Policy Briefing:

The benefits of a community-oriented approach to surface water management

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Introduction

This Policy Briefing summarises the findings of a research project studying community engagement in adaptation to climate change through surface water management. The project was conducted between 2020 and 2023. (Details of the project can be found on page 11).

The Briefing begins by describing the problem of disconnected and fragmented infrastructure before summarising our finding that the exclusion of ordinary people represents a missed opportunity for the integration of more distributed form of water management. The Briefing then presents some of our key practitioner-focused publications.

For more details on what follows, please see our linked publications or visit our website: **www.communityactionforwater.org**

Water infrastructures: a multifaceted problem?

The UK's current water system is beset by a number of serious and interconnected problems. Climate change is increasing the variability of the water cycle, and the frequency of both heavy rainfall and periods of drought.[1] This means our shared future will involve continuing issues with river pollution (which result partly from heavy rainfall) as well as even more frequent problems with both flooding and drought. Though the impacts of this will be felt by both humans and the environment, our changing relationship to water is not always well understood by the general public.

Domestic water usage continues to rise[2], and the Environment Agency now predicts that demand for water in southern England may outstrip supply in the next 20 years.[3] This increased consumption entails energy-intensive water pumping, transportation, and treatment. However, public awareness of this looming crisis remains low.

According to a study published in 2020, part-funded by the Environment Agency, 72% of people surveyed believe that the UK has enough water to meet the country's needs.[4]

Yet, at the same time, as many as 5.2 million UK properties are currently threatened by flooding.[5] Heavy rainfall associated with climate change is likely to worsen the situation, with a recent study predicting that the amount of damage caused by floods each year in some parts of the UK will rise by 25% even in the best-case climate scenario.[6] Again, public consciousness of the problem is limited: in 2019, only 39% of those with properties in areas classified by the Environment Agency as being at risk of flooding believed their property was either 'definitely' or 'probably' at risk.[7]

Further, increased rainfall, in tandem with rising urbanisation and population, is placing stress on the ageing sewerage infrastructure in the UK.[8] Water companies are repeatedly discharging untreated sewage into the UK's rivers and seas: a total of 301,091 monitored spills were recorded in 2022, lasting 1.75 million hours.[9] This is causing severe pollution and eutrophication, with negative impacts on ecosystems and biodiversity and health risks for human water users.[10] In many areas, current levels of investment are far short of the amounts required to remedy the situation, a problem exacerbated by the fact that the regulatory approach to date has not facilitated sustained funding for infrastructure in the longer term.[11]

1 For a summary of the scientific evidence on flooding see S. Blenkinsop, L. Muniz Alves, and A. Smith (2021) 'ScienceBrief Review: Climate change increases extreme rainfall and the chance of floods'. In: *Critical Issues in Climate Change Science*, edited by: C. Le Quéré, P. Liss & P. Forster. https://doi.org/10.5281/zenodo.4779119; for drought see Environment Agency (2006) *The impact of climate change on severe droughts: Major droughts in England and Wales from 1800 and evidence of impact* Science Report: SC040068/SR1 S; Blenkinsop and H. Fowler (2007) 'Changes in drought frequency, severity and duration for the British Isles projected by the PRUDENCE regional climate models'. *Journal of Hydrology* 342: 50–71.

2 P. Herrington (1996) *Climate Change and the Demand for Water* HMSO: London; Downing, Butterfield, Edmonds et al. (2003) *Climate Change and Demand for Water*. Oxford: Stockholm Environment Institute; R. Lawson, D. Marshallsay, D. DiFiore, et al. *The long term potential for deep reductions in household water demand*. London: Oftwat.

3 National Infrastructure Commission (2018) *Preparing for a Drier Future: England's Water Infrastructure Needs*; Environment Agency (2020) *Meeting our Future Water Needs: A National Framework for Water Resources*

4 Love Water, Cranfield University (2020) *The Great British Rain Paradox*.

5 Environment Agency (2020) *National Flood and Coastal Erosion Risk Management Strategy for England*.

6 P. Bates, J. Savage, O. Wing, et al. (2023) 'A climate-conditioned catastrophe risk model for UK flooding', *Natural Hazards and Earth System Sciences*, 23(2):891-908

7 Environment Agency (2020) ibid.

8 T. Giakoumis and N. Voulvoulis (2023) 'Combined sewer overflows: relating event duration monitoring data to wastewater systems' capacity in England' *Environmental Science: Water Research & Technology*, 9: 707-22

9 Environment Agency (2023) *Event Duration Monitoring - Storm Overflows - Annual Returns 2022*. For a map see https://theriverstrust.org/about-us/news/new-interactive-map-reveals-the-truth-about-sewage-pollution

10 B. Petrie (2021) 'A review of combined sewer overflows as a source of wastewater-derived emerging contaminants in the environment and their management', *Environmental Science and Pollution Research* 28:32095–32110; R. Angerville, Y Perrodin, C Bazin et al (2013) 'Evaluation of ecotoxicological risks related to the Discharge of Combined Sewer Overflows (CSOs) in a periurban river'. *Int J Environ Res Public Health*. 10(7):2670-87. doi: 10.3390/ijerph10072670

11 House of Commons Environmental Audit Committee (2022) *Water Quality in rivers Fourth Report of Session 2021–22*, see especially paragraph 232.

However, significant recent regulatory changes have increased pressure for action on this issue: the Environment Act (2021) now places a statutory duty on water companies to reduce the adverse impact of discharges from storm overflows, and Defra's 2023 *Plan for Water* has signalled an intent to change the law to allow the Environment Agency to penalise water companies for damaging the environment.[12]

For many years, water management in England has been focused on infrastructure projects provided by engineers. These can be small-scale, like tackling individual combined sewer overflows, or large-scale, such as the construction of reservoirs to withstand drought and larger sewers to deal with flooding and water pollution.[13] While such solutions will remain important in future, they have their disadvantages: they can be costly and disruptive, and leave very little space for local communities to play a role in water management. This can lead to public opposition, in turn increasing delays, risks, and costs of projects.[14] However, engineering 'answers' are strongly promoted by the current funding regimes for water infrastructure, which are often weighted towards narrow quantitative measures, e.g. the volumes of water 'held back'. The problem is that this deprioritises solutions that cross the silos between different problems, e.g. interventions that address both flood and drought, or that improve human health and wellbeing or biodiversity.[15]

Underpinning these different crises is a wider problem: many people remain alienated from the water system, with low levels of understanding and participation among ordinary people in water management.[16]

Most engagement initiatives from water companies aim to reduce demands on water infrastructure by nudging consumers towards behavioural changes, rather than encouraging wider, more holistic forms of public engagement with water.[17]

The UK government's 2023 Plan for Water recognises the need for better integration between water management and flood planning and emphasises the need for a joined-up approach across a whole catchment, underpinned by partnerships to coordinate action and investment. Yet such partnerships are still being imagined in a manner that gives precedence to 'expert' stakeholders and organised civil society groups, as opposed to ordinary people and communities.

[12] Defra (2023) *Our integrated plan for delivering clean and plentiful water*. London: HMSO.
[13] See, for example, Ofwat (2023) *Accelerated infrastructure delivery project: draft decisions*.
[14] Copper consultancy (2022) *The Water Pipeline. Readiness and reassurance: A study of public attitudes to water infrastructure*
[15] M. Gandy (2006) 'The Bacteriological City and Its Discontents' *Historical Geography* 34:14-2 http://dev.matthewgandy.org/wp-content/uploads/Gandy_Bacteriological-City.pdf; M. Muller (2007) 'Adapting to climate change: water management for urban resilience' *Environment & Urbanization* 19(1): 99–113. DOI: 10.1177/0956247807076726; P. Gober and H. Wheater (2015) Debates—Perspectives on socio-hydrology: Modelling flood risk as a public policy problem, *Water Resources Research*, 51: 4782– 4788, doi:10.1002/2015WR016945.
[16] L. Sharp (2017) *Reconnecting People and Water: Public Engagement and Sustainable Urban Water Management* London: Routledge
[17] M Foden, A Browne, D Evans et al. (2019) 'The water–energy–food nexus at home: New opportunities for policy interventions in household sustainability' *The Geographical Journal*, 185(4): 406-18; L. Sharp, R. Macrorie, A. Turner (2015) 'Resource efficiency and the imagined public: Insights from cultural theory', *Global Environmental Change*, 34: 196-206

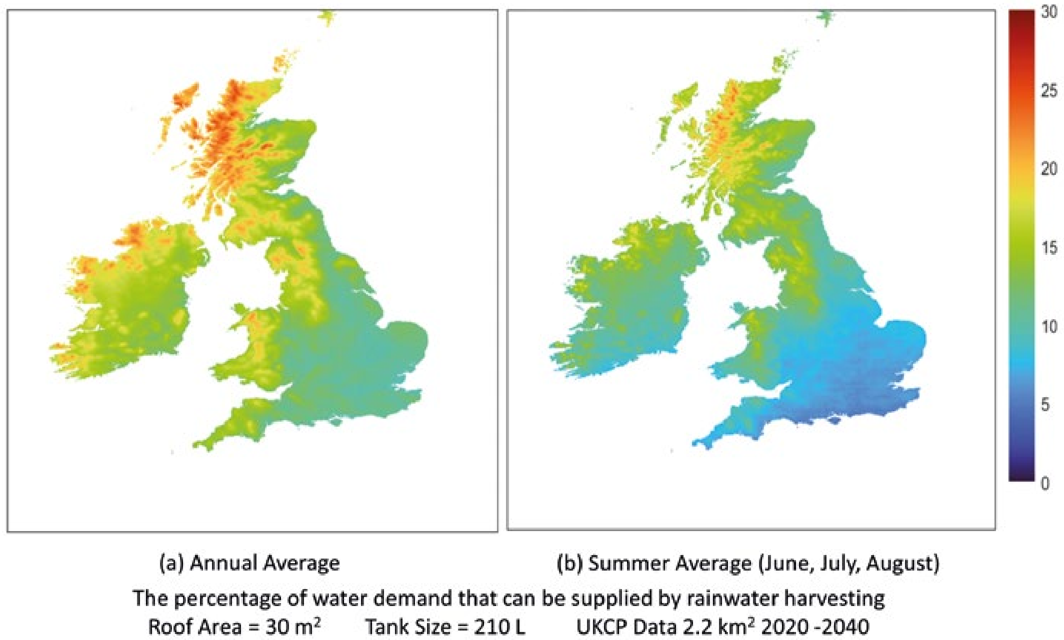
An alternative, community-based approach

Our research argues that this exclusion of ordinary people represents a missed opportunity to involve communities with the management of water. We believe in the social, economic, and environmental merits of an alternative approach: engaging communities on water issues, and encouraging them to make a number of small-scale, distributed changes to the way that they use and manage water. Rather than treating water as something that is subject to the control of specialist engineers, such interventions work at the level of 'everyday' practices and understandings, involving ordinary people in water management as a novel form of climate change adaptation.[18]

For example, collecting rainwater in waterbutts can reduce water usage. The roof area of an average terraced house in the UK ($30m^2$) receives 19,000-55,000 litres of rain each year.[19] Our modelling suggests that a significant proportion of household water consumption could be met by collecting this water. Averaged across the UK, we found that a 210-litre rain tank – equivalent to a small bath – could supply 15% of a household's total annual water consumption.

This figure is clearly subject to clear geographic and seasonal variation. In the wetter northwest of Scotland, we found that 26% of a household's annual water consumption could be met by collecting rainwater. In contrast, only 9% could be supplied in the southeast of England, dropping to 4% in the driest months. Although this seems low, it still equates to 14 litres of water per household each day. The calculations account for the loss of rainwater through evaporation, but it is worth considering that current regulations also restrict the use of rain tank water to non-potable demands, such as flushing toilets.[20]

Figure 1. Rainfall rates vary across the UK. Provided with Ruth Quinn



[18] C. Sefton, L.Sharp, R. Quinn, et al. (2022) 'The feasibility of domestic raintanks contributing to community-oriented urban flood resilience' *Climate Risk Management*, 35: 100390
[19] Met Office 'UK Climate Averages'. Dataset available at https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages. Accessed 2 May 2023.
[20] British Standards (2018) 'On-site non-potable water systems - systems for the use of rainwater BS EN 16941-1' https://knowledge.bsigroup.com/products/on-site-non-potable-water-systems-systems-for-the-use-of-rainwater/standard

Beyond reducing water usage, water butts can also help communities to hold back the flow of water in a rainstorm, reducing the risks of flooding and of sewage overflows into rivers. In the event of a storm, a 210-litre water butt can capture 7 mm of rainfall from the roof of an average terraced house. To put this in context, in the English city of Hull, a storm that deposits 22.3 mm of rain is sufficient to cause flooding.[21] This amount of rain typically falls once every ten years. So if we can store 7 mm of that rain in a water butt, then the amount that is required to cause a flood rises to 28.6 mm. A storm that results in this amount of rainfall only occurs once every 30 years.

This approach is not without its limitations. Obviously, the area that is occupied by roofs is far smaller than the total area over which rain falls. The hydrology of a flood is also complex, including the movement of water through a catchment from uplands to lower-lying areas. Further, to slow the flow into the drainage network, water butts need to be empty at the start of a storm, which means that they need to be voided several hours before the commencement of rain. This can be done automatically, via smart taps, or manually, by individual householders (perhaps following a text alert). But if used in combination with domestic interventions like raingardens and permeable paving, water butts could make a small but meaningful contribution to reducing the threat of flooding and water pollution.

Further, there are wider educational benefits to increasing public awareness of our multifaceted water crisis, which may in turn lead to other beneficial behaviours, such as the installation of domestic water saving devices.

To read more about this research, click here: 'The feasibility of domestic raintanks contributing to community-oriented urban flood resilience'

[21] NERC (1975) *Flood Studies Report Volume I Hydrological Studies*. London: Whitefriars Press.

Testing a community-oriented approach in practice: MAGIC in Hull

'Mobilising Adaptation: Governance of Infrastructure through Co production' (MAGIC)[22] was a 30 month project trialling new ways of managing surface water in our urban areas. It focused on case studies around the flood-vulnerable city of Hull, installing rain tanks and rain garden planters on well-known buildings used by the public in five neighbourhoods (a church, a primary school, a petrol station with a shop, a civic hall, and a community centre). The project was built on a previous feasibility study that suggested that demonstrations of working rain tank management in public places would encourage household takeup, inspiring people to find out more about what they could do to slow the flow of rain in their own domestic spaces.

As part of the main research project, we conducted a series of interviews with professionals in the fields of water and flood risk management. We found that many were describing a shift away from a focus on physical infrastructures, towards more people-centred practices in their work. However, this change was not without its tensions. Many professionals described time and resource constraints as a significant limiting factor on their public engagement work. Some projects simply did not last long enough to build trust and shared aims, with professionals concerned that communities did not feel genuinely involved or listened to. Several also experienced difficulties translating local knowledge acquired from community engagement into 'data' that was generalisable and acceptable as evidence by policy actors to obtain funding.

As a result of our findings, we produced a guide for water professionals to assist them in engaging local communities around water infrastructures. It recognises the constraints under which many professionals are working, but also points out significant advantages of engagement, including ensuring that water infrastructure meets a wide range of local needs (beyond the hydrological), working with local knowledge, enabling communities to have some ownership of infrastructure, and reducing vandalism, litter-clearing, and maintenance costs. The guide is illustrated by a number of detailed case studies illustrating successful community engagement projects, but also the potential risks that attend a failure to engage local people.

A further series of interviews with water professionals, community influencers, and residents of two areas in Hull provides an empirical basis for this work. Findings suggested that all participants were happy to install and empty rain tanks, and that the major barrier to their use as a distributed community SuDS was a lack of clear communication. When asked about their engagement preferences, participants favoured face-to-face interactive activities, using simple vernacular language, and relying on existing community infrastructure to cascade messages to a wider community. Interviewees reported that messaging focused on the benefits of community rain management (e.g. water for plants) rather than its negative consequences (e.g. flood mitigation) was more effective.

Read our Community Rain Management Report

[22] MAGIC ran from 2020-2022 and was funded by the UK Research and Innovation's Strategic Priority Fund for Climate Resilience (Grant no NE/T01394X/1).

Understanding developer views on Sustainable urban Drainage Systems (SuDS)

Sustainable urban Drainage Systems, or SuDS, represent a cost-effective way of managing rainwater where it falls, reducing surface water flooding and sewerage overflows, and improving water quality and reducing pollution. They were first introduced to the English planning system in 2010, and national planning policy encourages their use in all major developments.[23] Defra's recent review of Sustainable urban Drainage Systems concluded that they should be made a legal requirement in all new developments.[24]

Yet a recent report concluded that delivery on the ground lags behind these ambitions. Part of the issue is a rift between national and local policy. In local authorities, there is wide variability in SuDS policy, with many relying on Design Guides rather than formal regulations. This confusing landscape is exacerbated by the fact that Non-Statutory Technical Standards do not require submissions to highlight the multifunctional benefits of schemes beyond hydrological goals. Developers are also failing to use Best Practice guidance, and 96% of local authorities report that the quality of planning submissions for SuDS is 'inadequate' or 'mixed'.[25]

Our research suggests that part of the problem lies in the way that this complex, contradictory and non-mandatory policy context around SuDS interacts with principles of land valuation that underpin development. Regulatory ambiguity leaves developers to choose between wildlife-friendly rain management interventions that are distributed across the surface of the development site, or other SuDS, such as concrete underground tanks, that alleviate flooding but have few other benefits. Unfortunately, the former take more careful forward planning and use land that might otherwise provide more housing, with implications for land and property values. Further, some SuDS schemes can require maintenance, which comes with a cost, and there are currently no clear rules for the 'adoption' of these features into the future.

Our findings, grounded on a series of interviews with housebuilding firms, are that the uncertainties surrounding the regulation of SuDS, and the non-mandatory nature of their implementation, are leading to a situation where developers simply cannot include them if they wish to remain competitive in the land bidding process. When purchasing or optioning land, developers are often competing with one another, and landowners will often choose the scheme that maximises land values and therefore profits. In turn, this often means increasing the built area of a site in a way that leaves little room for nature-friendly surface SuDS features. We conclude that clear, robust, and mandatory regulation would pre-empt many of these issues, leading to a more transparent system of land valuation and more investment in SuDs. Furthermore, our research suggests that developers themselves would be broadly in favour of such a system.

Sustainable drainage and new housing developments

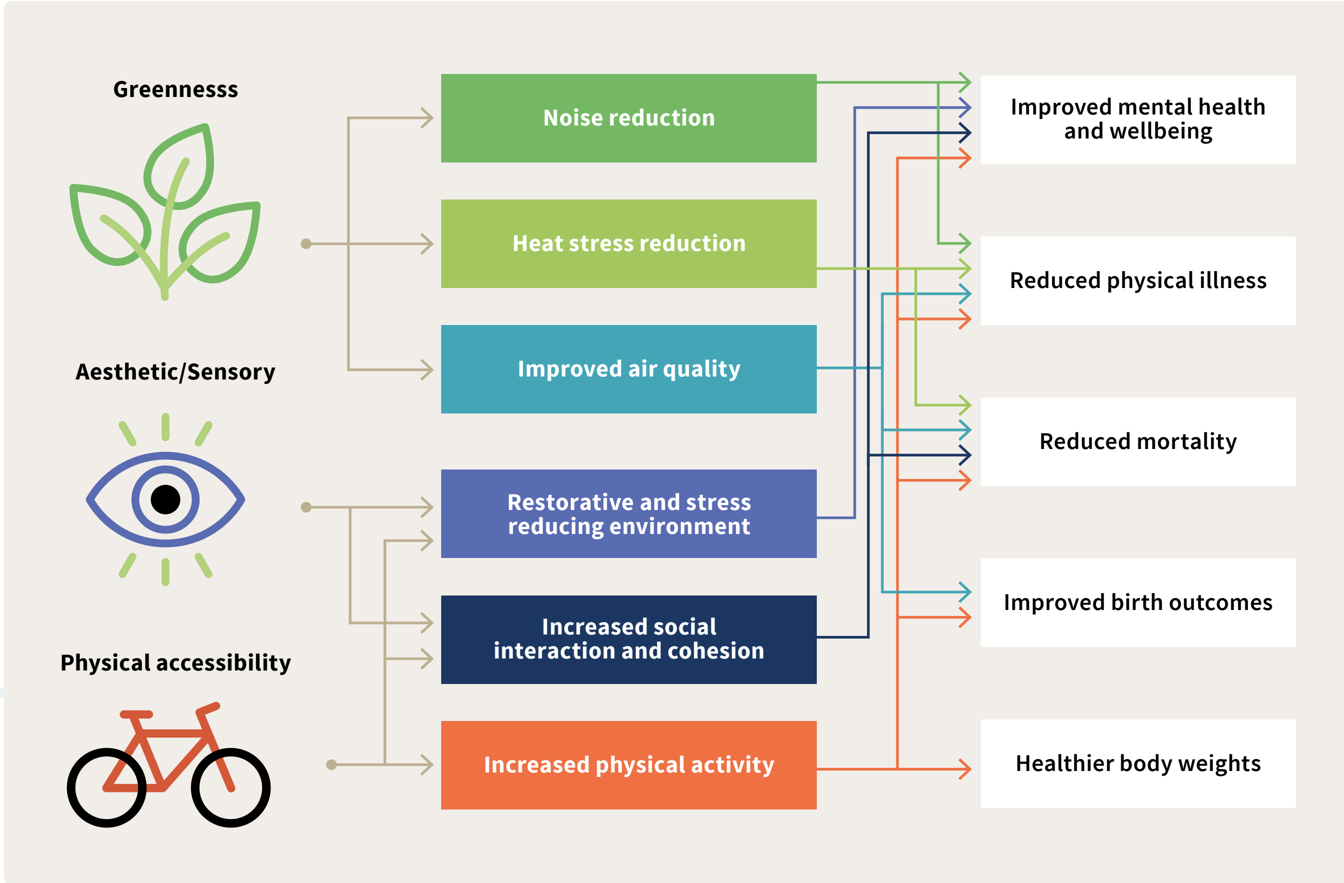
[23] Ministry of Housing, Communities and Local Government (2021) *National Planning Policy Framework* Department for Levelling Up, Housing and Communities (2022) *Planning Practice Guidance* associated technical guidance paragraph 055.
[24] Defra (2023) *The review for implementation of Schedule 3 to The Flood and Water Management Act 2010*
[25] CIC and Landscape Institute (2019) *Achieving sustainable drainage: A review of delivery by Lead Local Flood Authorities.*

Understanding the multiple benefits of blue-green infrastructure

Engaging communities with water can solve problems beyond the hydrological. There is a wealth of research on the multiple benefits of blue-green infrastructures (BGI), yet this has not been synthesised into an easy-use format for water practitioners and policy-makers. Funding regimes for water infrastructure are also often narrowly focused on engineering benefits, rather than taking a wider, more holistic approach to social, health and wellbeing, and ecological gains.

Our team has produced a guide drawing together the current evidence on the health and wellbeing benefits of SuDS. Our aim is to enable water practitioners to identify alternative sources of funding, and to make an argument to policy-makers for recognition of the multiple benefits of water infrastructures.

We conducted a wide-ranging literature research, identifying relevant research and meta-analyses from a wide range of disciplines, including environmental and social epidemiology, environmental psychology, geography, landscape studies, and urban planning. This enabled us to define three key attributes of BGI that provide health-related benefits: promoting a healthy physical environment with less noise, heat stress, and air pollution; providing therapeutic aesthetic and sensory qualities for wellbeing, such as appearance, sound, smells, and tactile qualities; and promoting exercise and social interaction. We argue that designing BGI with these benefits in mind can help to reduce health inequalities as well as mitigating the impacts of climate changes (which also disproportionately impact poorer communities).[26]



[Designing Blue Green Infrastructure]

Further information

For more information on Community Action for Water, visit our website at **www.communityactionforwater.org**

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This document was written with the benefit of funding from the UKRI Strategic Priority Fund -UK Climate Resilience, which funded Mobilising Adaptation: Governance of Infrastructure Through Coproduction (MAGIC, grant NE/T01394X/1).

Please refer to this guide as: Chapman, K; and Sharp, L.,(2023), Policy Briefing: The benefits of a community-oriented approach to surface water management, Sheffield: University of Sheffield, https://doi.org/10.15131/shef.data.23985813

The authors would like to thank:

Our project partners: Timebank Hull and East Riding, Susdrainability, Stantec, CIRIA, and the LIving With Water Partnership (including Hull City Council, East Riding District Council, Yorkshire Water Services and the Environment Agency).

The team who helped form and deliver the MAGIC project including: Virginia Stovin, Sarah Payne, Ross Cameron, Nigel Dunnet, Gill Hughes, Megan Clinch, Stephen Connelly, Anne Hayes, Ruth Quinn, Christine Sefton, Fran Ellis, Jo Birch, Emma Westling, Kate MacDonald, Lee Pitcher, Rachel Glossop, Kate Lonsdale, Louise Walker and Chris Digman.

Additionally, Laure Divisa and the Susdrain team have contributed the photographs and Anna Pethen has undertaken the graphic design.

[26] Institute of Health Equity (2020) *The Marmot Review 10 Years On.* https://www.health.org.uk/publications/reports/the-marmot-review-10-years-on

www.communityactionforwater.org