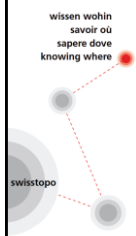
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Landestopografie swisstopo
Eidgenössische Vermessungsdirektion



Land Administration and Management – Towards the Fifth Dimension

Geoconference on Cadastre 4.0
Coimbra, Portugal, 25/26 Oct. 2016

Dr. Daniel Steudler

Towards the Fifth Dimension

- Swiss Think Tank "Dimension Cadastre"
- Trends and Developments
- Social and Economic Context
- Beyond 2D
- Conclusions

Dimension Cadastre – Beyond Limits

- Think Tank active since 2012;
- aim is to identify the current trends in the geoinformation field and to develop a strategy for the cadastre;
- Swiss cadastral system is well advanced: digital, well conceptualized, close to full coverage, legally comprehensive;
- issues in Switzerland are mainly organizational (federalist environment) and structural;
- a first result of the Think Tank is a Discussion Paper published in May 2014
  → identify trends and developments
  → open eyes and minds of professionals

available in 4 languages
(www.cadastre.ch/vision/)

Changing World

- from drawing board and pencil to computer technology
- from terrestrial measurements to photogrammetry and GNSS
- from analogue to digital
- from paper maps to databases to knowledge bases

- technology push vs. citizen pull
- trend from written word to imagery
- social media

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Towards the Fifth Dimension

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Identified Trends

Objects of the Cadastre

The legitimate often prevails over the legal

Big Data and Data Mining

Data mining is going to speed up the mass exploitation of "big data"

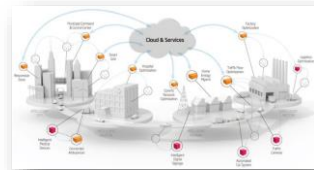
Ubiquitous Mobility

© http://cosstech.com

Crowd-sourcing, Augmented Citizen

Citizens as the nation's number one geomaticians!

Internet of Things, Linked Data



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Numerous political decisions depend on official data

Sooner or later it will be necessary to regulate algorithms

1. Positioning instead of field surveying

Algorithms and positioning will do the job → the end of classic land surveying. There won't be a need for surveyors in the future anymore in order to get measurements done, no need for "heavy" interventions in the field with instruments; the job may be done – in real-time – by drones or other virtual representations (imagery, calculations, etc.).

- **We need a strategic vision: Who does what in the future? What legal basis will be required? How can we share responsibilities between administrative levels and between public and private sectors?**

2. Private property & public property – the basis for a common asset

Land is more than just a privately or publicly owned property. It is also a "source of knowledge": the history of its use, specific features from the past and present, limitations, and future projects. By linking such information, new knowledge can be gained.

- **Land will be more than just the object to be surveyed. The awareness that land can tell a story – to be read and interpreted – can lead to a reorientation of the cadastre.**

3. The parcel will have a unique identifier and some sort of «intelligence»

If an IP address (URI) is assigned to each parcel, it becomes conceivable to also include a smart chip in each parcel. That would make it possible to link the parcel – in real time – with different information, such as weather data, seismic hazard, geological information, pollen data, noise pollution etc.

- **The traditional, isolated parcel is to become a cell in a living landscape.**

Making the invisible visible…

The landscape becomes the map

From:
Cadastre 2034 – A 10-20 Year Strategy for developing the cadastral system

Land Information New Zealand
Toitū te whenua

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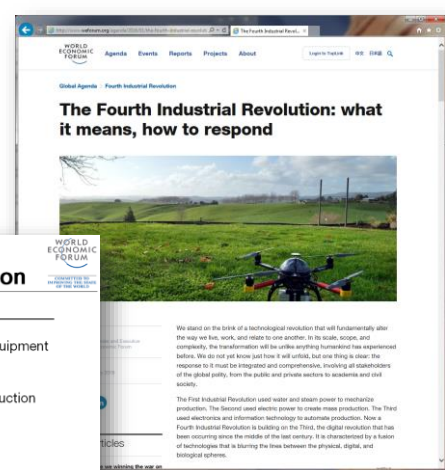
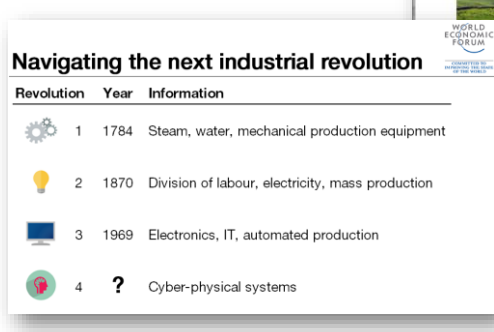
WEF 2016: The Fourth Industrial Revolution

WORLD ECONOMIC FORUM





Social and economic context today and tomorrow

Third Industrial Revolution (Rifkin, 2013):

- drastic changes in **communication technology** in terms of connectivity, speed, and volume
- drastic changes in the **energy** production and consumption, more decentralized solutions, Internet of energy

- increased participation, closer cooperation between producers and consumers, decentralization:
  - examples: open data, AirBnB, Uber, Wikipedia, sharing platforms (car, bikes, etc.), handicraft web (etsy.com), Tripadvisor, Facebook, Twitter, eBay, booking platforms, OpenStreetMap, etc.
  - music industry and bookselling trade did undergo revolutions
  - finance sector: bit coin, digital transactions, mobile payments (Apple Pay, Android Pay, etc.)
  - supply is not happening any longer from a few central supply points, but will be much more decentral with shorter distances and closer contact between suppliers and consumers

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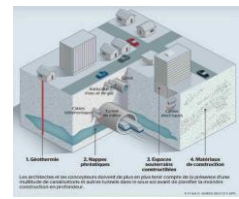
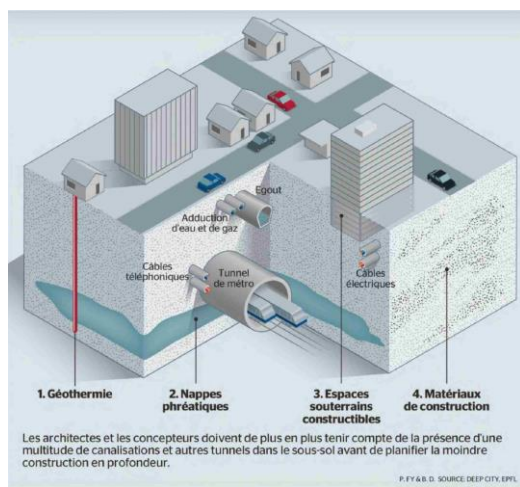
Five Dimensions for a Cadastre

- 1st Dimension (points)
  - control points as the basis
- 2nd Dimension (area)
  - cadastral surveying has been conducted in 2D so far; the 3rd dimension has been treated separately
- 3rd Dimension (volume)
  - 3D-Cadastre, documentation of facts also in 3D; the focus, however, will probably be more on the underground



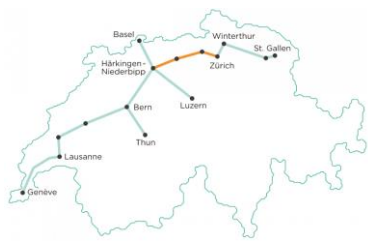
- 4th Dimension (historization, simulation, projection)
- 5th Dimension (anticipation)

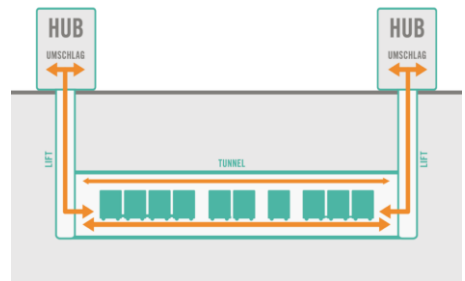
Example for 3rd Dimension: Intensive use of underground



Example for 3rd Dimension: Existing project idea

CARGO SOUS TERRAIN





www.cargosousterrain.ch

4th Dimension

- Historization
- Projection (of the past)
- Simulation

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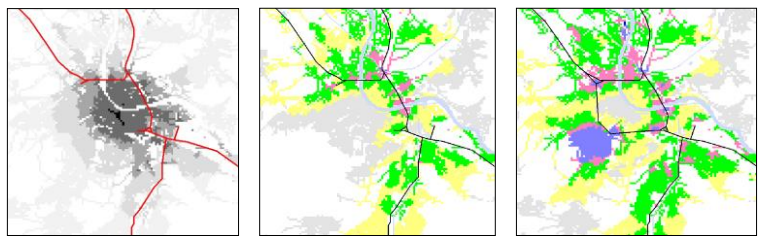
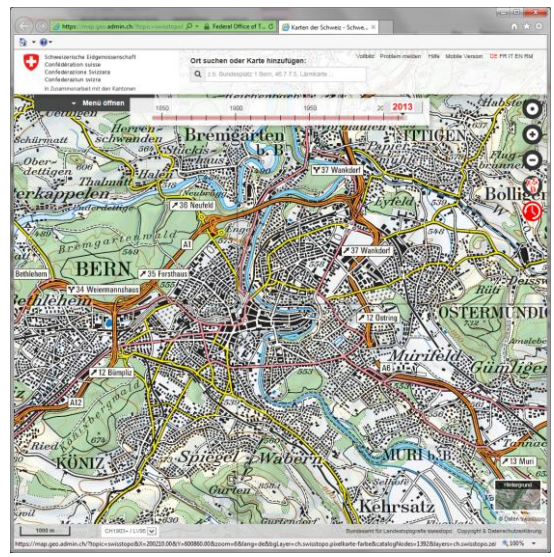


Example for the 4th Dimension

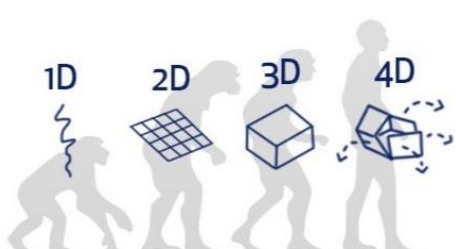
A journey through time at: map.geo.admin.ch

1860
1880
1900
1920
1940
1960
1980
2000
2013



5th Dimension (dimension of anticipation)

- the 5th dimension can be understood as a derivation from the 4th dimension, i.e. anticipation or the ability to **predict** an event or a result;
- tools such as «Big Data» and «Data Mining» are instrumental;
- in that sense, anticipation is more than just the projection of the past into the future.



Examples for the 5th Dimension

Social and economic developments can be made visible with «Big Data» und «Data Mining» in a way not possible before:

- news about earthquakes spread quicker via Twitter than via the official channels;
- next music hits can be detected via social media;
- unusually frequent activities of BlackBerry employees on LinkedIn gave hints to economic difficulties of the company;
- our mobile phones are permanent sensors that help to monitor and improve traffic flow;
- an increased number of requests on real estate portals for particular areas can give hints to where people may want to live, and can be taken into account for land-use planning.

"Ecosystems"

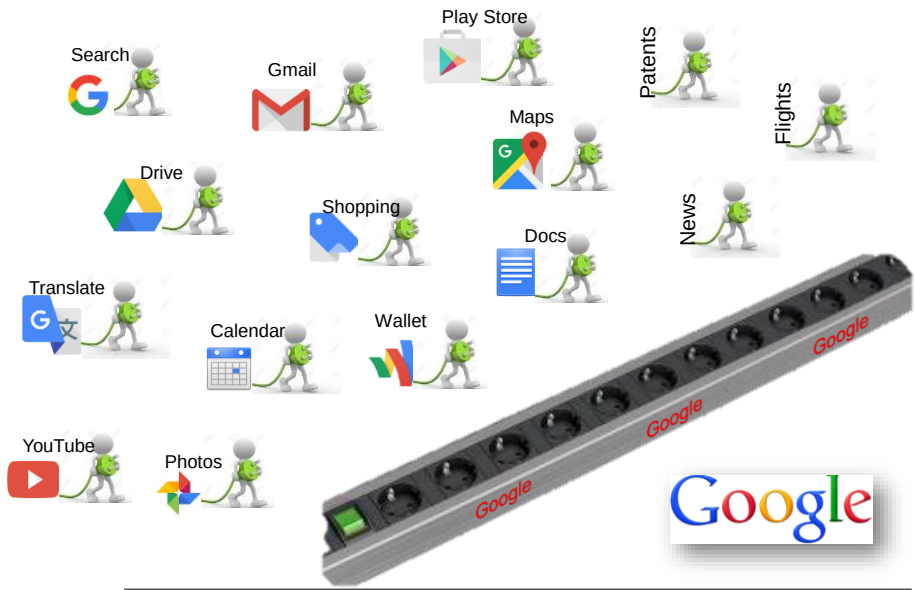
A whole new way of setting up value chains.

Existing examples:

- Sales platforms: IKEA
- App stores: App Store (iOS), Google Play, Windows Store, etc.
- Map services: Google Maps, Apple Maps, Bing Maps, Here, MapBox, etc.
- what about public SDIs, NGDIs ?

The basic idea is to provide an infrastructure / platform, where market participants can "plug-in" their services.

Ecosystem – The Google Way



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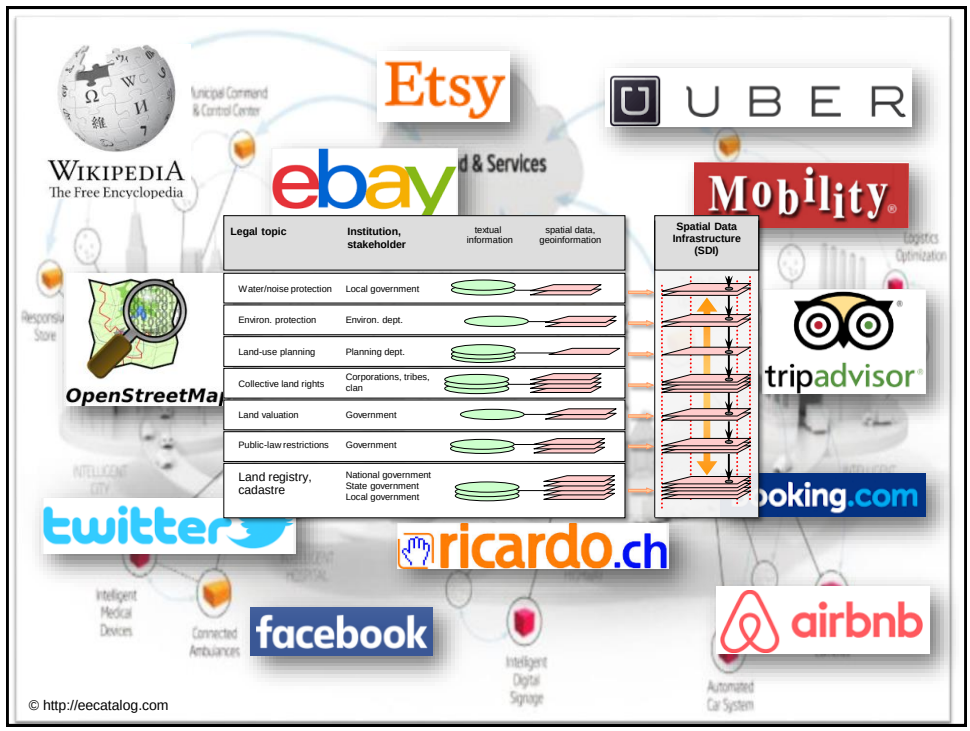

Conclusions

- Our societies are entering the era of the digital economy;
- the social and political context is developing rapidly;
- cadastral systems are systems of documentation: they document facts (rights and restrictions) about land and real estate, and are at the same time a core element of national geodata infrastructures.

Open questions:

- How do cadastral systems fit into such trends and developments as mentioned before?
- How can/should they position and develop themselves?

➢ The aspect of the five dimensions might be a guiding principle.

➢ In regard to the emerging "ecosystems", we may have to rethink the structures of our value chains.