Building Longitudinal Data Using DesignSafe

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OBSERVATIONS

GEER Team August 2021

ECU Team October 2022

Pepinster, Belgium sits at the confluence of two rivers (Hoëgne & Vesdre) which feed into the Meuse. Evacuation warnings were not issued to Pepinster from the national alert cellular app Be-Alert. Residents are still awaiting insurance disbursements and government assistance. Many buildings, including schools and businesses, remain vacant.

Pre-flood 2021 (Left
GEER Team August 2021 (Right)

ECU Team October 2022

Altenburg, Germany in the Ahr Valley, just upstream from the municipality of Altenahr. Normally the Ahr meanders, but the rising waters flooded the homes and businesses built along its banks. Bridges and rail and roadways were significantly damaged.

GEER Team August 2021

ECU Team October 2022

Altenahr is situated on the Ahr River's "Ahrbend" which puts a majority of the town surrounded by water on three sides. Its AM Tunnel was flooded and cut off the exit from areas upstream such as Ahrweiler. Both the railway bridge and pedestrian bridge were destroyed. Thirty-three people died in Altenahr.

REFERENCES

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ACKNOWLEDGEMENTS

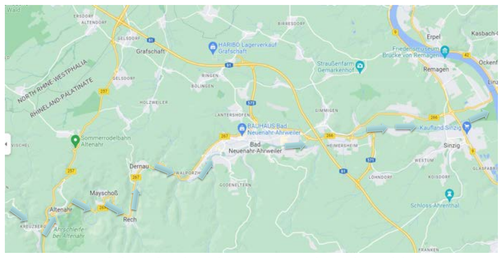
Support by NASA under grant #80NSSC22K0048
Caroline Williams, University of Delaware for technical assistance

ASTRACT

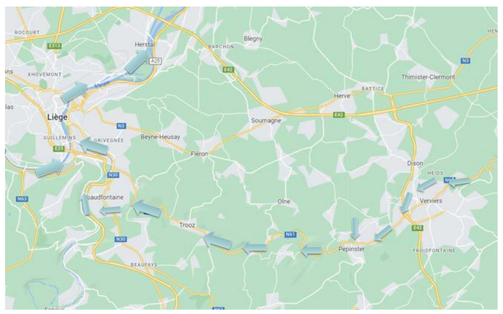
In July 2021, Germany and Belgium were inundated with flood waters from the Rhine and Meuse Rivers and their tributaries. In August, only a few weeks after the storms, a Geotechnical Extreme Events Reconnaissance (GEER) research team of international scholars provided a preliminary post-event assessment of the impacted areas. Using unmanned aerial vehicle (UAV) and terrestrial photography, terrestrial light detection and ranging (LiDAR) scans, multispectral photography, and on-site photography, sampling, measurements, and interviews, the team documented geotechnical and structural damage, water level measurements, erosion, and sediment redeposition, scour, utility network performance, and first response information. Their preliminary data were submitted for the natural hazards research community to DesignSafe. Both the GEER and the National Hazard Engineering Research Infrastructure's (NHERI's) DesignSafe are supported by funding from the National Science Foundation (GEER-CMMI#1826118, DesignSafe-#2022469). Our team followed the GEER team's tracks one year later (October, 2022) using the digital and visual information archived in DesignSafe platform. This poster describes the process we used to create a similar photographic collection to extend the GEER's original data set. The GEER team comprised of local experts and academics in engineering and geological sciences reported on structural damages. Our team of economists and an engineer looked at the same sites, at a different time and through a different disciplinary lens. This poster compares the photographic record prior to the flood, the GEER team's assessment, and our team's assessment to document recovery.

ECU Team October 2022

Temporary Water Treatment Facility in Altenahr, Germany built in front of the old facility destroyed during 2021 flooding, depicts a major step in recovery.



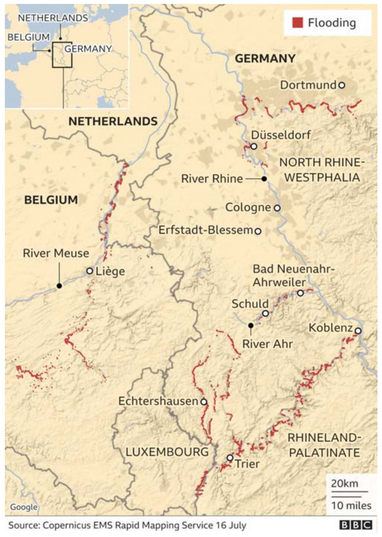
Flow of the Ahr river in Germany into the Rhine.



Flow of the Hoëgne & Vesdre rivers in Belgium into the Meuse.

ECU Team October 2022

In Dernau, Ahr Valley, Germany, the residents of this 3-story home were survived the storm on the roof. The white house has provided a canvas for painting and messages of hope and gratitude. If you look closely, you can see the water level marks. The vineyards line the backdrop of this wine-dependent town.



Map of affected regions and major areas of flooding

DISCUSSION

From August 9th – 18th the GEER research team visited areas affected by the extreme flooding. This team consisted of 18 members that were split into 5 independently operating teams. 14 months later, in October of 2022, our team made up three economists and one engineer, endeavored to recreate the GEER team's observations through the eyes of social scientists. Originally, our goal was to speak with residents and emergency managers to ascertain their responses to warnings and emergency alert systems in place. However, the goals quickly shifted after being on site to how these areas have undertaken recovery post-event. Following the GEER team's footsteps, we cataloged the state of recovery in these locations with plans to add photos to DesignSafe. In Germany, there was significant infrastructure damage (~€ 33 Billion) as well as loss of life (196 deaths). Recovery was faster in some parts of Germany than others due to the damage to railways, roads, and bridges as well as the rural nature of these communities. During our visit, we saw many communities with newly erected warning sirens as well as new cellular towers. Much of the debris has been removed and construction of important infrastructure, such as water treatment facilities, have been completed. In Belgium, the infrastructure damage (~€10 Billion) was roughly a third of Germany's. The loss of life was also much less (43 deaths). During our visit, we did not see much in the way of recovery. There had been major debris removal and construction done on some of the bridges and roads.

THOUGHTS AND CONCLUSIONS

DesignSafe provides great resources for hazards researchers to share information. This creates an opportunity for many teams to contribute to longitudinal studies. Accessing these folders can be challenging. The site does not allow filtering by discipline or field of interest which causes interested parties to download large files full of information not pertinent to their needs. DesignSafe has the potential to be a repository of hazards reports and documentation that can be updated regularly by teams on the ground during emergencies and then used by teams such as ours to create follow up reports and further publications in our fields.