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Low-cost Watercourse Sensing for Flood Management and Citizen Engagement

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Abstract

Climate change combined with increased urbanisation is expected to cause annual flood losses across the EU to rise from €4.9bn to €23bn a year by 2050 (Jongman *et al.*, 2014).

Traditional approaches to water cycle monitoring (satellite and in-situ observations) are vital to both everyday watercourse management and contingency planning for anomalous (critical) events such as floods. Unfortunately, the costs involved in such monitoring result in geographically (and temporally) sparse data that is insufficient to adequately describe the water cycle. A further drawback of this approach is the passive role of the community in which citizens are generally at the end of the information chain. In reality, local communities embody a rich source of historical knowledge - commonly more extensive and/or nuanced than that held by the local authority - as well as having the potential for providing dynamic, higher resolution data.

Successful management of an event such as flooding relies on maintaining good situation awareness - a challenge during rapidly changing circumstances. The WeSenseIt project is developing a citizens' observatory for water in order to establish interaction and co-participation between citizens and authorities both during emergencies but also during the day-to-day management of fundamental resources.

A core citizens' observatory theme is the ability to deploy local citizens as 'social sensors' and to engage them in citizen science. To this end, two approaches have been developed: an Android phone app and a Raspberry Pi-based sensing device. The former allows static sensor readings (such as gauge board levels), qualitative reports and photographs to be submitted. The latter provides a low-cost, mobile device that records atmospheric conditions (temperature, barometric pressure, luminosity, etc.) as well as a means of estimating river flow using the Raspberry Pi camera module.

We describe the design, implementation and use of both of these citizen engagement approaches and our plans for further low-cost sensing within the WeSenseIt citizen observatory.

References

1. Jongman *et al.* (2014). Increasing stress on disaster-risk finance due to large floods. *Nature Climate Change* 4, 264–268.