“Swamped” in Bleckede: GERICS scientists flood city

After heavy rains in May 2017, the Bleckede Fire Department pumped out cellars and subterranean parking garages. The drains were opened in order to make the streets accessible again.

Global warming of up to two degrees Celsius will change natural spaces, economic sectors and living environments in Germany. For example, the book "Klimawandel in Deutschland", published by the Climate Service Center Germany (GERICS), points out that heavy rainfall has increased during the winter months. The amount of rain is pushing the urban drainage infrastructure to its limits.

GERICS scientist Dr. Markus Groth provides advice on climate-adapted municipal development so that cities and communities don't increasingly find themselves "swamped". He turns to the GERICS-adaptation toolkit for cities for his work (see information box). This modular system is based on the current state of research knowledge and can be used flexibly while remaining focused on a specific city.

Bleckede, a city on the Elbe, is one of the first cities to be counselled by GERICS specialists on the topic of "water in the city". Jens Böther, the mayor of this community, comprised of approximately ten thousand inhabitants in the Elbtalaue in Lower Saxony, speaks with Markus Groth about the results.

Climate change, with is impacts for the environment, economic sectors and society, presents various challenges for cities and communities in Germany. What challenges does Bleckede face?

Jens Böther: Climate change impacts affect us in different areas. On the one hand, we are located directly on the Elbe, where we have experienced floods in 2002, 2006, 2011 and 2013, which have triggered disaster alarm here in the region. We have built new dykes between 2007 and 2014 in answer to this situation. We didn't have these floods before this for decades. It's clear to us that something has changed. Heavy rainfall has also become a topic. There were two heavy rain events in 2016 and three already in 2017 with overloaded sewage systems together with flooded cellars and streets.

Markus Groth: There are regional climate projections for the Elbtalaue which show that summers are becoming dryer and that fall, winter and spring will see rather more precipitation. The total amount of precipitation remains about the same in terms of the yearly average. We cannot make clear statements on future changes in frequency and intensity of heavy rain events. Initial observations and calculations show, nevertheless, that the amount of precipitation is increasing during heavy summer rainfall. This is expected to lead to an increased risk of damage from heavy rains.

What exactly happens during such a severe rain event and how has this been dealt with so far?

Jens Böther: We had two focus areas: the "Industriestraße" and the "Nindorfer Moorweg" both in the city centre. That is the drainage axis for the small Bruchwetter Creek. The roads were flooded, the fire brigade was on its way and the cellars pumped out. The water wasn't retreating. In part, the pipes were completely filled with sediments because, for example, the top soil was swept away and wound up in our rainwater drainage system. We're now looking closely at this issue because, in the last few decades, infrastructures were created here that no longer drain the current amount of rainwater.

Jens Böther (left-hand side) – has been mayor of Bleckede since 2006. He holds a degree in public administration as well as in computer business management. Prior to his election as mayor, he served the District of Lüneburg in a managerial capacity. Jens Böther is a member of the CDU.

Dr. Markus Groth (right-hand side) – is a scientific staff member in the GERICS department for "Climate Impacts and Economics". He has been teaching sustainability economics at Leuphana University Lüneburg since October 2014. Groth studied economics at the University of Hanover and earned his doctorate at the University of Göttingen.

Good cooperation despite different preferences: HSV fan Jens Böther does not mind if Markus Groth prefers to drink from his Pauli cup.

Mr. Böther, why are you having the run-off behaviour, in particular, investigated by GERICS

Jens Böther: Floods on the Elbe have been closely studied in detail and we know how to deal with them. We still have very little experience with heavy rain events. We needed to flush the rainwater inlets and pipes during such events, which had become clogged with grass and sand. This costs the city of Bleckede a great deal of money, quickly amounting to a five digit sum. We now not only want to work on the symptoms, but we also want to get a handle on the causes. What leads to overloaded drains? What concerns us in Bleckede is sensitive urban development in regard to water.

Mr. Groth, how did you proceed in a scientific sense? How was the GERICS adaptation toolkit for cities put to use?

Markus Groth: On the one hand, we surveyed six hundred inhabitants in the affected urban areas as well as evaluated the volunteer fire brigade's field data. This is how we obtained a good data set on the damaging events, but we also uncovered how well-informed the citizens are and what measures have already been taken. These include, for example, constructing drainage systems, securing the water entryways or buoyancy protection for oil heating.

Were there methodological challenges in the investigation?

Markus Groth: With our partner, Tauw GmbH, we also modelled a severe rain event. We ran the simulations where we "drowned" Bleckede with the equivalent of sixty litres of water per square metre and observed what happened: Where does the water accumulate? Where can it run off? The approach in this model is standard. What was new, however, was that a very flat area was simulated and evaluated with a survey of historical events. The model has an accuracy of 1x1 metre.

Jens Böther: What impressed me was how closely the results reflect our experiences. This described our precise problem: these were the areas where we had experienced floods in recent years.

The GERICS adaptation toolkit for cities:
Planning that serves climate change – individually-tailored advice for cities

In various consulting modules, interdisciplinary solutions are developed for specific urban challenges. Processing takes place in cooperation with the city and is always case-related, as there are no cure-all solutions for adapting to climate change consequences. The modules, for example, cover city-specific climate information; urban green spaces; economics and financing; city planning that is adapted to climate; quality of life and residential environment; and water in the city.

The map of Bleckede shows the simulation of a heavy rain event. The areas in blue and red depict the areas that would be flooded.

We must act quickly through adaptation measures to keep regional climate impacts to the barest minimum. What measures does GERICS suggest?

Markus Groth: Buildings, which rapidly fill with water, obviously can't be moved, but there are numerous technical flood protective measures. We are therefore investigating what would be realistic. On the one hand, this can mean the intensivation of maintenance of the Bruchwetter Creek and other possible drainage pathways so that the ditches don't become overgrown with vegetation. On the other hand, the expected run-off behaviour can already be taken into account in new construction sites even before the planning phase.

Jens Böther: In some areas, we need to look at the pipe cross-sections and check if they perhaps need to be replaced. The insights are also helpful in future planning. Maybe an additional rainwater retention basin must be integrated into the plans for new development areas. This can clearly be seen in the simulation. In another area we might need to think about diverting the rain water first to a field rather than straight into the Bruchwetter Creek. In such cases, we would engage a hydraulic engineer who could draw up a concept for us on how to handle the issue in the future.

Mr. Groth, what further recommendations does the GERICS adaptation toolkit for cities provide?

Markus Groth: We recommend that the residents in such areas be provided with better information on severe rain events. Citizens should be informed, for example, on what property owners can do to be well-prepared should flooding occur due to severe rain events. This can be achieved through discussions, but informational material should also be produced.

Jens Böther: Building ordinances state that rainwater has to infiltrate onto the property itself. The circumstances are often different, which is completely normal. Sometimes the water simply seeps into the garden; on other properties, the rainwater, for example, flows via the driveway. In this case, you can educate the residents so that they look after their drainage systems or gutters. One way to appeal to citizens would be to say that their personal protection from heavy rains is not only the city's responsibility but is also a responsibility of those on private property.

Thank you very much for the interview.

The interview was conducted by Heidrun Hillen (HZG).

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