Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

wissen wohin
savoir où
sapere dove
knowing where

swisstopo

3D National Geodata Switzerland Analysis Ready and updated

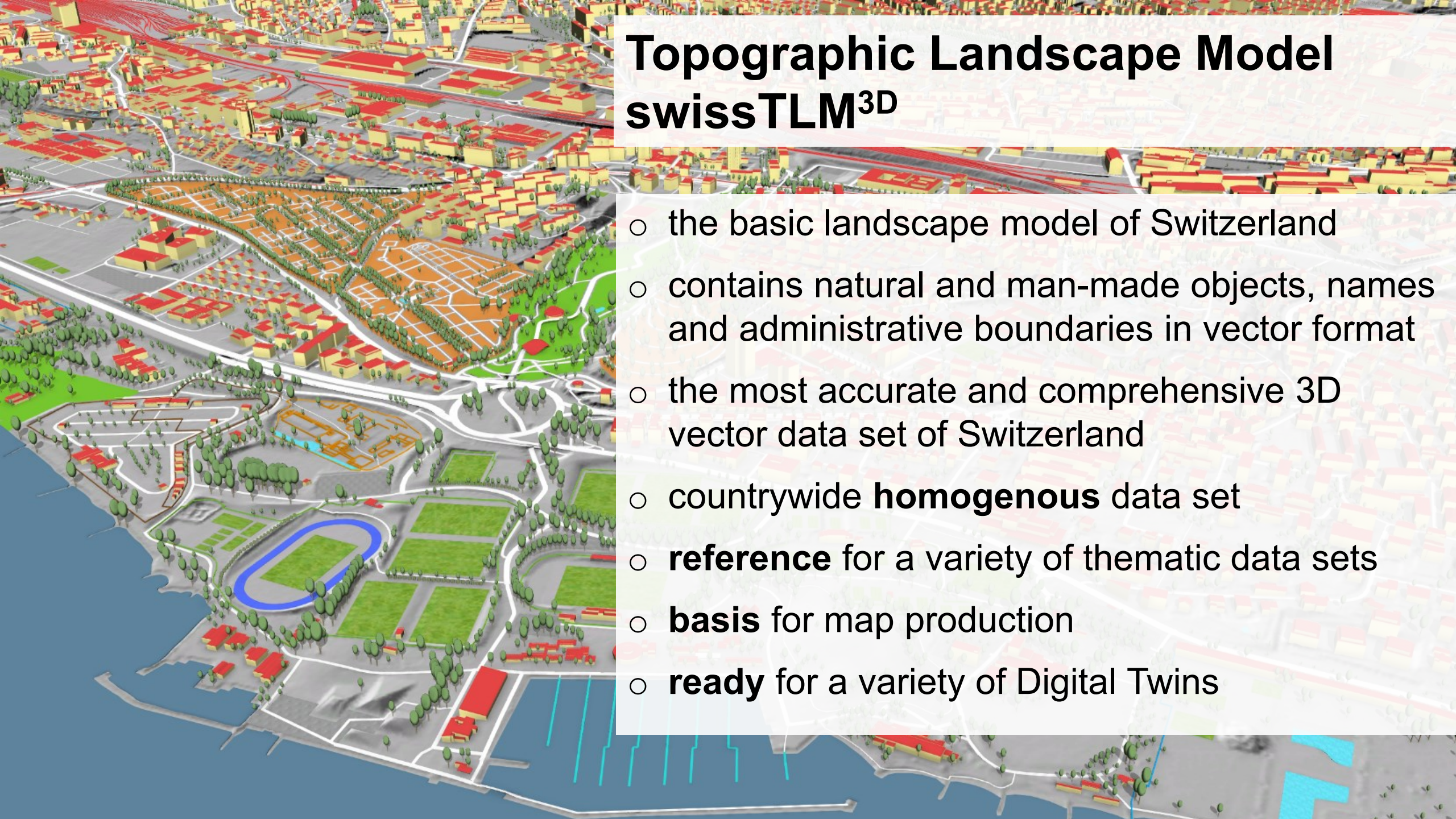
EuroSDR Workshop «The way forward for 3D mapping at national and regional mapping agencies”

21. & 22. January 2026, London

Tobias Kellenberger & André Streilein, swisstopo

Agenda

- **Dataset swissTLM^{3D}**
- Ready for Digital Twins and applications
- Update of 3D elements & Consistency issues



Topographic Landscape Model swissTLM^{3D}

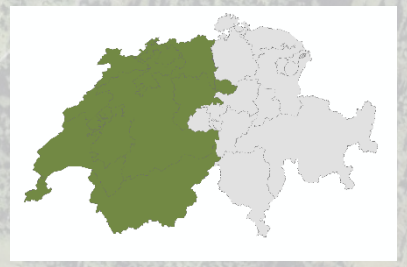
- the basic landscape model of Switzerland
- contains natural and man-made objects, names and administrative boundaries in vector format
- the most accurate and comprehensive 3D vector data set of Switzerland
- countrywide **homogenous** data set
- **reference** for a variety of thematic data sets
- **basis** for map production
- **ready** for a variety of Digital Twins

swissTLM^{3D}

landcover

Total Area

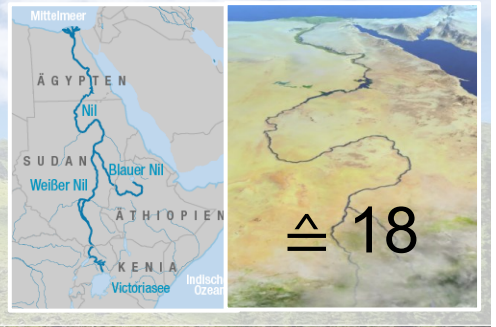
22’594 km^2



hydrographie

Total Length

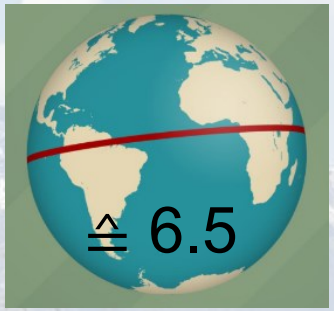
119’865 km



roads

Total Length

260’547 km



public transportation

Total Length

125’189 km

constructions

Total Buildings

3’986’990

swissTLM^{3D}

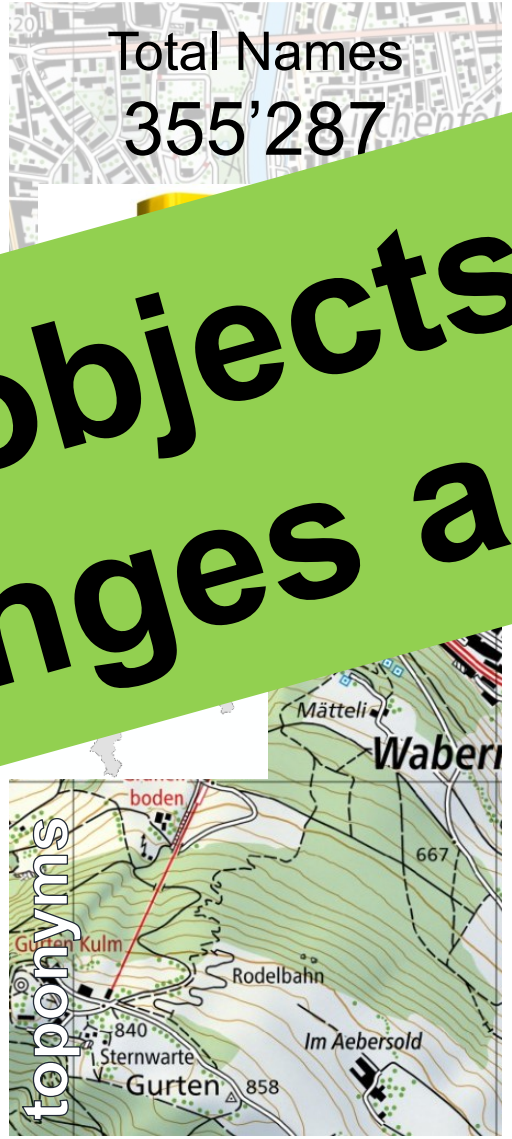
Total Area
712 km^2

Total Objects
23’570

Total Names
355’287

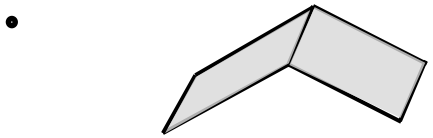
Total Length
km

~37 Mio. objects
~24'000 changes a day

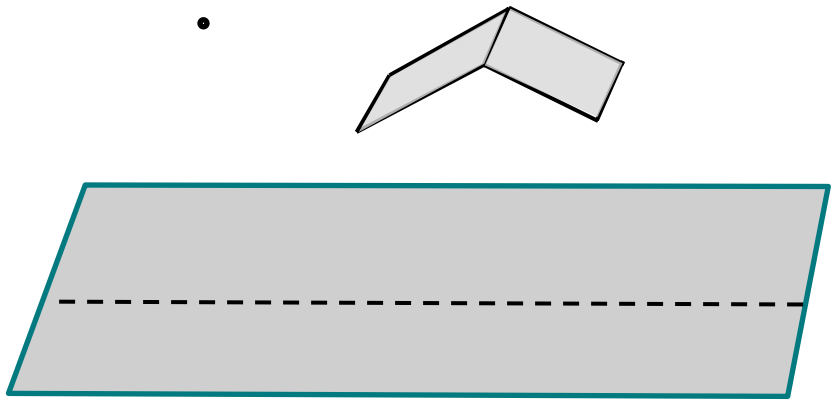


swissTLM^{3D} - data vs. visualisation

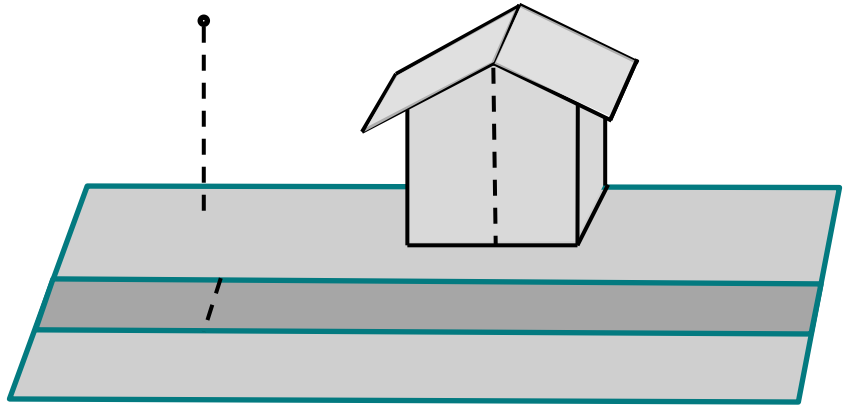
1. swissTLM^{3D} : Points, Polylines, Polygons, Semantic Attributes



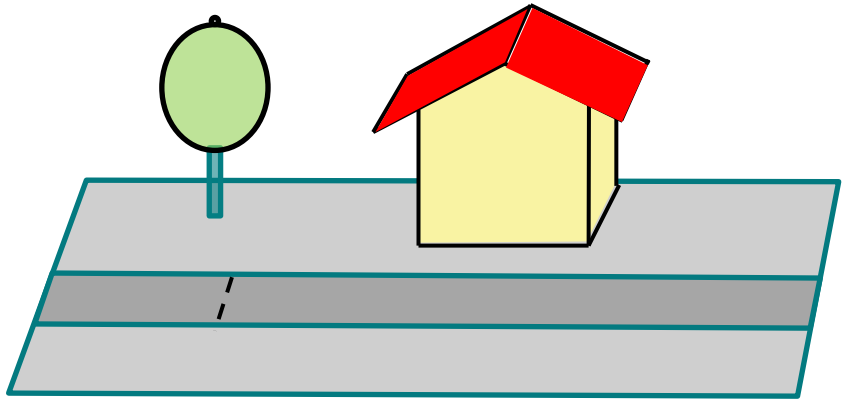
2. swissALTI^{3D}



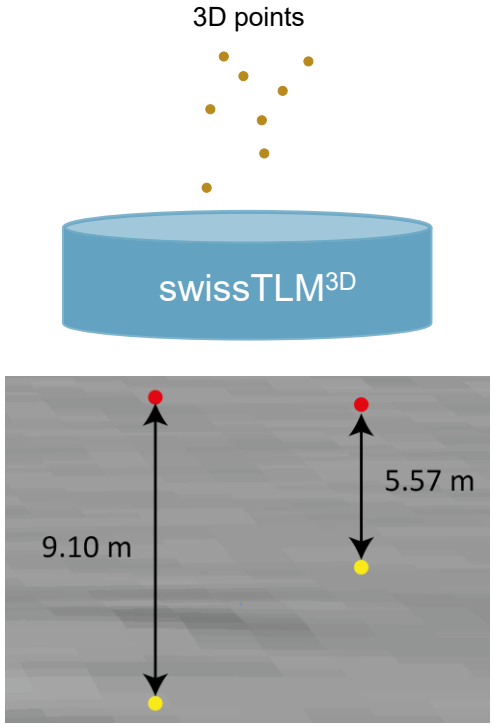
3. Geometric transformation



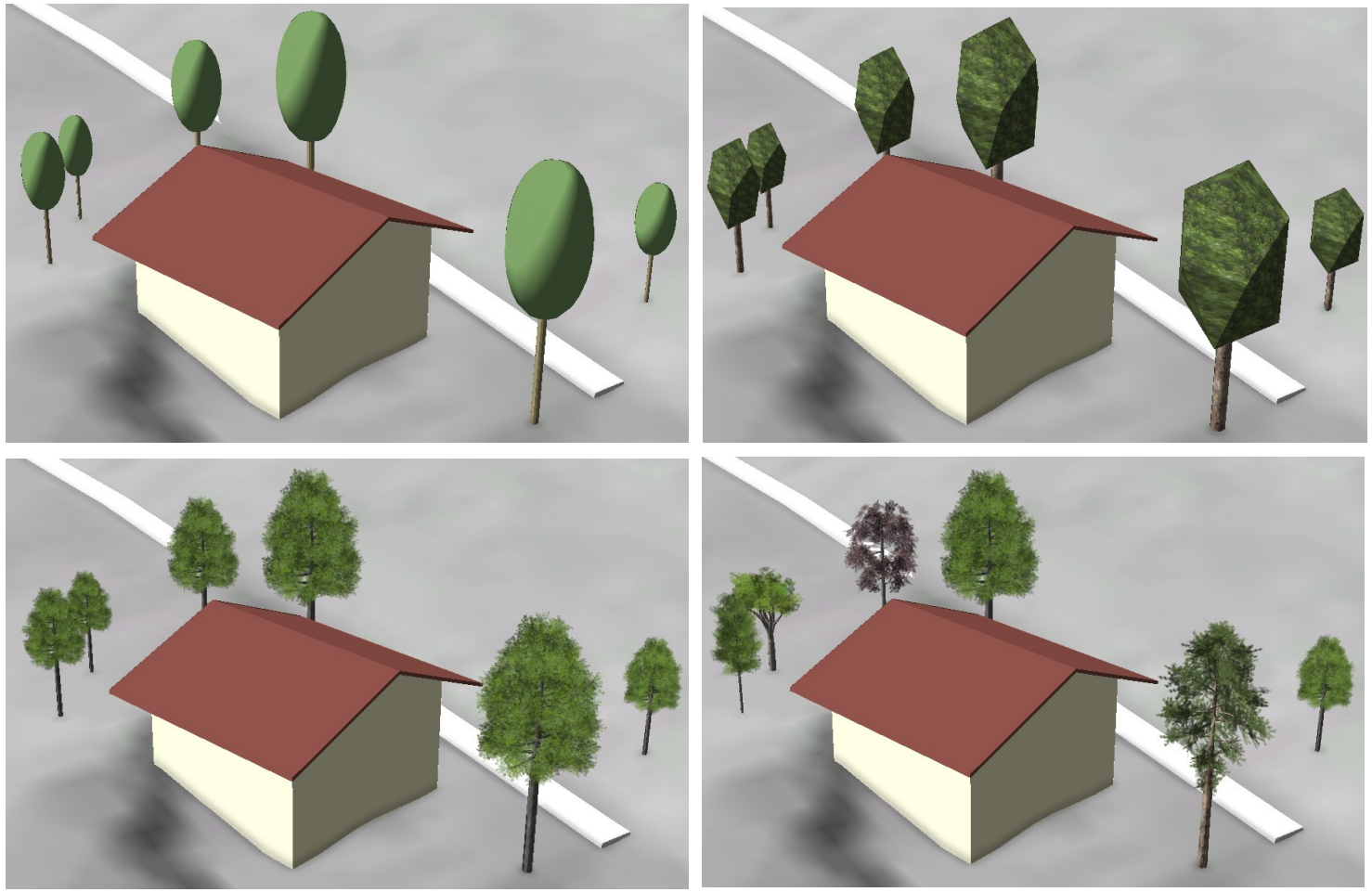
4. Visualisation/Texturing



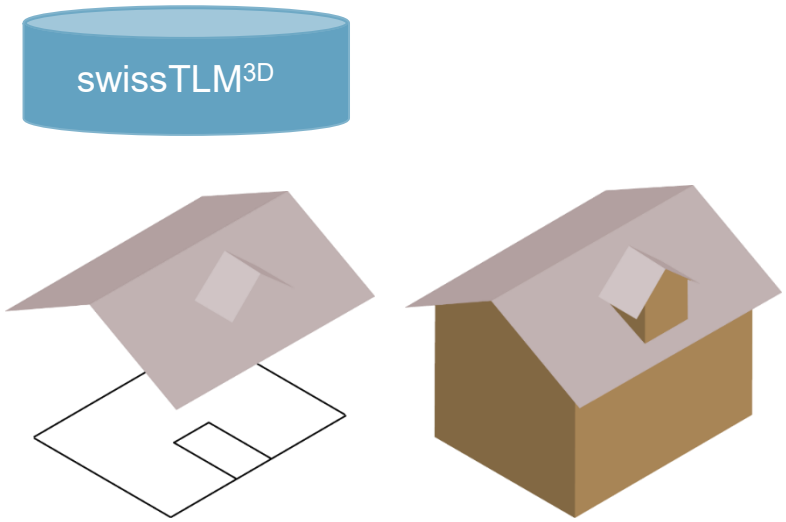
swissTLM^{3D} - data vs. visualisation (vegetation)

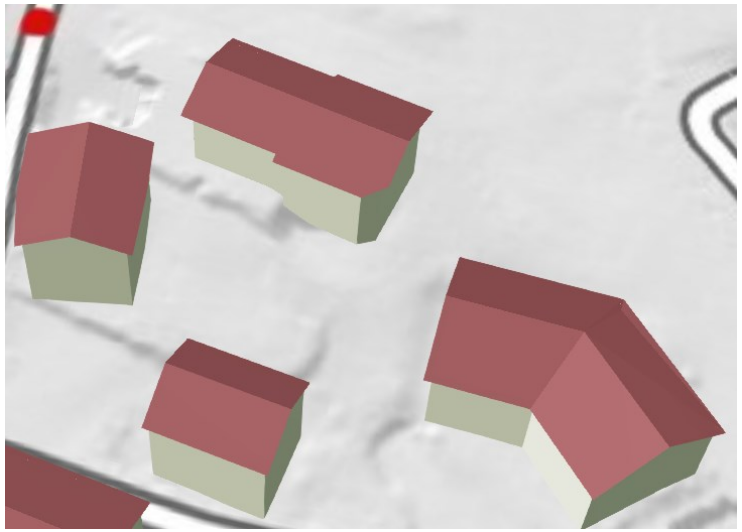


The point is digitised at the top of the tree, making it possible to calculate the actual height and scale the 3D model appropriately.

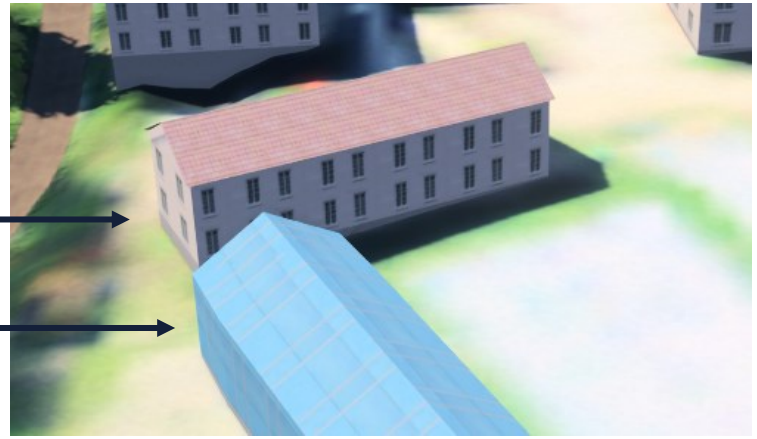


swissTLM^{3D} - data vs. visualisation (buildings)





OBJEKTART	GEBAEUDE_NUTZUNG	EGID	…
Gebaeude Einzelhaus	Schiessstand	1098538	…
Treibhaus	-	1074230	…

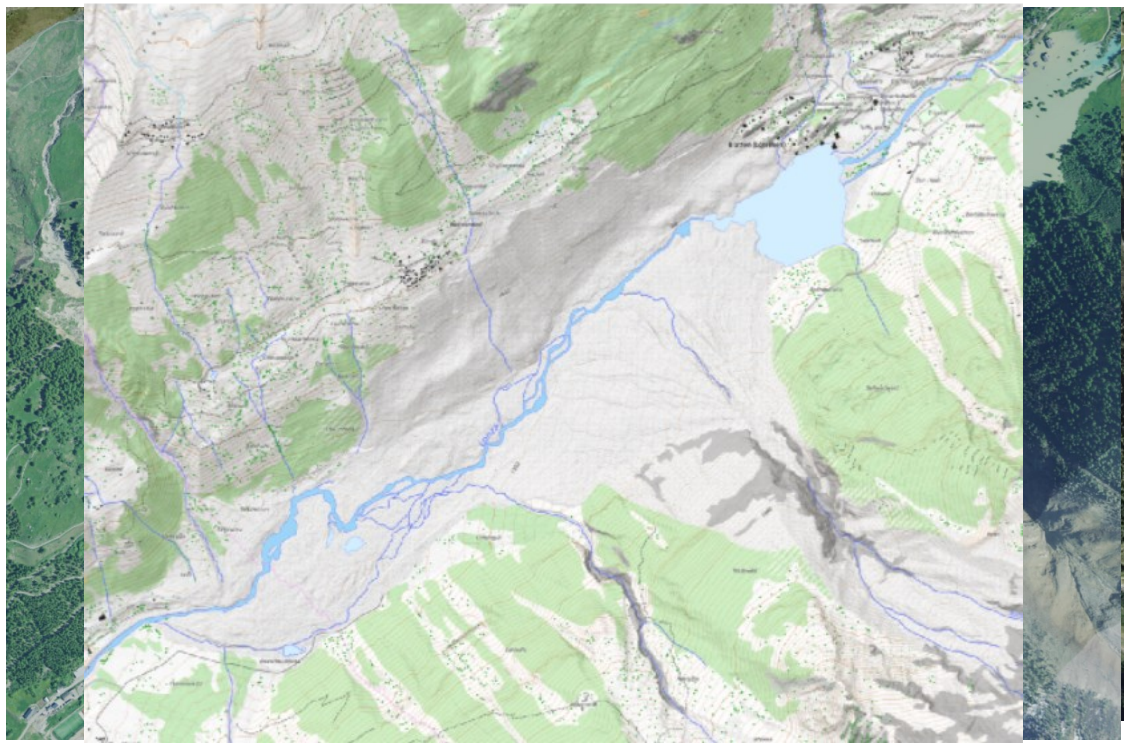


swissTLM^{3D} - an analysis ready system

State and modelling of the development

man-made objects

natural elements

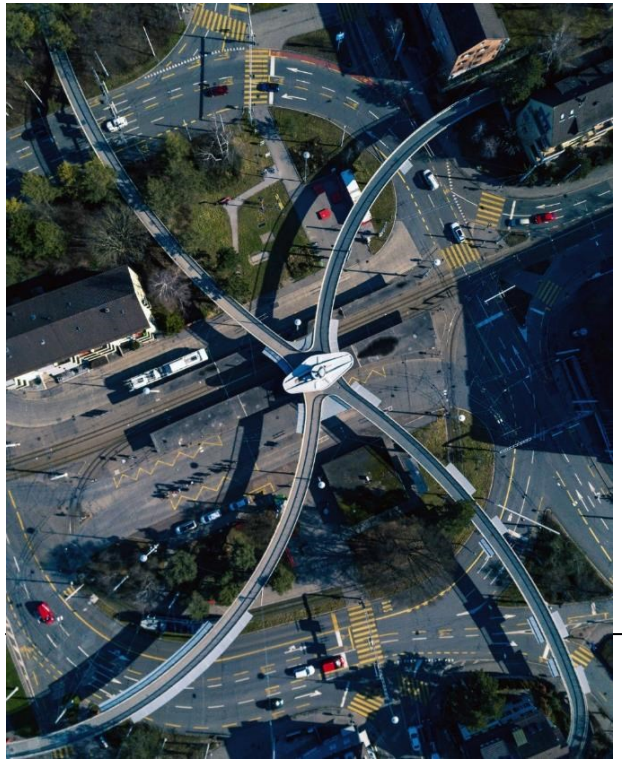


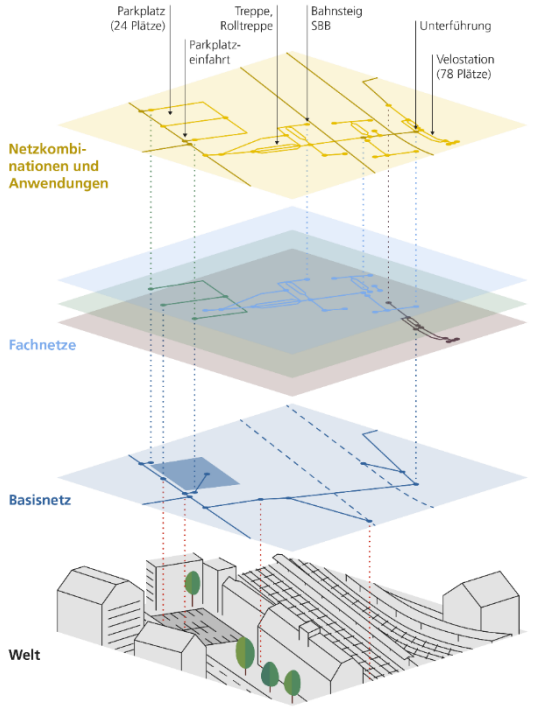
Agenda

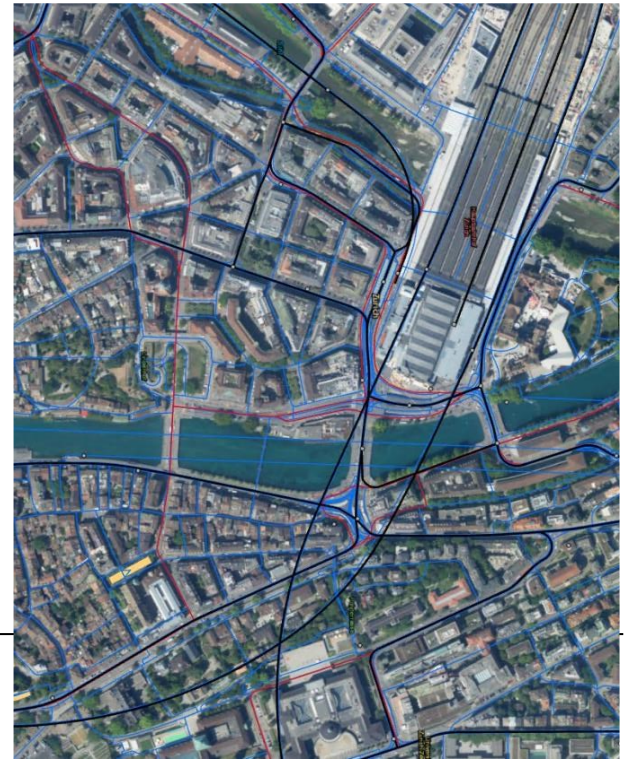
- Dataset swissTLM^{3D}
- **Ready for Digital Twins and applications**
- Update of 3D elements & Consistency issues

swissTLM^{3D} - Ready for Digital Twins and applications

A digital twin is an integrated data-driven virtual representation of real-world entities and processes, with synchronized interaction at a specified frequency and fidelity. *(digital twin consortium)*







Digital Twin for….
Spatial and development planning

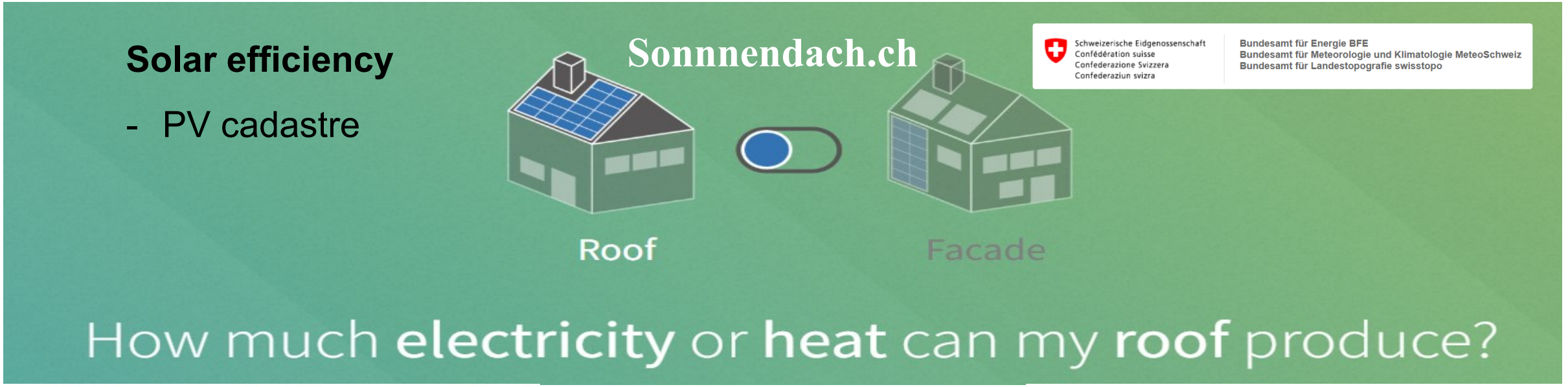
- Site developments and building studies
- Neighbourhood analyses
- **Development concepts**
- Compaction analyses
- Visualisation of building regulations
- Visualisation of usage figures
- Shadow cast and visual axis analyses
- Evaluation of building heights
- Town planning studies

Source: Ville de Nyon; Video: https://youtu.be/um-NPiEUicM

Digital Twin for….
Energy modelling / energy strategy development

Solar efficiency

- PV cadastre



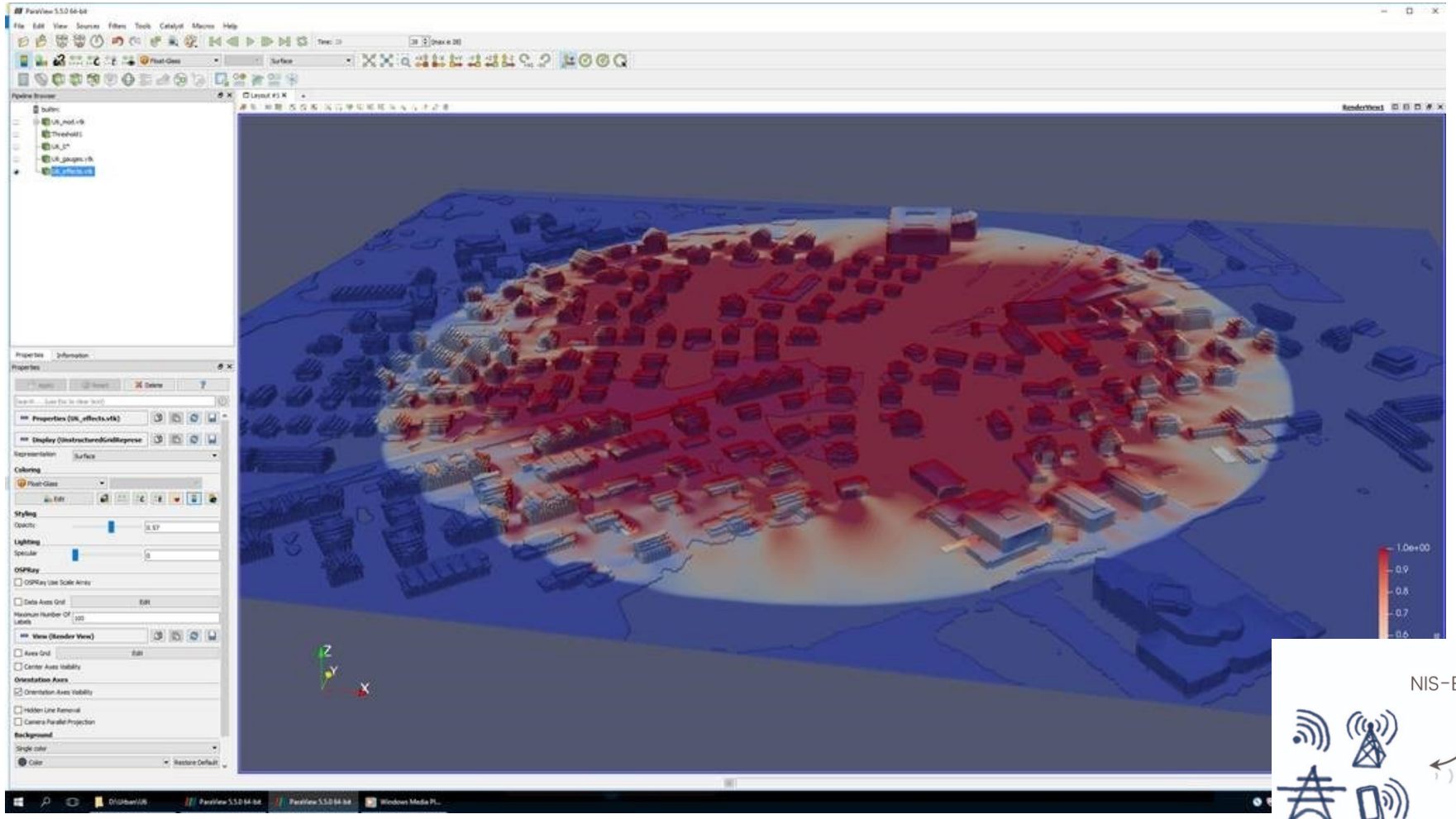
Seftigenstrasse 264
3084 Wabern

Suitability: Very high

Either Solar electricity worth up to 6'000 Swiss francs...

...or Solar heat for 4 % lower heating costs.

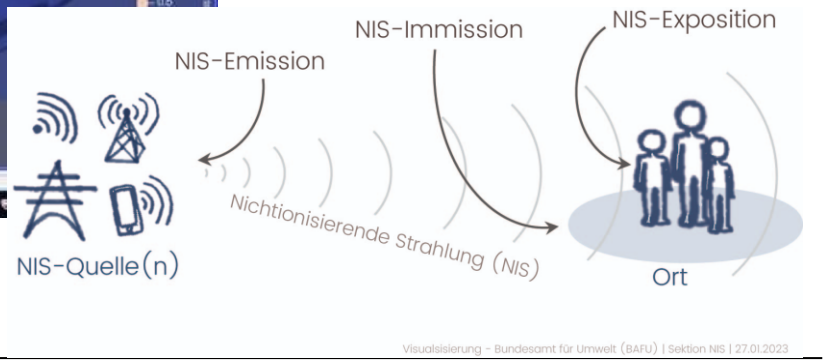
Digital Twin for…. **Analysis and Planning**



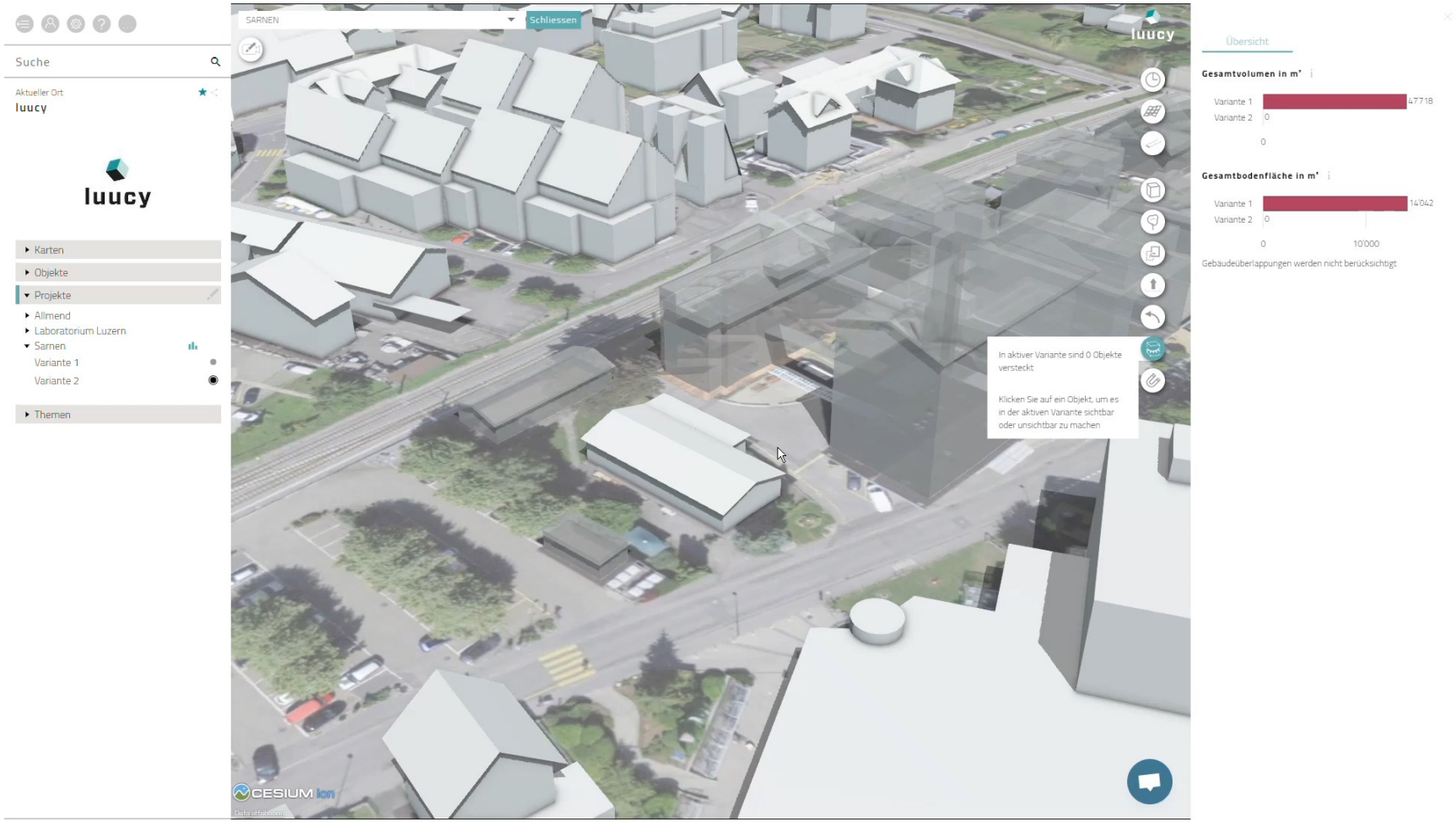
Source: BABS

Non-ionising radiation (NIR) is everywhere in our daily lives:

- electricity transmission lines, electricity supply systems and household appliances generate low-frequency electric and magnetic fields.
- Radio and mobile phone masts, mobile phones, radar systems and microwave ovens generate high-frequency radiation.



Planning of buildings and infrastructure



Digital Twin for…. **many other use cases**

What we as a mapping agency **need** from Digital Twins

Agenda

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- **Update of 3D elements & Consistency issues**

Update of 3D elements – **automated change detection**

- Transport: vector-based CD for railways and roads
- Vegetation: vector-based CD for individual vegetation classes
- **Buildings**: attribute-/raster-/vector-based CD for buildings

building identifier

footprints & cadastre

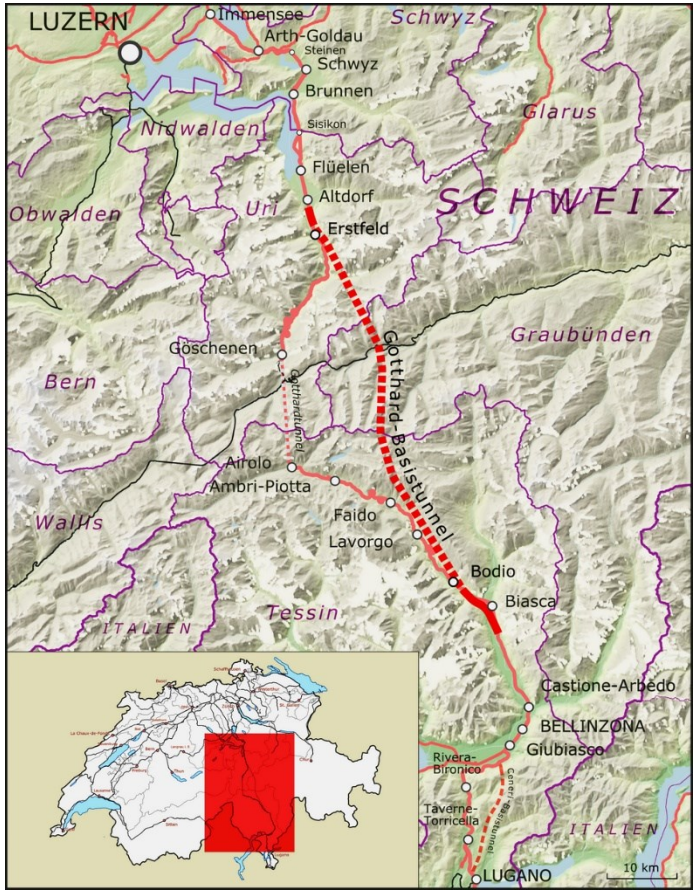
elevation & imagery indices

A major challenge: Consistency in time - the existence of an object in the landscape model

When should an object appear in the landscape model and when should it be deleted again?

Example : Gotthard Railway Base Tunnel

- 1961 first project idea
- 1989 government decides to go ahead with project
- 1999 construction start
- 2010 penetration of the eastern tunnel
- 2011 penetration of the second tunnel
- 2013 test operation
- 2015 inauguration act
- 2016 regular operation



A major challenge: Consistency in time - the existence of an object in the landscape model

swisstopo approach:

element of swissTLM^{3D}

object attributes in the database

- **Project:** Groundbreaking has not yet taken place. Dates are known and financing has been secured.
- **Under construction:** Groundbreaking has taken place.
- **Open:** Official opening has taken place. Depending on the construction project, this may be the opening ceremony or the opening to traffic.
- **Info:** Groundbreaking has not yet taken place. Dates are unknown and financing has not been secured.
- **Closure/demolition:** Operation of the object has been discontinued or demolition has begun.

Open issues

- **A digital twin is an integrated data-driven virtual representation of real-world entities and processes, with synchronized interaction at a specified frequency and fidelity** (*www.digitaltwinconsortium.org*)
- **In the geoinformation world:**
  a digital twin = 3D
- **Not one system – updated database for many decision support systems, distributed via services**
- **Today synchronized interaction often just implicit or even not clear**
- **What about time and existence?**