

City of Bonn, Germany: Warning of the Flood Wave

Challenge

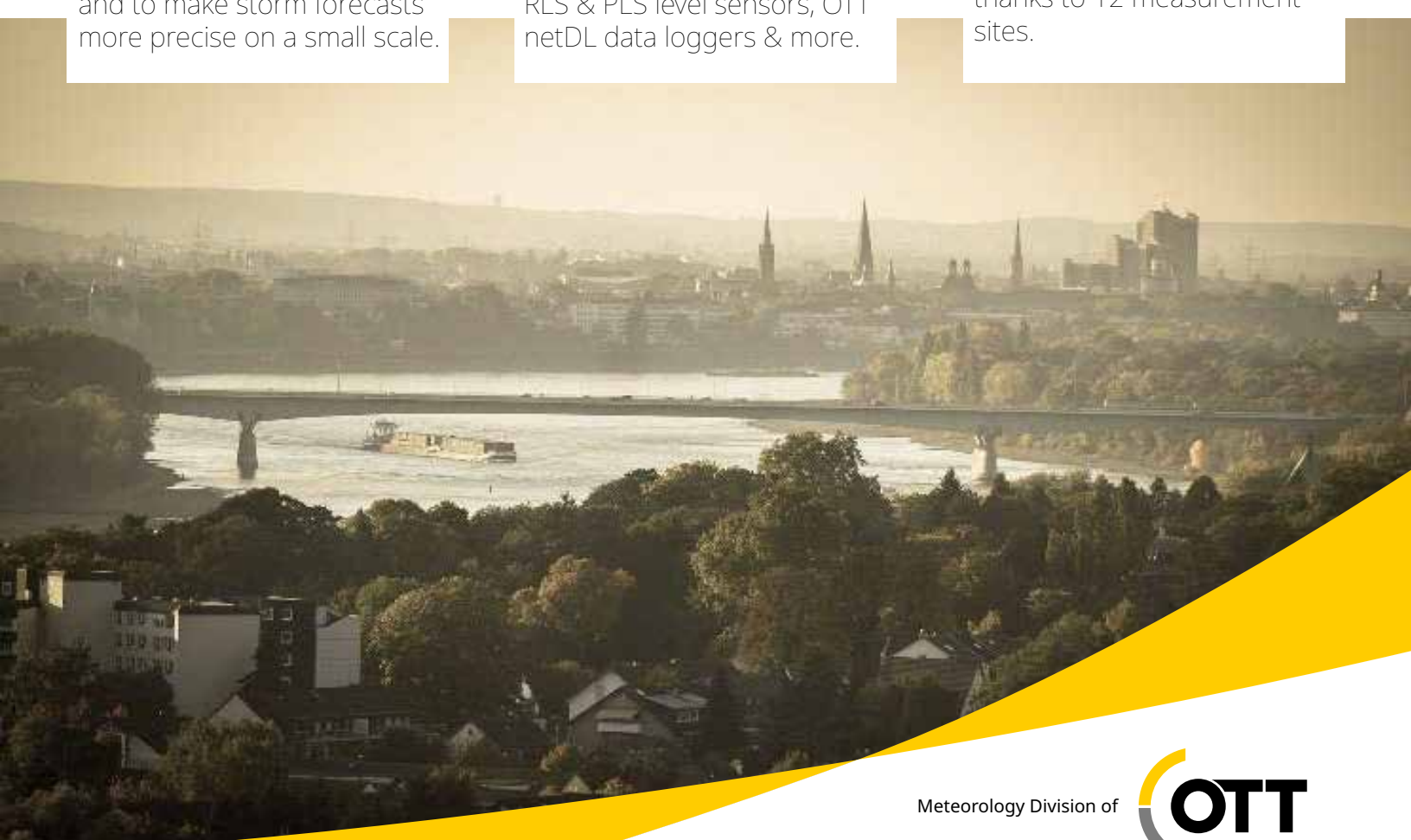
Heavy rain and storms are quite common in the Cologne/Bonn region causing damages worth millions of Euros. The city of Bonn planned to create more clarity and to make storm forecasts more precise on a small scale.

Solution

With a monitoring system from OTT HydroMet the emergency teams have a clear time advantage to prevent the worst. It consists of 20 Pluvio rain gauges, OTT RLS & PLS level sensors, OTT netDL data loggers & more.

Benefits

The new system helps to localize storms and to detect stream overflow at an early stage. 2 streams with high damage potential are now monitored around the clock thanks to 12 measurement sites.



Technologies used



OTT RLS

Radar Level Sensor

Non-contact water level sensor for long term surface water measurements



OTT PLS

Pressure Level Sensor

Robust ceramic pressure transducer for water level measurement



OTT netDL 1000

Datalogger

Versatile datalogger specifically for the use in hydrology and meteorology

Case Study

New alarm levels for streams with high damage potential in Bad Godesberg district



BACKGROUND



Storms and heavy rain occur frequently in the Cologne/Bonn region. Heavy rain and subsequent flash

floods caused damage amounting to millions in the Federal City of Bonn in 2010, 2013 and 2016. In June 2016, it poured down up to 100 liters of rain per square meter on individual city districts in just two hours. The storm was particularly devastating in Bad Godesberg and some neighboring communities in the south of Bonn. Creeks burst their banks, streets were flooded, basements, apartments and underground car parks were filled to capacity. Some houses even had to be evacuated because the water masses of the otherwise harmless Mehlemer creek had torn a hole in the wall of the underground stream channel and threatened to wash out neighboring houses.

Flood Warning in the City of Bonn, Germany

Although storm warnings had announced heavy precipitation, it wasn't sure when and were exactly it would take place. It was also not certain whether the streams would be able to withstand the flood runoff. This is because many influencing factors depend on local conditions, such as the absorption capacity of the soil or whether the water can flow unhindered in the streams. The city of Bonn wanted to provide more clarity and make small-scale weather forecasts more precise. In this context, the "Alarm Level" project of the city's civil engineering office attracted a great deal of attention. Around the clock, the water level is monitored fully automatically at neuralgic points of the local "Mehlemer" and "Godesberg" streams. In addition, video cameras are in use at three bridge passages so that not only water levels but also pictures of the on-site situation are transmitted

to the control center. Precipitation values supplement the data. This makes it possible to warn residents in a more targeted and timely manner so that they can take the last protective measures.

In addition, the city is focusing on preventive and educational measures. On the Internet, citizens can find information on how they can protect their homes and yards from flooding themselves and what they should do in an emergency. Construction measures such as a discharge channel at the Mehlemer stream or the installation of coarse screens in the upper course of the streams help to drain the water masses and keep passages free. A special challenge was a solar supply despite the router and camera technology used causing a higher energy demand.



Monitoring Solution

Radar level gauges, pressure probes, IP dataloggers, solar panels and rugged cabinets form the new monitoring stations.

Decisive time advantage through sophisticated measurement technology

Level monitoring is currently concentrated on the Bad Godesberg district, as people here have been particularly affected by the damage. It is intended to limit storm warnings locally and to detect overloading of the streams at an early stage. Two streams with a high damage potential and partly large catchment areas were equipped with measuring stations at twelve critical points for this purpose. OTT sensors measure the water level around the clock and send it via UMTS/LTE to a traffic computer. If critical rise rates or limit values are exceeded, the systems send warning and alarm messages to the Bonn fire brigade

and to the neighbouring control centre of the Rhein-Sieg district. In an emergency, they trigger siren alarms. In addition, live images are sent from the installed webcams from alarm level 1 onwards. They show whether important bridge passages are passable or whether emergency services have to be called out to remove floating debris and refuse. Of course, the monitoring concept does not prevent a flood wave, it does give emergency services and citizens a time advantage, enabling them to prevent the worst. About 20 existing OTT Pluvios were included in the monitoring network.

Project specification

7	OTT RLS radar level sensors	Water Level
1	OTT PLS pressure sensor	Water Pressure
8	Video cameras at bridge passages	Liveshot Pictures
8	OTT netDL 1000 IP dataloggers	Data Handling
7	Solar Panels (all measurement sites)	Power Supply
7	Vandalism-safe cabinets	Integration

Conclusion

Medium-term, alarm levels are to be installed in the Bonn area at all streams with a higher damage potential and the precipitation measurement network should also grow. In view of the unpredictability of natural events, however, a warning system can never be absolutely reliable. "In the future, it may still happen that a warning message fails to appear or false alarms are triggered," says the head of the civil engineering office, Peter Esch. But in most cases, the new system will detect the danger before it is too late.



OTT RLS: Compact and robust radar sensor which is installed outside the water for sites where a lot of debris is expected.



OTT PLS: Pressure sonde with insensitive, longterm stable ceramic measurement cell and rugged stainless steel housing for gapless data around the clock



OTT netDL 1000: Energy-efficient IP datalogger with comprehensive alarm management functions and ethernet interface for the connection of IP cams.