Hessian Agency for Nature Conservation, Environment and Geology
Hessian Centre on Climate Change, Wiesbaden

Supporting communities in reducing their vulnerability against impacts of short-term heavy precipitation events

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Why supporting communities?

- Flash floods in build-up areas mostly linked to convective precipitation
- Sealed surfaces increase surface runoff, water accumulates in lowest areas
- Many disaster reports at the same time: overstrained civil protection
- Low awareness of/competence in handling flash floods in municipalities, due to:
  - rare occurrence of short-term heavy precipitation events
  - heavy-precipitation-risk is not mapped (flood risk is known for large streams, no information for areas along small streams/offside any stream)

Flooding after heavy precipitation in Offenbach/Central Germany in June 2016 (Pictures: © Stadt Offenbach)

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How supporting communities?

Key Challenge: finding ways how to **communicate highly complex scientific results to public decision makers** in communities of various size

We aim at:

1. Increasing vulnerability awareness within municipalities
2. Conveying benefits of precaution measures
3. Analysing deficits in disaster control/precaution measures
4. Jointly developing measures to reduce vulnerability

Flooding after heavy precipitation in Kassel/Central Germany in June 2014 (Pictures: © Stadt Kassel)

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Navigation

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Motivation: damages by heavy precipitation

Flooded streets and tunnels

damaged infrastructure (rails, electric supply lines), ...

Heavy precipitation event in Wiesbaden in July 2014 (up to >50 mm of rain in short time
Pictures: © ELW, H. Roling (Stadt Wiesbaden)

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Motivation: damages by heavy precipitation

Flooded homes, stores and cellars → damages to furniture, fuel leakage, short-circuits, electric shocks etc.

Threatened functioning of critical civil infrastructure (e.g., hospitals)

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Motivation: damages by heavy precipitation

Arable land erosion and impacts in nearby settlement areas

Damages by erosion in Altenstadt (upper picture) and Ebersburg (right pictures) after a heavy precipitation event
Pictures: © Gemeinden Altenstadt and Ebersburg, respectively

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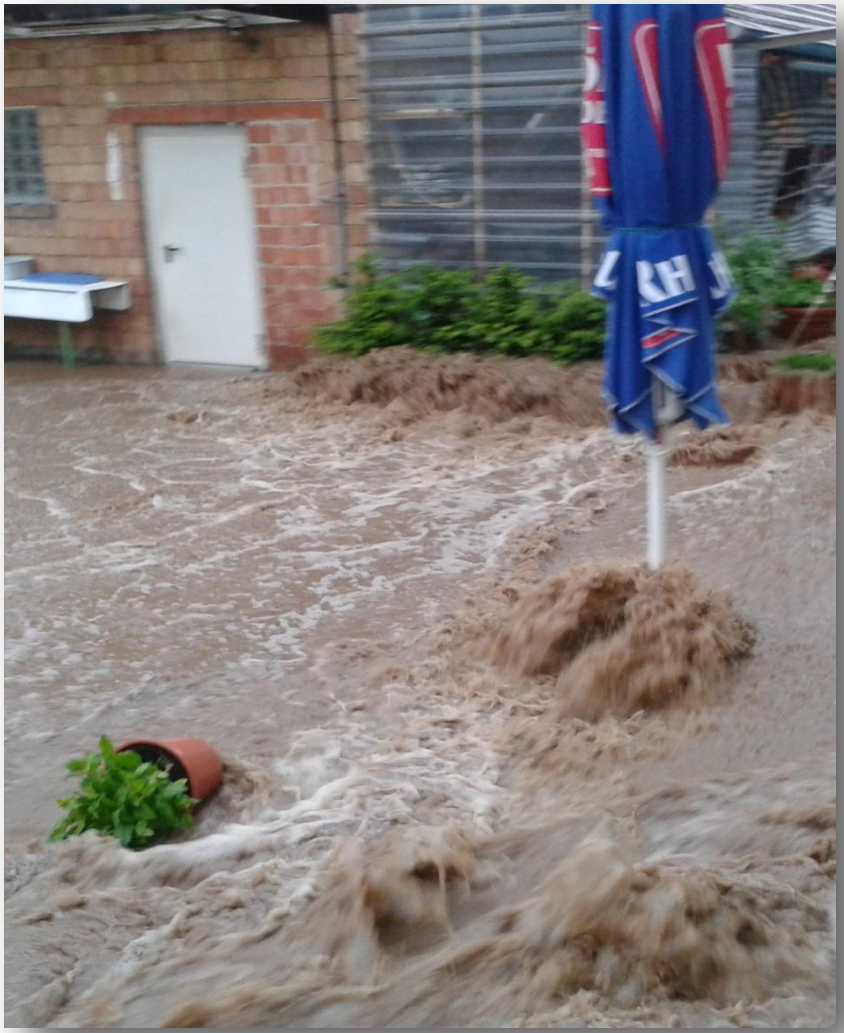
Heavy precipitation hot spot mapping

Identification of particularly vulnerable areas by county-wide

“heavy precipitation reference map” (*“Starkregen-Hinweiskarte“)*

→Illustrates areas potentially affected by heavy precipitation, based on:

- Precipitation observations (15 years of radar data, 60 years of conventional precipitation measurements)
- Documented civil protection missions (fire fighter data base, press reports)
- Land use (vegetation, surface sealing)
- Geology (slope, soil type, soil structure, → vulnerability to erosion/landslides)



Hünfeld, June2013 (© Stadt Hünfeld)

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Heavy precipitation hot spot mapping

Goals:

- Improving local land use planning
- Identification of neuralgic spots and vulnerable infrastructure
- Providing basis for higher-resolution analyses by municipalities

“heavy precipitation hazard risk map”
(*“Starkregen-Gefahrenkarte“)*
within the project provided for 2 model communities

- Enabling concrete and efficient protection measurements, e.g., for vulnerable streets and buildings,
- optimised disaster management planning,
- detention of large amounts of precipitation/water

Offenbach, June 2016 (© Stadt Offenbach)

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Facilitating use of complex data

Radar data (provided by the German Weather Service) have the potential to strongly improve hydrological calculations needed for drainage and water catchment, allowing more efficient precaution measures

→ but how do we enable and motivate users (engineers) to use those new and complex data?

→how do we convince municipalities to request the use of those data?

Kassel, June 2014 (© Stadt Kassel)

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Facilitating use of complex data

- Software to **improve managing and analysing radar data** in GIS
  1) Ad-hoc analysis of current events
  2) Climatological analysis of past events (last 15 years)

- Data collection of past heavy precipitation events observed since 2005 in Hesse
- Events can be remapped to other locations to serve as “potential events”

Offenbach, June 2016 (© Stadt Offenbach)

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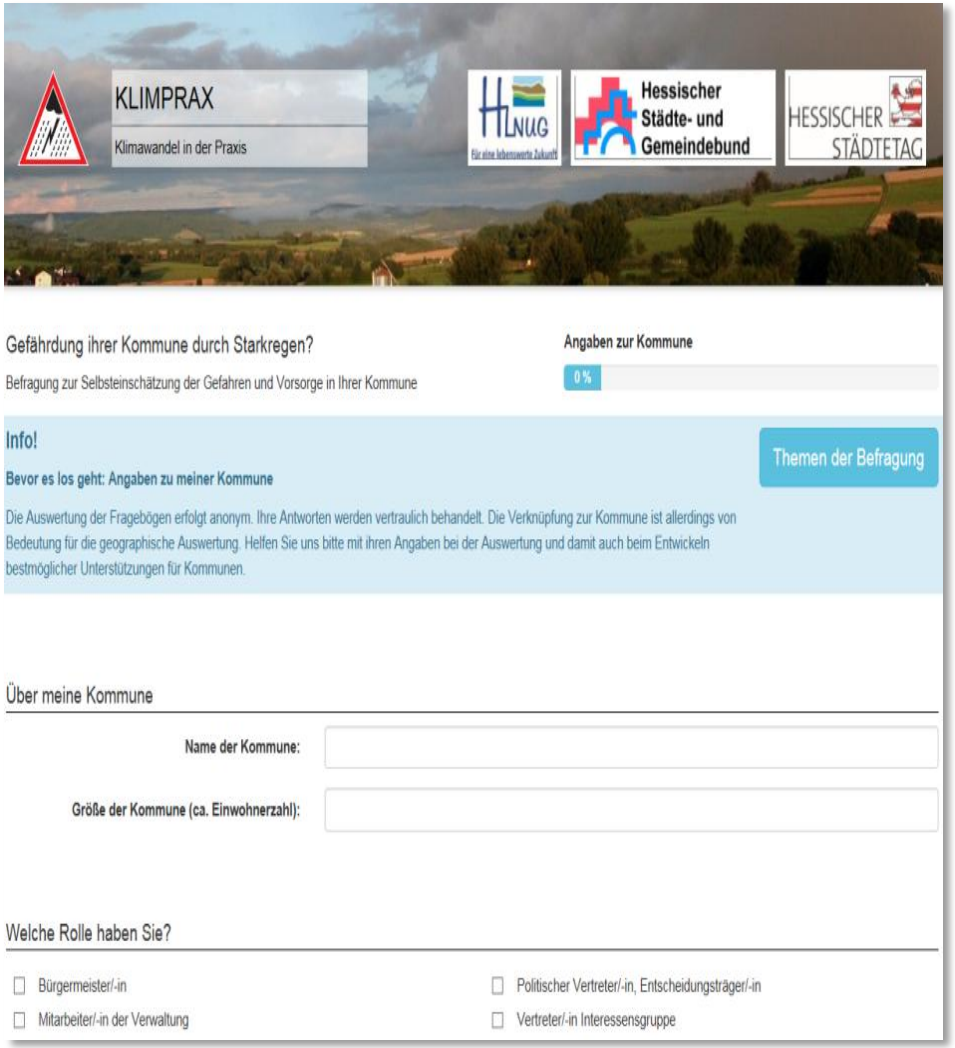
Communication: Survey

Survey among all municipalities within county of Hesse (# 426)

Goals:

1. Identifying support needs of communities
2. Communication:
    1. Increasing vulnerability awareness within municipalities
    2. Conveying benefits of precaution measures
    3. Analysing deficits in disaster control/precaution measures
    4. Jointly developing measures to reduce vulnerability



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Communication: Survey

Survey participation: 57%

Key factor for high participation: survey was supported and promoted by Hessian Associations of Municipalities

Feedback

municipalities want:

- Information material for administration and public
- Heavy precipitation hot spot maps
- Subsidies for building rainwater storage facilities and drainage systems

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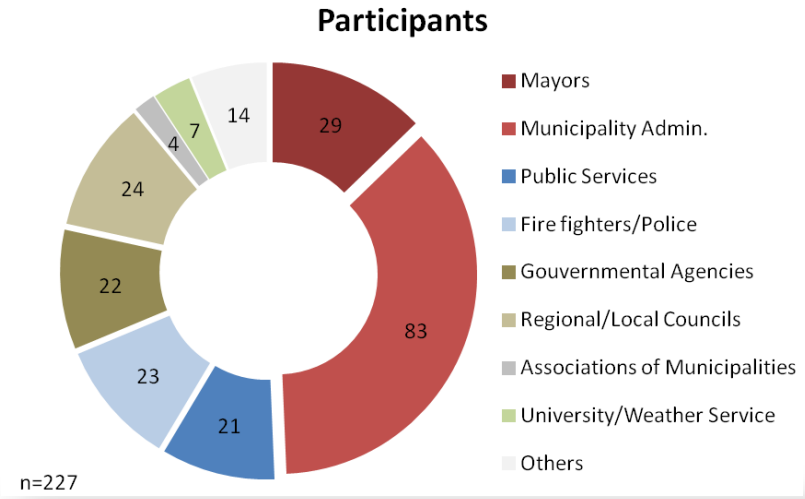
Communication: Events



- March 2017: Two stakeholder events in northern and southern project area
- Diverse mix of participants, mainly municipality representatives
- About 75 participants in more rural northern area and 150 in more urban southern area

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Communication: Events

Involving municipality representatives through presentations by selected stakeholders and subsequent open discussion

Stakeholders presented past events, damages and consequences / solutions

Results: Some measures are cost efficient while yielding large benefits, e.g.,

- Erosion protection vegetation on agricultural land retains soil on the field
- Changing slope of rural street channels water to an uncultivated road side area


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End of presentation
Thank you for watching!