

# Predicting and Mitigating the Risk of Floods

In the UK, there is a national move away from flood defence to flood risk management and enabling communities to take reasonable responsibility to protect their homes, work places, businesses and communities. New innovations, such as robust gauges that can collect rainfall data remotely, are now helping to mitigate the risk from the increasing incidence of high intensity rainfall and flash flooding, says Neal Hill, Product Line Manager, Casella.

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Recent extreme weather in the UK has caused widespread devastation and reminded the country of the high level of threat that it faces from flooding. All Unitary Authorities and two tier County Councils are termed Lead Local Flood Authorities (LLFAs) and under the Flood and Water Management Act 2010, LLFAs have been assigned a number of duties and powers relating to the management of local flood risk. Spurred by the recent floods, the environment secretary confirmed £21m worth of grants to help councils protect and support their own community when managing flood risk.

It is a common perception amongst homeowners living away from rivers or coastal areas or when there are periods of drought and water shortages that the risk of flooding is not conceivable. However, the hottest and driest weather conditions are often preceded by thunderstorms or flash flooding. In urban areas, heavy rainfall over dry land with poor absorption increases run-off, overwhelming the drainage capacity in the local area. Where sewer and rainwater drainage are combined, the effects of surcharge (i.e. water level rise up through manholes) can result in backflow through the system with raw sewage contaminating properties through sanitary appliances.

It is estimated that around half of all residential and commercial property flooding is caused by backflow from public and private sewers, with the number of incidents being on the increase. The causes range from changes in climate patterns, resulting in flash floods, plus sewer failures and a lack of foresight from the public, who treat the sewer system as a vehicle for disposing of all kinds of inappropriate waste. The problem has been highlighted by the Environment Agency, which estimates that over two and a half million homes in England and Wales alone are at risk from flooding from adverse weather conditions. It's clear that, as heavy rainfall and flooding becomes increasingly common, the problems are going to become progressively worse.

The need for water management has become increasingly urgent but the manufacturers working on today's solutions are innovating around a concept that has been in existence for quite some time. Hydrology - the study of the movement, distribution, and quality of water - is an important influence on flood risk management, the evaluation of water resources and environmental watershed sustainability. Many hydrologists are now employed as environmental scientists, geographers and civil engineers, with hydrological research informing much environmental engineering, policy and planning.

Even six thousand years ago, hydrology was a hot topic. For example, in 4000 BC the Nile was dammed to transform barren wastelands into valuable agricultural resources, while Mesopotamian towns were protected from flooding with high earthen walls. The Greeks and Romans are, of course, renowned for their aqueducts, while historians of Ancient China have marvelled at the construction of their irrigation and flood control works. Today, the study of hydrology is still applied to mitigate

and predict flood, landslide and drought risk and technology has evolved to provide real-time flood forecasting and flood warning.

Casella has a long history – more than 100 years – of supplying rain gauges to the world from 'old school' manual devices to automatic, logging systems. For example, accurate and precise measurements can be achieved by using a modern Tipping Bucket Rain Gauge (TBRG). The best of these are mounted on a cast aluminium-alloy base, which incorporates a built-in spirit level to achieve correct and accurate positioning of the bucket. To withstand the elements the modern TBRG is made entirely from non-corrosive materials, with key components such as bases, septum rings and funnels all fashioned in aluminium alloy and protectively coated, while integral loggers and batteries can be IP65 rated to prevent water ingress.

Key to the success of these gauges is that data can be accessed from anywhere in the world thanks to integral GSM/GPRS telemetry and a dedicated website. Additionally it will operate in remote conditions for up to seven years without the need for a solar panel thanks to ultra -low power electronics making for simple installation and low total cost of ownership. Email alerts and optional texts are also invaluable tools should rainfall exceed set limits that are indicative of imminent flooding.



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## Application example

As a Lead Local Flood Authority with initiatives designed to develop flood resilience amongst residents and businesses at risk, Northamptonshire County Council recently provided 3 Casella STORM Guardians, based on its popular TBRG communities in the County with a plan to roll out to 15.

Northamptonshire County Council described its aims and objectives in a project summary that is becoming increasingly typical for concerned local authorities. "There is a national move away from flood defence to risk management and with that comes learning on how to communicate flood risk to communities and empower them to take reasonable responsibility to protect their homes, work places, businesses and communities. Flooding incidents in recent decades have shown that a large majority of properties affected were as a result of surface water flooding. This challenges the public's understanding and perceived security associated with their property's distance from a river. It is the unpredictable localised nature and rapid onset of surface water saturation that can cause spate conditions across the county that is

hard for Emergency Services to respond to. Within the 60,000 properties at risk of surface water flooding in Northamptonshire, we can identify areas that are more susceptible. The Council's resources have to be used efficiently therefore this project builds on the existing experience, expertise and resources of the Council and its flood risk management partners. The activities planned are underpinned by three guiding principles: sustainability of the project, leaving legacy and to be inclusive as far as reasonable possible."

STORM Guardian was chosen because of Casella's experience in producing rain gauges but also because the data logger, battery and telemetry and all the main components are housed together, making for easy installation. The first STORM Guardian was located at a particularly vulnerable location - Yelvertoft Primary School, which is at risk of surface water and river flooding and one of the 15 communities that will be invited to work with Northamptonshire County Council on this project. On the basis of this installation, Northamptonshire County Council intends to take forward the learning from this project and encourage more communities to set up their own localised flood warning system.



Whatever the causes of flooding - whether they be changes in climate patterns, sewer failures or a lack of foresight - there are a range of robust precipitation measuring instruments now available. These mechanisms bring new enhancements to an old technology to help mitigate the risk to lives from the increasing incidence of high intensity rainfall and flash flooding.

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