Interoperable urban flood management
Exploring data needs

FACTSHEET

Project area: Integrated urban flood management
Intended audience: Researchers and practitioners

Introduction

The amount of spatial data on urban areas is higher than ever before (e.g. on flood risk, infrastructure, urban development plans, socio-economic indicators, environmental characteristics etc.). This presents an unprecedented opportunity to guide actual integrated urban flood management. However, to date, there is a lack of systematic frameworks to bring together different data sources and disciplines in flood management research and practice. This factsheet presents the first step in developing such a framework and discusses the results of a workshop held with flood management practitioners and researchers in Newcastle-Upon-Tyne (UK) on different data sources, its use and associated challenges.

Practical application of this research:

- To enhance interoperability between infrastructure systems to manage surface flooding there is a need to bring together spatial data from multiple disciplines in flood management research and practice;
- Practitioners often have access to many datasets, but lack a systematic way to bring the data together;
- There is a need for a holistic framework which structures and combines useful spatial data to identify needs, opportunities and challenges for integrated flood management.

Interoperability in urban flood management

Integrated flood management is essential to address the many infrastructural, environmental and social dependencies and interactions in urban areas. To this end, we introduced the concept of "interoperability" to explicitly consider the linkages between different systems and their capacity to deal with excess water[1]. To apply interoperability to facilitate system integration in flood management, understanding of the hydrological, environmental and socio-economical functioning of a city is required. The growing number of spatial data on urban environments present an opportunity in this context. Insights into how this data can be combined with hydrological modelling and the range of multi-functional options for flood management, is one of the key research needs to operationalise integrated flood management. Following a literature review, we identified two main areas in which detailed information is needed to achieve this: (i) where does flood water come from and how does it relate to identify intervention priorities, and (ii) where can flood water go across the urban system (Figure 1)[1].
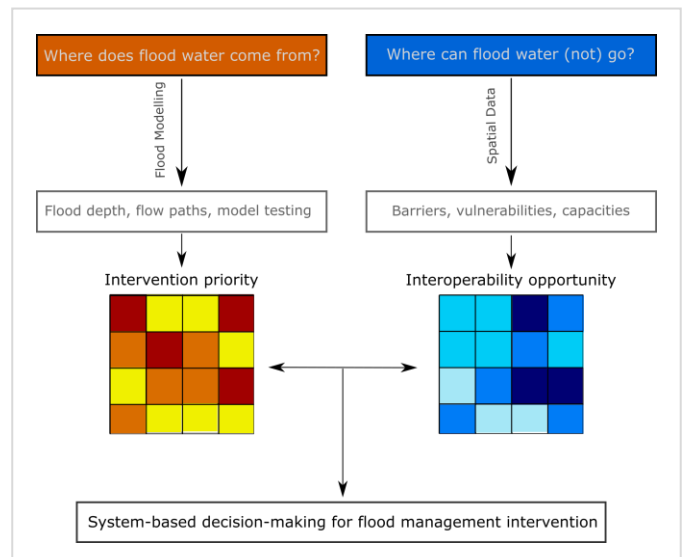

Figure 1: To enhance interoperability between infrastructure systems to manage surface flooding, insights are needed into where flood water comes from and where it can (not) go[1]
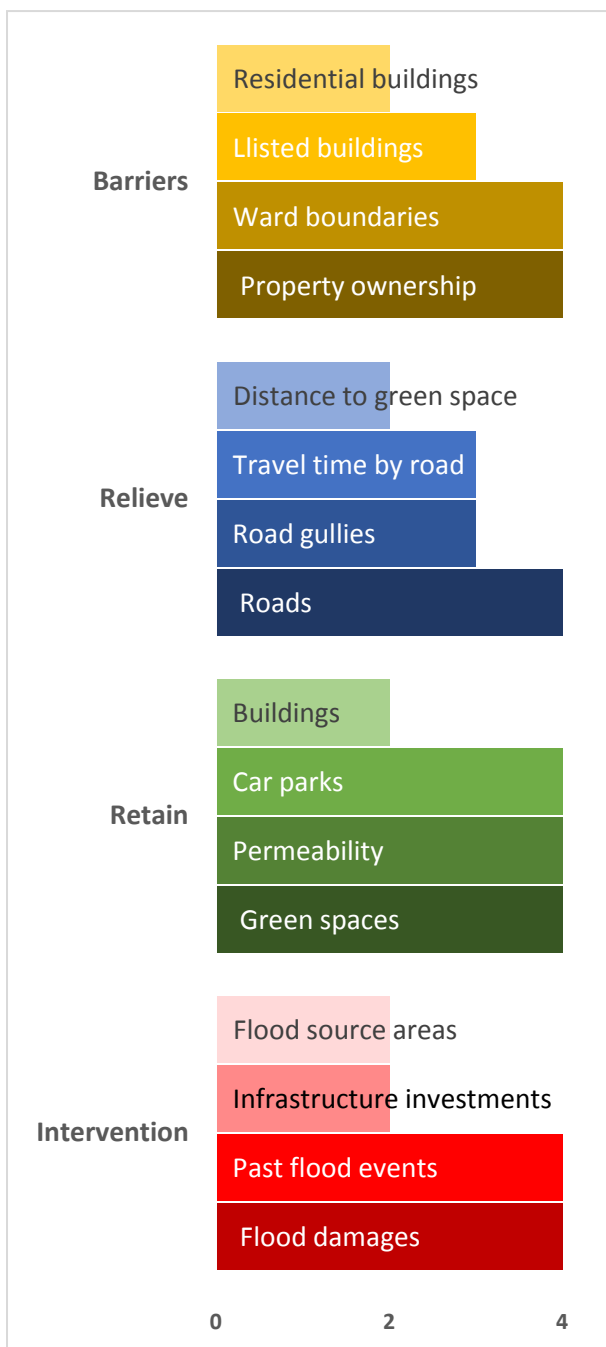
Figure 2: Selection and ranking of the top four datasets workshop participants choose to answer the four questions (x-axis shows the number of groups selecting this data)

Opportunities for interoperability

Opportunities for interoperability in flood management are present when infrastructure systems (e.g. road network) can be assigned a secondary water management function. In general, this function can be in the form of two processes: retain (e.g. green roofs, enhancing infiltration in green spaces) or relieve (e.g. transferring water along roads).

Data needs and importance

To identify available data sources related to opportunities and challenges to interoperability and select the data practitioners consider important, a workshop was organised in December 2018 with 16 flood management practitioners and researchers. They were asked to discuss in four groups which data are most useful to identify:

- **Spatial priority locations** for flood management intervention;
- Infrastructure systems capable of **retaining** flood water;
- Infrastructure systems capable of **relieving** flood water;
- Socio-political **barriers** for interoperable flood management.

The four most selected datasets for each aspect are shown in Figure 2. Potential damages and historical flooding are considered as factors that have an impact on spatial prioritization for flood management intervention, while green spaces and roads are important infrastructure assets that can increase interoperability. The most important barrier to interoperability is the fact that it requires cross-boundary (e.g. properties or wards) thinking.

Data challenges

From the workshop, it can be concluded that there are data sources available which can guide a more integrated, system-based approach to flood management. However, two important challenges remain: (i) data availability; (ii) developing a framework that provides enough specific information to guide flood management, but that is also general enough to be applied in different cities. This challenges are further address in ongoing research.

References

[1] Vercruysse, K., Dawson, D., & Wright, N. (2019). Interoperability: a conceptual framework to bridge the gap between multi-functional and multi-system urban flood management. Journal of Flood Risk Management, (January), 1–11. https://doi.org/10.1111/jfr3.12535

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