Journal of
Flood Risk Management

Investigating the social value of the Ripon rivers flood alleviation scheme

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DOI: 10.1111/jfr3.12176

A version of this paper was presented at the 6th International Conference on Flood Management, September 17th 2014, Sao Paulo, Brazil.

Key words
Community; design; experience; flood alleviation; flooding; qualitative research; river landscapes; social value.

Abstract

This paper argues for an approach to flood alleviation design that considers the need not only for technical knowledge, but also a social perspective. It is predicted that more intense rainfall and rising sea levels will result in a greater number of people vulnerable to flood events. Flood alleviation design in the UK is often focused upon technical and cost-effective solutions, and consideration of social impact is seen as secondary. This paper examines how the social value of a UK flood alleviation scheme is perceived and discussed, by the local community and by those responsible for the design of the scheme, and exposes differences in perceptions both between and within these two groups. It recommends a future approach in which an understanding of the social value of a flood alleviation scheme is first co-produced with the community affected, enabling the design of a socially acceptable and successful project.

Introduction

Current patterns of increased intensity in rainfall events and rising sea levels are predicted to continue as a result of climate change (IPCC, 2013; Johannessen and Hahn, 2013; Tripathi *et al.*, 2014). The result is an increase in the number of people vulnerable to flood events in many parts of the world. In England, 2.4 million properties are at risk from coastal and river flooding, and 3 million properties are at risk from surface water flooding [Environment Agency (EA), 2014]. It is predicted that 600 000 properties are at risk from both sources of flooding (EA, 2014). Consequently, an increasing number of local communities will be impacted by the design and construction of flood alleviation schemes. This is reflected in the UK Government's increased financial investment in flood protection measures for the most vulnerable communities (HM Treasury, 2014).

The design of flood alleviation schemes in the UK is currently driven by economic and technical considerations (Howgate and Kenyon, 2009; Meyer *et al.*, 2009; Penning-Roswell and Pardow, 2012; Graham *et al.*, 2013). This focus can be seen as a reflection of how current industry knowledge is created, and of the processes that dictate how development is justified, approved and progressed (Lane *et al.*, 2011, 2013). There is a commonly held perception that knowledge is 'scientific' and grounded in factual data (Kellens *et al.*, 2011). Whatmore and Landstrom (2011) point out that the scheme designers rely heavily on mathematical modelling to predict and justify the best course of action. This construction of industry knowledge feeds into the processes used to approve flood alleviation schemes, such as the cost–benefit analysis (CBA) methodology (Hunt and Taylor, 2009). The process of CBA involves quantifying the cost of the scheme against the benefits that are envisaged to be brought in monetary terms (Vickerman, 2007). Porter (1995) suggests that the focus on quantification stems from the belief that it provides a rule-bound logical evidence base, rooted in the discipline of mathematics, leading to greater trust of expert advice within lay populations.

However, such an approach struggles to take into consideration the subjective, and therefore it is difficult to quantify the social value (Steelman, 2002; Millar and Hall, 2013) of flood alleviation schemes. Where social values are included in the CBA, they are often misrepresented or underestimated (Hunt and Taylor, 2009; Nicholson-Cole and O'Riordan, 2009). O'Brien and Wolf (2010) stress the importance of understanding social values as indicators of what is important to a local community, what they require and what they want (Raymond *et al.*, 2008; O'Brien and Wolf, 2010; Graham *et al.*, 2013; Ives and Kendal, 2014). Understanding

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the social values of a community can aid industry in delivering both a technically and socially successful flood alleviation scheme, while avoiding potential conflict with stakeholders (Fordham *et al.*, 1991).

This paper examines the multiple perspectives of social value held by stakeholders, including members of the local community and members of the design and construction team within a flood alleviation scheme. The qualitative data gathered were analysed to identify similarities and differences between the two groups, and the reasons for those differences. The purpose of the research was to create a better understanding of the social values of community stakeholders in order for designers to develop a more socially considerate approach to flood alleviation design and construction in the future.

The next section provides further background and literature review. This is followed by an explanation of the research design, including a description of the flood alleviation scheme investigated and the process of data collection and analysis. The results and discussion are then presented. The paper ends with some concluding remarks and a recommendation for design practice and for future research.

Background: social value

A common understanding of the term 'value' relates to '. . . interests, pleasures, likes, preferences, moral obligations, desires, wants, goals, needs, aversions and attractions' (O'Brien and Wolf, 2010, p. 233). However, values are not objective, fixed aspects of a person. Instead they can be seen to be constructed through the experiences and knowledge a person gains through his/her living and working environs, and to be constantly changing and evolving as new knowledge is gained and new experiences processed (Rokeach, 1979; O'Brien and Wolf, 2010). Boztepe (2007) and Sandstrom *et al.* (2008) suggest that value from a service or product – in this research, the flood alleviation scheme – is derived at the point in which the user experiences the product or service; this is the user experience.

Value can be understood both at the individual level and at a shared level (Rokeach, 1979). At the individual level, people hold values unique to themselves due to their interpretations of the experiences they have had and the knowledge they have gained. However, where a group of people have had similar experiences, through working or living together, they will develop some shared values. Their interpretation of these experiences will nevertheless still be unique, and consequently people are still likely to respond in different ways (Camarinha-Matos and Macedo, 2010; O'Brien and Wolf, 2010; Ives and Kendal, 2014).

Downton *et al.* (2005), therefore, urge caution in perceiving a community-wide value. Local communities are not single entities, and due to the different experiences and knowledge their perception of value will not be uniform (O'Riordan and Stoll-Kleeman, 2002). One particular difference in the experience of infrastructure schemes is identified by Baines *et al.* (2003), who use the example of waste infrastructure to explain two different experiences from two distinct types of user community. The first is the 'host community', which is a community situated within close proximity to the physical waste infrastructure but does not itself receive significant value from the service created. The second is 'source community', which is any community that is provided for by the service created, but which is not situated within close proximity of the physical waste infrastructure, and therefore not affected by the physical presence of the system. Applying this concept to the flood risk management context, it is clear that some communities impacted by flood alleviation schemes will be 'host' and some 'source' communities, while others will be both 'host' and 'source' communities being situated in close proximity to the infrastructure, such as floodwalls, river culverts or floodgates, and also afforded protection by the scheme.

Although useful, the 'host' and 'source' concept is only one, rather crude, division of possible community groups based on their geographical context. In addition, the term 'source community' may not be the most appropriate for use in the context of flood alleviation infrastructure: while for waste facilities the community is the source of waste generation, for flood alleviation schemes it is seldom the community that is the 'source' of the flooding. However, for the purposes of this study, the concept is useful to help explain some of the findings.

Social value has been studied from a number of perspectives using both qualitative and quantitative techniques (Graham *et al.*, 2013; Ives and Kendal, 2014), with the result that social value is a contested concept with multiple definitions and interpretations (McShane, 2006; Ives and Kendal, 2014). One perspective is rooted within the discipline of economics that understands social value in terms of the quantifiable financial market price of a service, determined by the willingness of society to pay for such a service (Allingham, 1983; Frischann, 2012). A different perspective perceived social value instead to be a non-financial, intangible value and unquantifiable concept (Slootweg *et al.*, 2001; McShane, 2006; Graham *et al.*, 2013).

Within these different perceptions, there are a number of different types of social value. The economic perspective identifies one type of social value as the social benefits brought to an area by a project or process, and the positive impact this has on the local economy through job opportunities, tourism potential and area regeneration (Saxon, 2005). In contrast, the types of non-financial, intangible social value range from quality of life, including community safety, social inclusion, access to health care, amenities and resources (Slootweg *et al.*, 2001; McShane, 2006; Graham

et al., 2013), to sense of place, including environmental enhancements to the area, sense of community and the identification of a certain type of lifestyle due to the experiences available within that area (Saxon, 2005; Barrat, 2010). Of particular importance for flood alleviation schemes are the values held by local communities gained through the aesthetics and recreational uses that rivers are noted for (Correia *et al.*, 1998).

The multiple and diverse, subjective and contested nature of social value makes it both difficult to understand as a concept and difficult to identify the different perceptions, let alone act on them. For a design, construction and delivery team providing a flood alleviation scheme, capturing social value is therefore a difficult challenge. Perhaps unsurprisingly, there has been limited academic research into this topic to help them. This research aims to help address this gap.

Scheme description: Ripon rivers flood alleviation scheme

The scheme of focus for this research was located in the north of England. Ripon is a city located in North Yorkshire, UK, within the authority of Harrogate Borough Council (HBC). Ripon is subject to flooding due to the convergence of three rivers within its vicinity: the River Laver, the River Skell and the River Ure (Figure 1).

The last significant flood within the city was in the summer of 2007. In 2006, the body responsible for flood management, the EA, had submitted a planning application to HBC for a flood alleviation scheme for Ripon (Halcrow, 2006a). Construction started on the scheme in 2009 and was completed in 2012. The scheme protects in excess of 500 residential and commercial properties, and has been designed to afford protection from a 1 in 100 year flood event (Williams, 2012).

The scheme consisted of a number of phases of works. The first phase consisted of constructing an 8.6-m high flood storage embankment on Birkby Nab farm, north of Ripon. The purpose of the embankment was to allow the River Laver to pass through a culvert in normal conditions. However, when the River Laver is in flood, water can be stored by the embankment. The presence of the culvert allows the water to run at normal flow down through Ripon, alleviating the risk of high flows and subsequent flooding (Halcrow, 2006b).

In addition to the construction of the embankment at Birkby Nab farm, additional flood alleviation works were carried out within the town of Ripon itself. Figure 2 identifies the key areas of works within Ripon: Borrage Lane,

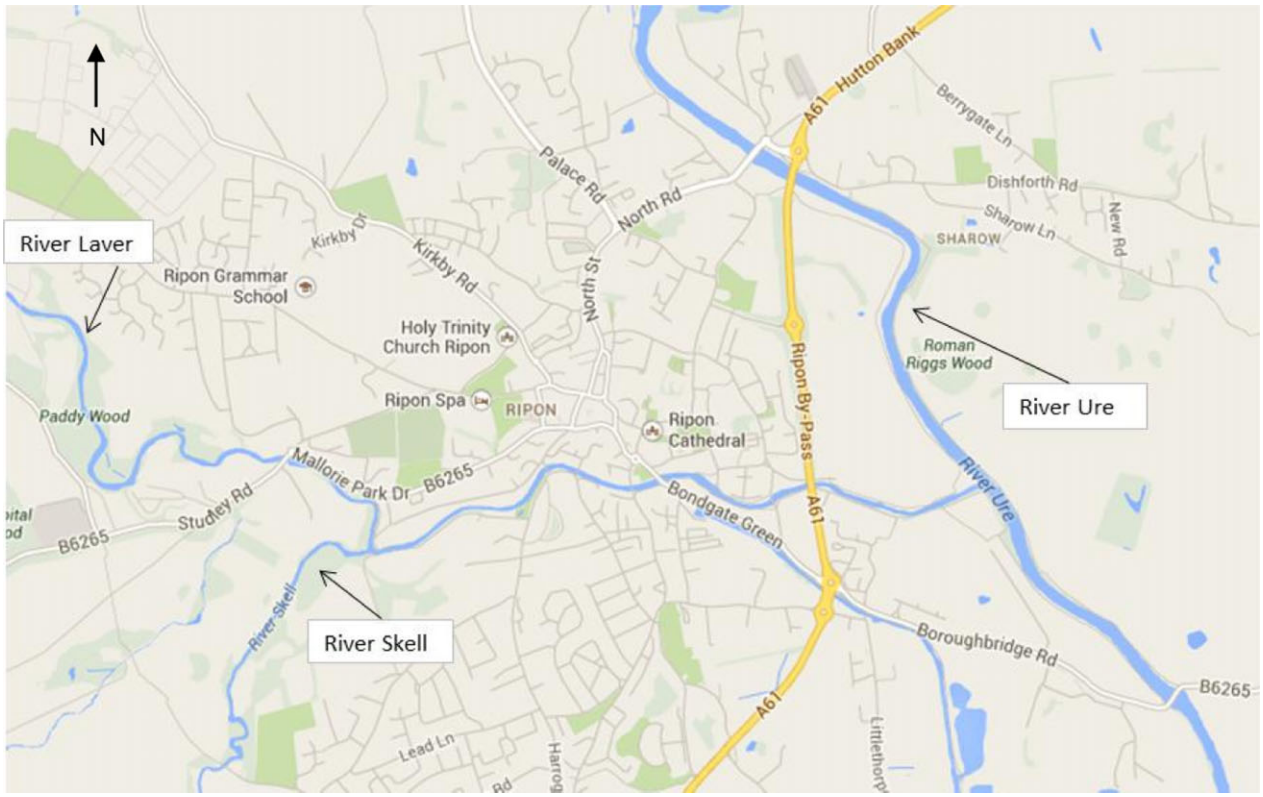

Figure 1 The town of Ripon situated close to three rivers (source: Google maps).

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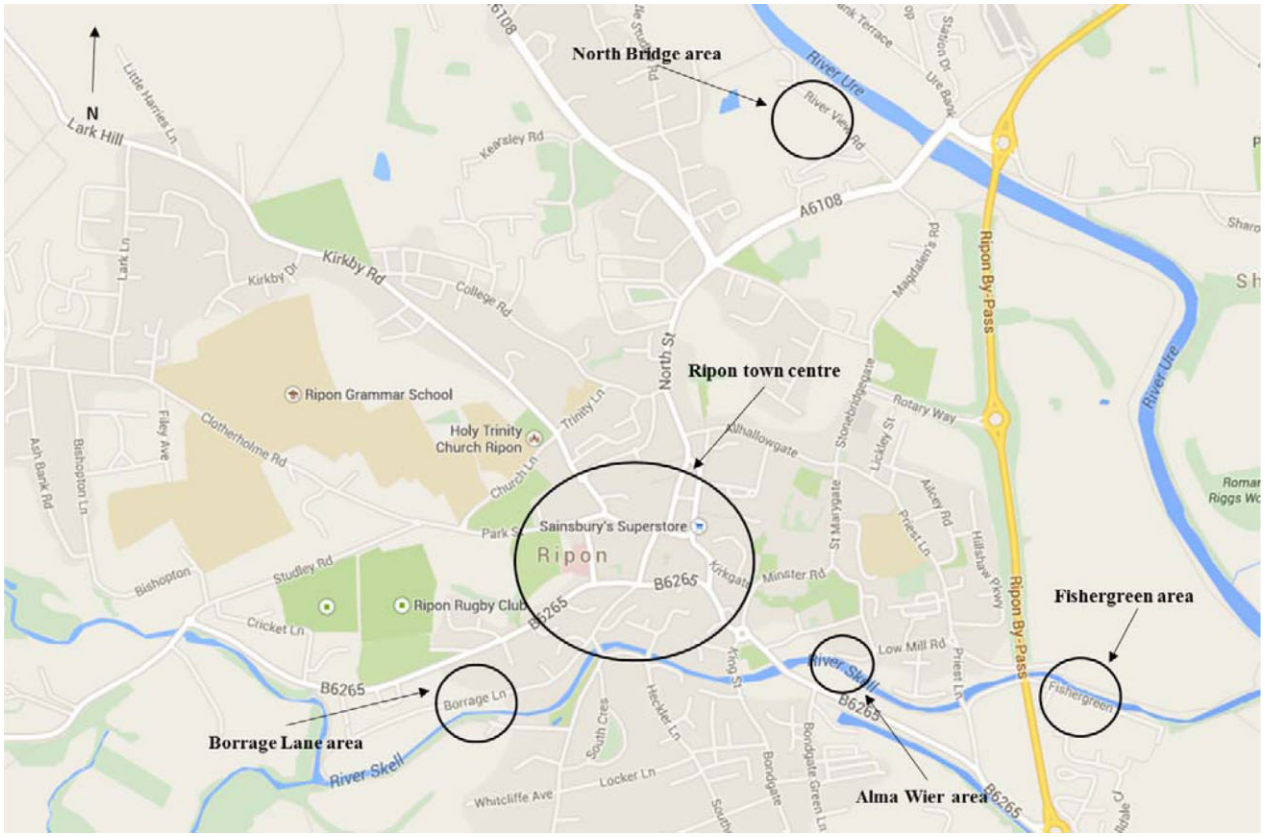

Figure 2 Areas of works with Ripon (source: Google maps).

Fishergreen, Alma Weir and North Bridge, as well as Ripon town centre.

The residential properties along one side of Borrage Lane are bounded by the River Skell. For this reason, new bespoke floodwalls were constructed in the gardens of the properties to afford protection from high flows. Similarly, the Fishergreen area of the city also sits on the banks of the River Skell, and for this reason floodwalls and embankments were also constructed. The North Bridge area is affected by high flows on the River Ure, and works were carried out along the river bank and within the boundaries of residential properties to provide additional defences. Alma Weir itself was reduced in size and a fish pass added (Halcrow, 2006b).

Research design

The approach to this research was qualitative and inductive in nature, following the process of constructivist grounded theory (Glaser and Strauss, 1967; Charmaz, 2006). This approach seeks to develop theory from data, checking the proposed theories against further data collected (Charmaz, 2006; Urquhart, 2013). This approach acknowledges the influence the researcher has on the data collected, and understands that the emerging theories are not discovered *per se*, but constructed by the researcher through the interaction with the participants and the analysis (Thornberg and Charmaz, 2014).

The research reported in this paper focused on a recently completed UK infrastructure project, the Ripon rivers flood alleviation scheme (Figure 1). This scheme has received industry recognition for success, being awarded a Centenary Award and Certificate of Excellence from a regional branch of the Institution of Civil Engineers (Institution of Civil Engineers, 2012). The scheme was the first of three schemes to be investigated under the same research programme. All schemes were chosen as a recently completed, significant, UK river flood alleviation scheme that had been identified by industry as a successful project.

Data were collected through semi-structured interviews with a range of stakeholders, employing a mixture of theoretical and snowball sampling in order to gather participants (Bryman, 2012). Initial community participants for this research were identified using the consultation information contained in the planning application submitted to HBC in 2006 (Halcrow, 2006c). This information identified the residents and businesses who were likely to be impacted by the works and who therefore should be consulted as part of the planning process. In order to identify stakeholders who

could be classed as both the 'host' and 'host and source' community, the authors focused on finding participants from within the main areas of work in Ripon. No residents from the North Bridge area responded to a request for participation, and so the research focused on the following areas: Fishergreen, Borrage Lane and Skellfield Terrace (adjacent to Alma Weir). A leaflet was produced explaining the research, the need for participants and what would be involved, and a cover letter explained who the researcher was and why the leaflet was being received. Seventy-four leaflets and letters were sent to residents and local businesses. This method identified a number of participants initially, and at the end of each of these interviews the participants were asked to recommend anyone else who would be relevant for the research and could be contacted by the researcher.

To gather participants responsible for the design and delivery of the scheme, the planning application was also used. Members of the design team were identified from the documents submitted as part of the planning application and were contacted to ask if they were willing to participate. Similar to the discussions with the local community, at the end of the interview, participants were asked if they could recommend anyone who had a role on the project and could be contacted.

In total, 20 semi-structured interviews were conducted with 26 participants between October and December 2013, six interviews being conducted with two participants at their request and the remaining with single participants. The composition of participants was as follows:

1. Three participants were interviewed in their professional capacity as employees of the EA.
2. Four participants were interviewed in their professional capacity as members of the design team responsible for the scheme.
3. Nineteen participants were interviewed as members of the local community.

Prior to each interview, participants received a brief synopsis of the research, protocol for the interview, information regarding the use and storage of the data, and a signature form to confirm their agreement for the recording of the discussion (Ryen, 2011). In addition to this information, a discussion guide was also sent in order to describe the key topics to be covered in the interview, such as their opinion of the scheme, their understanding of the scheme and their perception of social value with regard to the scheme.

The nature of semi-structured interviews allows the discussion to be guided through specific topics of interest, but also gives participants the liberty to broach relevant, but different topics (Creswell, 2009; Hammersley, 2013). Interviews typically lasted between 30 and 40 min and were conducted at a location convenient for the participants, usually within Ripon. In line with the process of constructivist grounded theory, the interview topics broadly stayed the same throughout interview process, although some changes were made (Thornberg and Charmaz, 2014). As reoccurring subjects or events of importance were identified by the participants, discussions regarding these were also built into the interview with subsequent participants. Similarly, if a subject that did not stimulate sufficient discussion was raised by the researcher, it was omitted from future interviews.

Secondary data, including the planning application (Harrogate Borough Council, 2011) and documents received from the EA and design team, were also reviewed. This was carried out prior to conducting the semi-structured interviews in order to comprehensively understand, and provide context for the scheme.

The transcribed interviews were analysed iteratively during data collection in accordance with the process of constructivist grounded theory (Charmaz, 2006; Urquhart, 2013). This allowed the identification of emerging theories to be examined and tested in the subsequent interviews. Two phases of coding were carried out, although this was an iterative process. The first phase (initial coding) sought to interpret what was happening in the data line by line or section by section, where appropriate. The codes used were short and relatively simple and were reviewed on a number of occasions as new codes were identified (Charmaz, 2006). This allowed the researchers to compare data as well as codes, and identify similarities and differences (Thornberg and Charmaz, 2014). Focused coding was employed that captured the essence of the initial codes, synthesising the main themes and concepts of the data and deriving the emerging theories (Thornberg and Charmaz, 2014). Coding was facilitated by the Computer-Assisted Qualitative Data Analysis Software (CAQDAS) NVivo (Bryman, 2012).

During the data analysis process, the local community participants were categorised according to their experiences of flood events. The local community participants who had been victim of flooding were classed as the 'host and source' community, and eight participants were in this category. The remaining 11 participants were classed as the 'host' community because they had not personally experienced flood events or were at significant risk, but were impacted by the physical infrastructure of the scheme. These categories excluded the industry participants (seven in total) because these participants were interviewed in their professional capacity.

Results and discussion

The multiple interpretations and definitions of social value (McShane, 2006; Ives and Kendal, 2014) were clearly reflected in particular responses when asked about their own, general, perceptions of social value. Most local residents interviewed, and especially those classed as the 'host and source' community, perceived social value to refer

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to community-wide, intangible, non-financial values (Slootweg *et al.*, 2001; McShane, 2006; Graham *et al.*, 2013). While this aspect was acknowledged by some of the industry participants, many of these identified social value primarily in economic terms as the additional benefits to the community (Allingham, 1983; Frischann, 2012). This economic perspective was also indicated by some of the local community participants who were classed as the 'host' community alone.

The different perspectives were also reflected in perceptions of the specific social value of the flood alleviation scheme. The majority of participants, both local community and industry, perceived the main type of social value to be an improvement to quality of life (Slootweg *et al.*, 2001; McShane, 2006; Graham *et al.*, 2013). This came in the form of a reduction in stress and anxiety afforded by the protection of the scheme. A local community participant classed as 'host and source' explained:

> I think peace of mind is important and I think we are pleased for ourselves as it has reaffirmed the fact that we can stay here [in current house close to the riverbank] . . . (Local Community Participant 7a)

An industry participant also acknowledged the stress and emotional impact flood risk can have on a person and subsequently the social value the scheme provided:

> . . . it raises that dark cloud of flood risk and removes that . . . or at least it relieves it from being at the forefront . . . of people's minds . . . then people will go away on holiday and not think about it or go away for Christmas or on the run up to Christmas they won't be thinking, what if this happens? (Industry Participant 8a)

Other types of social value were also identified, including recreational improvements (Saxon, 2005; Barrat, 2010), which ranged from scheme specific interventions – 'They have put . . . a path alongside the river . . . and a lot of people do use the path to be fair' (Local Community Participant 11) – to improvements felt on a community-wide basis:

> I do think that the whole community can enjoy something that looks much nicer than it used to and it is an area for play, for relaxation, for enjoying and lots of people do enjoy this little area by the river . . . (Local Community Participant 17)

It is unsurprising that recreational and aesthetic improvements to the river frontage were a common perception of social value in the case of this flood alleviation scheme. As identified by Correia *et al.* (1998), experiences of both the recreational uses and the aesthetic values of river landscapes inform the perception of social value held by local residents, and so improvements to these areas were considered to be significant social values of the scheme.

A further type of social value identified, by both industry and local community respondents, was economic (Allingham, 1983; Saxon, 2005; Frischann, 2012). This included perceptions of increased economic prosperity as a result of the increased level of protection, stabilisation of property values, and benefits to the local economy and tourism:

> I mean the main thing is to stop the City flooding and therefore there will be better social value because people are not flooding and they can focus on economic prosperity . . . (Industry Participant 1)

> I certainly think there are businesses further up the river that are now able to function without that threat so I think those properties will rent out and that has a positive effect on jobs, things like that . . . tourism, it [reduced flood risk] would attract people to the area and then those people come and spend money and [then] Ripon is known as somewhere that is actually quite nice. (Local Community Participant 17)

Various individual perceptions of social value from the industry participants included the community engagement process itself, as well as the delivery of a successful scheme:

> . . . there was quite a lot of one to one discussion with the residents about the proposed works in their garden so that they didn't end up with a lump of concrete in their garden. (Industry Participant 4)

> . . . there was sponsorship of local events like the duck race, there was engagement with local schools which was done on two levels really, one to promote what we were doing in the area but also to advise children on health and safety on site. (Industry Participant 3)

> . . . we built exactly what was on plan to be built. We built it, it has worked, it has been tested . . . (Industry Participant 2)

It has been demonstrated that the perceptions of the social value of the Ripon rivers flood alleviation scheme were varied. Their diverse nature can be attributed to the influence of diverse personal and collective experiences (Rokeach, 1979; O'Brien, 2009). The local community participants classed as 'host and source' in general perceived social value as the reduction in stress and anxiety brought about by flood risk. The influence of their experiences of having been flooded influenced their dominant interpretations of social value as the reduced risk of that happening again. Most of these participants did not articulate social value in any other way. In contrast, those local community participants who were not personally at risk of flooding and who were therefore classed only as 'host' had a different experience both of the river and of the scheme (Boztepe, 2007; Sandstrom *et al.*, 2008). They experienced the river as improved river

frontages if this was a part of their life, or economic prosperity if they had experienced the impact of flooding. As a result, their perceptions of the scheme included other types of social value such a recreational improvements through their experiences of the river as recreational amenity, or economic benefits through their experience of flooding as having a negative impact on employment opportunities, business or tourism (Saxon, 2005). This is in addition to identifying social value as the reduction of stress offered.

The difference in perception identified between the two groups of local community participants was furthermore understood by some of them themselves. Some identified the social value of the scheme as being only for those directly affected by flooding, the 'host and source' community:

> I think it is quite limited [the social value]. The truth is, it affects a fairly small proportion of properties here in Ripon. (Local Community Participant 5a)

> Yes for Ripon as a whole, but not for us personally. (Local Community Participant 9a)

> But for us who have not been flooded, I think the social value is less than, for example, the people . . . who have been flooded a number of times. (Local Community Participant15a)

Experience is also critical in understanding the different perceptions between the local community and industry participants. Although some industry participants did identify similar types of social value to the local community, they were more identifiable with those classed as 'host'. Again, this is due to their experiences (Rokeach, 1979; O'Brien, 2009), which in their case were focused on how the scheme was designed and constructed and the processes followed. The influence of their professional training and the use of processes relying on quantification were also likely to have influenced their perceptions of social value, which tended to either be focused on the processes followed or on economic value (Hunt and Taylor, 2009).

It is clear that these results indicate that the different experiences of both flood events and of the flood alleviation scheme influence participants' perceptions of social value (Camarinha-Matos and Macedo, 2010; Whitmarsh *et al.*, 2013; Ives and Kendal, 2014). They also suggest a clear difference in industry perceptions and local community perceptions.

Conclusion

The industry processes dictating how UK flood alleviation schemes are developed do not easily facilitate the consideration of social value. Decision making, justifications and approvals are largely focused on quantification, and the intangible and subjective nature of social value means this cannot be easily or comprehensively quantified. This approach to UK flood alleviation development risks omitting the consideration of a local community's social values, needs and requirements, leading to the potential result of an ineffective and socially unsuccessful scheme. However, gaining an understanding of the social values of a local community is complex and multifaceted due to the diverse ways this type of infrastructure and the resultant services are experienced.

This research sought to examine the perceptions of social value of the local community and of those responsible for the design and construction of the flood alleviation scheme in Ripon, UK. The results suggest that there were multiple perceptions among local community participants, as well as clear differences between local community and industry participants. This can be attributed to the different experiences the local community participants had of both flood events and the scheme itself, which influenced their perceptions of social value. The industry participants also had their own experiences of the scheme itself, and this clearly influenced their understanding of social value in relation to the project. It is suggested that the longer term experiences of their professional training and the design processes they followed had further influenced the industry participants' perceptions of social value. The result was a far greater focus on quantifiable, process-led types of social value.

It is clear that until the processes, such as CBA, that the industry use in the decision-making process for flood alleviation schemes change, many aspects of social value will continue to be ignored. The focus on quantifiable outputs effectively excludes the consideration of the social value experienced by many residents in the communities affected by the scheme.

Based on the findings of this study, it is recommended that these multiple perceptions of social value should be acknowledged, identified and acted upon at the feasibility stage of flood alleviation schemes.

As part of the wider research programme, a further two UK flood alleviation schemes are being examined using the same approach with the aim of identifying where similarities and differences exist in perceptions across the three schemes. An important future work stream is to continue this qualitative examination to incorporate the perception of social value of local communities at different stages of flood alleviation design and implementation. This would develop an understanding of the influences on social value during this process and of how perceptions change. Further long-term research should apply this method across different countries and continents in order to develop an international perspective of the social value of flood alleviation schemes.

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Acknowledgements

The research presented in this paper is part of a larger study. The research is conducted with the aid of funding from an Engineering and Physical Sciences Research Council (EPSRC) iCASE doctoral award. Ove Arup and Partners also provide sponsorship as part of the award. The authors would also like to thank Dr Maria Christina Georgiadou for her initial comments on the first draft of this paper.

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Journal of Flood Risk Management published by Chartered Institution of Water and Environmental Management and John Wiley & Sons Ltd