Final Conference
Webmeeting | 02 February 2022

Flood disasters in July 2021 in Germany: how can we better adapt to extreme events

Peter Heiland
INFRASTRUKTUR & UMWELT Professor Böhm und Partner

FLOOD DISASTERS IN JULY 2021 IN GERMANY: HOW CAN WE BETTER ADAPT TO EXTREME EVENTS

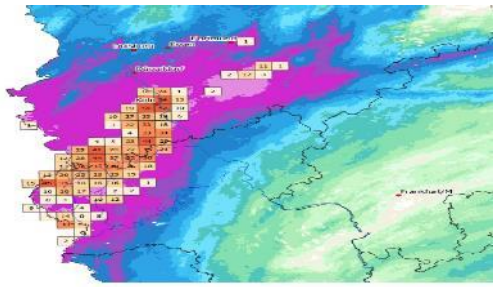
1. The July-2021 events *- in the light of climate change*

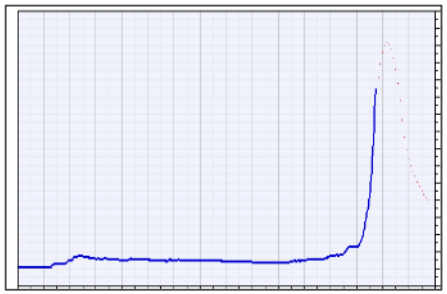
2. Lessons learnt so far: *what are first conclusions*

3. how can we better adapt to extreme events

Floods 14./15. July 22 in Western Germany

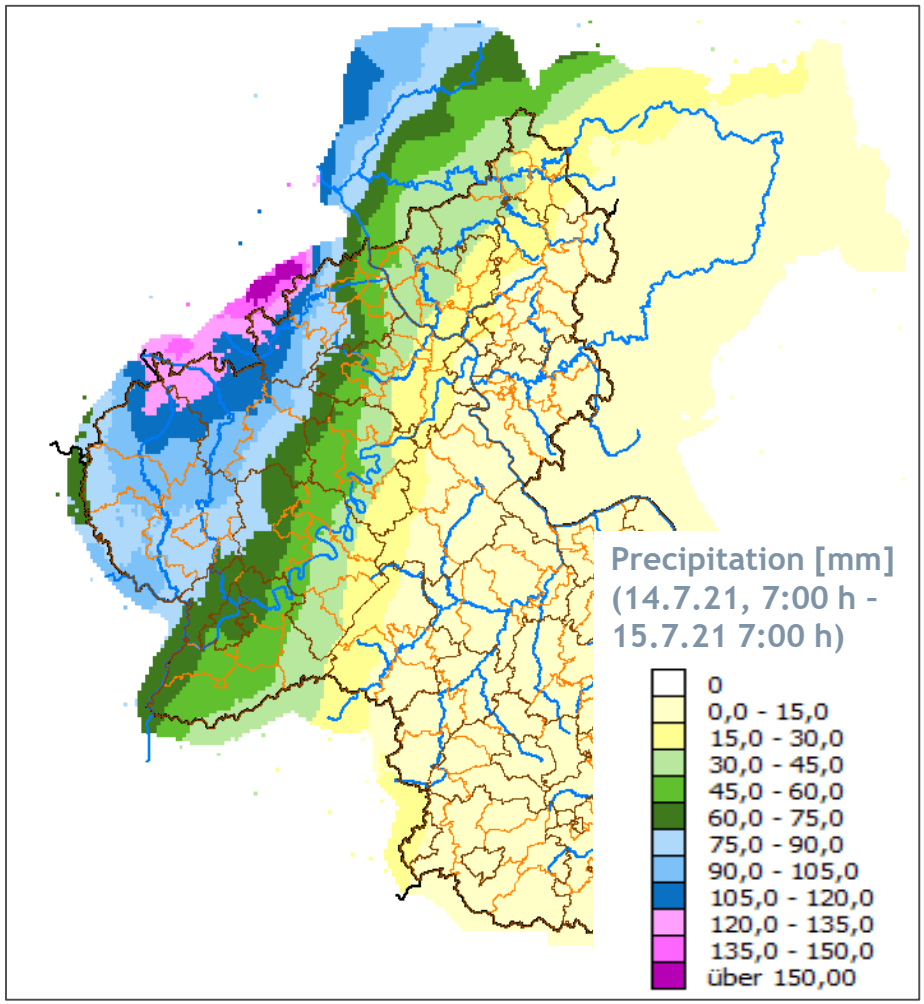
- 180 cities and villages with damages
- 184 persons died
- 33.000.000.000 € damage

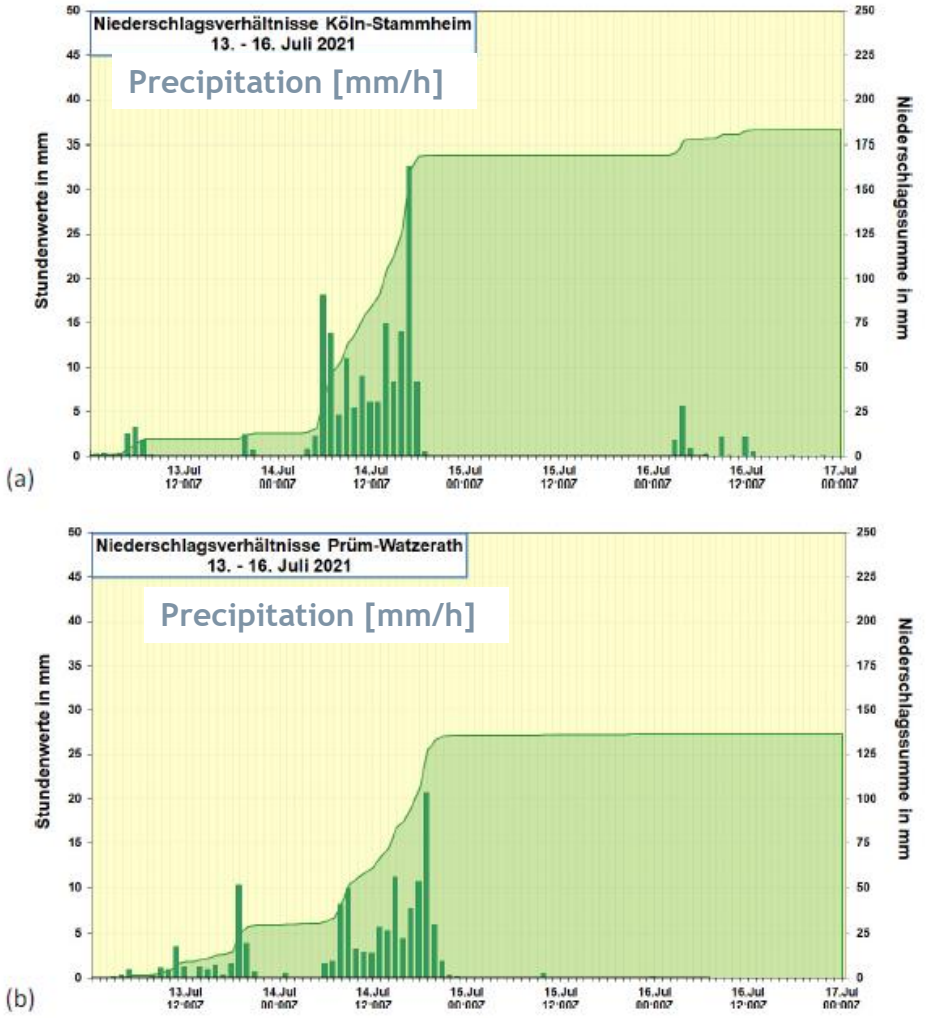




Figures:
- Center for Disaster Management and Risk Reduction Technology (7/2021)
- LfU, Mainz, 7/2021

1. THE JULY-2022 EVENTS - IN THE LIGHT OF CLIMATE CHANGE





Source: German Weather Service DWD; in: Center for Disaster Management and Risk Reduction Technology (7/2021)

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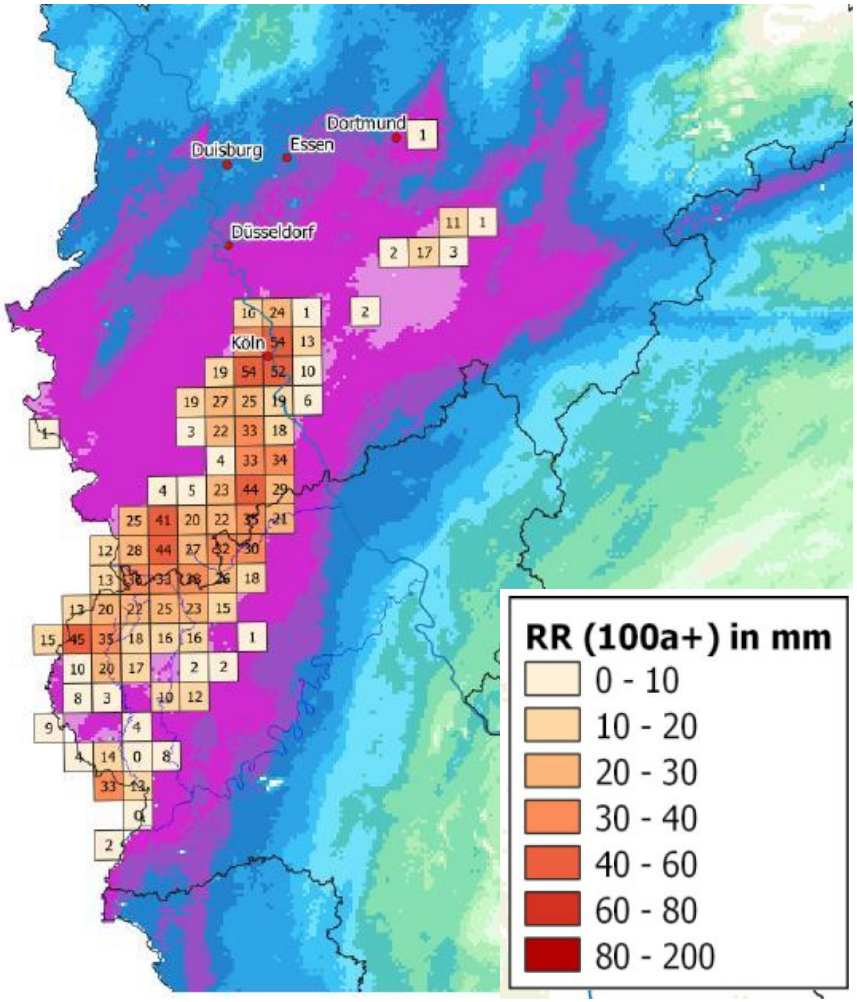


Source: Center for Disaster Management and Risk Reduction Technology (July 2021)

Grid cells in which the RADOLAN maximum precipitation value (1 km²) measured on 14 July 2021 exceeded the previous KOSTRA (statistical rainfall data) maximum for a 100-year precipitation event (in mm).

The distribution of 24-hour precipitation according to RADOLAN on 14 July 2021 is highlighted in color.

Conclusion:
the event exceeded the reference data used for modelling 100-year events partly by far.

1. THE JULY-2022 EVENTS - IN THE LIGHT OF CLIMATE CHANGE

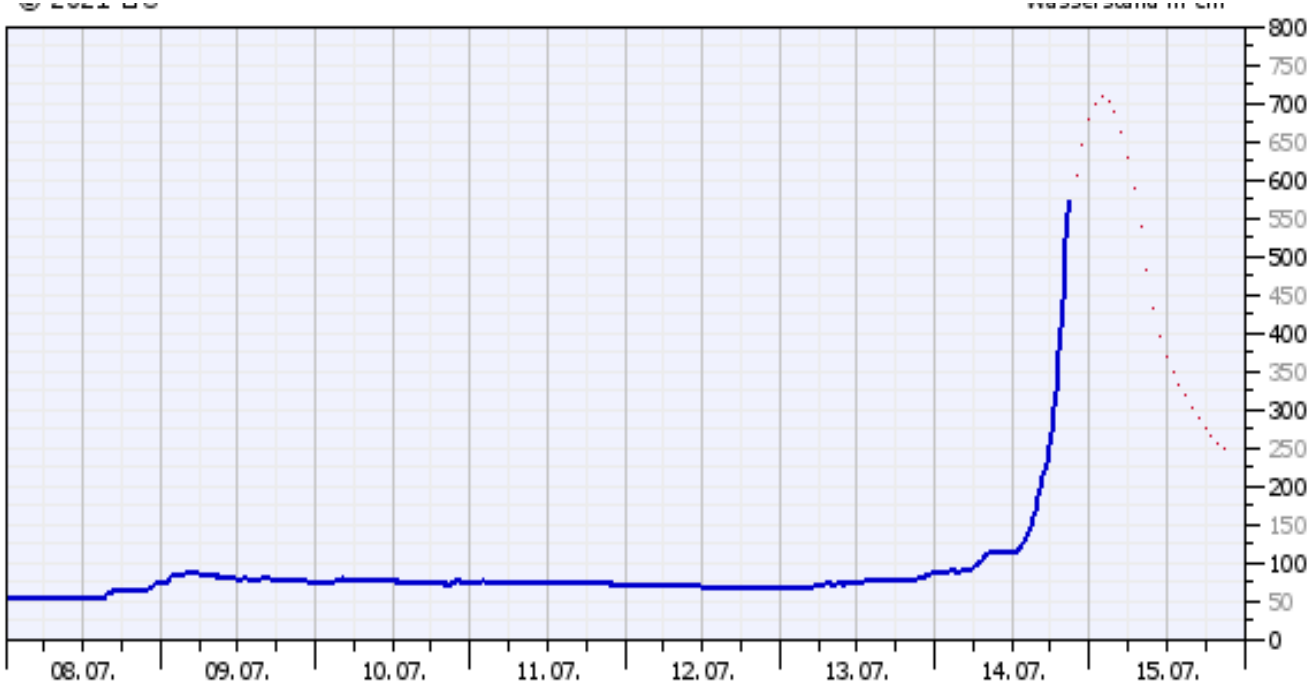
Köln-Stammheim			Schneifelforsthaus		
Datum	BL	RR24h	Datum	BL	RR24h
14.07.2021	NW	153,5	14.07.2021	RP	124,1
19.07.2017	NW	95,0	07.10.1982	RP	73,3
30.08.1968	NW	91,3	16.09.2000	RP	70,0
02.06.1961	NW	68,8	03.06.1999	RP	69,7
29.06.2005	NW	68,3	06.02.1984	RP	63,8
11.07.1958	NW	53,7	03.11.1977	RP	61,6
08.07.2014	NW	49,1	13.01.1900	RP	59,3
20.07.1965	NW	47,3	12.02.1962	RP	57,4
13.06.1995	NW	46,5	21.12.1991	RP	54,9
09.06.1949	NW	45,4	09.08.1979	RP	51,7

List of the 10 wettest days and the 24-hour rainfall amounts of the entire measurement series at the stations in Cologne-Stammheim and at the Schneifelforsthaus. The length of the measurement series in both cases covers about 70 years (data: DWD).

Source: Center for Disaster Management and Risk Reduction Technology (July 2021)

1. THE JULY-2022 EVENTS - IN THE LIGHT OF CLIMATE CHANGE

Water level of the Ahr River (station Altenahr)



Messung
Vorhersage
Abschätzung

Betreiber der Messstelle:
WWV RLP

Wasserwirtschaftsverwaltung Rheinland-Pfalz

Letzter Messwert: **14.07.2021 20:45 Uhr, 575 cm** ● >= 100 jährliches Hochwasser
Vorhersage der HVZ Rheinland-Pfalz vom 14.07.2021 21 Uhr

Source: Federal Environment Agency Rhineland-Palatinate (7/2021)

1. THE JULY-2022 EVENTS - IN THE LIGHT OF CLIMATE CHANGE

Reconstructed historic and measured flood events: discharge (Station Altenahr)

Year	Discharge [m^3/s]	Reconstructed historic (H) and measured (G) events
21.06.1804	1208	H*1
15.07.2021	1000	G*2
13.06.1910	500	H
24.06.1888	280	H
02.06.2016	236	G
16.01.1918	240	H
21.12.1993	214	G
30.05.1984	192	G
16.03.1988	190	G
11.12.1966	178	G
31.01.1961	175	G
11.01.1920	170	H
23.01.1995	167	G
23.11.1984	165	G
07.02.1984	158	G
12.01.1993	145	G

Flood marks in Dernau, 2016

Source: Federal Environment Agency Rhineland-Palatinate (7/2021)

GLIDE number: N/A
Int. Charter Act. ID: N/A

Activation ID: EMSR517
Product N.: 07ERFTSTADT, v1

Erftstadt - GERMANY

Flood - Situation as of 18/07/2021

Grading - Overview map 01

Cartographic Information

1:17000

Full color A1, 200 dpi resolution

0 0.35 0.7 1.4 km

Grid: WGS 1984 UTM Zone 32N map coordinate system
Tick marks: WGS 84 geographical coordinate system

N

Legend

Crisis Information
- Flooded Area
- Flood trace
- Landslide

Built Up Grading
- Destroyed
- Damaged
- Possibly damaged

Transportation Grading
- Road, Destroyed
- Road, Damaged
- Road, Possibly damaged
- Highway, No visible damage
- Primary Road, No visible damage
- Secondary Road, No visible damage
- Local Road, No visible damage
- Long-distance railway, No visible damage

Facilities Grading
- Damaged
- Possibly damaged

General Information
- Area of Interest
- Detail map
- Not Analysed

Administrative boundaries
- Province
- Municipality

Placenames
- Placename

Hydrography
- River
- Stream

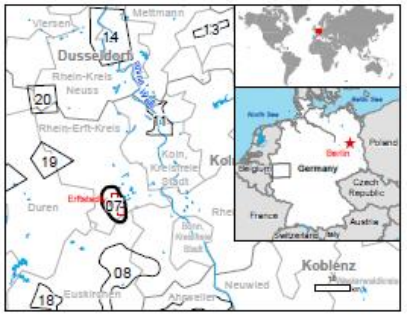
Hydrography
- Lake
- River

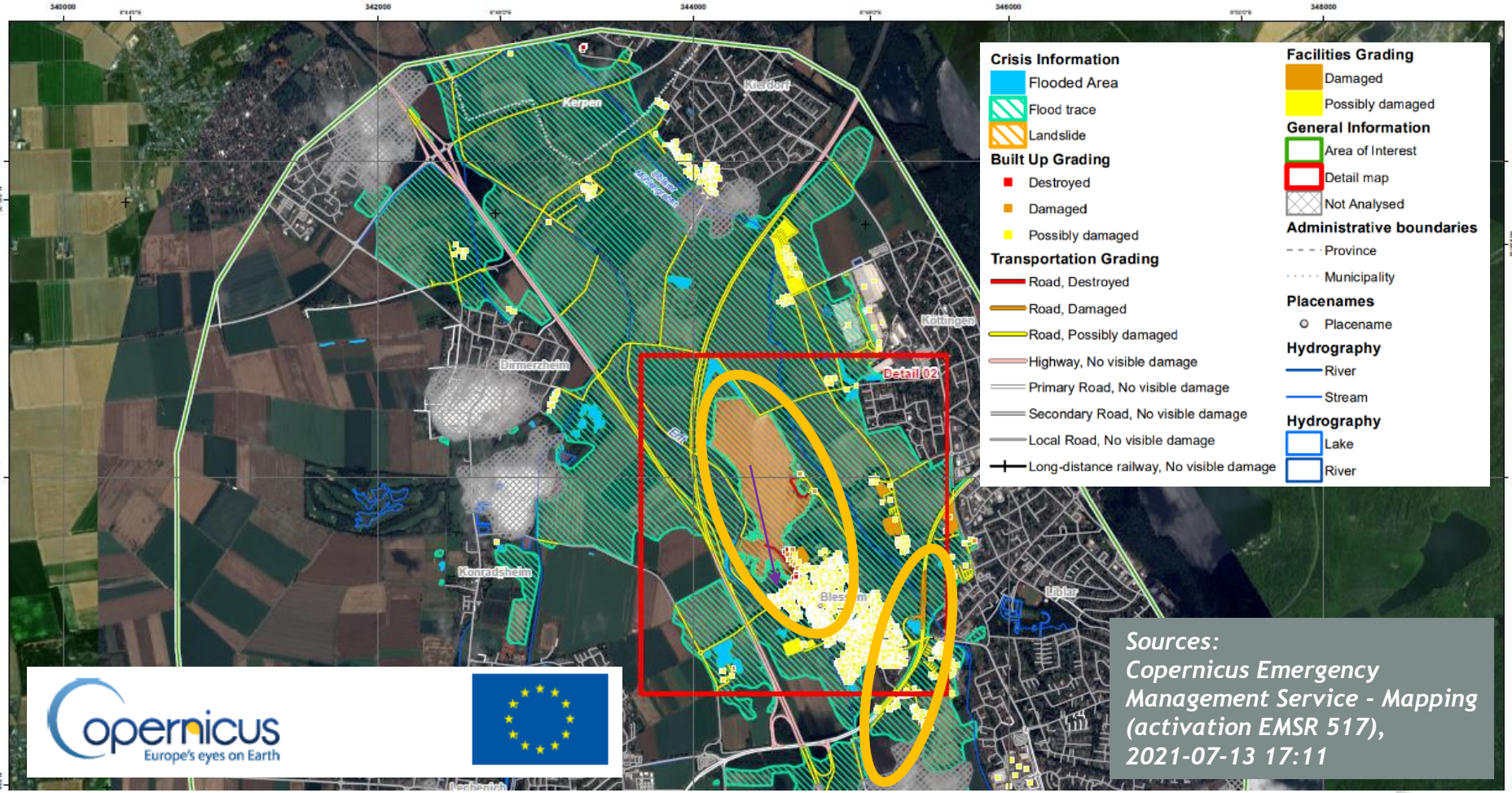
Land Use - Land Cover
Features available in the vector package

Consequences within the AOI

		Destroyed	Damaged	Possibly damaged*	Total affected**	Total in AOI
Flooded area	ha					15.9
Landslide	ha					37.7
Flood trace	ha					1 055.3
Estimated population					4 984	36 078
Built-up	No.	10	25	1 717	1 752	1 752
Transportation	km	0.5	1.7	52.4	54.6	349.6
Facilities	ha	0.0	4.4	10.0	14.4	14.4
Land use	ha	NA	NA	NA	1 105.3	5 112.5

* Presence of damage proxies and proximity with destroyed/damaged asset
** Sum of Destroyed, Damaged and Possibly damaged
Full table available in the vector package





Copernicus
Europe's eyes on Earth

Sources:
Copernicus Emergency Management Service - Mapping (activation EMSR 517), 2021-07-13 17:11

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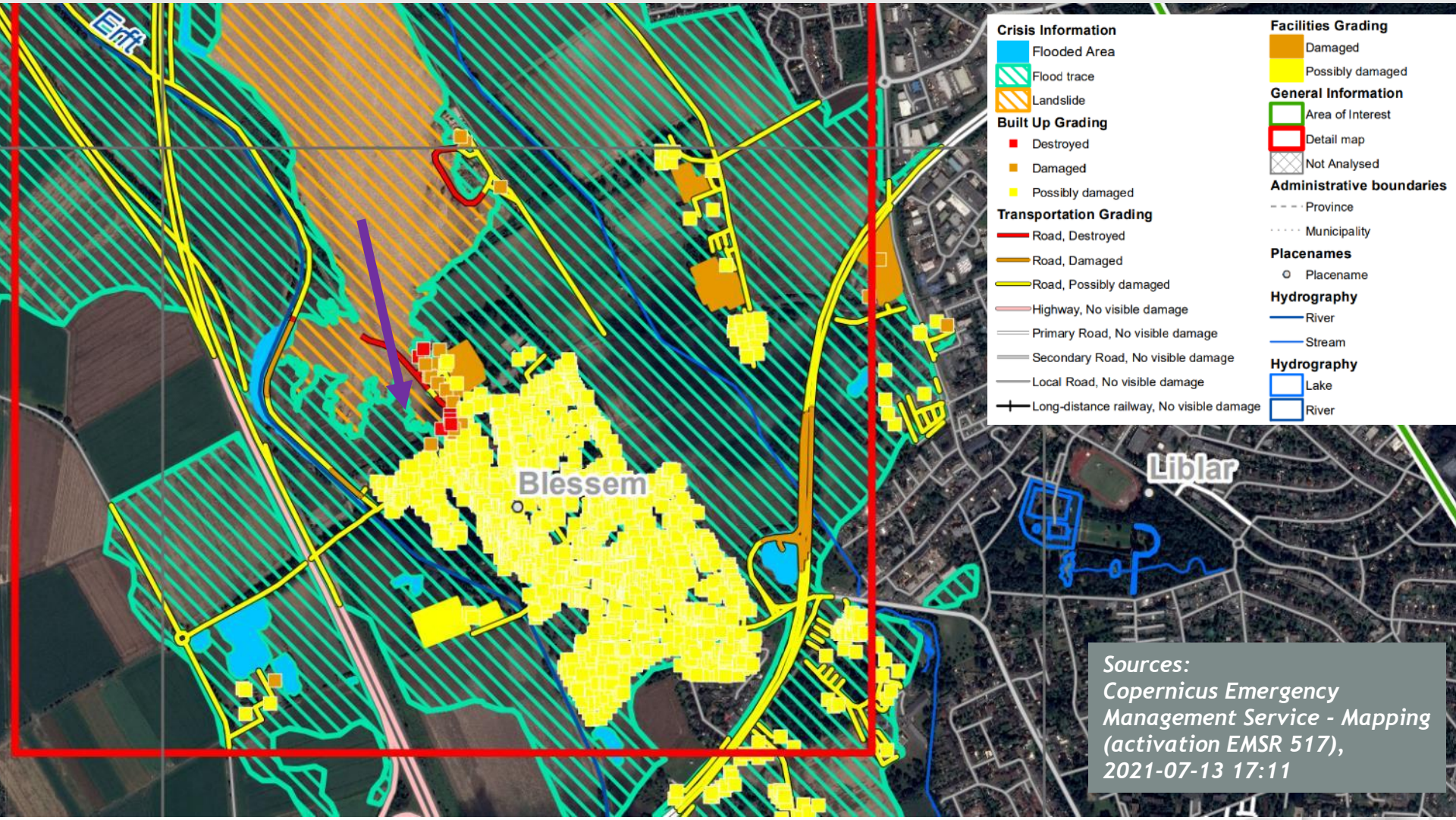

Sources:
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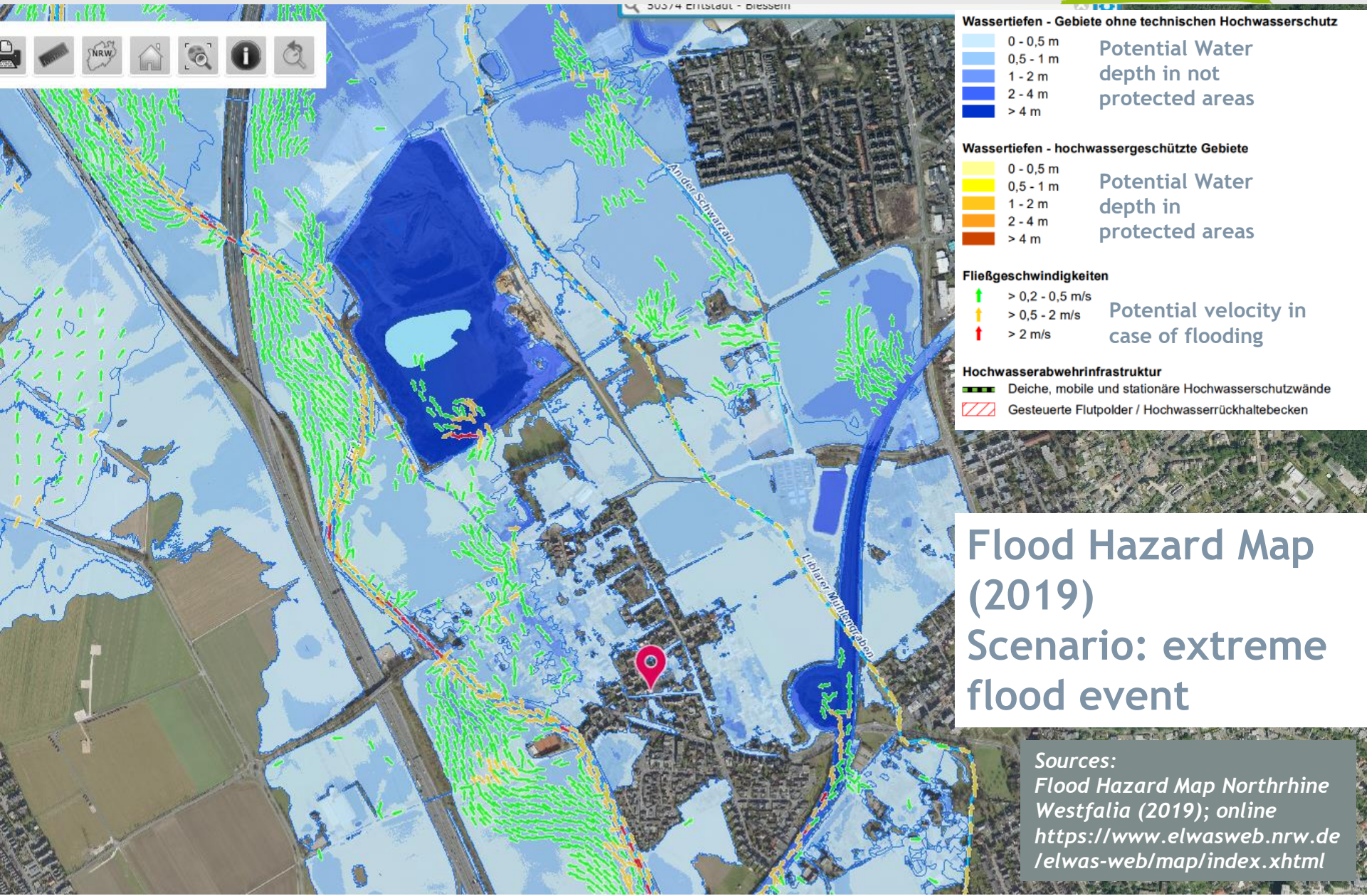
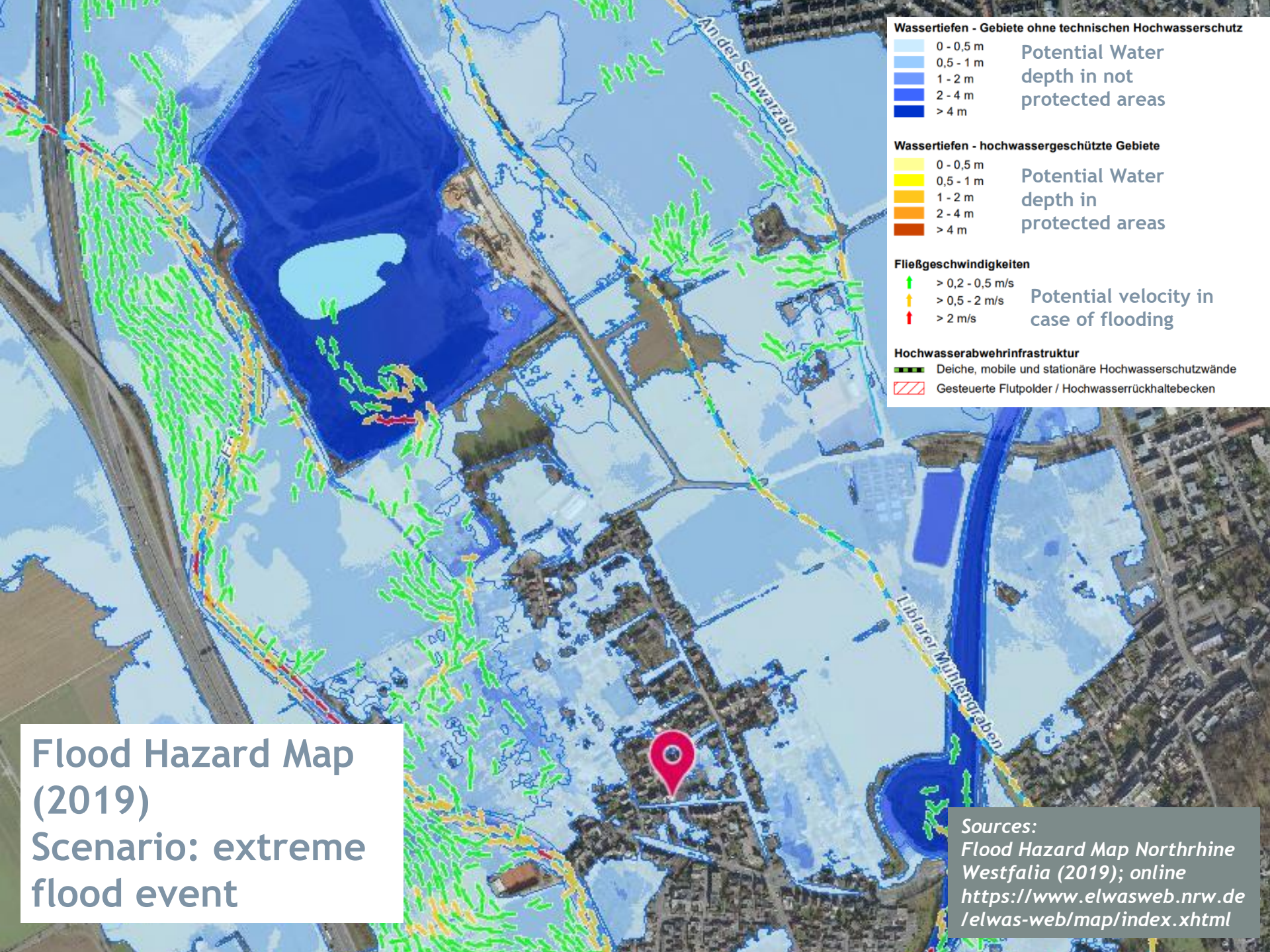


Flood Hazard Map (2019) Scenario: extreme flood event

Sources:
Flood Hazard Map Northrhine Westfalia (2019); online https://www.elwasweb.nrw.de /elwas-web/map/index.xhtml



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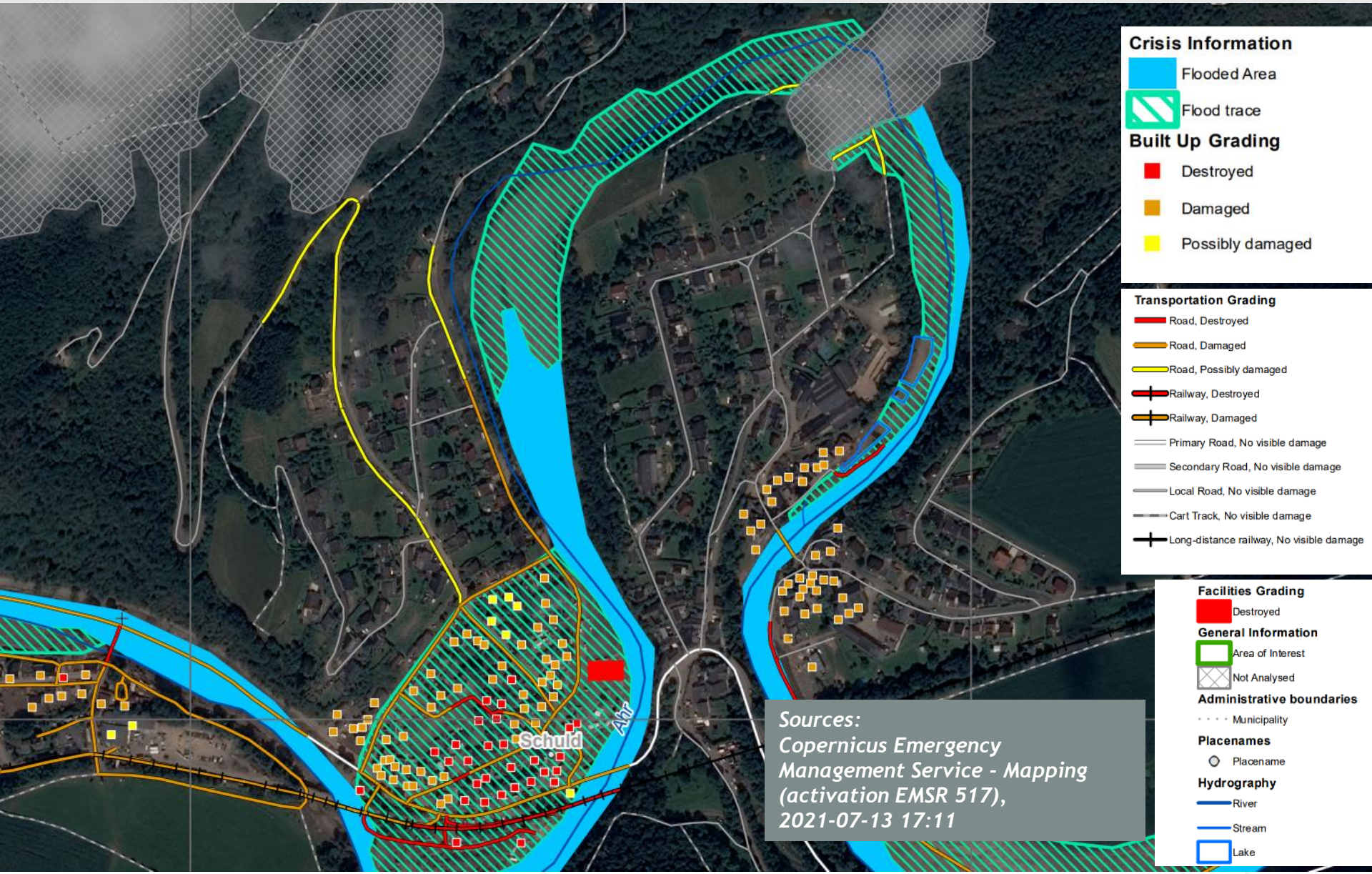
2. LESSONS LEARNT SO FAR: WHAT ARE FIRST CONCLUSIONS



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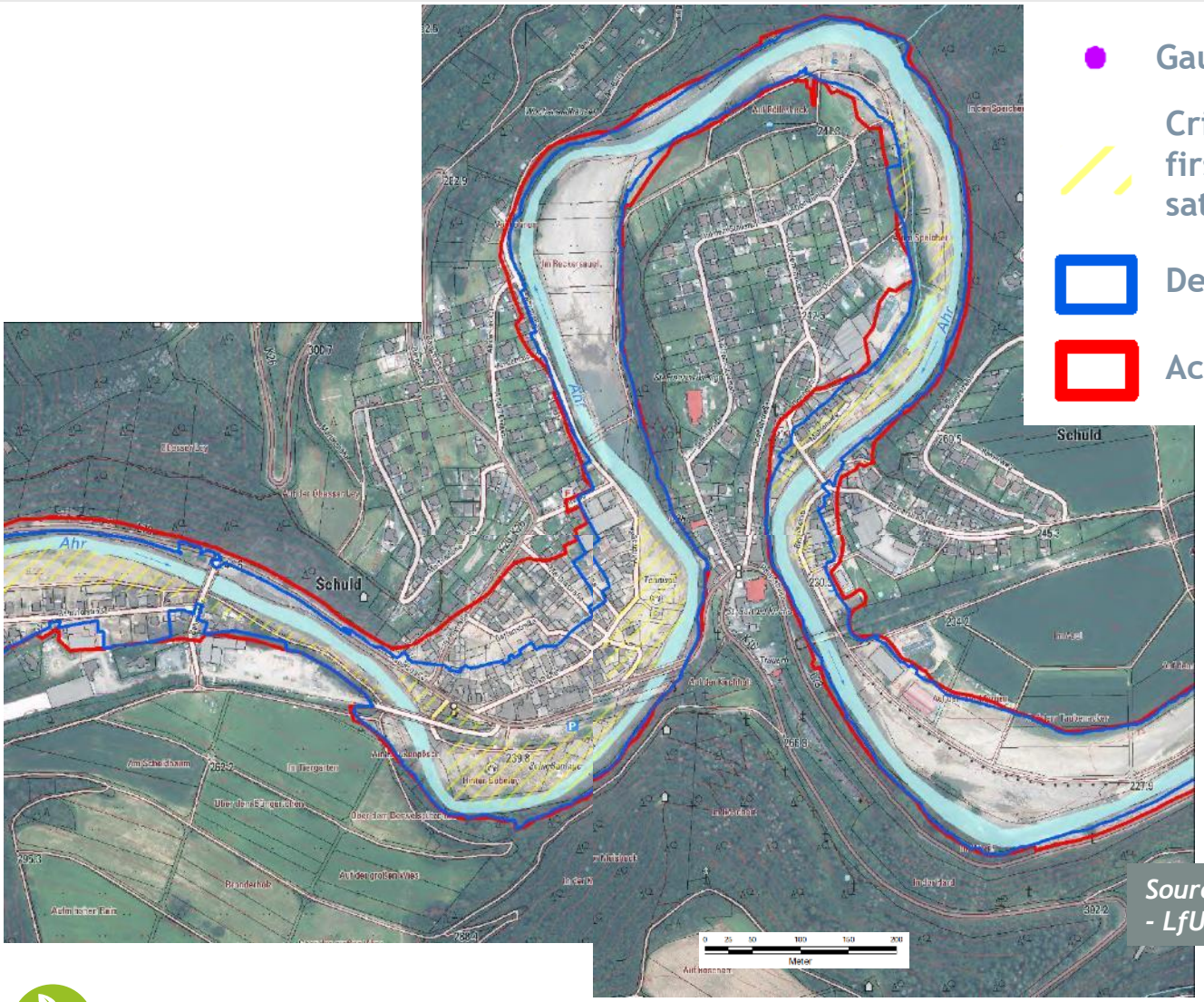

Gauging station

Critical hazard area based on first evaluations of damages satellite date after the event

Designated flood plains Ahr

Actual flooding 14./15.7.2022

Sources:
- LfU Rh-Pf (Sep 2021)

2. LESSONS LEARNT SO FAR: WHAT ARE FIRST CONCLUSIONS

- **Extreme events really happen … now we cannot ignore that**
  - although many people did/do not want to know.
  - in future perhaps even more.
- **Small catchments are today's problem …**
  - dangerous meteorological situations are increasing
  - combined impacts of long term heavy rain, erosion, blocking, flooding
  - no sufficient forecast, danger for people (not "only" economy)
  - for large catchments we have improved over 30 years.
- **Risk areas must be reviewed and redefined according CC?**
  - is the maximum design flood really the maximum in future?
  - aren't restrictions in extreme-risk-areas adequate if we safe lifes?
- **Preparedness, preparedness, preparedness …**
  - but how can we improve risk-communication? We tried since 30 years?

3. HOW CAN WE BETTER ADAPT TO EXTREME EVENTS

(1) Improve modelling & forecast in small catchments

(2) Close the communication-gaps during crises
meteorology + hydrology + emergencies + local actors

(3) Clear and honest risk-communication (in times without floods), improve awareness

(4) Improve preparedness (honest information, training, self-protection)

(5) Review and improve risk area definition and determination

(6) Strengthen management of land use and sensible objects in risk areas

3. HOW CAN WE BETTER ADAPT TO EXTREME EVENTS

Phase 1 immediate	Phase 2 short term		Phase 3 medium/long term
1. Vision, strategy, objectives (overarching for all sectors + cross-sectoral) Installation of a "future conference"	**2a. Sectoral resilience requirements** (what to consider when rebuilding ... / many different disciplines)	**2b. Focussed spatial analysis / development restrictions & potentials** (where is what possible, where is what to be considered; discussion/coordination with local actors!)	**3. Development concept / „Masterplan" sustainable, climate adapted Ahr Valley** (… overall and sectoral development)

Provision of consulting offers for municipalities, planners, local actors, infrastructure operators etc.

Sources: Heiland, Peter (Aug 2021) on behalf of the parliament of Rhineland-Palatinate

3. HOW CAN WE BETTER ADAPT TO EXTREME EVENTS

We need clear guidelinies & requirements for all relevant sectors (guidance, consulting)

„Resilience-requirements“: areas, design, material, organisation …:

- **Preventive flood protection, technical protection, flood&heavy rain resilience**
- **Adaptation to additional impacts of climate change**
- **Climate protection, energy efficiency, reduction of carbon gases**

Sectoral „resilience-requirements“

- Aspects fo urban/village development, social aspects
- Economy, agriculture, winery, tourism
- Water supply, energy supply
- Urban drainage, waste water collection and treatment
- Roads, railway, other transport aspects
- Cultural heritage, protection of historical building/objects
- Social infrastructure, education
- Nature protection, urban green, multifunctional uses

Implementation and organisation guidance
- coordination
- regulation
- subsidising

[Legal aspects]

[Financing, funding]

Sources: Heiland, Peter (Aug 2021) on behalf of the parliament of Rhineland-Palatinate

3. HOW CAN WE BETTER ADAPT TO EXTREME EVENTS

Requirements to improve flood resilience

1) Review risk assessments / risk area delineations (based on actually documented areas):

- Floodplains (new cross-sections).
- Risk areas
- heavy rainfall risk areas.

In addition:
- re-evaluate influences of blockages on bridges and debris/ bedload.
- risks from the interaction of floods and heavy rainfall

2) Consequent regulation of land use:

a. Keep free all areas for discharge of flood waves and heavy rain run-off (too many exceptions are allowed)

b. Keep free all high risk areas, also those where buildings were destroyed

c. Moderate risk areas: precautionary measures, protection of objects, raise awareness and preparedness

3) General requirements e.g.:

(1) Retention areas and ponds, flood channels, room for the rivers

(2) Risk awareness and risk communication

(3) Protection works where suitable and necessary

(4) Identify and solve conflicts of land users, land owners and existing risk; dialogue and solution-finding

Sources: Heiland, Peter (Aug 2021) on behalf of the parliament of Rhineland-Palatinate

Thank you for your attention!

Peter Heiland
INFRASTRUKTUR & UMWELT Professor Böhm und Partner

https://www.interreg-central.eu/TEACHER-CE