Earth Observation based Crisis Information –
Emergency mapping services and recent operational developments

Konstanze Lechner, Monika Gähler

German Aerospace Center (DLR)

Center for Satellite Based Crisis Information
– Emergency Mapping & Disaster Monitoring –
a service of DFD

Knowledge for Tomorrow

DLR

Landsat

WorldView

TerraSAR-X

Code

Drone

DEUTSCHLAND - Elbe / Saale - Breitenhagen
Hochwassersituation am 12. / 18. Juni 2013 - Veränderungsanalyse - Übersicht
1:40.000

DEUTSCHLAND - Frankfurt am Main - Tag der Deutschen Einheit
Situation am 29.08.2015 - Detailkarte
1:3.500

JORDAN - Al Zaatari
Refugee Camp as of January 03, 2013 - Situation Map
1:5,000

CHILE
Fires as of January 26, 2017 - Situation Map
1:1,125,000 / 1:500,000

ZKI-DE 005 – Hochwasser 2013 in Deutschland

Gebäudedichte
Anzahl der Gebäude pro Hexagon
(ein Hexagon entspricht 5000 m² Fläche)
1 - 13
14 - 25
26 - 38
39 - 50
51 - 62

Adobe Acrobat Pro
Werkzeuge   Ausfüllen und Unterschreiben

Crisis or Disaster

National authorities
(Department for foreign affairs, Federal Office of Civil Protection and Disaster assistance, Federal ministry of the Interiour)

German Red Cross

Federal Agency for Technical Relief

Satellite Based Crisis Mapping

Information

① *Mobilization*
- *triggering process*
- *situation briefing*

- *satellite tasking*
- *archive search*
- *auxiliary data*

② *Data acquisition*

- *geometric correction*
- *image enhancement*

③ *Pre-Processing*

Planning and Decision Support

⑥ *Dissemination*

- *Cooperation with national/local authorities*
- *Relief organisations, NGOs*
- *Public,...*

⑤ *Map Production*

- *quality control*
- *maps (printed; online)*
- *GIS-ready geodata*
- *information dossiers*

④ *Analysis*

- *data fusion*
- *information generation*

Integration of auxiliary data

Integration in collaborative platform

DLR

Emergency Mapping Mechanisms
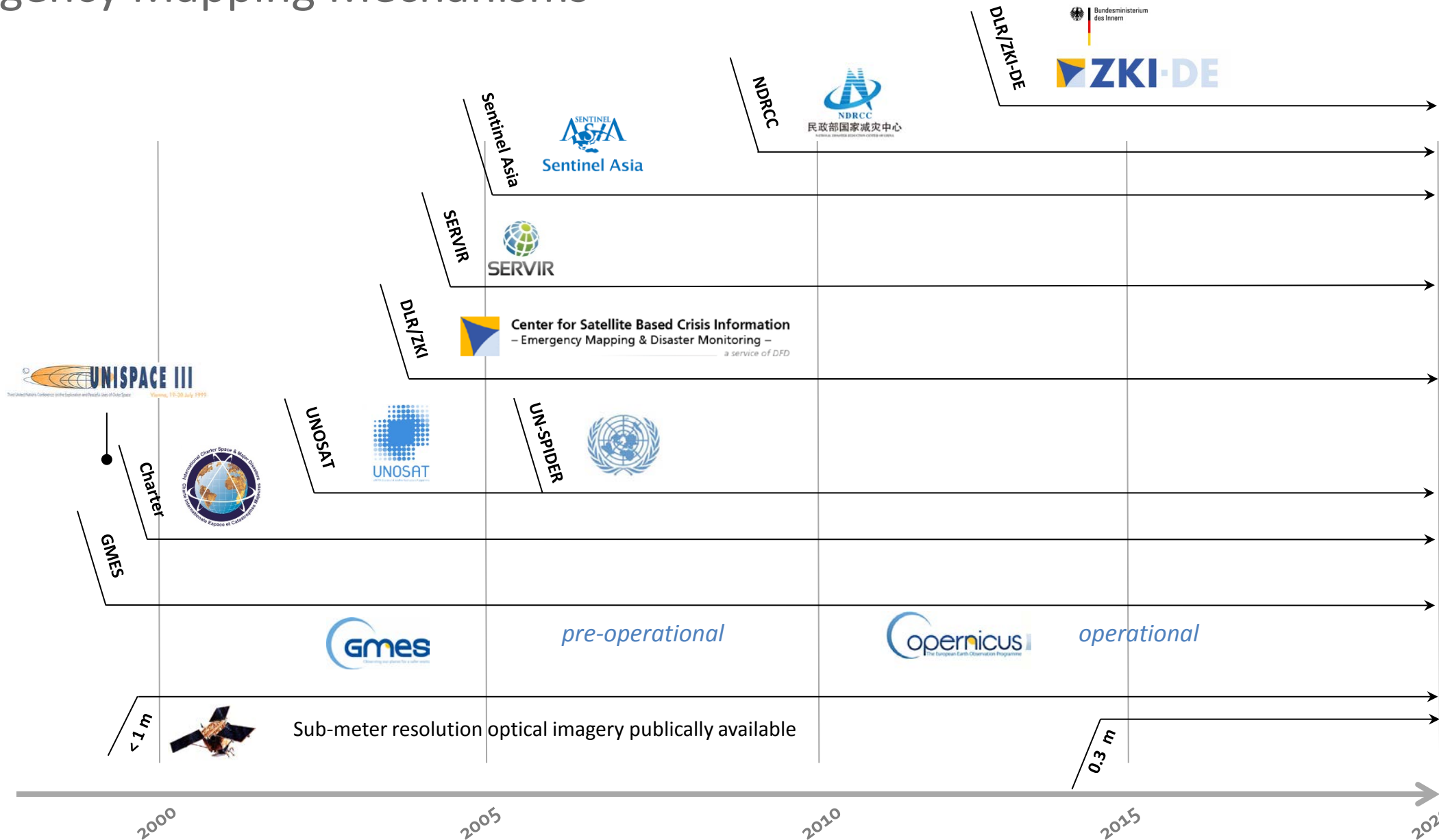
Center for Satellite based Crisis Information (ZKI)

GERMANY

Provision of
ZKI-Services for national
authorities

GLOBAL

DLR membership in the
International Charter „Space
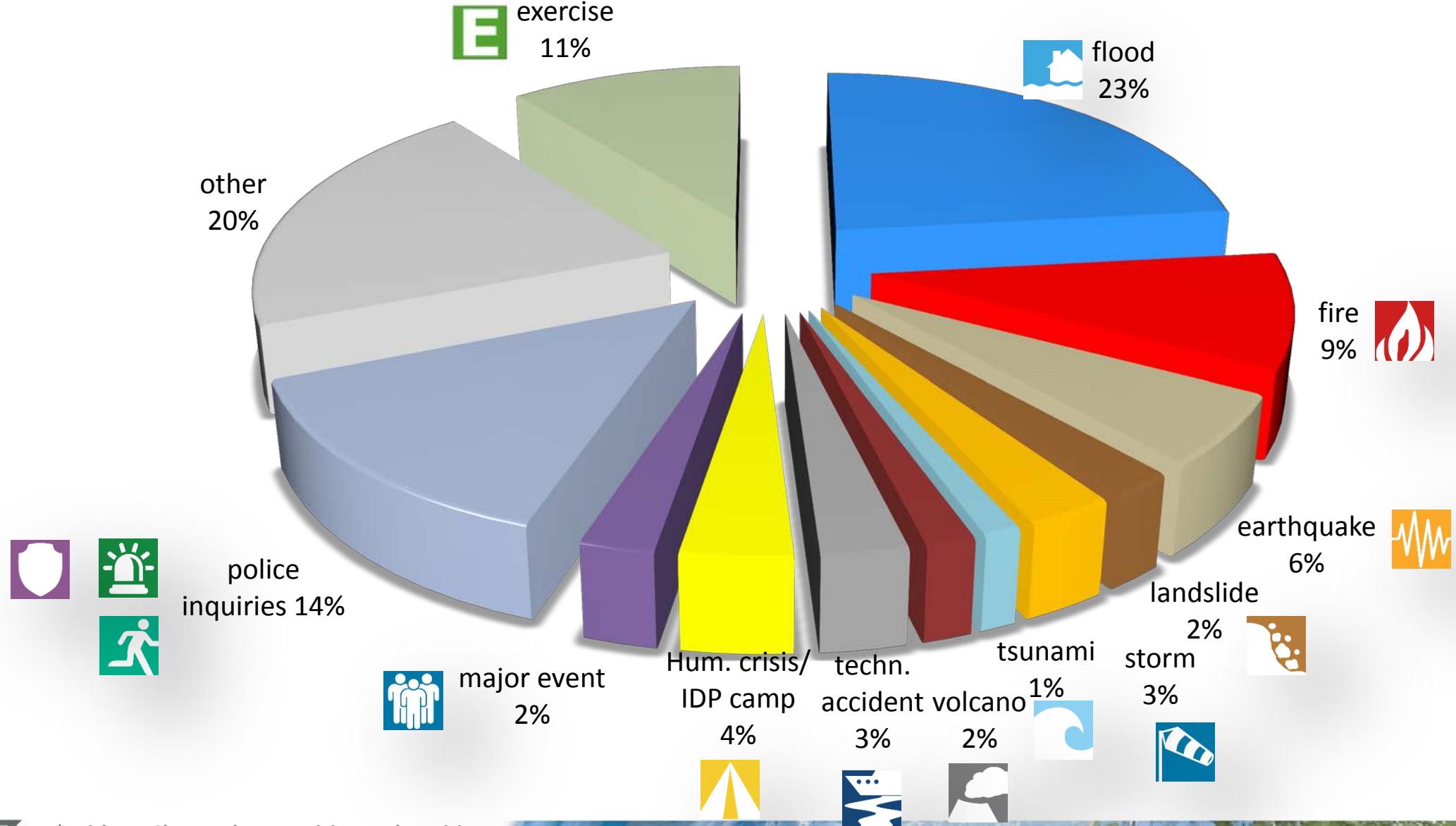and Major Disasters"

EUROPE

Participation in the European Copernicus
Emergency Management Service

Remote Sensing Service

✓ Analysis of Earth Observation data

   ✓ in case of natural disasters

   ✓ for humanitarian relief operations

   ✓ for civil security

✓ 12 hours / 7 days on-call duty

✓ Trainings and Specialist Advice

✓ Research and Development

Thematic type of ZKI activations* since 1999

exercise
11%

flood
23%

other
20%

fire
9%

earthquake
6%

police
inquiries 14%

landslide
2%

tsunami
1%

storm
3%

major event
2%

Hum. crisis/
IDP camp
4%

techn.
accident
3%

volcano
2%

DLR

To develop **a pan-European Test-bed** for Crisis Management for trialling solutions

TRIALS
Poland, France, Austria, The Netherlands

FINAL DEMO
Poland/Italy

To develop a comprehensive **Portfolio of Crisis Management Solutions**

To facilitate a **shared understanding** in Crisis Management across Europe

driver-project.eu

tabletop experiment "transport and logistic support", 2016

- Simulation of 2013 flood scenario in Magdeburg, Germany

- Supporting Federal Agency for Technical Relief (THW) in disaster response phase

- THW main requirements were:

  - Overview of the traffic situation in the affected region

    - ✓ Aerial images recorded by DLR (U-Fly) and fed into DLR's traffic management system (KeepOperational)

  - Support THW's transport and logistic

    - ✓ Generate organization- and scenario-specific models (HumLog)

2016 © THW

KeepOperational
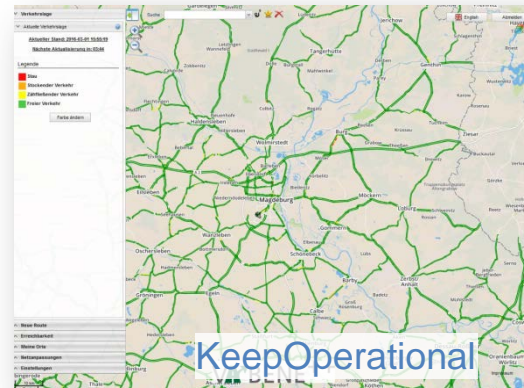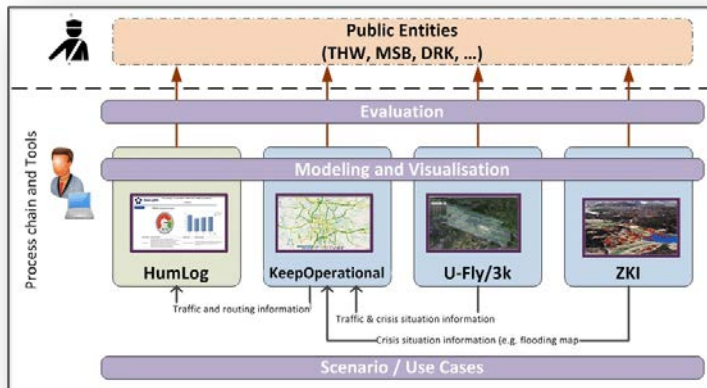
DLR/ZKI Supporting Relief Units with 3D mapping products

- THW main requirements were:

  - General situation awareness

  - Virtual impression of affected region

  - Detection of flooded areas and inundated roads

  - Monitor the transformer station (critical infrastructure)

  - Measure altitude of affected buildings

  - Measure distances / size of areas

  - Flood depths

  ✓ Aerial and satellite imagery analyzed to provide crisis relevant information (ZKI)

3D geopdf

2D flood map

2D kmz

3D video animation
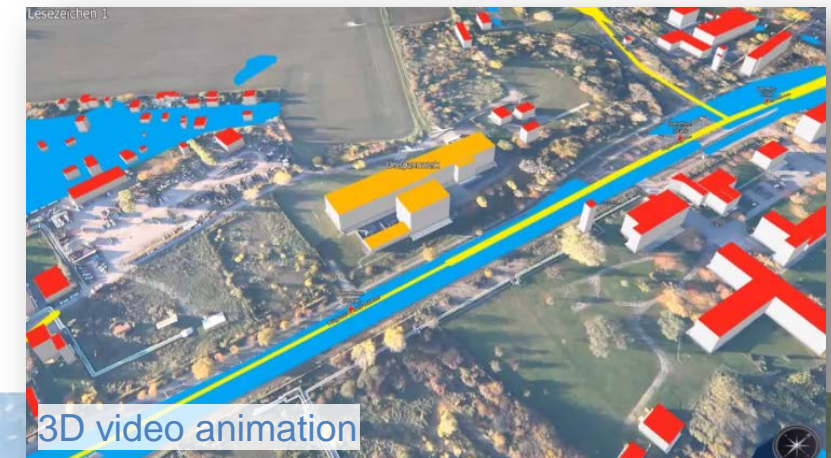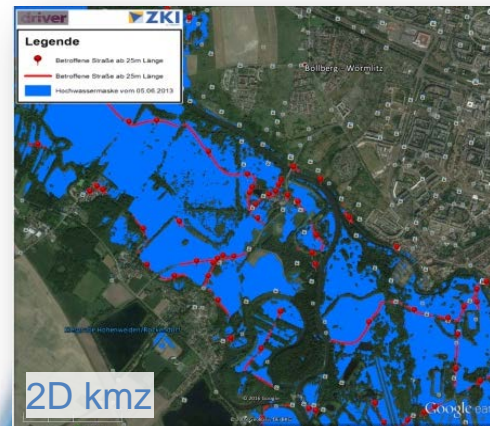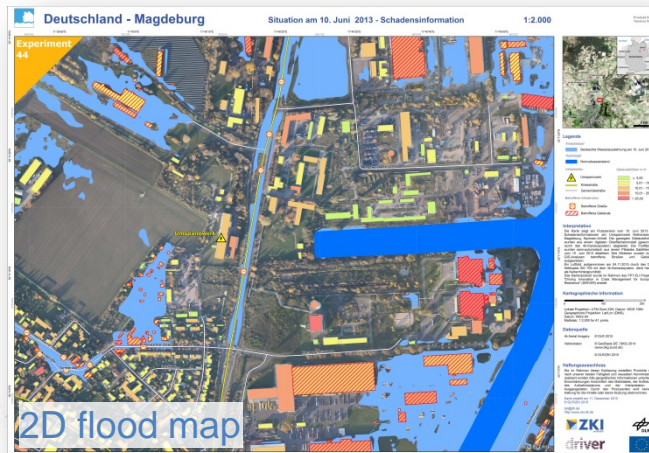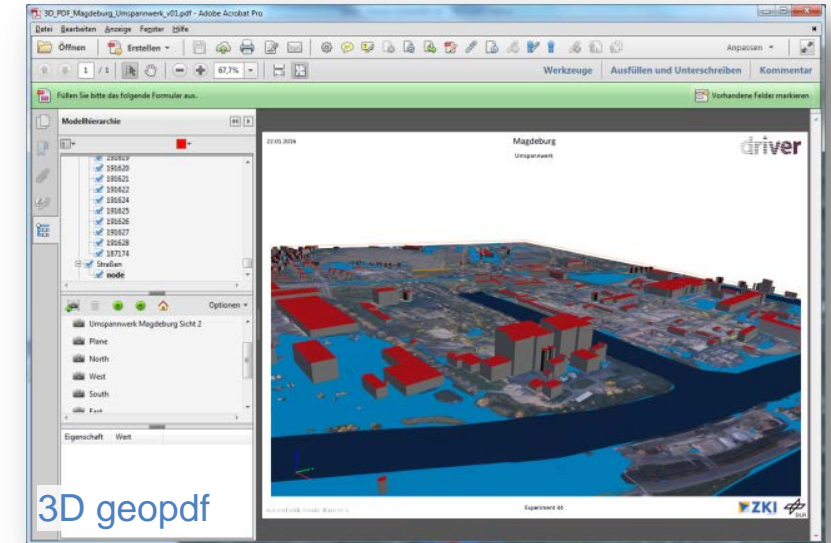
# Near-Real Time Situational Awareness during Major Events

- Major event: 36th German Protestant Church Conference in Wittenberg 2017

- Users: Federal Agency for Technical Relief (THW), LVwA Saxony-Anhalt, Wittenberg District,

  Johanniter Unfall-Hilfe e. V.,   Saxony-Anhalt Police Department

- Main requirements:

  - Planning and monitoring the major event

    ✓ Aerial images recorded by DLR and visualized in near-real time in DLR's webclient

    ✓ Satellite images acquired and analyzed for general situation awareness

    ✓ Automatically generated map products

  - Overview of the traffic situation, focusing on the arrival and departure traffic

    ✓ Aerial images recorded by DLR and fed into DLR's traffic management system
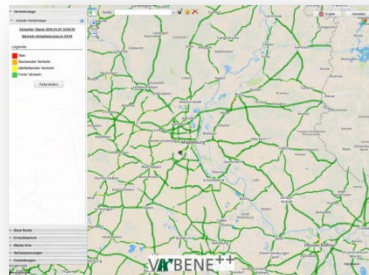

4k camera system on a helicopter
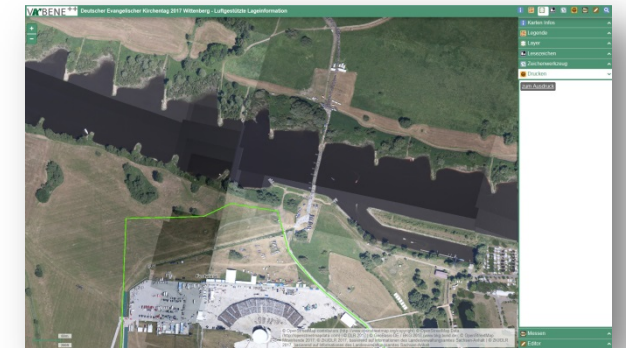

DLR's webclient
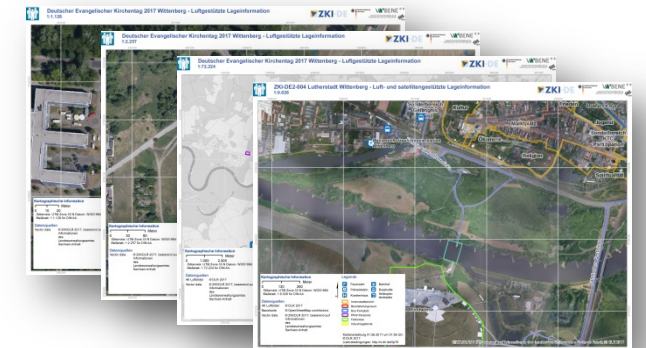
Automatically generated maps

KeepOperational

3D Mapping of German Protestant Church Conference

Conclusion and outlook

✓ Earth Observation-based disaster information has improved and operationalized enormously

✓ Rapid Mapping Procedures have been standardized

✓ Many Emergency Mapping Mechanisms at different (inter)national levels have been established

✓ Permanent development of new methodologies and their operationalization at DLR/ZKI in different contexts of emergency mapping, e.g.

  ✓ 3D mappings and generation of 3D mapping products

  ✓ Near-real-time provision of aerial imagery (DLR's 4k camera system)

✓ In the future improving Emergency Mapping by e.g.

  ✓ Using imagery derived from new sensors

  ✓ Combining different imagery types, e.g. UAV data

  ✓ Generation of augmented/virtual reality products

  ✓ Incorporation and fusion of other data, e.g. coming from social media
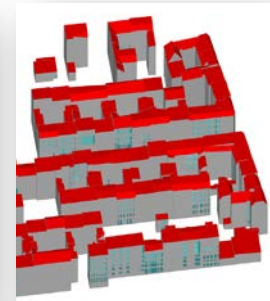
Thank you for your attention!

German Aerospace Center (DLR)

Earth Observation Center | German Remote Sensing Data Center | Geo-Risks and Civil Security

Konstanze Lechner

konstanze.lechner@dlr.de

zki.dlr.de