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FLOOD MODELLING AND VISUALIZATIONS OF FLOODS THROUGH 3D OPEN DATA

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Outline

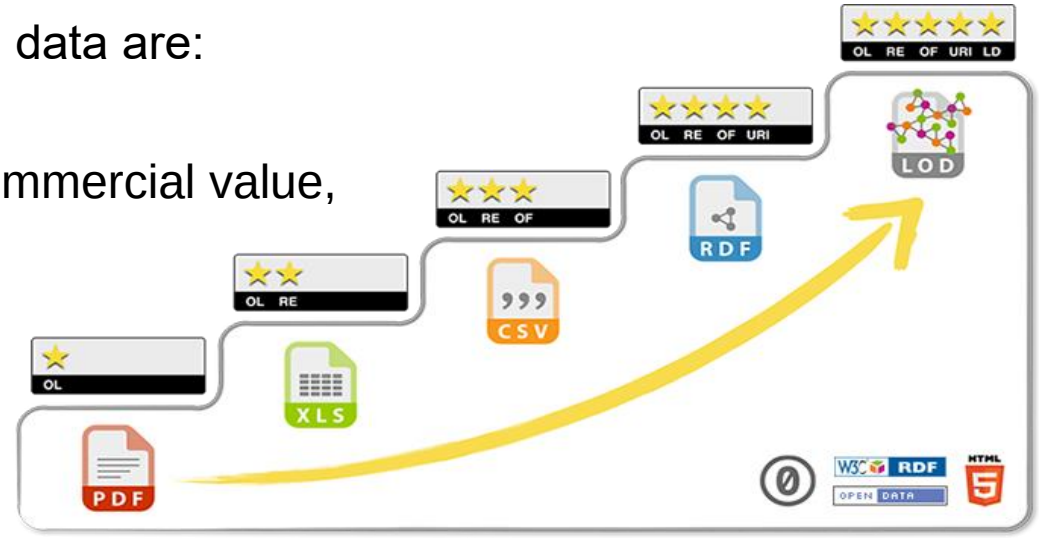
- Open data
  - in general …
  - geospatial data
- 3D technologies and GIS
- Pilot study
  - input data
  - used software
- Discussion & conclusions

Open Data

- „Open Data and content can be freely used, modified, and shared by anyone for any purpose”.

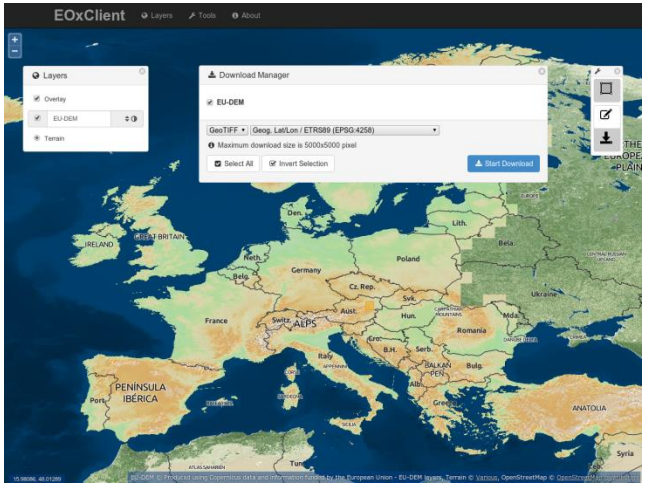
- Available without access restrictions, licenses, copyrights, patents, or charges for access or re-use.

- The main reasons for „opening“ data are:
  - transparency,
  - the release of social and commercial value,
  - the release of participation,
  - the release of engagement.



Open 3D geospatial data

- **Data „opened“ by an institution, organization or government**
  - SRTM DEM, ASTER GDEM
  - EU-DEM
  - …



- **VGI – Volunteered Geographic Information**
  - OpenStreetMap (OSM) and many related projects, e.g. Simple 3D Buildings, Open Earth View, OSM2World, OSM-3D, ...

3D formats and 3D GIS software

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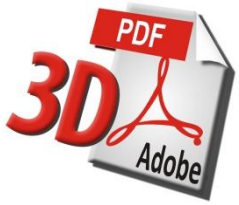

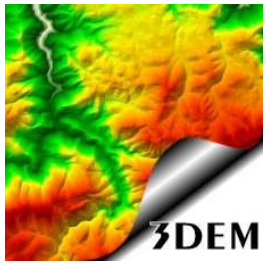

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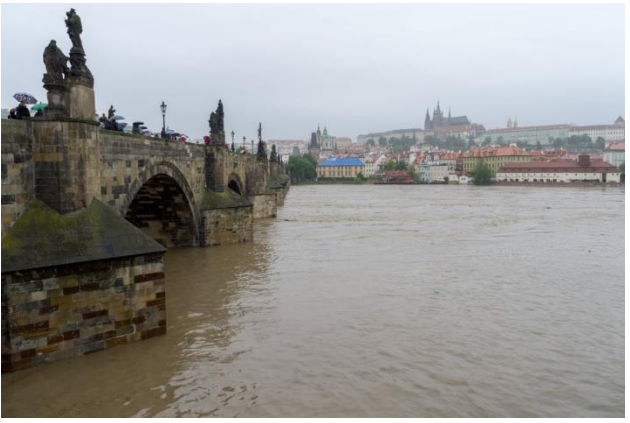
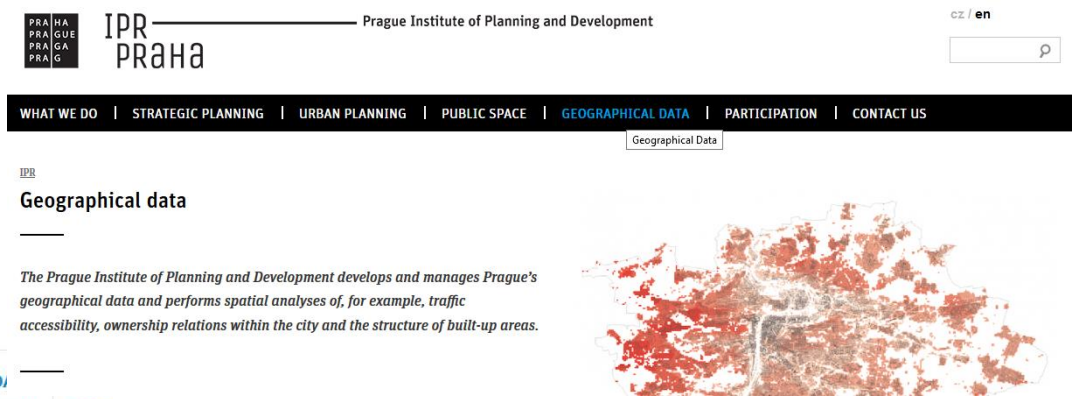
Pilot study

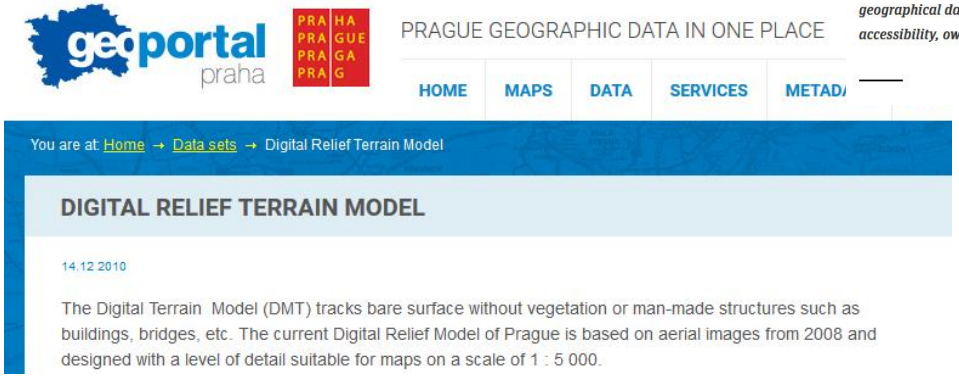
- Prague (Czech Republic) - Vltava River
- Floods in 2002 – the most destructive in the history of Prague
  - flow of the Vltava River culminated at 5300 m^3/s.
  - about 40 000 people were evacuated
- Prague was flooded again in 2013
  - culmination at 3 200 m^3/s



Open data for our pilot study

- Some available for whole Czech republic – e.g. Registry of Territorial Identification, Addresses and Real Estate (RUIAN)
- Regional / local data sources: Prague – **Institute of Planning and Development** (IPR)





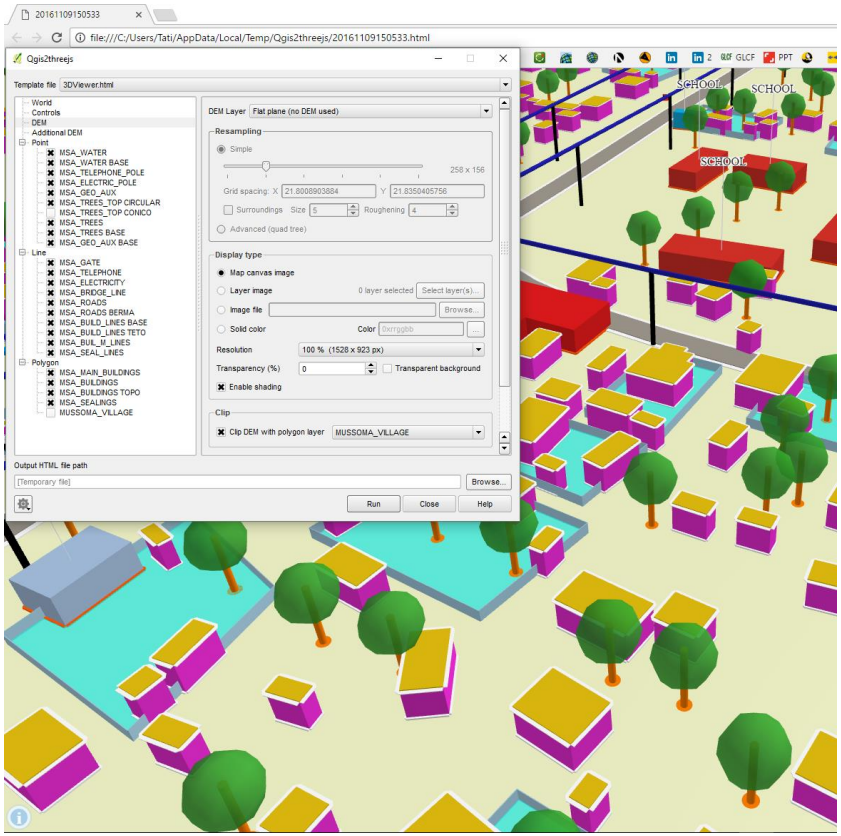
http://www.geoportalpraha.cz

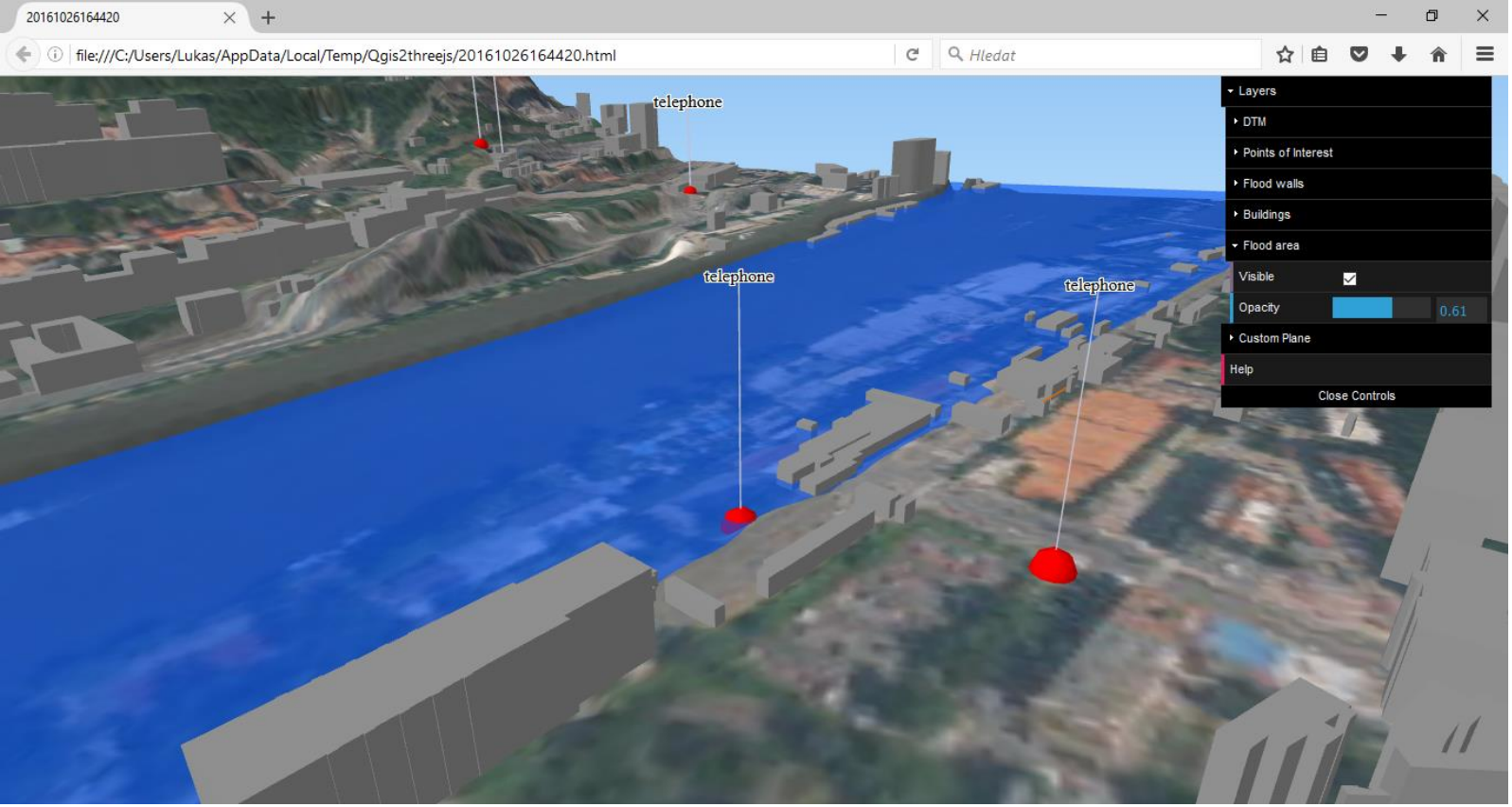
Used Data

- DTM of the city Prague provided by IPR in TIFF format,
- building footprints from RUIAN that are available on-line as a WFS or as GML files,
- flood areas for various water levels (for 5-, 20- and 100-year floods) provided by IPR as Shapefiles with Polygon geometry,
- flood walls provided by IPR as Shapefiles with Polyline geometry,
- orthophoto of Prague 2015 with a pixel resolution of 50 cm (true colors, TIFF),
- OSM POI (downloaded from Geofabrik Tools).

Used software

- **QGIS** – version 2.12
  - pre-processing, interpolation and other techniques of virtual surfaces creation
- **Qgis2threejs** – plug-in to QGIS
  - exports terrain data, map canvas images, and vector data to HTML page and JS files
  - Three.js library is used in the result for 3D visualization and interaction
- Web browser supporting WebGL is a must for interactive 3D visualization

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Points of Interest
Flood walls
Buildings
Flood area
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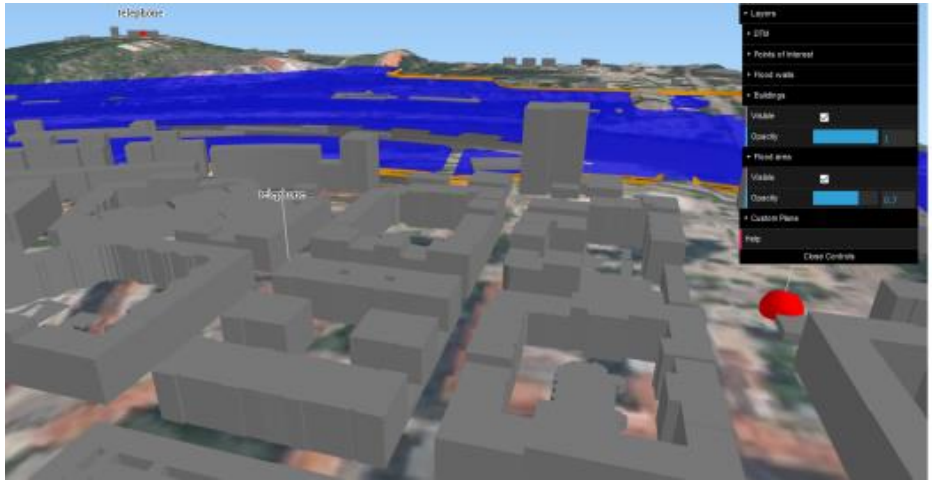

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Discussion

- Advantages of 3D visualization based on open data and Three.js library:
  - enables user-friendly interactive 3D visualization, which is accessible to a broad spectrum of users (from the general public to experts),
    - incl. map algebra equivalents, calculation of surfaces or volumes of 3D objects etc.;
  - does not require any new software or plug-ins to be installed on the client or server sides.
  - our pilot study represents an example of an open data application usable in flood impact analysis and crisis management.

- Limitations of used sources and tools, in general:
  - support of vector full-3D (volume) analysis in non-commercial GIS
  - support of ESRI Multipatch geometry in non-commercial (3D) GIS

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Conclusions

- Verification of feasibility of 3D visualization of floods purely based on open technologies and data
  - analysis of available 3D open data sources, data formats, Web-based technologies and software
- Pilot Web application visualizing floods was developed
  - selected part of the city of Prague
  - visualizations of terrain models, 3D buildings, flood areas, flood walls and other related information

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THANK YOU FOR YOUR INTEREST!

QUESTIONS…

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