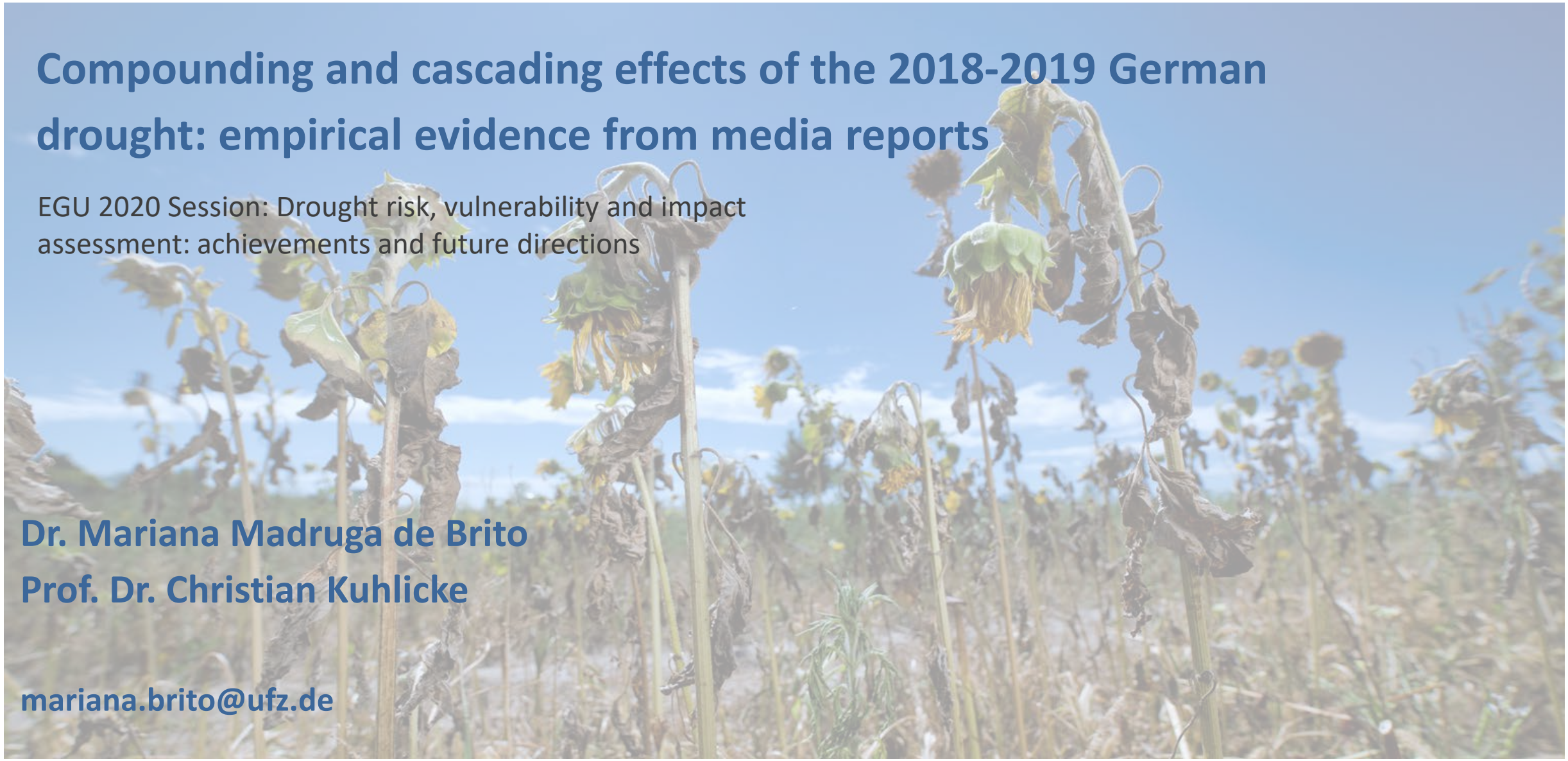

Compounding and cascading effects of the 2018-2019 German drought: empirical evidence from media reports

EGU 2020 Session: Drought risk, vulnerability and impact assessment: achievements and future directions

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Outline of the display

1 What is the issue?

Little research has been conducted on the quantification of drought compounding effects and of how they propagate as cascades across the society

2 What is our goal?

Propose a method for the visualization and quanti-fication of droughts compounding and cascading effects based on media report data

The case of the 2018/19 drought in Germany is used to illustrate our approach. It affected 90% of the German territory

3 How is our approach implemented?

Data: media reports from 17 German newspapers published between April 2018 and August 2019

Methods:

- text-mining
- network inference
- data mining techniques

4 What were the main outcomes?

4,839 media impact statements (MIS) were identified

multiple MIS were reported simultaneously, especially forestry-related. Positive associations outnumber negative ones (80.3% vs 10.8%)

Crop loss were usually followed up by a shortage of feed for livestock MIS

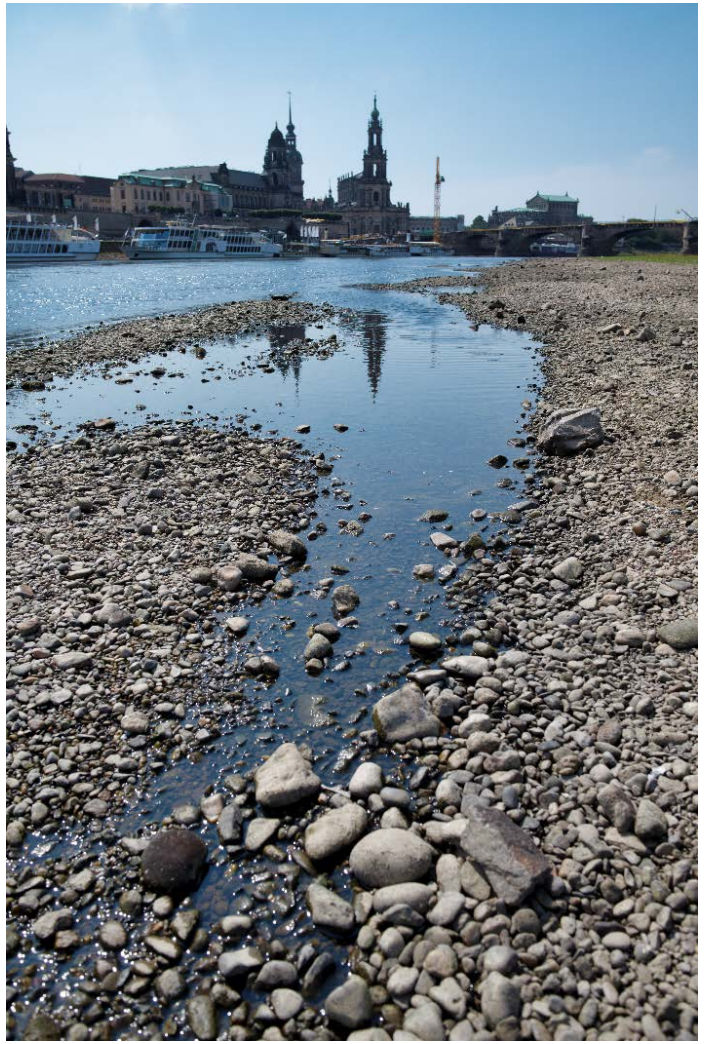
5 What is the value of our approach?

Our method allows for:

- near-real-time impact assessment
- high spatial and temporal resolution
- validation
- user friendly visualization of impact interactions, cascading paths and dependency
- estimation of next impacts likely to take place

1 What is the issue?

- Contemporary drought impact assessments have been constrained due to data availability, leading to an incomplete representation of impact trends
- Validation against official statistics or other independent data is usually not performed
- The understanding of their effects and cascading consequences is still incipient. Existing studies are constrained to the development of conceptual pathways, expert-based scenarios and narratives



2018 drought in Dresden *© André Künzelmann / UFZ*

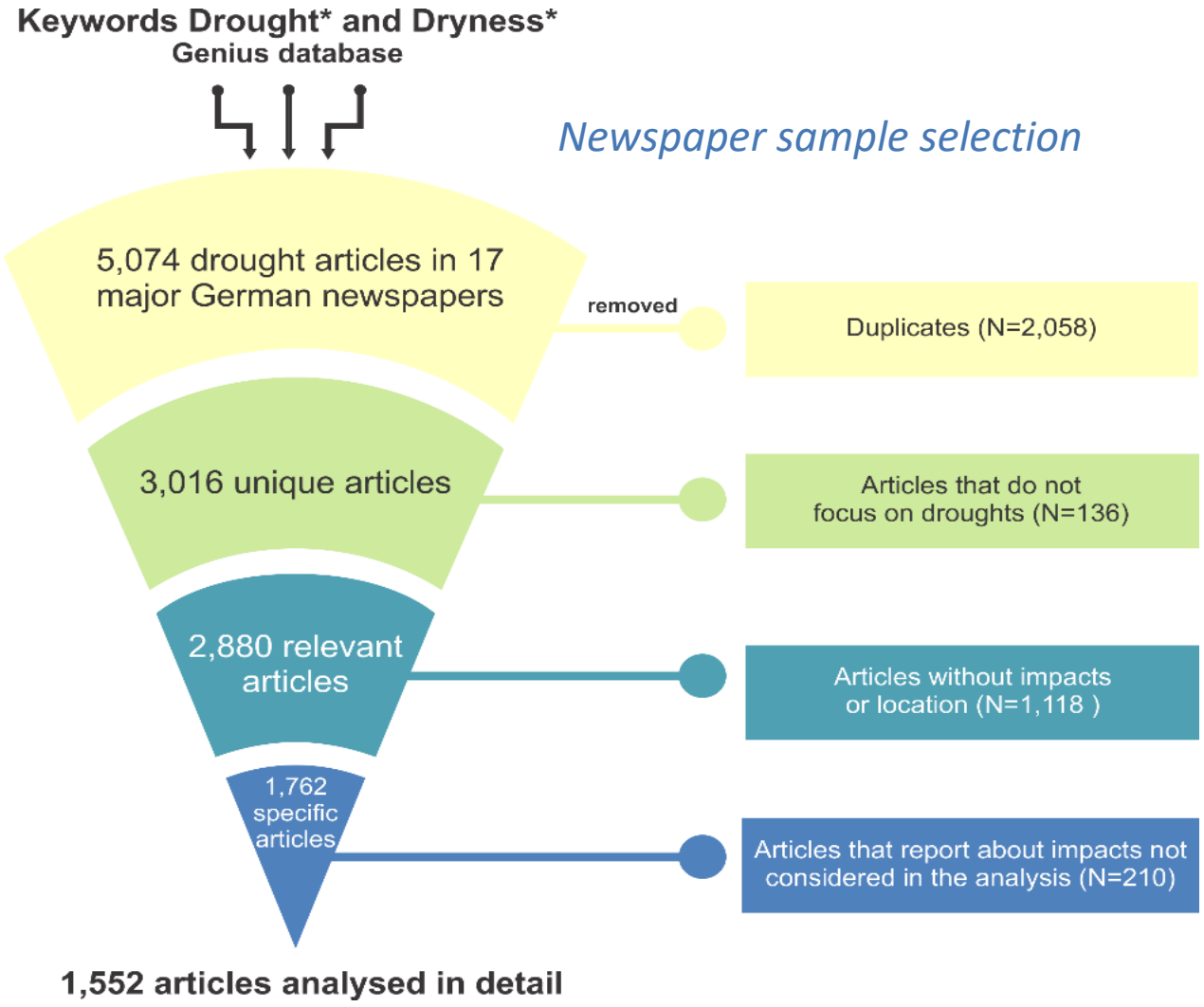
2 What is our goal?

- Propose a method for the assessment of drought impacts at near-real-time
- Visualize the co-occurrence and cascading patterns of the drought impacts
- Investigate if the impacts co-occur by chance or follow a pattern

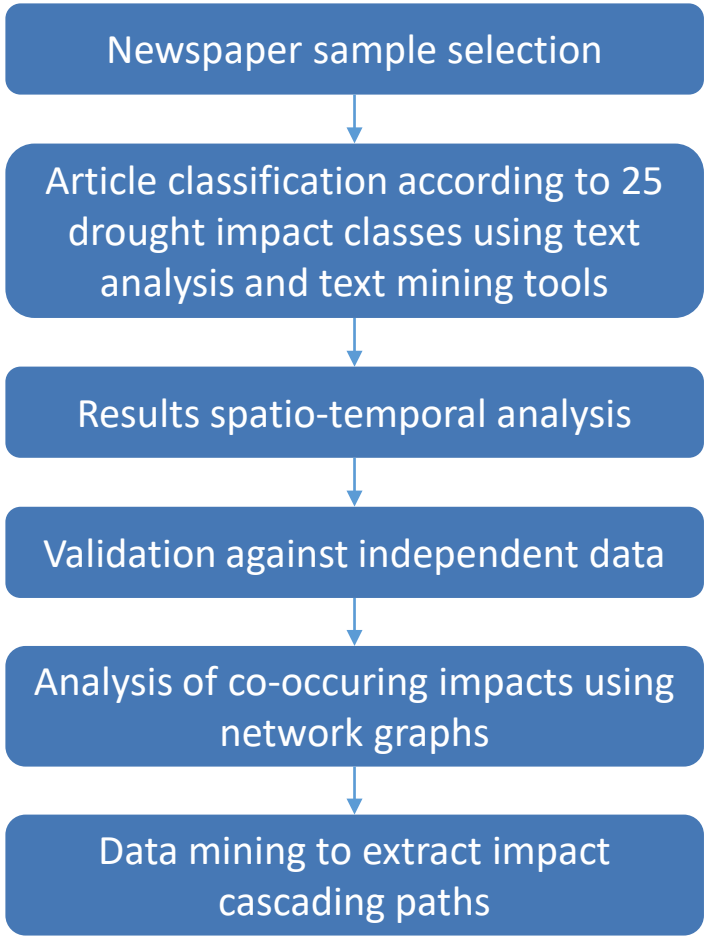
Our approach is illustrated through the case of the exceptional 2018/19 German drought

Dieback of trees in Harz forest, 2020 *© Roland Krieg / UFZ*

3 How is our approach implemented?

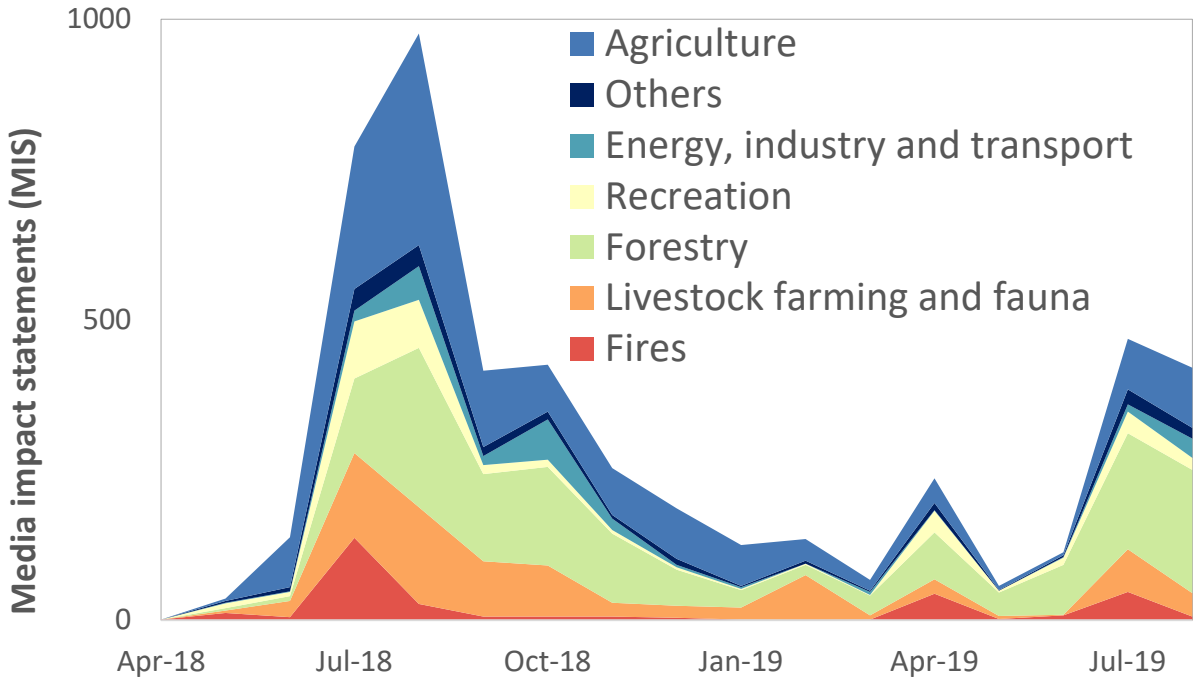


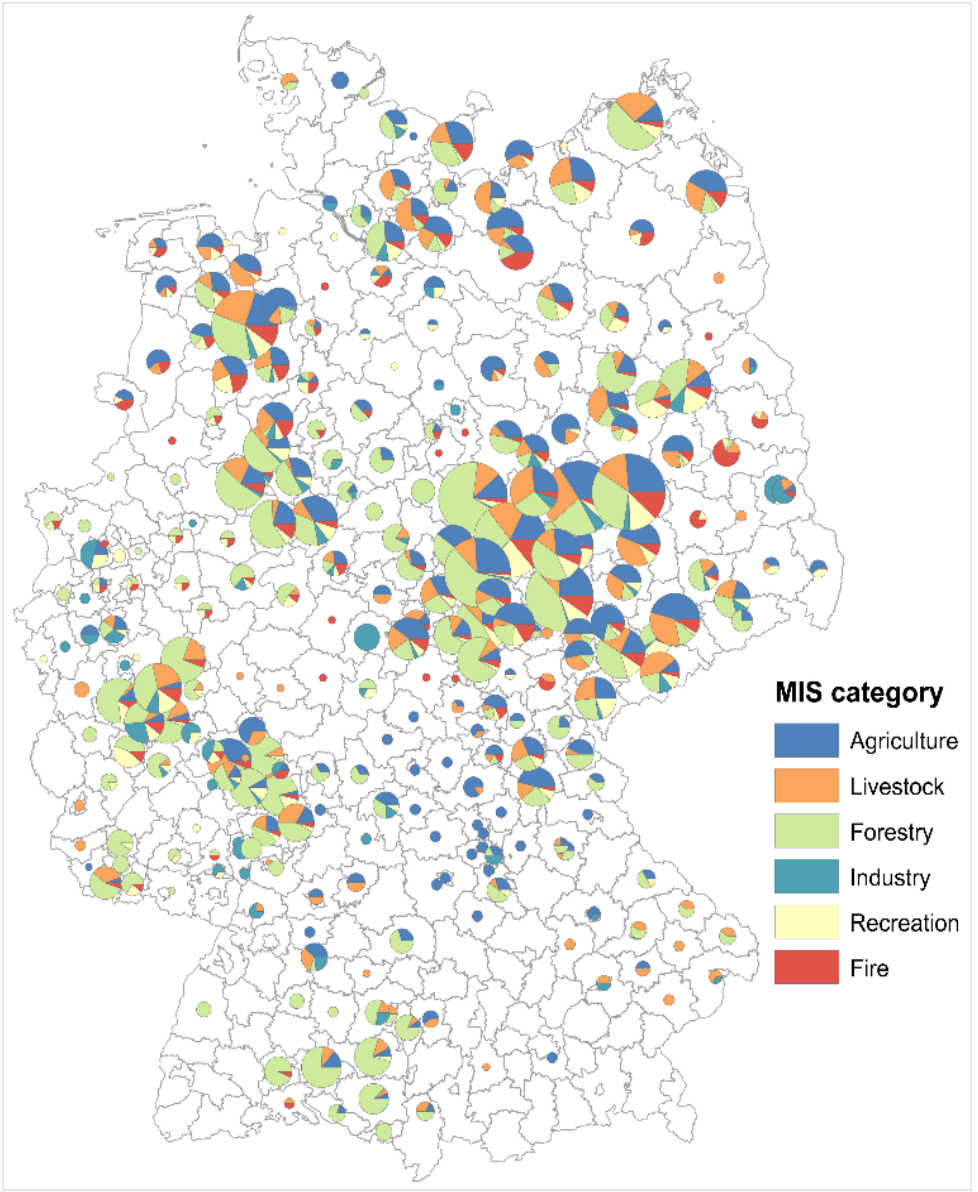
Main steps



4 What were the main outcomes?

Spatio-temporal distribution of the media impact statements (MIS)



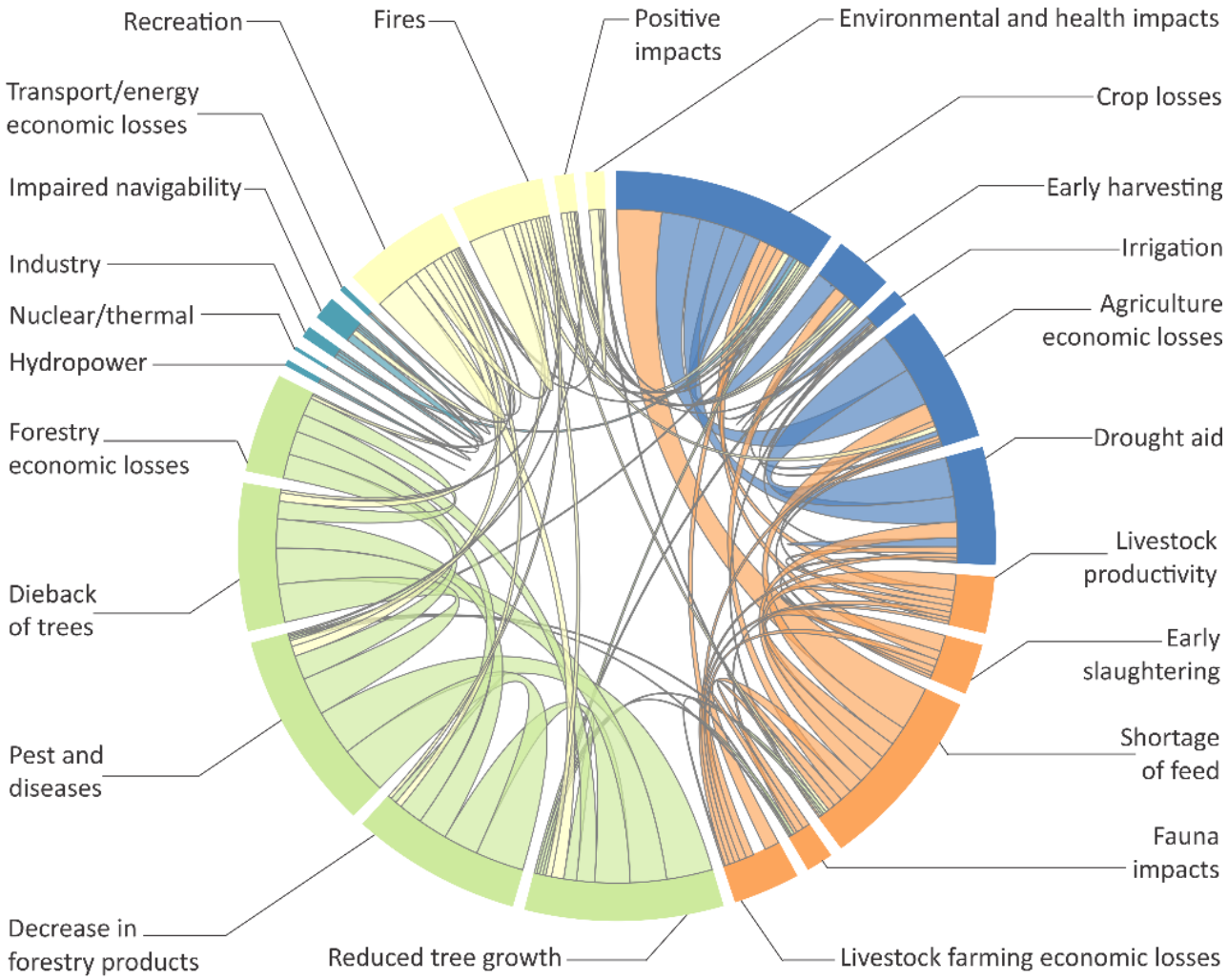


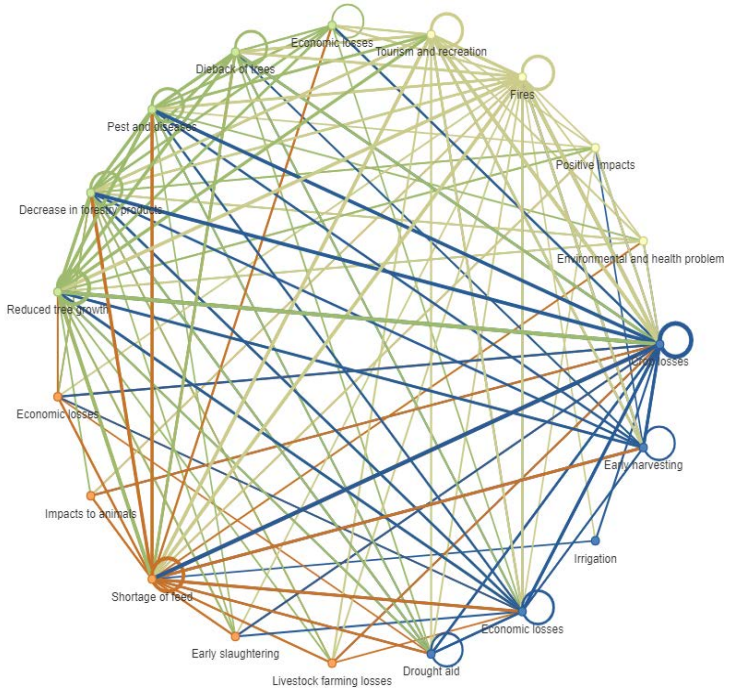
- 4,839 media impact statements (MIS) were identified. An accuracy of 95.5% was obtained for their automatic classification
- High levels of performance were found when validating our results against independent data (e.g. soil moisture data, average precipitation, population interest in droughts, crop yield and forest fire statistics)

4

What were the main outcomes?

Compounding or co-occuring media impact statements (MIS)





MIS cascading paths

- 4,608 co-occurring interactions were found
- Results of a probabilistic model show that 4,197 MIS interactions were non-randomly distributed, meaning that the probability of having found each of these interactions by chance alone was <0.05
- Positive associations outnumbered negative ones (80.3% versus 10.8%)
- a total of 5,018 different combinations of MIS cascades were identified with a total of 82,968 MIS cascading sequences

5 What is the value of our approach?

Our study provides robust solutions for some of the main issues in drought impact analysis, namely:

- Automatic classification of the impacts by using text mining
- Near-real-time impact assessment
- High levels of spatial and temporal stratification at NUTS 3 scale
- Validation against a series of independent data
- Identification and user friendly visualization of compounding and cascading effects

The proposed approach can help to increase awareness on possible impact interactions and dependency, improving decision-making ability
We anticipate our method to be used as a starting point for an impact-based early warning system

What do you think?

From our perspective, our research shows **a simple yet systematic and reproducible method, which makes it possible to rapidly assess drought impacts and their relationships**.

We are curious about your opinion. Do you think our approach could be helpful for other case studies? How can we move forward towards impact-based early warning systems? Do you see potential for **collaboration**?

We would like to discuss with you how the use of analytical approaches such as network inference and text mining can contribute to drought impact research.

Please leave a comment or contact us directly: mariana.brito@ufz.de and christian.kuhlicke@ufz.de

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