



THE CADASTRAL SYSTEM IN SWITZERLAND – Achievements of the Last 20 Years and Future Challenges

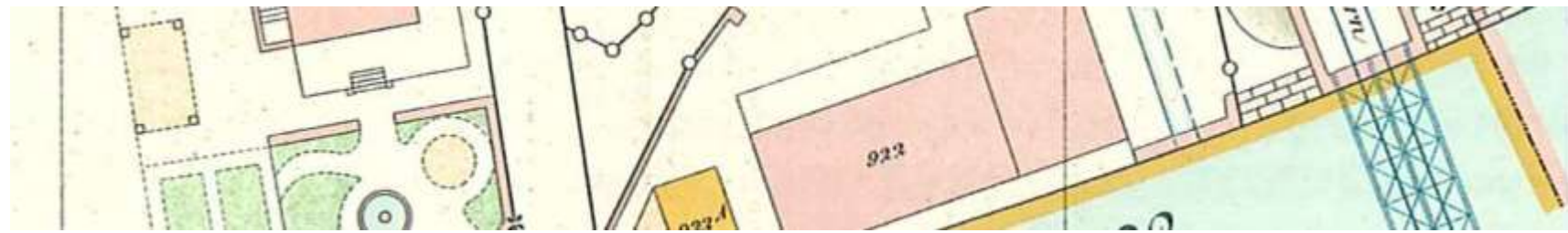
DANIEL STEUDLER

TABLE OF CONTENT

- History
- Digital Format
- Opportunities and Future Challenges
- Conclusions



History

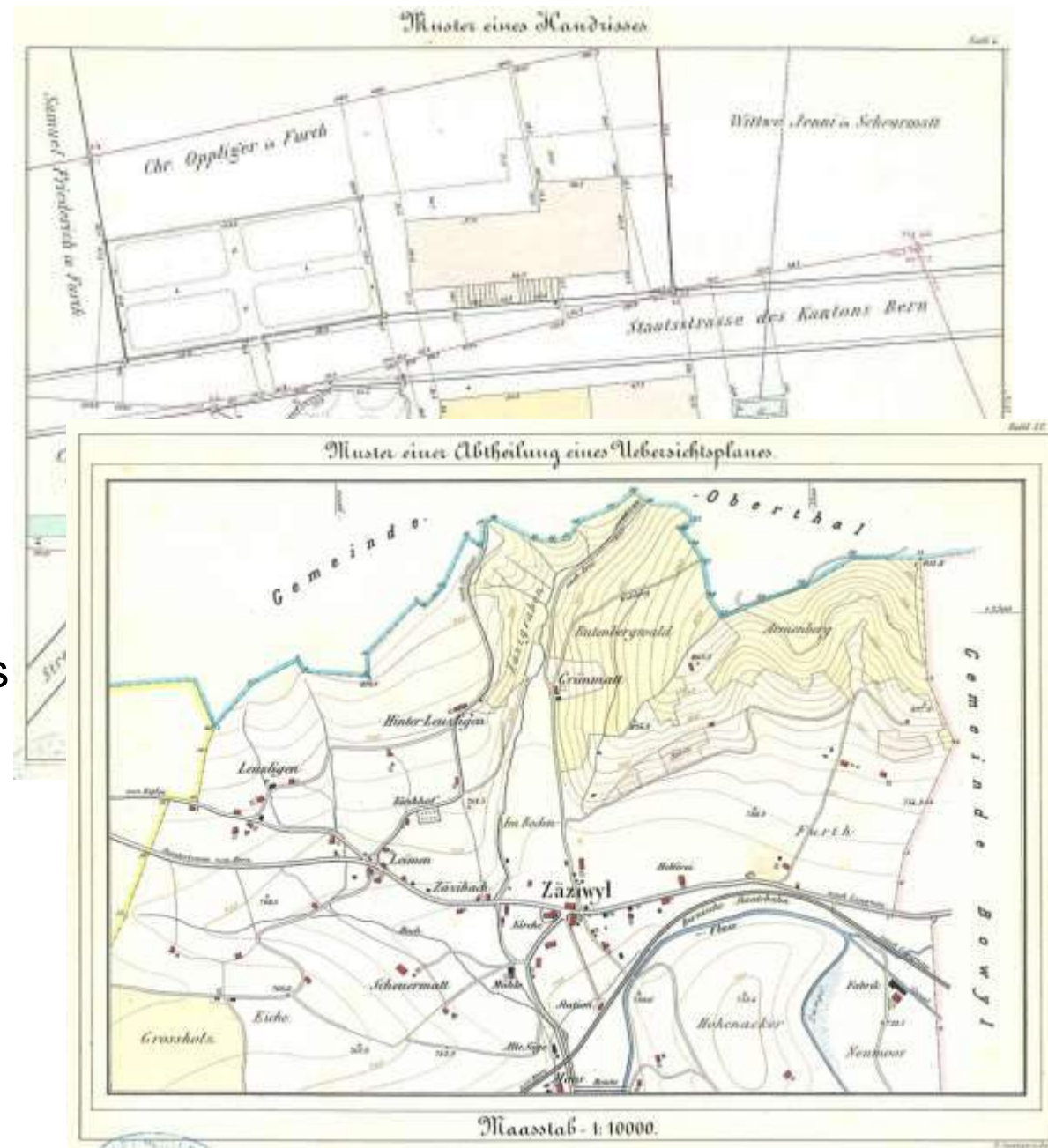


- 17th century: first cadastral plans for fiscal purposes ("Zehntenpläne"), on municipal level in some cantons
- 1803-1812: French cadastral surveying in some occupied territories
- after ~1815: cadastral surveying in some cantons, following the French example, plane table surveys based on triangulation, at scales of 1:1'250 / 1:2'500 / 1:5'000
- 1860s: "Surveyors Concordat" of 12 cantons to standardize the cadastral surveying system and the licensing of the cadastral land surveyors
- 1912: enactment of the civil code, adding a standardized land register to cadastral surveying, transition from fiscal to legal cadastre
- 1919: technical instructions for systematic cadastral surveying, with aim to finish within 60 years



History – Content / Organization

- next to systematic "cadastral maps", cadastral surveying also had to produce a "general map" with topographic elements
- the content of cadastral surveying was rather rich
- in most cantons cadastral surveying was mandated out to private sector land surveyors since the 1860s





History – Issues in the 1980s

- full territorial coverage – planned for 1976 – has not been achieved
- cadastral surveying does not satisfy the expectations of users anymore
- updating of the topographic elements is not satisfactory
- electronic tools (distance measurements, calculations, plotting of plans, etc.) become more and more important
- users of cadastral data such as architects, construction engineers, facility companies, etc. start to digitize cadastral data on their own
- fixed tariff system for private sector land surveyors is based on (traditional) methods

TABLE OF CONTENT

- History
- **Digital Format**
- Opportunities and Future Challenges
- Conclusions



Digital Format – Reform of Cadastral Surveying in 1993

Principles of Reform Project RAV:

- Minimum of regulations on the Federal level
- avoidance of double data acquisition
- increase of data actuality
- freedom of data acquisition method
- **data as basis for LIS as well (not only registry)**

1992

Legal basis for **AV93**:

- Ordinance for Official Surveying (**VAV, 1.1.1993**)
- Technical Ordinance for Official Surveying (**TVAV, 1.7.1994**)

RAV = Reform der amtlichen Vermessung

VAV = Verordnung über die amtliche Vermessung

TVAV = Technische Verordnung über die amtliche Vermessung

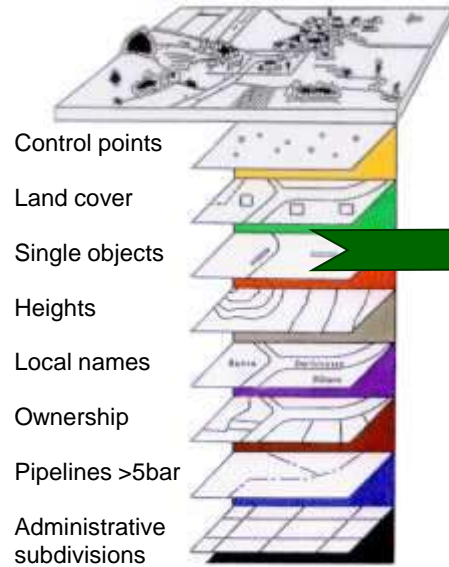
Two relevant achievements:

- extension of purpose (data not only for land registry, but also for land information in general)
- need of flexible data exchange mechanism

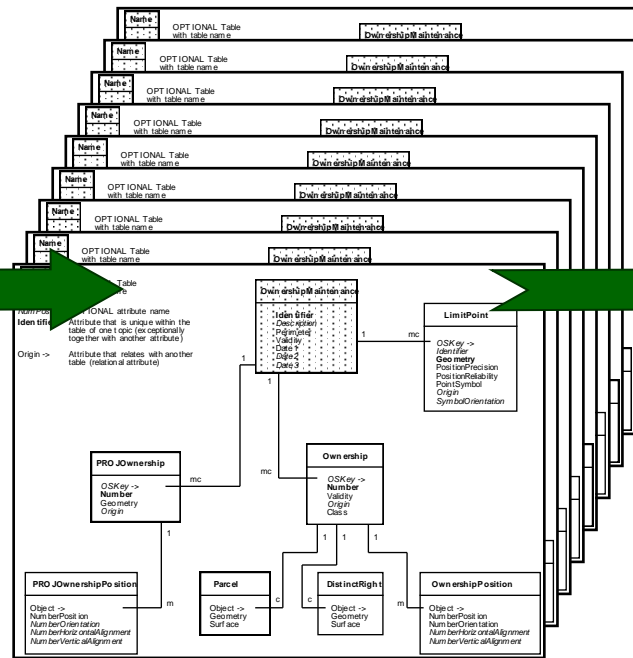


Core Data Model of Swiss Cadastral Surveying

Digital data description AV93 (introduced in 1993)



8 Information Layers
(Possibility to manage the layers separately)



Data Model (UML)
(8 Entity-Relationship-Diagrams)

```
TRANSFER Data_Catalogue;
MODEL Basic_Data_Set
DOMAIN
  LKoord = COORD2 480000.000 700000.000
                840000.000 300000.000;
  HKoord = COORD3 480000.000 700000.000 0.000
                840000.000 300000.000 5000.000;
  Height = DIM1 0.000 5000.000;
  Precision = [0 .. 300];
  Reliability = (yes, no);
  LetterOrientation = GRADS 0.0 400.0;
  Status = (planned, valid);

TOPIC Control_Points =
  .....
END Control_Points;

TOPIC Land_Cover =
  .....
END Land_Cover;

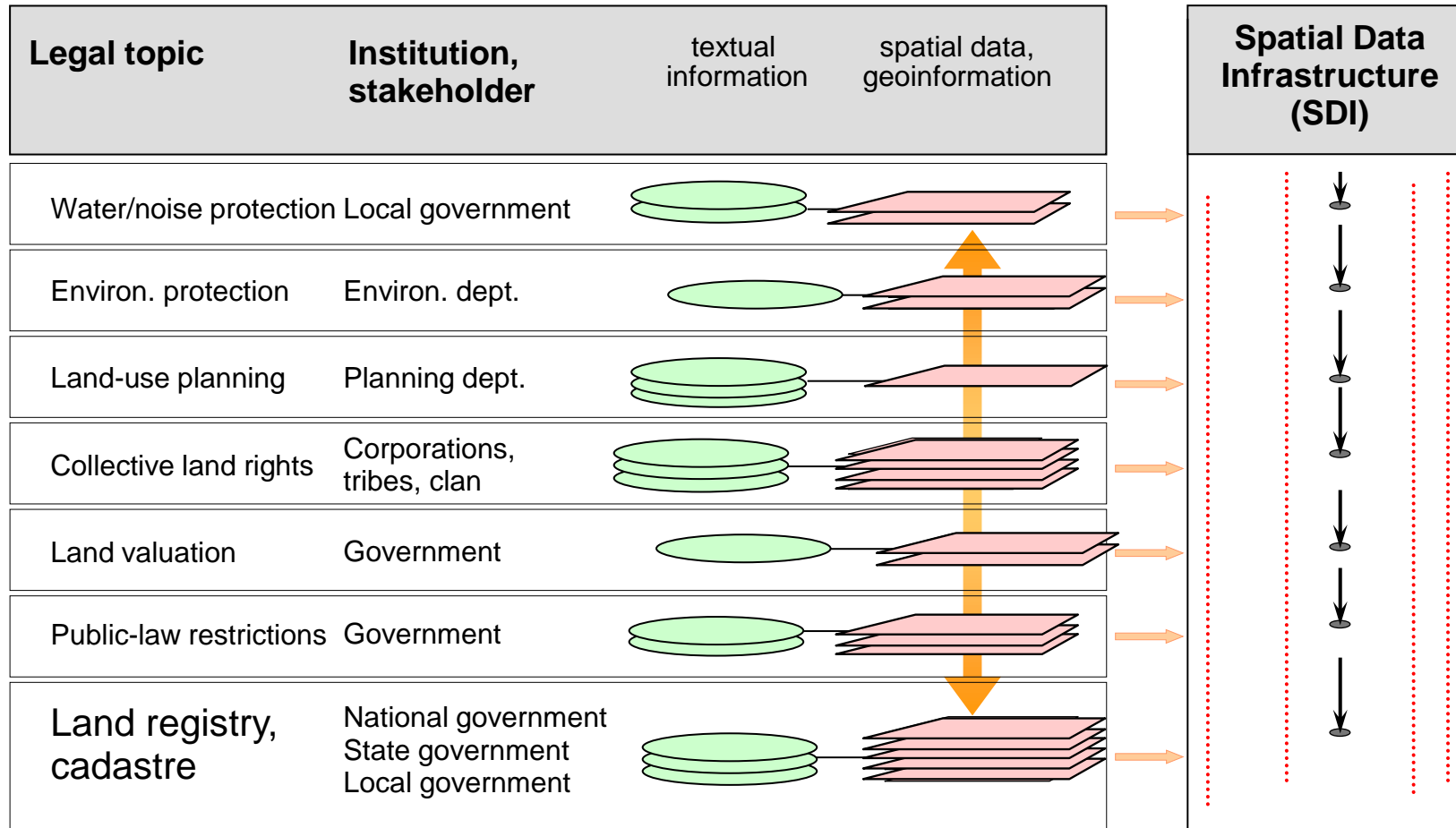
TOPIC Ownership =
  .....
  OwnershipType = (parcel, distinct_right,
                  construction_right, water_source_
                  right);

TABLE LimitPoint =
  OSKey: OPTIONAL -> OwnershipMaintenance;
  Identifier: OPTIONAL TEXT*12;
  Geometry: LKoord;
  PositionPrecision: Precision;
  PositionReliability: Reliability;
  Origin: OPTIONAL TEXT*30;
  SymbolOrientation: OPTIONAL LetterOrientation;
  !! Default: 0.0
  IDENT
  Geometry;
END LimitPoint;
END Ownership;
END Basic_Data_Set.
```

Data Description Language
INTERLIS



Common Data Integration Concept



Four basic principles for a common data integration concept:

- 1) to respect the legal / institutional independence of stakeholders
- 2) to use a standardized data modelling concept
- 3) to use a common geodetic reference framework
- 4) no logic relations between objects in different topics except through geographic location

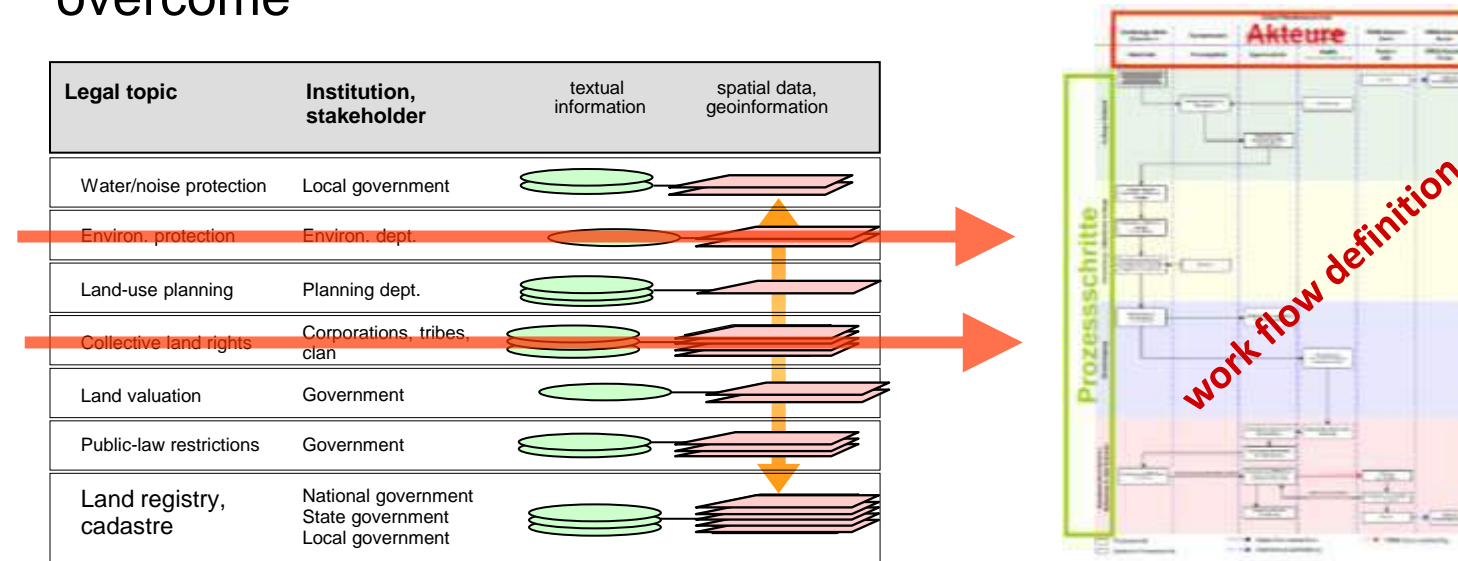




Independent information layers

Advantages:

- stakeholders can look after their own data sets, they only have to respect the defined basic principles
- the fear of stakeholders – losing control over their data – can be overcome



- work flow and data flow can be clearly defined and managed for each stakeholder independent from the others



Legal basis



Swiss Civil Code, 1912

- **Security of ownership**, efficient land market, and mortgaging of real estates

Ordinance on Cadastral Surveying, 1993

- **Digital format** of cadastral surveying, extension of purpose beyond land registry to information systems

Act on Geoinformation, 2008

- A **uniform legal basis** for **all land information** based on the various federal decrees (incl. cadastral surveying)
- A legal basis for the introduction of a **cadastre for public legal restrictions on landownership rights (PLR-Cadastre)**



Landownership: the macro-economic dimension



The Swiss cadastral system secures real estate values in the order of EUR 2,000 billion, of which approx. EUR 900 billion of mortgages are given out (more than EUR 100,000 per population).

The documentation of PLRs potentially can improve transparency and security of landownership; if the effect is only 0.1%, it would correspond to EUR 900 million.



17 Public-law restrictions in Swiss cadastre (full coverage by 2020)

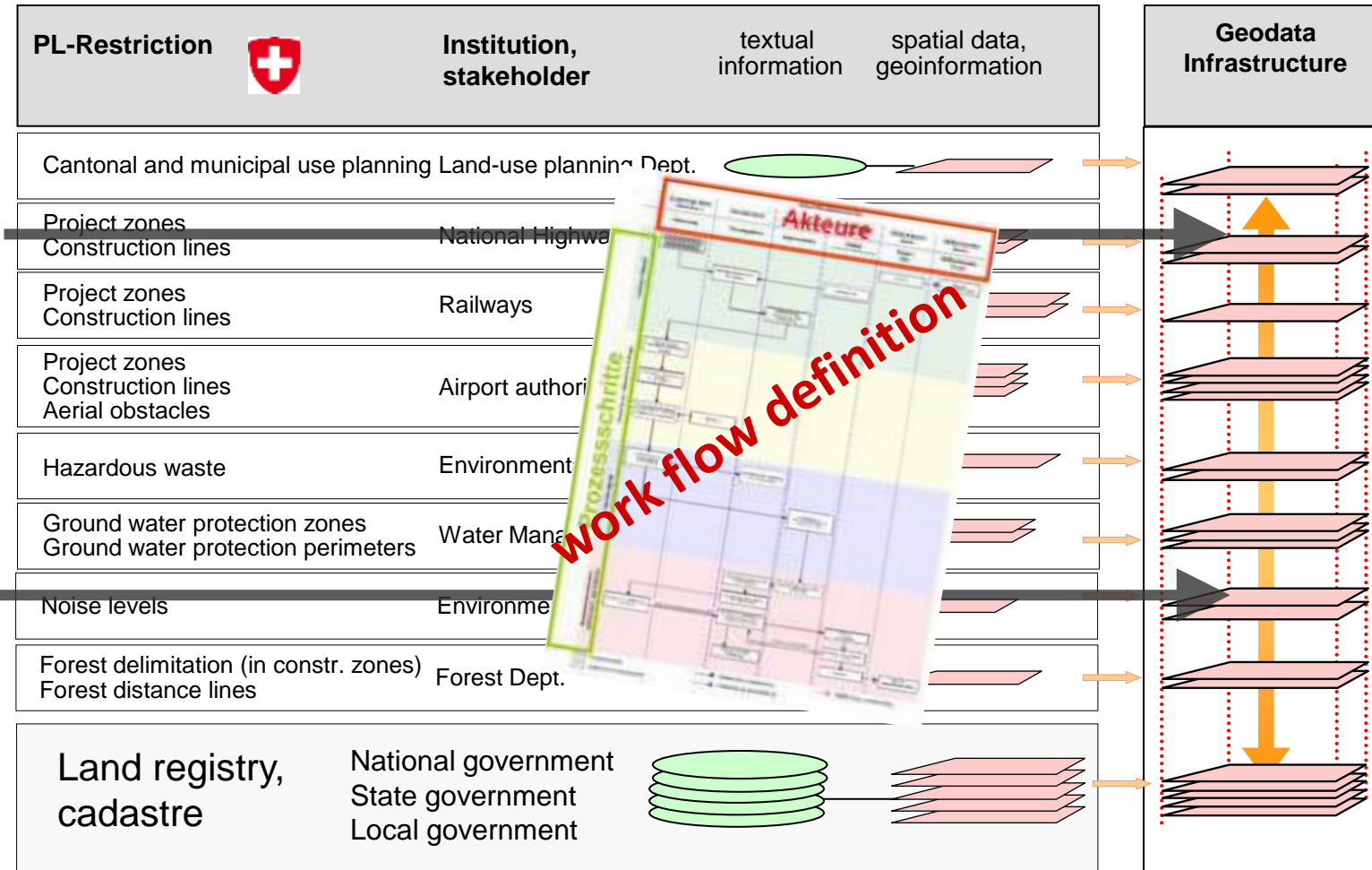


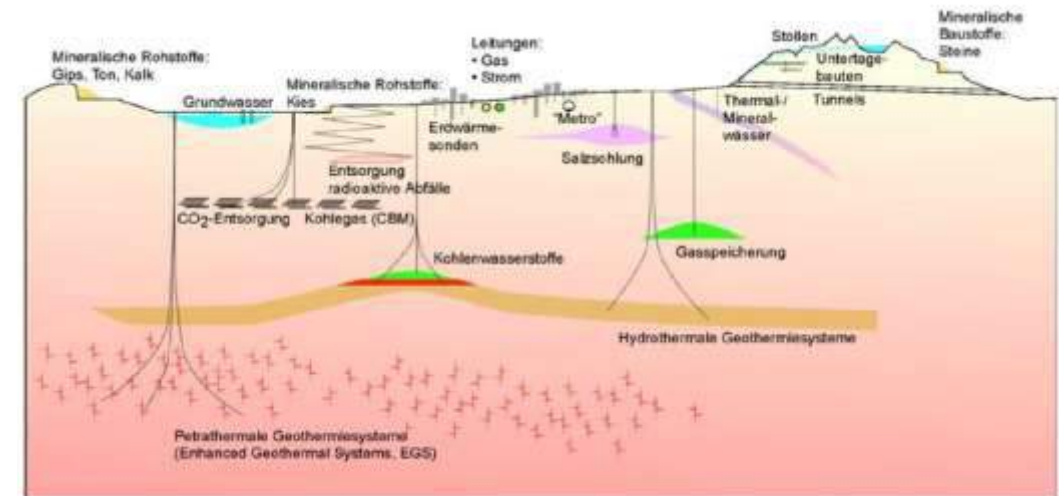
TABLE OF CONTENT

- History
- Digital Format
- **Opportunities and Future Challenges**
- Conclusions



Switzerland – «There is Chaos in the Underground»

- Postulate by Member of Parliament in 2011: Gov. is requested to explain:
 - (i) how the use of the underground is legally regulated; and
 - (ii) what opportunities and concepts exist for the better regulation and sustainable use of the underground.
- Report from the Federal Office for Spatial Development (ARE) in 2014 with the recommendation
 - ... to investigate how the extension of official cadastral surveying and the cadastre of PLRs into the underground as well as the harmonization of the cadastre of underground utilities can help to satisfy the requirements for the 3rd dimension.





Global – Towards Sustainability

- Sustainable Development needs a sound Land Administration System (FIG-Bathurst Declaration, 1999)
- World Bank Land and Poverty Conferences since 1999
- 17 Goals of the 2030 Agenda for Sustainable Development (UN, 2016)
- Integrated Geospatial Information Framework IGIF (UN-GGIM, 2018)
- Framework for Effective Land Administration FELA (UN-GGIM, 2020)





European Level

- EU Directives and initiatives: INSPIRE, High-Value Datasets, Green Deal, etc.
- **Next Generation EU agreement (NGEU)**: EU stimulus package to overcome the immediate economic and social damage caused by the pandemic
- **Recovery and Resilience Facility**: part of the EU multiannual financial framework to support public investments and reforms set out in the recovery and resilience plans
- The EU will implement the **green and digital transition** with the following reforms and investments for achieving a public administration fit for the future:
 - Better policymaking and implementation, enhanced transparency, trust and integrity in the public sector
 - Digital transformation of public sectors and enhanced service delivery for citizens and businesses
 - An attractive and dynamic civil service delivering for tomorrow



Swiss Think Tank "Dimension Cadastre" Discussion Paper 2017 – Paths to Digitisation

- identifies four elements of megatrends that may affect the cadastre
- call on the profession to keep eyes open



<https://www.cadastre.ch/en/services/publication.html>



Four opportunities for the future of the cadastre

1
Data: the basis of the digital revolution

→ RECOMMENDATION 1

Data science is a new area that will supplement the field of geodata as we know it today. It is therefore essential that Swiss universities introduce studies for **geodata scientists**.

2
Meta platforms for a high level of market dominance

→ RECOMMENDATION 2

In the future, people will access public services via apps. Requests will be carried out through application algorithms. Public administrations will have to operate **meta-platforms** for the future provision of their services. In addition, they can manage their official data and algorithms in the form of (geo)services available to other meta-platforms operated by other third parties (public or private). An example might be BIM (Building Information Modelling).



Four opportunities for the future of the cadastre

3 Revolutionising registers through the use of Blockchains



RECOMMENDATION 3

Blockchain technology is moving in the direction of distributed ledgers, i.e. distributed, transparent and high-security registers. This development will have a particularly strong impact on the public sector, which will have to react swiftly and offer such services as quickly as possible, especially in the context of the land register.

4 Towards an administration and governance of variable geometry



RECOMMENDATION 4

The "Smart Cities" concept will affect the structure of public administrations. Smart Cities will sit across different territories (municipality, canton or region, e.g. Greater Geneva) and will be digital rather than bureaucratic. Administrations therefore have to create **smart data** that form the digital building blocks **for Smart Cities**.

EU Ministerial Declaration on eGovernment, signed in Tallinn on 6 Oct. 2017

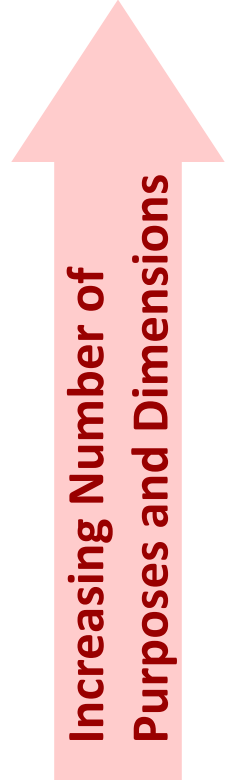
- signed by 28 EU countries (incl. GB) + IS, FL, NO, CH
- ... the overall vision remains to **strive to be open, efficient and inclusive, providing borderless, interoperable, personalized, user-friendly, end-to end digital public services to all citizens and businesses** – at all levels of public administration.
- Policy action lines:
 - 1) Digital-by-default, inclusiveness and accessibility
 - 2) Once only
 - 3) Trustworthiness and Security
 - 4) Openness and transparency
 - 5) Interoperability by default
 - 6) Horizontal enabling policy steps

TABLE OF CONTENT

- History
- Digital Format
- Opportunities and Future Challenges
- **Conclusions**



Evolving Dimensions of the Cadastre



Increasing Number of Purposes and Dimensions

Description	Aim, Purpose	Effect
Digital transformation	Linked Data, Internet of Things, Big Data	to support E-Government, to connect with Smart Cities and BIM
Extension of geometric dimensions	document 3D owner-ship situations	enable planning and coordination above and under-ground
Extension of legal dimensions	documentation of public-law restrictions	more transparency in legal terms, more transparent land market
Digital format	maintain data digitally	interoperability, basis for Spatial Data Infrastructures
Traditional cadastre	documentation of land-ownership rights	legal, social, and economic security



The Swiss way of thinking ...

- data and information need to be shared among partners (horizontal, vertical, across sectors), therefore **data exchange** is essential;
- clearly defined **data models** are fundamental; we do not talk of maps and plans anymore, we are talking and thinking of data sets; the data models need to be under the control of the **public sector** (not software companies or private sector organizations);
- the **four principles of the "Common Data Integration Concept"** need to be followed by all partners; only then a modular and flexible Geodata Infrastructure can be established and operated.



VPRAŠANJA / QUESTIONS