



Simulation of Heavy Rainfall Events by using a Digital Twin

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Federal Agency for
Cartography and Geodesy



BKG

Wir geben Orientierung.



The Digital Twin Germany

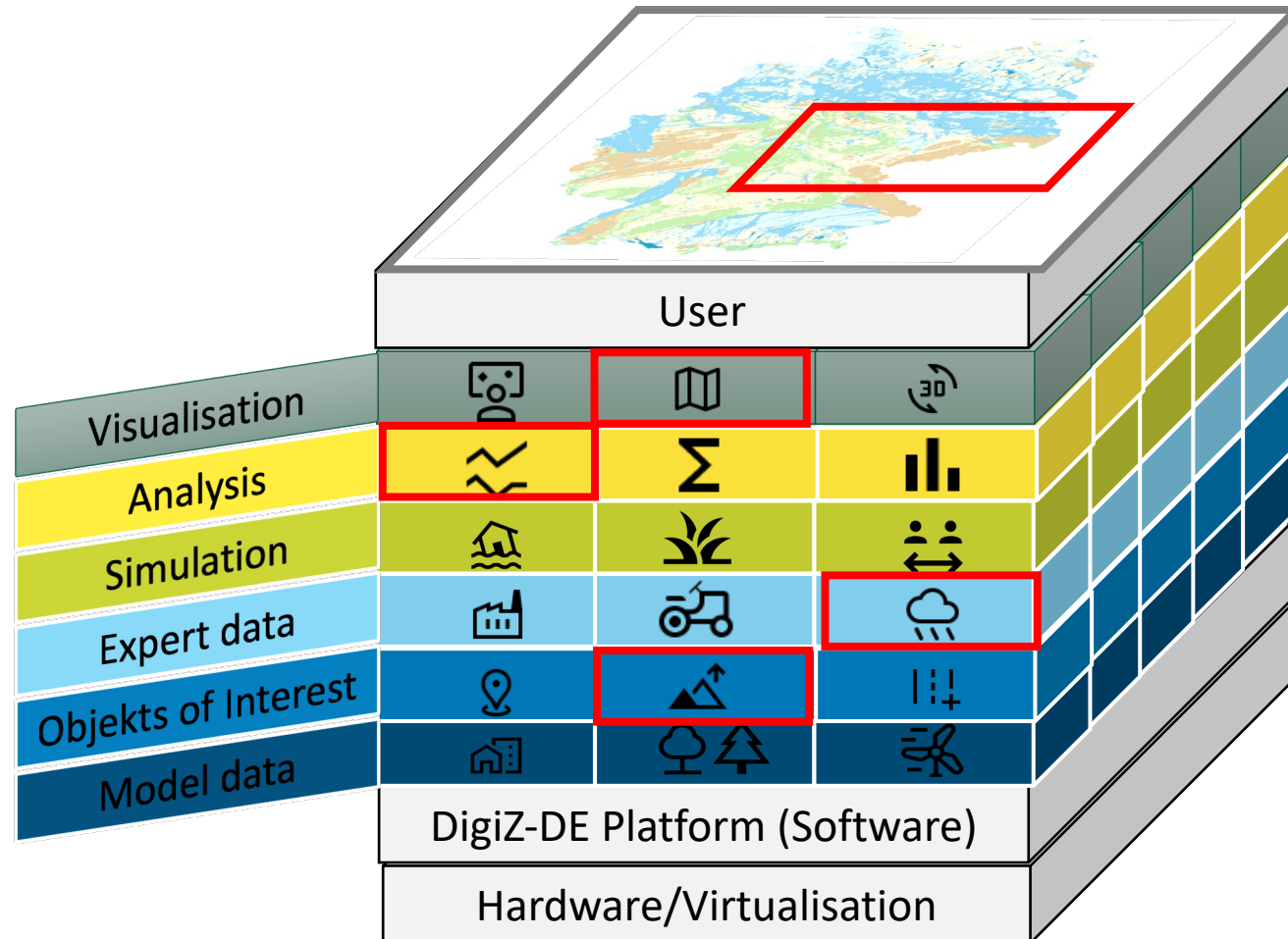
Objective: "Provide an analysis platform for the federal administration as a service by the end of 2026 to create relevant added value for a variety of societal issues."

Essential components:

- Establishment of a **technical platform**
- Development of the **data offer**
- Implementation of **pilot use cases**



Technical platform - from the user's point of view



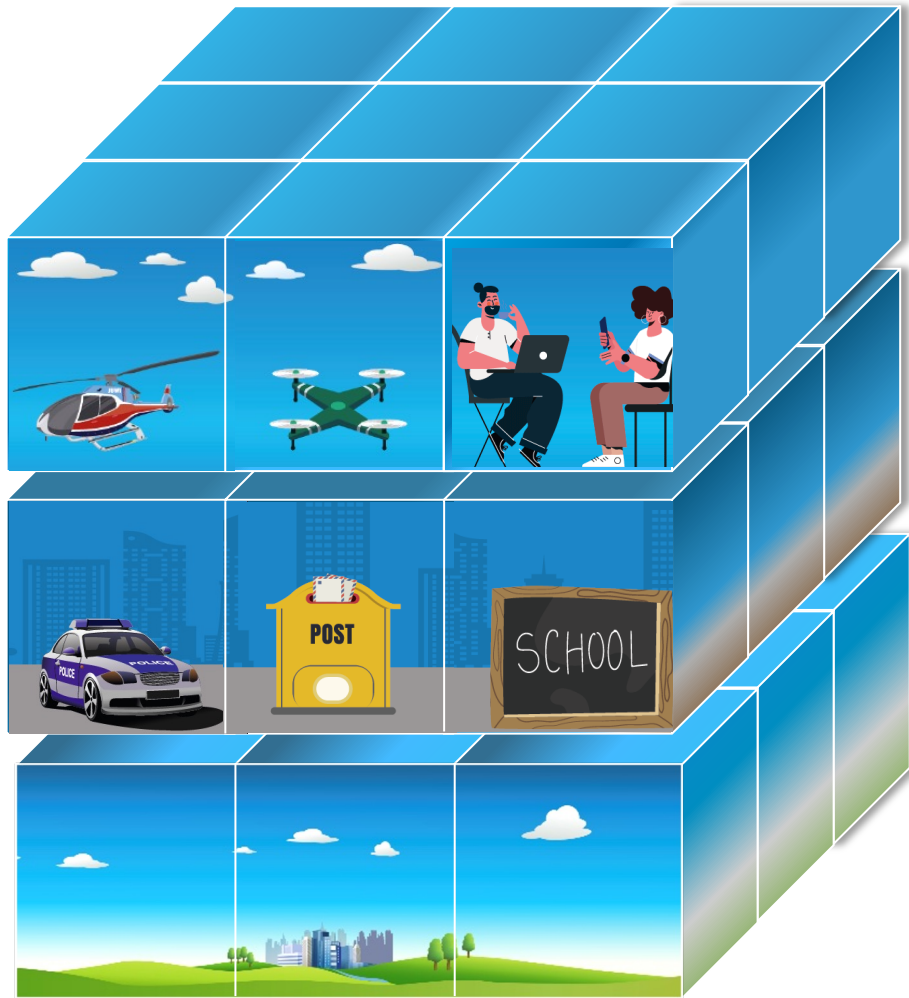
Standard use:

- Selection of existing components

Experienced users:

- Extension/adaptation of existing modules
- Development of new modules

The data offer of the Digital Twin Germany



Expert Knowledge

How does all fit together?

Objects of Interest

What do we have?

Model data

How the data is captured?

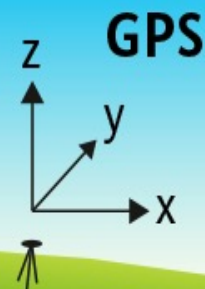
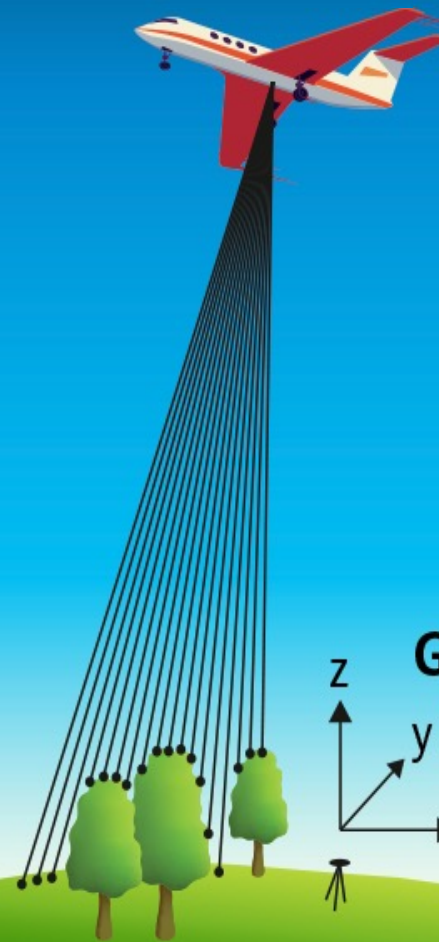
Nationwide LiDAR collection

Preliminary project in Hamburg Metropolitan Region

Data collection: 2024 and 2025

Planned actuality: Every three years

Area size:	8650 km ²
Flight altitude above ground:	3350 m
Point density:	42 pts/m ²
Height accuracy:	<10 cm
Ground resolution Aerial images:	22 cm



How the data is captured?

Demonstration phase Hamburg - Example of resulting point cloud

... provides information about:

- Ground
- Surface
- Vegetation
- Buildings
- Infrastructure
- visible objects

Other utilisation possible!



Expert uses cases in the Digital Twin

Illustrative example use cases

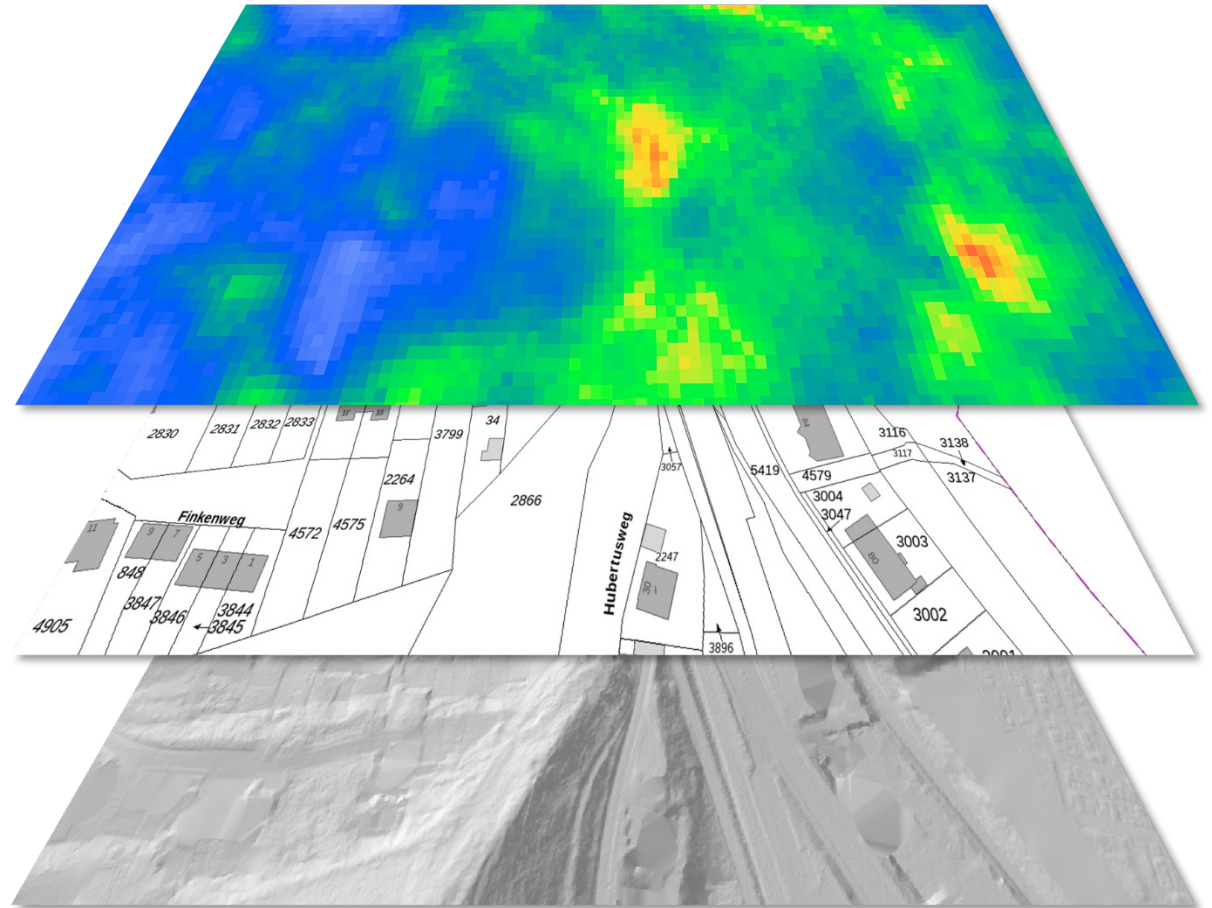
Expert applications in the Digital Twin

Advisory map on the risk of heavy rainfall

Probability of heavy rainfall

Building data / land cover / vegetation...

Digital elevation model



Advisory map on the risk of heavy rainfall: Background and objective

Current objectives (ongoing project):

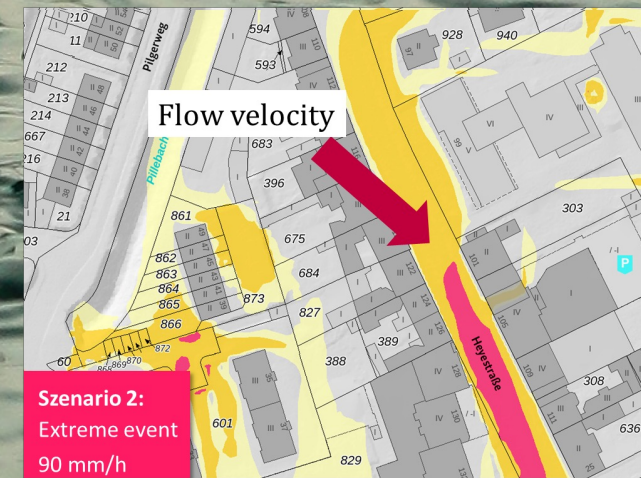
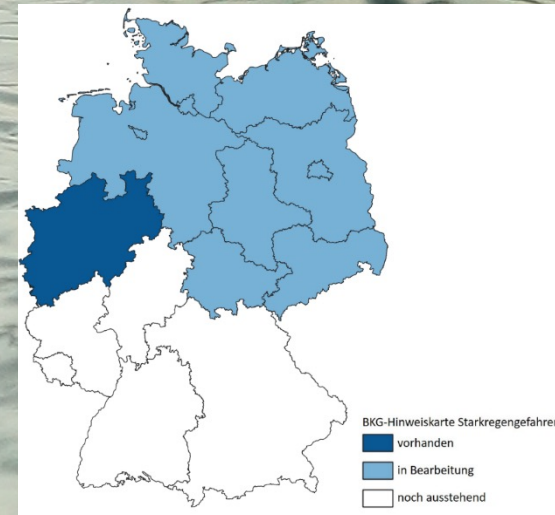
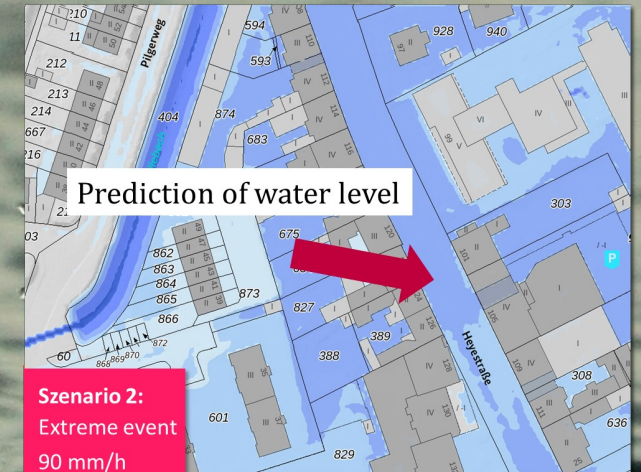
- Simulation of flooding scenarios (two dimensional, numeric)

Results:

- Water levels and flow velocities
- Maps with risk zones covering Germany, published in national geoportal (WMS, Download)

Project started in 2020, completed in 2025

- Costs: about 3 Mill. €
- Useful but only rough information for disaster prevention and management



Source Roman Grac on Pixabay

Outlook: Dynamic Twin on the risk of heavy rainfall

Main Challenges / Further goals:

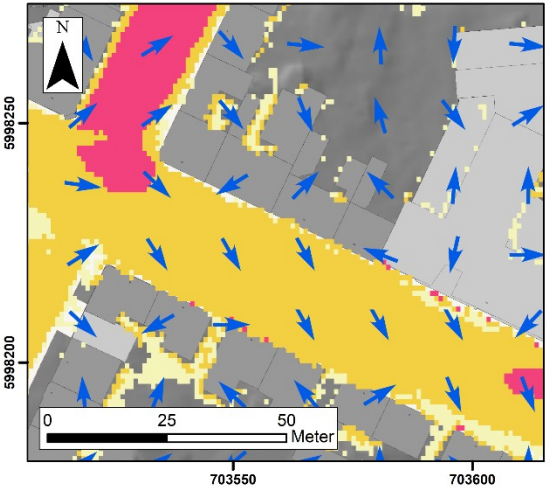
- Integrated data management
- Integration of precise short term rain forecasts
- Calculation time for dynamic predictions (regional warning)

Idea: Dynamic twin (Usage of more current predictions)

- Data from DT-Germany: → Actual digital terrain model, derived from 3D data
- Further data (inhabitants, POI, aerial photographs, technical data, rain forecast, etc.)
- Dynamic tools flooding simulation (regional simulations < 1hour)

Prototyping Digital Twin Germany

- In collaboration with research institutes and environmental authorities
- First results should be available in 2024 / 2025



Further expert applications – Pilot use cases

- **Forest:** National single tree inventory
- **Agriculture:** Improved identification of woody landscape elements
- **Security:** Flight obstacles
- **Socio economic:** Relationship between accessibility of childcare facilities and higher labour force participation of parents?

For more details on the first results of this further application, please visit the ePoster today:

- 12:45-14:15, Patrick Knöfel: *Advancements in Germany's Digital Twin Project*



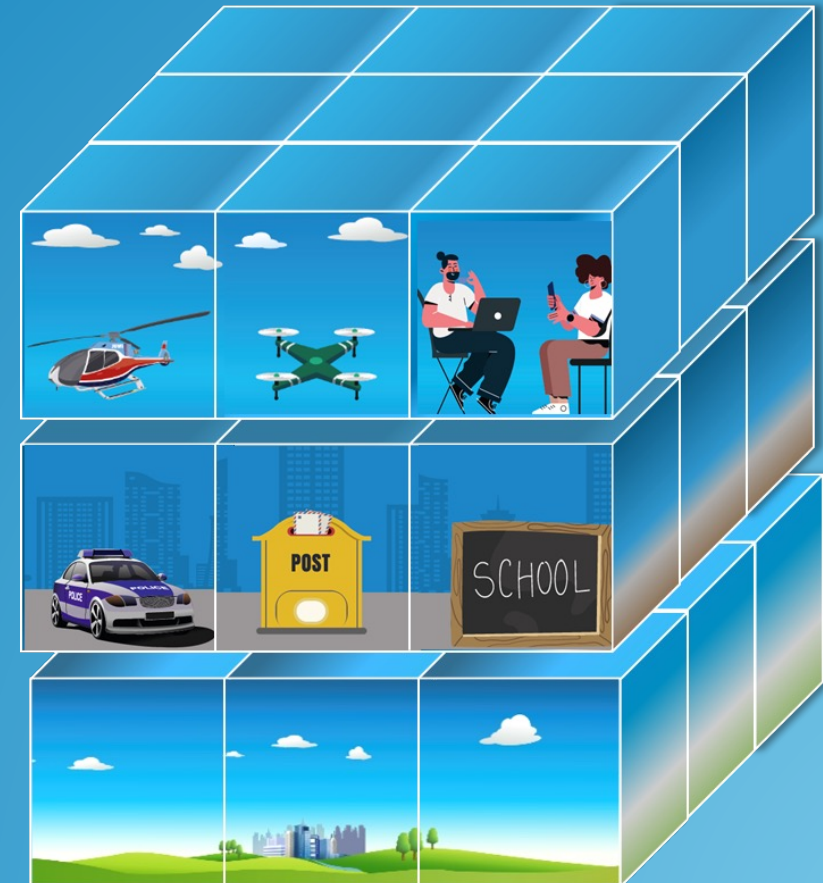
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Thank you for your kind attention!

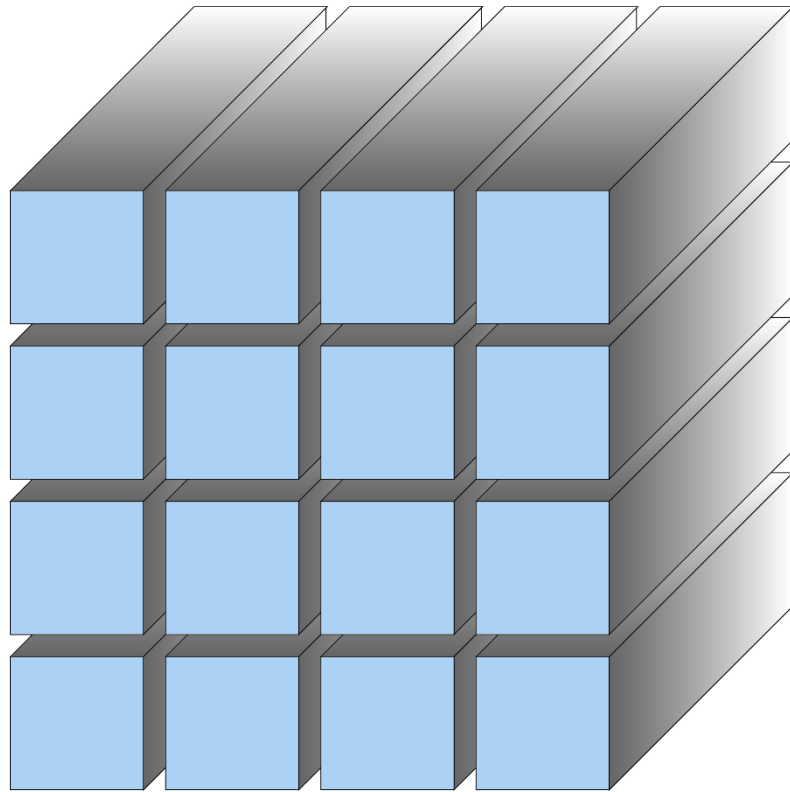
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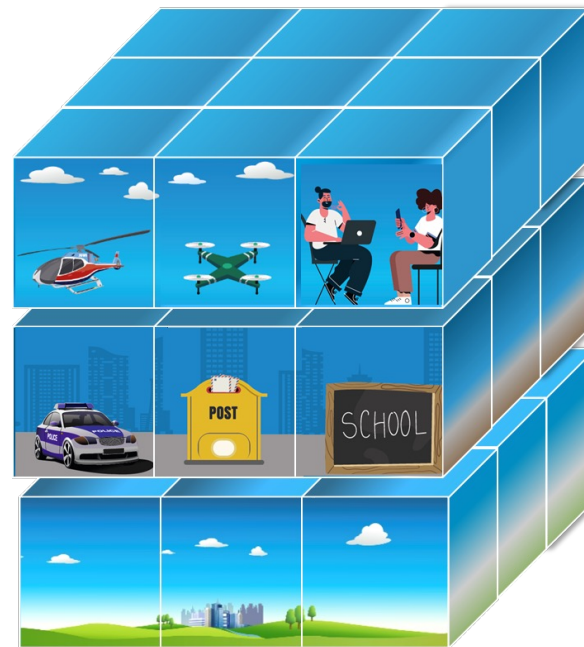


Interfaces with Digital Twins at different levels

Destination Earth



Germany



Federal states & municipalities

