Building resilience to flood risk at Loughborough University

Floods caused by heavy rainfall and streams overflowing occasionally impact Loughborough University campus and the frequency and severity of these floods are expected to increase because of climate change. To build resilience to this current and growing risk, Loughborough has developed a set of flood risk indicators and implemented a high-resolution flood nowcasting system for the campus.

Loughborough University campus is vulnerable to flash floods, caused by intense rain falling in just a few minutes, and localised floods caused by streams overflowing (**Figure 1**). In recent years, floods have impacted the campus in several ways, some of which include:

- Flood damage to halls of residence, which destroyed bespoke wooden flooring and led to an insurance claim of £60,000
- Flood damage to sports centres, which required costly protection measures and caused disruption to facilities
- Flooded roads on and around campus that blocked access for staff and students moving to and from the site
- Flood damage to power circuits, which contributed to power outages on campus, causing potential disruption to student experience and assessments

As the atmosphere warms, air can hold more moisture which leads to more frequent heavy rainfall events. Loughborough is particularly exposed to such events. According to the UKCP18 climate projections, winter rainfall totals near Loughborough could change by +10% (central estimate) to +20% (upper estimate) by the 2050s relative to 1981-2000, as a result of climate change.

KEY MESSAGES

Suggestions for other universities seeking to manage climate-related flood risks:

- **Collate local information** and data about heavy rainfall, river and ground water levels (and/or sea levels), land use, flood-related damages, and flood zones to benchmark the likelihood and consequences of flooding.
- **Use the above information** to identify and protect critical assets and services that are most exposed to various sources of flooding.
- **Improve early warnings** and preparedness for local surface water flooding by implementing a 'nowcasting' service.

> "The main challenge for building resilience to flooding is around raising awareness of sites and facilities most at future risk, to avoid developments in these areas."

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One of the most intense rainfall events recorded on campus so far was in June 2012, when a summer downpour produced 27.8 mm in just 15 minutes, causing a stream bordering the campus to rise by more than 0.5 m in 30 minutes. The resulting widespread surface water flooding caused damage to vehicles and buildings, as well as disruption to a university open day.

To track changes in heavy rainfall and flood occurrence, six indicators have been developed for long-term monitoring and reporting of flood risks to the Loughborough University campus. These were compiled using automatic weather station records from campus and stream level data gathered by the Environment Agency from a nearby gauge.

This information helps to improve understanding of evolving flood risk and to support various adaptation measures. Such actions include using more resilient materials and services to retrofit damaged buildings, installing temporary and/or demountable flood defences and providing operations managers with access to near real-time flood 'nowcasts' for the campus (**Figure 2**). Such forecasts can be used to prepare for floods (e.g., by evacuating people and moving vehicles).

Other adaptation measures that might be considered include:

- Incorporating allowances for climate change in the design of new infrastructure
- Re-establishing and protecting green and blue spaces to soak up rainfall
- Replacing impermeable surfaces with green roofs and permeable parking areas
- Retrofitting resilience measures (e.g., raising floor levels, replacing floor materials, improving drainage)
- Maintaining and clearing local drainage networks

The main challenge for building resilience to flooding is around raising awareness of sites and facilities most at future risk, to avoid developments in these areas. A centralised system for compiling data on flood- (and other climate-) related damages and disruptions would also help.

Key facts about the institution:	
Institution name:	Loughborough University
Location (city and nation):	Leicestershire, England
Number of students (total for institution):	19,767 (2022/23)
Number of staff (total for institution):	3,645 (2022)
Campus type and location:	Town campus

Key facts about the intervention (case study):	
University or department led:	Both
Number of staff engaged:	3 + staff maintaining the campus weather station since the 1970s
Number of students engaged is:	0
External partners:	Previsico (nowcasting system), Environment Agency (data provider)
Climate risks the intervention addressed:	Surface water and fluvial flood risk

PROJECT TEAM:

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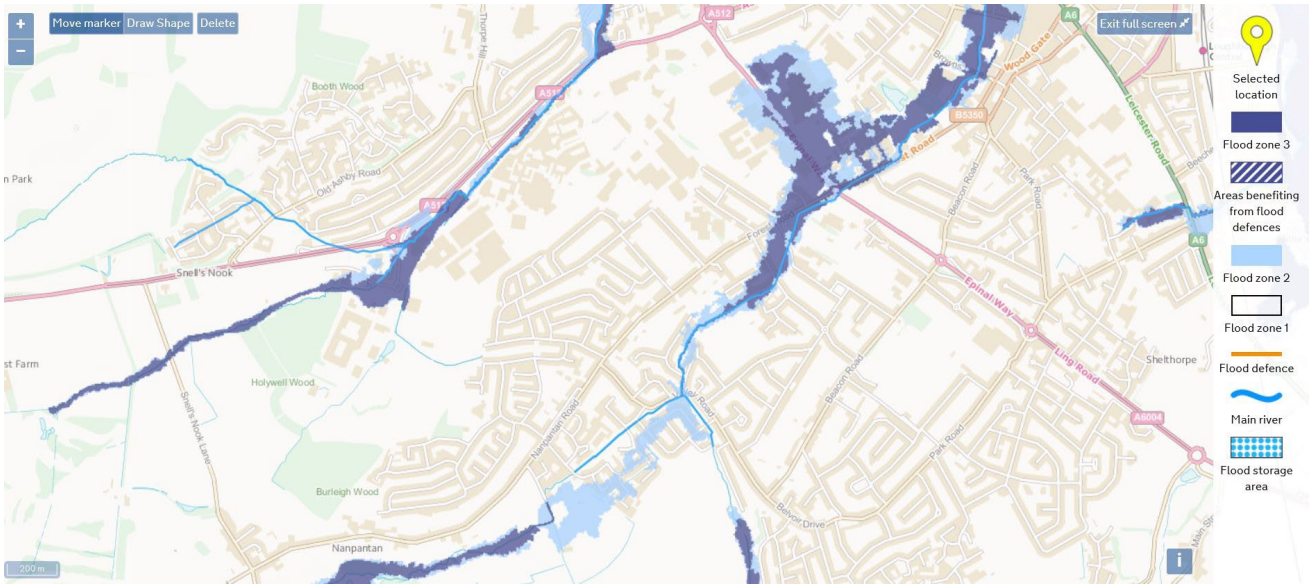

Figure 1: Flood zones for Loughborough University campus. Source: Environment Agency.

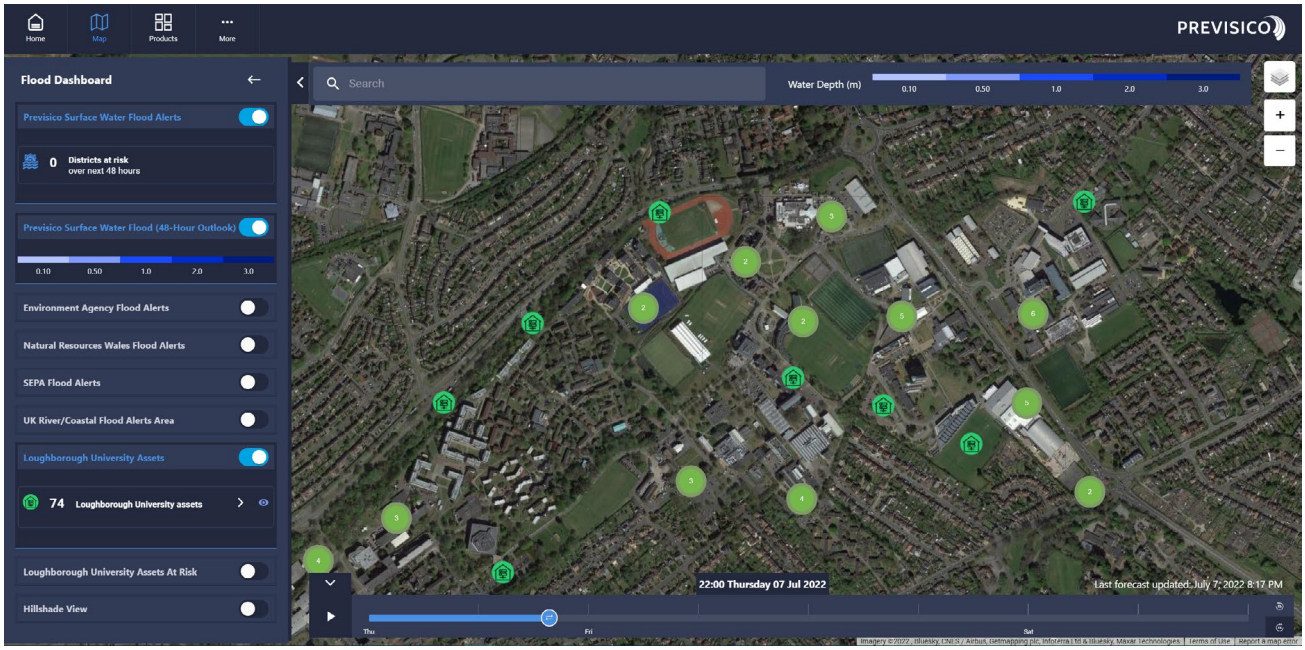

Figure 2: Dashboard of the flood nowcasting system used by Loughborough University. Symbols represent assets for which alerts are issued. Source: Previsico.