the possibility to get a print (typically against a small payment). Even in Tyrol, where the formal process is fully digitised, printed versions of land use plans need to be accessible at the municipalities' town hall. Many plan data portal have specific print options. However, it is combined with quite an effort even by an interested professional to reproduce the plan in its original scale (Figure 4.3). A public accessibility of a printed plan, e.g. in the town hall, is therefore with the current plan formats and law regulations difficult to substitute (AT06).

Figure 4.3
Printed and stitched land use plan



Source: Kanonier & Weninger (2019)

In Upper Austria, municipalities have to submit land use plans in digital and analogue form to the regional planning authority (Birngruber and Sykora, 2008). The analogue version is used by the department checking the plan according to the plan law ("Raumordnungsrecht"), a check of the plan content. The digital version is checked for technical issues. A comparison of both versions is necessary.

> *"Correct, in this phase we have it double […] We have some persons, who compare the digital and the analogue version. […] When they get the plan, it only was checked technically, but that does not mean that the content is in order. That is why they need to compare if the digital version is similar to the analogue version. If this is ok and the checks according to the plan law as well, the plan will be uploaded to a provisional law-server." (AT03, 0:17)*

Traditional formats and plan symbols are also a barrier for digitalization. Some administrations prioritize it higher to keep the original aesthetics, some of which are difficult to handle in a digital format.

> *"[In the local development plan] we have building lines (Baufluchtlinien), which, because of historical reasons are defined as lines. Actually, it is an area, where it is not allowed to build. But the administration does not want to change that... it would be necessary to change the familiar aesthetics, the cartographic symbol … to an area symbol, which is unthinkable [for the administration]." (AT04, 1:01)*

In Upper Austria, the current format of the land use plan also leads to some redundancies. As the land use plan has to include relevant other planning as well, e.g. risk zones. Risk zones are provided by the states, included in the land use plans of the municipalities and then sent back as part of the plans to the state where they are part of the supervisory check.

> *"Actually it does not make sense. It would be better [the planners] only send us the zoning while we then overlay our risk zones digitally. But the people are still sticking to a land use plan, where everything needs to be in, as it was always with the analogue version." (AT03, 0:50)*

Another issue are older plans. Sometimes it is necessary to know which plan regulations were in place in the past. Older plans are though typically not in the same way available digital or online as newer or current plans. Lower Austria is working on a digital archive with all old plans, possible to access online. However, they will only be available as scanned PDFs, not georeferenced or with any geodata available (AT04).

The digitisation of other plan types at local or state level is diverse. It is clear though, that a harmonized view, like done for land use plans in Geoland (Figure 3.2) and for INSPIRE, of e.g. state development plans won't be possible, as those plan types are much less standardized and used very differently in the different states (AT01).

4.6 Future use scenarios

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 of conflicts when uploading plan data (AT02).

In Upper Austria, the upcoming law reform will reduce the effort for checking between the digital and the analogue plan, by requiring planes to highlight areas where changes occurred. Furthermore, the administration works on implementing electronically signed plans, PDFs, which then can be distributed digitally as legally binding plans (AT03). A long-term wish is the simplification of the plan symbol regulation, which with the overlay of other plan data in digital plans instead of having the data integrated in each plan, would be possible.

In Vienna, which is one of the nine federal states and a municipality at the same time, the administration currently works on a digital twin (AT01), called a geoTwin. The idea is, that the digital twin will be a hub for all geodata of the city (Lehner and Dorffner, 2020). This will open new possibility for interacting with plan data and for making plan data more accessible.

The COVID-19 also highlighted a problem which could be solved in the future with digital processes:

> *"… if you want to get the permission for a building, you need to have a meeting at the place where you want to build and all parties have to get together. In the Corona situation, this meeting couldn't take place, so no building permission was in fact, no new one, was possible. So that's for me a very good example, to think about, what could digitalisation really mean in terms of planning process. Not from a legal point of view, but from the practical point of view. I think there we really have to think about a smart application of our digital tools, besides the formal legal process." (AT01, 0:52)*

5 Synthesis and recommendations

How does the availability of digital plan data empower different actors?

Digital plans and plan data have certainly increased the role of the federal states in planning. Federal states adapted their planning laws which require municipalities to deliver digital data. The data provides new opportunities for overview and insight (and control) for the states. Future automatic checks of some content of digital plans (besides the technical checks which are in place already now) have been discussed, or at least in the form of automatic information during submission. These potentials have not been realised (yet), probably caused by long transition periods, limited resources or different political priorities.

Municipalities also see the benefits of digital plan data, e.g. regarding the quick information on planning restrictions on a specific plot. Often, however, they are not concerned, as private planning consultancies organise the communication with the other planning authorities. In Vorarlberg, the state even overtook the technical implementation of the land use plans. The digitalisation of plans has not affected the smaller municipalities, as they are served by private planning consultancies. However, it has led to a market shakeout in the consultancy sector in Upper Austria as well as the increased role of a few software providers in some states. On the other hand, transition periods were kept very long, and extended several times.

How does the availability of digital plan data change collaboration within the administration and between administration and stakeholders?

The digitalisation of plans has added transparency and accessibility of plan information. Access to the portals includes a majority of external users, and increasing in number (AT01). However, some portals can be very complex and confusing for non-experts (AT06). Furthermore, the discrepancy between digital plans and the analogue plans confuses. In general, the state governments do not have specific information on the use of the data, nor if it is used specifically in participation processes or for public awareness, as these activities are mainly conducted by the municipalities. However, the possibility to access plan information for a specific plot has been mentioned as a benefit for citizens, and more and more municipalities want to have that functionality in their software (AT04). For trained or expert users the share of governmental data, as plan data, has been a huge improvement (AT06).

How does the driver (e.g. efficiency, need for transparency, need for control) and funding source of digital plan data affect planning practice?

For the states, digital plans and plan data have primarily increased efficiency (i.e. reduced time need for the same task) of workflows. Also in states where digital and analogue plans are handled in parallel and new tasks regarding comparison needed to be introduced, efficiency has improved. A very common way to use plan data is for the calculation of building land statistics (‘Baulandbilanz’). Planning software solutions used by planners and municipalities often have basic analysis functionality, e.g. to calculate obligatory building land statistics for municipalities. However, with digital plan data it is possible to do that on state level as well. A recent report of the Environment Agency Austria (2019) says that 3 out of 6 states which were studied, have already implemented such calculations. The states’ joint portal “geoland.at” shows land use plan data from all 9 states in a harmonized way. This is however only for information purposes. ÖROK, the Austrian Spatial Planning Conference, is using the same data for general analysis on building land. The collection of this data is done manually and a reference table to generalize land use categories from all 9 states into 5 categories is used. Excerpts on the valid zoning (“Widmungsauskunft”) now and previously (historical data) are getting more important, not least because a change in tax law, using different tax rates on sales price depending on how long back a zoning from ‘green’ land to build-up land was done.

Patterns

Similar to the development in other countries, digital tools for plan making and administration have been used in the sector for many years, and several states started experimenting with digital plan data in the

1990s (Klotz and Marth, 2000). Lower Austria was one of the first to establish a standard for digital plans in 1996, which got adopted in 1999. Nevertheless, implementation was not successful at that time. Many states adapted their planning laws during the 2000s and 2010s, requiring the submission of digital plans, often parallel with printed plans. The changes in law were often followed by long transition periods and several follow-up adaptations of the planning law. We identify three phases of the digitalisation of land use plans in Austria (Table 2.3). In the 1990s digital plan data, as well as geodata in general, became established in public administrations and online geodata platforms made their first appearances. In the 2000s, many states worked on guidelines and adaptation of the planning laws and not least the digital interfaces. Portals for internal as well as external use were developed. In the 2010s digital plans have been implemented in many states, though accompanied by considerable transition periods. Technology, data availability and planning process and laws were continuously elaborated on further.

The full impacts are not yet clear due to a long transition period. In several states, a parallel system of both analogue and digital plans is in place. Only Tyrol has implemented a fully digital process, with the only remaining analogue part being the official announcement of the plan by the municipality.

Policy recommendations

Have the users in mind

Plan data portals can be very complex, data can be difficult to find and then to interpret. Specific user portals, e.g. as done in Upper Austria with a specific mobile interface for their system, are great improvements to broaden the use of digital plans and plan data.

Use digitisation to improve flexibility in the planning process

During the COVID-19 crisis planning departments with a high degree of digitalisation had an advantage in regards of workflows, especially when people have to work from home and need to have access to plans. Futhermore, it also highlighted the problem with required building site meetings during the lockdown. Even though, public life opens up again, digital processes could improve such meetings.

Make use of digital plan data to evaluate planning

The steady of increase of building land in Austria is a recurring topic in the public debate. A big problem was that states did not have data on what was planned in the municipalities, at least not in a format, which could be used for a broader evaluation. Digital plan data can help to get an overview as well as to conduct analysis on what, where and when new building land is zoned. The use of this data can provide the highly necessary evidence to base future spatial planning policy on.

References

Administration of Lower Austria (2020) *Statistisches Handbuch des Landes Niederösterreich [Statistical yearbook of Lower Austria] 2020*. 44. St. Pölten, Austria: Amt der Nö. Landesregierung, Abt. Raumordning und Gesamtverkehrsangelegenheiten. Available at: https://www.noe.gv.at/noe/Zahlen-Fakten/Publikationen__Zahlen__Fakten.html.

Administration of Upper Austria (2020) *Bodeninformationsbericht 2020 [Land information report]*. Linz, Austria: Amt der Oö. Landesregierung.

Auer N (2008) *Der interaktive Flächenwidmungsplan im Internet [the interactive land use plan in the internet]*. Master Thesis. Vienna UT, Vienna, Austria.

Aufhauser-Pinz OG (2009) *NÖ Richtlinien für digitale örtliche Raumordnungsprogramme [Lower Austrian guidelines for digital spatial plans] - revised version*. Herzogenburg, Austria.

Birngruber H and Sykora P (2008) *Der digitale Flächenwidmungsplan in Oberösterreich - Handbuch für Anwender [The digital land use plan in Upper Austria - handbook for users]*. Linz, Austria: Amt der Oö. Landesregierung.

Environment Agency Austria (2019) *Bodenverbrauch in Österreich [land consumption in Austria]*. Vienna, Austria.

ESPON COMPASS (2018) *Comparative Analysis of Territorial Governance and Spatial Planning Systems in Europe. Final Report*. Luxembourg: ESPON EGTC.

Gruber M, Kanonier A, Pohn-Weidinger S, et al. (2018) *Spatial Planning in Austria - with references to spatial development and regional policy*. 202. Vienna, Austria: ÖROK.

Jakob A and Niedertscheider J (2018) Electronic map for land-use planning in Tyrol. In: *Esri Map Book*. Esri Press.

Kanonier A and Weninger K (2019) *Plangenauigkeit - Genauigkeit von planlichen Darstellungen (Plangenauigkeit) im österreichischen Verwaltungsrecht, insb. im Raumordnungsrecht, sowie in der Judikatur des Verfassungsgerichthofes [Accuracy of spatial plan representations in Austrian administrative law]*. Vienna: Vienna UT.

Klotz A and Marth M (2000) Digitale Flächenwidmung der Stadt Wien - Strategien und Formen der Umsetzung. *VGI – Österreichische Zeitschrift für Vermessung und Geoinformation* 88(1): 24–31.

Lehner H and Dorffner L (2020) Digital geoTwin Vienna: Towards a Digital Twin City as Geodata Hub. *PFG – Journal of Photogrammetry, Remote Sensing and Geoinformation Science* 88(1): 63–75. DOI: 10.1007/s41064-020-00101-4.

Niedertscheider J (2017) Perspektiven für Tirol [Perspectives for Tyrol]. In: *AGEO Forum 2017 – "Vision:Geo:Information"*, Vienna, Austria, 2017.

Niedertscheider J (2020) Electronic Land Use Plan Tyrol. In: *DIGIPLAN workshop: Digitalisation in Spatial Planning*, online, hosted by Swiss Federal Office for Spatial Development, 25 November 2020.

ÖROK (2020) *Flächenwidmung in Österreich [zoning in Austria]. Expose*. Vienna, Austria. Available at: https://www.oerok-atlas.at/#indicator/72.

Riedl M (2003) Flächenwidmung online [land use planning online]. *roinfo - Tiroler Raumordning* (25): 24–26.

Riedler W (2016) Kernindikatoren der Raumentwicklung im Land Salzburg [core indicators of spatial development in Salzburg]. *SIR-Info* 2016(1): 7.

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

ESPON 2020

ESPON EGTC
4 rue Erasme, L-1468 Luxembourg
Grand Duchy of Luxembourg
Phone: +352 20 600 280
Email: info@espon.eu
www.espon.eu

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States, the United Kingdom and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

ISBN: 978-2-919795-63-5