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Understanding impacts and vulnerabilities in extreme climate events: an impact web of the 2021 flood in Belgium, Germany and the Netherlands

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Introduction



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What drivers of vulnerability exacerbated the short- and long-term impacts of the 2021 flood and to what extent did these lead to differences between regions and countries?

Pepinster (BE), 16 June 2022

Stolberg (GER), 16 June 2022

Approach



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Impact chains for risk assessment (GIZ and EURAC, 2017)

Step 1: Identify potential climate impacts and risks

Step 2: Determine hazard(s) and intermediate impacts

Step 3: Determine vulnerability

Step 4: Determine exposed elements

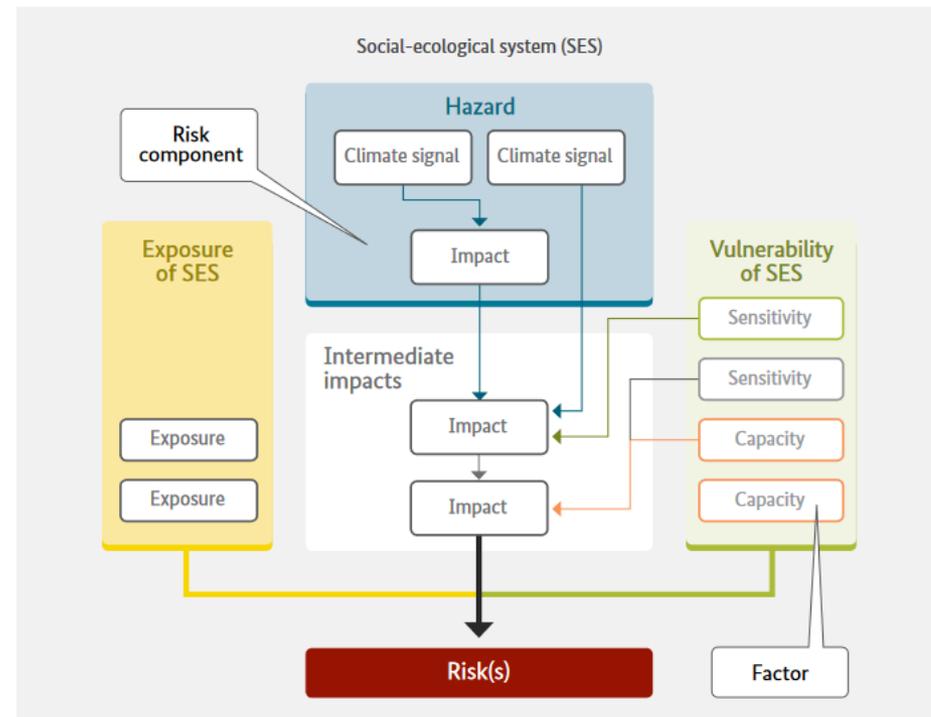


Fig. 1: Structure of an impact chain (Source: GIZ and EURAC, 2017)

Approach



Impact chains for risk assessment (GIZ and EURAC, 2017)

Step 1: Identify potential climate impacts and risks

Step 2: Determine hazard(s) and intermediate impacts

Step 3: Determine vulnerability

Step 4: Determine exposed elements

Impact web for assessing impacts and vulnerabilities (based on Hagenlocher et al., 2022)

Step 1: Determine hazard and intermediate impacts

Step 2: Identify impacts and cascading effects resulting from the hazard as well as response measures

Step 3: Identify drivers
Drivers of vulnerability including exposure, susceptibility, coping and adaptive capacity
Other hazards

Step 4: Identify interconnections between the elements

Data sources



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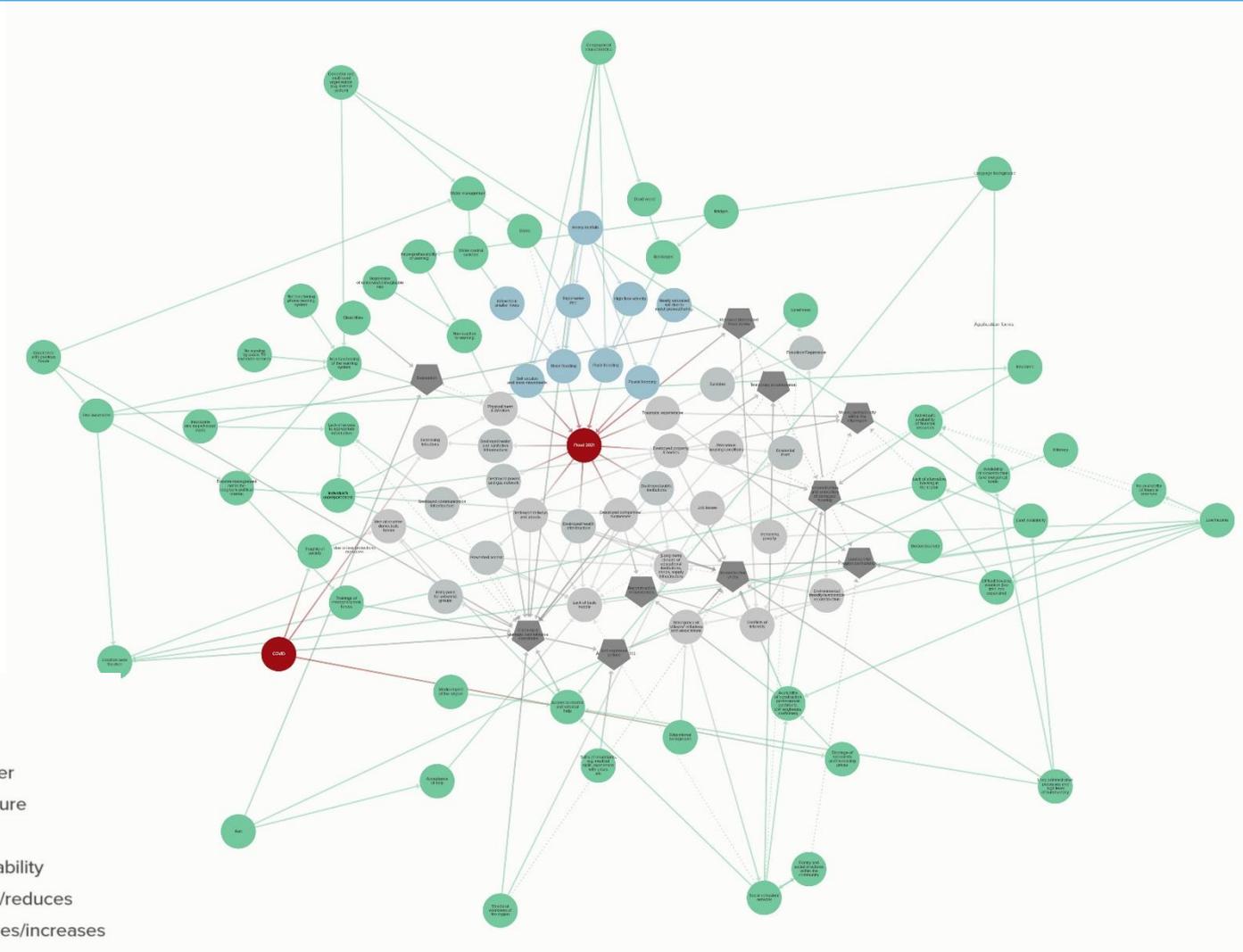
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- Desk study
 - 50 Newspaper articles
 - 10 Reports and papers
- Interviews
 - Water management (4)
 - Spatial planning and reconstruction (2)
 - Social association and emergency aid (1)
- Survey
 - 32 respondents



Development of impact web



Legend

- Hazard
- Biophysical driver
- ⬠ Response measure
- Impact
- Driver of vulnerability
- - - hampers/avoids/reduces
- leads to/enhances/increases

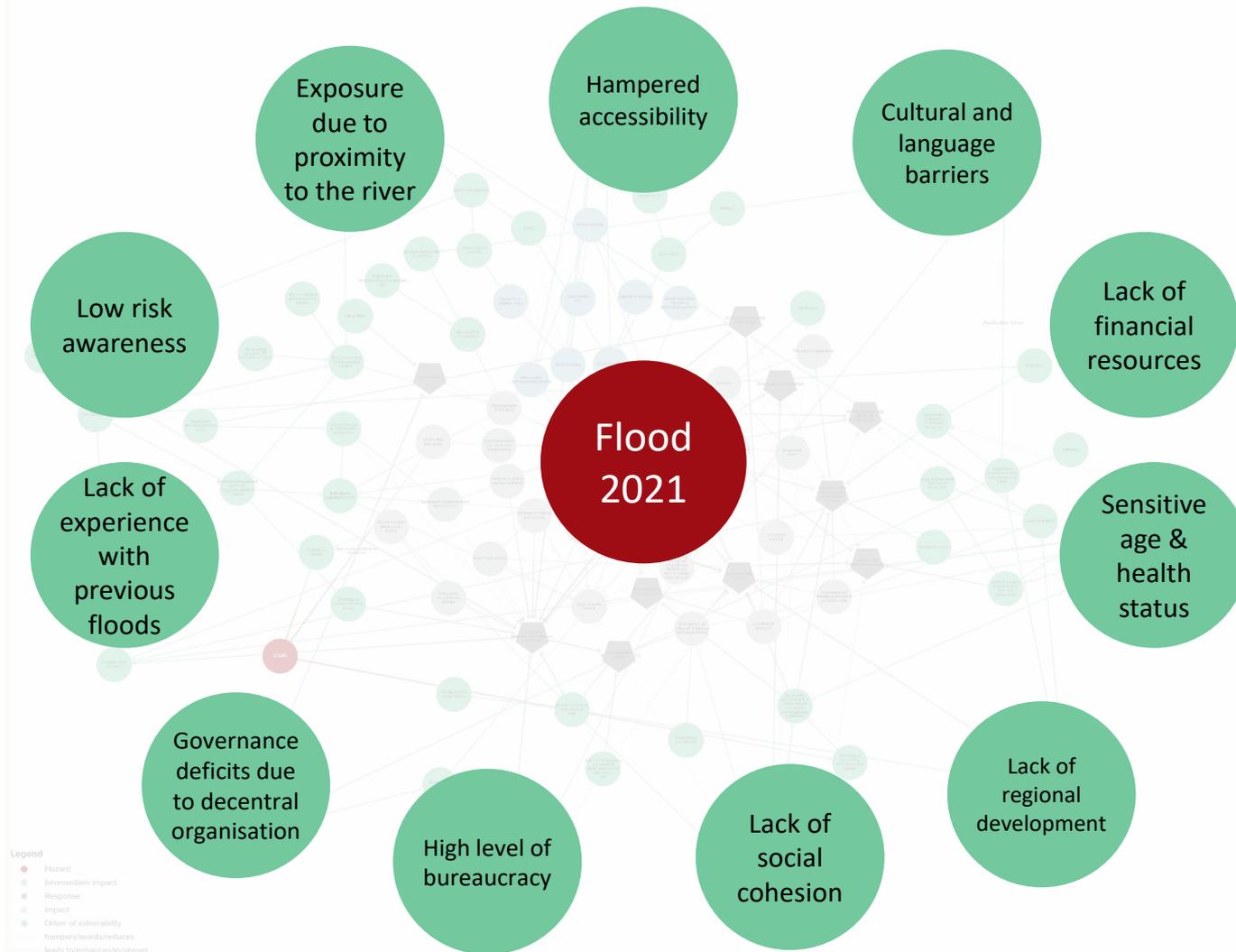
Drivers of vulnerability



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Spatial differences



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Pepinster (BE)
16 June 2022



Stolberg (GER)
16 June 2022



Valkenburg (NL)
13 June 2022

Drivers of vulnerability

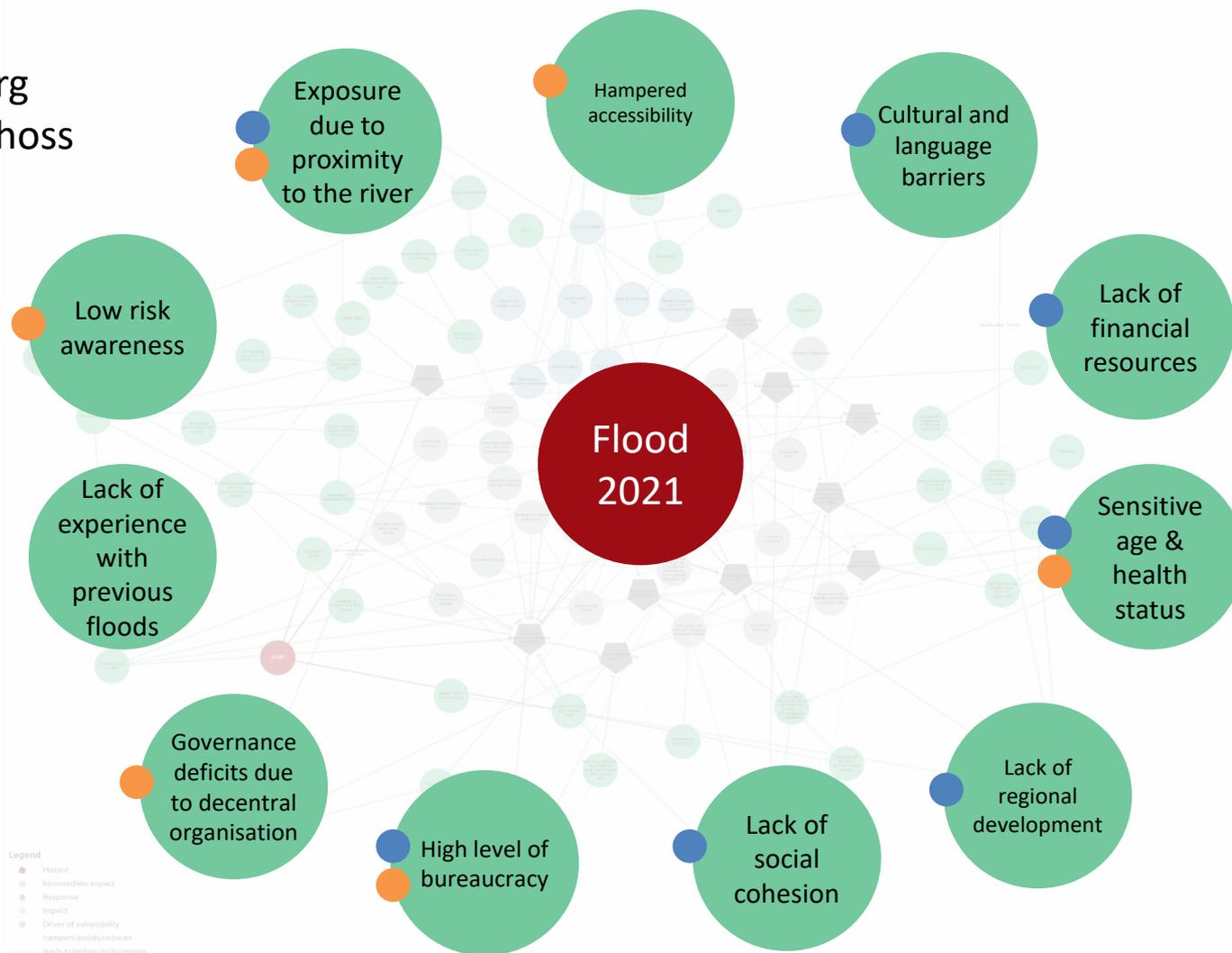


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- Stolberg
- Mayschoss



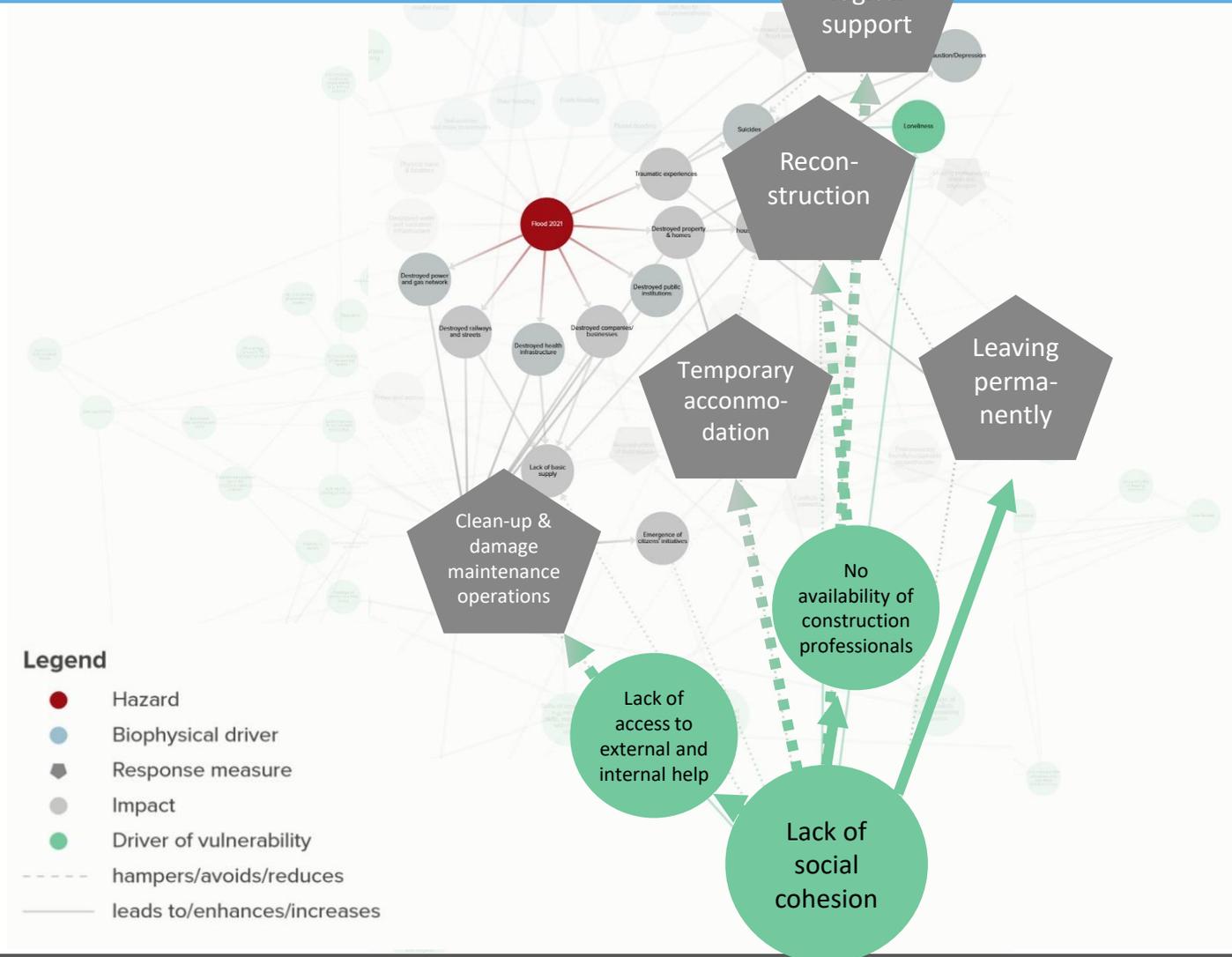
Social cohesion



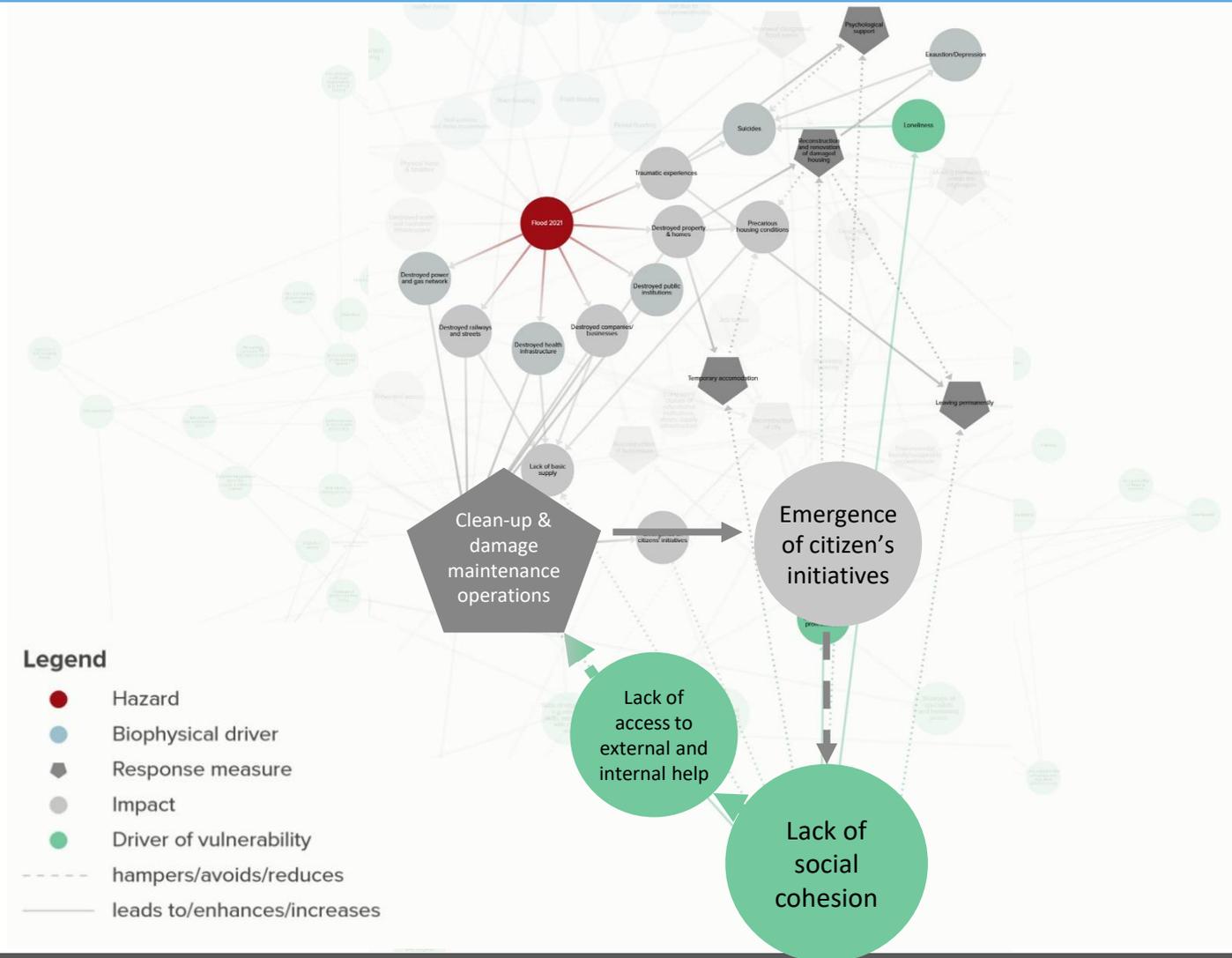
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Social cohesion



Key messages



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Drivers of vulnerability
are spatially
differentiated.

Impacts and drivers of
vulnerability change
over time.

Drivers and impacts
are interconnected in
themselves and with
each other

Strength of drivers can
change in response to
the disaster.

Methodological discussion



Advantages

- Identifying cascading and thus not only short- but also long-term effects
- Identifying interconnections between drivers and impacts
- Including responses measures and their cascading effects
- Assigning vulnerabilities to different locations
- Integration of different data sources

Limitations

- Selection of the elements and the interconnection is based on a subjective assessment
- A lot of data is needed to verify the interconnections
- Impact web quickly becomes complex and difficult to manage
- Weighting of drivers is difficult



Outlook & remaining questions

- How to integrate drivers of vulnerability into the disaster risk management cycle?
- How are different vulnerabilities and impacts are interconnected?
- How can spatial differences be analysed and highlighted?

Thank you!



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