# Creative practice as a potential tool to build drought and flood resilience in the Global South

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**Abstract.** Global South communities are increasingly exposed and vulnerable to natural hazards such as floods and droughts. Preparing for future extremes requires including diverse knowledges, elevating under-represented voices, thinking out of the box for possible solutions, enhancing communication between diverse groups, and instigating organisational and behavioural change. In this study we investigate whether artistic and creative processes could support Global South communities in improv-

5 ing their preparedness to extremes. A literature review of 267 journal articles published between 2000 and 2018 showed that there is a growing body of research on using creative practice in environmental issues. Art and creativity are for example often used for raising awareness of climate change and for encouraging behavioural change in relation to health issues. Research using creative practice to increase resilience to natural hazards, such as earthquakes, volcanic eruptions, tsunamis, floods and droughts is, however, still very rare. An opportunity exists to better understand the application of the wide range of creative

10 methods currently used for environmental and health-related issues also to enhance resilience to droughts and floods. We tested this in a pilot project in South Africa, in which we designed storytelling workshops to create community narratives about impacts of and preparedness for future drought. These narratives were filmed and edited and shared both with the community and governance actors. Although this was a short pilot project and the effects have not been thoroughly researched, we see potential for these kind of methodologies. We noticed that the approach allowed people to imagine future droughts and that it

15 opened up conversation about potential adaptation measures. Based on the literature and pilot study we call for more research on the use of creative practice in building resilience to extreme events. It is especially important to investigate how the use of creative methods compares to other methods, and how effective creative practice is to make a difference, either in people's own behaviour or in communicating people's needs to decision makers.

## 1   Introduction

20 Global South communities are vulnerable to the impacts of floods and droughts, and are expected to be even more at risk in the future (Winsemius et al., 2015b), as increased climate variability and is likely to lead to more floods and droughts (IPCC, 2012) and water demands and exposure and vulnerability are growing (Wanders and Wada, 2015; Winsemius et al., 2015a). Better resilience and preparedness to floods and droughts are urgently needed. Preparing for future extremes requires

including diverse knowledges, elevating under-represented voices, thinking out of the box for possible solutions, enhancing

25 communication between diverse groups, and instigating organisational and behavioural change. In this paper, we investigate

whether there is a potential for creative and art-based methods to support this transition to more resilience.

Our aim is to investigate the potential for creative practice in building resilience to droughts and floods in Global South

communities. To do that we systematically map the literature on how art & creativity are used in relation to floods and droughts

and in related other fields (climate change, health), and further discuss a specific case study of our own as an exemplar of

30 using creative practice to increase resilience to drought. We will use the word creative practice to mean all artistic and creative

processes (Niedderer and Roworth-Stokes, 2007). The reason for focusing on creative practice rather than artistic artefacts is

that the end product does not necessarily have to be of aesthetic value, and there need not be an end product at all.

With Global South communities, we mean marginalised and vulnerable communities living in the South as well as the North

(Barreto, 2014, p.404). We focus on marginalised communities because they often do not have access to engineering-based

35 flood and drought mitigation options such as dikes or reservoirs, either because these are too expensive or considered poor

'value for money' or because they are not feasible in the region these communities inhabit (e.g. Johnson and Priest, 2008;

Ikeda et al., 2016). Also, these communities might have knowledge of suitable traditional structural or non-structural measures

(Berkes et al., 2000; Altieri and Nicholls, 2013) and there is a need to surface their hidden voices. According to Gibson and

Gordon (2018), cultural resourcefulness and coping capacities of rural populations are rarely acknowledged within state-expert

40 modelling of resilience.

There is an important body of literature that critiques the term 'resilience', alerting us to the need to use it cautiously (e.g.

Davoudi et al., 2012; MacKinnon and Derickson, 2012; Moser et al., 2019). We are acutely aware of the sensitivity of our

research topic, with the risk of marginalised communities being denied access to structural measures and potentially being

offered creative practice as an alternative. Here, we use the term 'building resilience' to denote addressing and mitigating the

45 complex interaction of social and economic vulnerability of communities and supporting their way of preparing for, coping

with and recovering after disasters. We explicitly include decision makers in this investigation, to also study the added value of

creative practice for those with more agency.

In the following sections, we first map the existing literature on this topic and identify research gaps (Sect. 2). Then, we

discuss methods and results of a case study (Sect. 3), indicating potential for the research gaps to be filled. Finally, based on the

50 literature mapping and the case study, we share reflections and perspectives for future research (Sect. 4). We see potential for

creative methods as a currently under-explored way to surface the hidden voices of marginalised communities and to empower

them to take action or seek support to increase preparedness to extreme events. We envisage creative methods to be part of a

portfolio of methods to build community resilience to hazards and call for more research on the effectiveness of these tools in

communicating about flood and drought risk or as a way for communities to imagine future risk or potential preventive actions.

## 2   Literature

### 2.1   Literature framework

Research on art and creativity shows that these are used by a range of people in different ways with a variety of goals, participants, and audiences. There are different ways to categorise art-based practice. Miles (2010), who studied art exhibitions on the topic of climate change distinguish two types of aims: raising awareness and intervention. Guba and Lincoln (1989) adds the dimension of the audience or receiver: is the creative process or art product enhancing the insights of the participants or of others? Rathwell and Armitage (2016) noted the same categories, but added the aspect of the experience of the artistic process, noting "art as a site of knowledge coproduction" (Rathwell and Armitage, 2016, p.1).

From these categorisations three dimensions emerge: the goal of the creative practice, the doer, and the audience. The goal of the creative activity can be to raise awareness, instigate action, or both. The doer of the creative practice refers to whether the creative practice is carried out by community members, or by an academic or artist, or whether it is co-created between community and academics / artists. The intended audience of the artistic product or those who benefit from the creative practice can be the participants themselves, or other community members, decision makers, the general public, or researchers. The existing literature on creative practice used by or with communities shows these three dimensions in various combinations. Various types of art-based research, for example, are aimed at the participants of the creative process.

First, research on Traditional Ecological Knowledge (TEK) often focuses on how TEK is passed on within communities using traditional stories, songs, dance, etc. Researchers have described and documented these methods doing participant observation. For example, Rigby et al. (2011) and Zurba and Berkes (2013) showed how art is used by aboriginal communities to (re-)connect to the land in periods of environmental stress, McEwen et al. (2012) describes the practice of archiving diverse flood information including narratives and songs, and there are various examples of how traditional songs and stories are used to pass on knowledge between generations (Moncada, 2018; Simpson, 1999). Here, the creative practice is community-led, with other community members as audience.

Second, the use of art and creativity in therapeutic way is studied extensively (Snyder, 1997; Edwards, 2014), for instance as a post-disaster recovery and healing therapy (e.g. Huss et al., 2016; Zerrudo, 2016; Whittle et al., 2012). With regard to droughts and floods more specifically, there is some evidence from Australia that art and music festivals provide an escape from the hardship of prolonged drought, bring the community together, and enhance emotional well-being (Gibson and Connell, 2015). Here, the creative activities are used to forget the economic impacts of environmental issues or natural hazards and lessen their social impacts (e.g. feelings of isolation, loss of community, depression, suicide; Gibson and Connell, 2015). In other examples, psychological impacts are lessened by using artistic process to more deeply explore feelings and experiences (Whittle et al., 2012). In this form of art therapy, either traditional creative methods can be used or ones imposed by the therapist, and both the doer and the audience are the individual participant or community.

Third, art and creativity can be used with a goal of instigating action or behavioural change in the participants. This is, for example, studied in education (Bequette, 2007; Silo and Khudu-Petersen, 2016; Cramer et al., 2017) and health (Schmid, 2006). In these cases, researchers often have a more active role in guiding the process, sometimes in collaboration with artist(s).

Again, traditional art forms can be used or build on or the art form can be imposed by the researcher. There is an emerging
90    literature on using art in this way to build social-ecological resilience (Rathwell and Armitage, 2016) or to deal with floods
and droughts (Mason, 2015). The focus still is on the participants as the audience, but there is more involvement from the
researcher in this category.

In a fourth category, the audience of the creative process or user of the art product can be researchers themselves. If creative
practice is used as research tool, the aim often is to reach deeper layers of people's lived experience of environmental issues
95    or natural hazards (Skains, 2018). In this case, the process is used by the researcher(s) as a qualitative data collection method
to increase their understanding and knowledge on the topic (e.g. Kloetzel, 2017; Miller and Brockie, 2015). Using art and
creativity in this way has been argued to give vulnerable people a voice and for the message and emotions to travel beyond
those who experienced the event, but there seems to be no empirical research confirming this (Miller and Brockie, 2015).

Finally, the audience can consist of the general public. Researchers have investigated how various people (e.g. artists, NGOs)
100   have used creative practice in public-facing endeavours (e.g. Curtis et al., 2012). These creative 'interventions' can have a range
of aims, including communicating to an audience about environmental issues, raising awareness, reshaping public perceptions,
enhancing engagement, and promoting action (Rice et al., 2019). On the topic of climate change, for example, art is often
used with a focus on the general public, for communication and awareness raising (Nurmis, 2016) and instigating behavioural
change (Burke et al., 2018). In some of these the audience is quite passive, but there are also examples of how the public
105   is engaged in participatory art (Candy et al., 2006). The reasons for using art as an engagement tool include that it can help
people understand complex information (Curtis et al., 2012), can support the development of new mental models (Lozano,
2011), and is a powerful way to make people care about a topic because it can invoke strong emotions (Matravers, 2001; Silvia
and Brown, 2007; Barbour and Hitchmough, 2014). Interestingly, existing studies on the effectiveness of art-based climate
change communication offer only limited and inconsistent evidence of their impact. Some researchers also mention a potential
110   use of artistic products in decision making (e.g. Symons, 2016), but to our knowledge no examples of this exist.

In this paper, will use the three dimensions (goal, doer and audience) and focus on all aspects of using creative practice
(sharing traditional knowledge; instigation action; engaging the public; art as research tool), except for its therapeutic use.
Indeed, there is much research on art therapy and here we are mostly interested in how art-based information can be used to
make voices heard, enhance communication between diverse groups, think out of the box for possible solutions, and instigate
115   organisational and behavioural change.

## 2.2    Literature mapping

We mapped the scientific literature to find papers reporting on uses of creative practice to raise awareness or build resilience
to drought and flood risk in the Global South. We also looked at other hazards (earthquakes, volcanic eruptions, etc.) and
environmental issues, including climate change, more generally. As there is a more established praxis of using creative practice
120   in instigating behavioural change in health-related issues (notably HIV), social and economic inequality, and violence and
conflict, we have also reviewed the literature on those topics. More details on the literature mapping exercise can be found in
Appendix A.
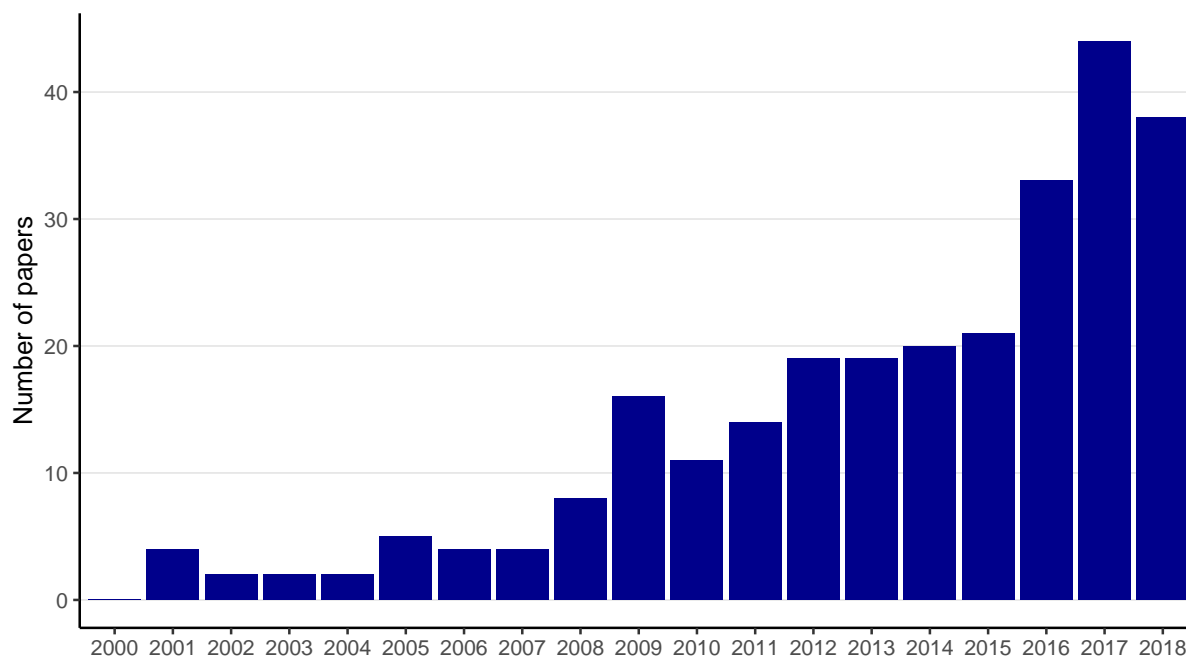
**Figure 1.** Peer-reviewed journal articles (in no. per year) found via a literature mapping exercise, focusing on the use of art-based and creative practice in the research fields of hazards and disasters, climate change, other environmental issues, health, social and economic inequality, and violence & conflict in Global South context (for details see Appendix A).

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Our iterative search process with manual screening resulted in a selection of 267 journal articles. These show a clear increase in number per year over time, especially after 2008 (Fig. 1), which is consistent with reviews focusing on art and climate change

125 (Galafassi et al., 2018) and art and vulnerable populations (Coemans and Hannes, 2017). Most of the papers focus on topics related to health (21% of total no. of papers) and climate change (18%); just over 15% discuss the use of creative practice in topics of environmental management and resource access. Papers on using creative practice in relation to natural hazards and disasters (volcanic eruptions, earthquakes, tsunamis, drought, and flooding) only make up 1-3% of the total sample each.

Recent review articles on the use of different art-based methods in environmental and health research found that most art-

130 based research is carried out in the United States, Canada, the United Kingdom and France (Nurmis, 2016; Galafassi et al., 2018; Coemans and Hannes, 2017). Research on arts and health is often also done in Africa (Teti et al., 2018) and water-related creative practice research is concentrated in water-scarce regions in Africa and Australia (Fantini, 2017). In this study, we searched for papers focusing on Global South and vulnerable communities. The resulting selection was spread across the globe (Fig. 2). Most research is done in Africa (29% of total no. of papers), followed by Oceania (25%) and Asia (16%). There is

135 also a lot of work with indigenous communities and vulnerable groups in North America (16%), but only a small amount in Europe (3%).
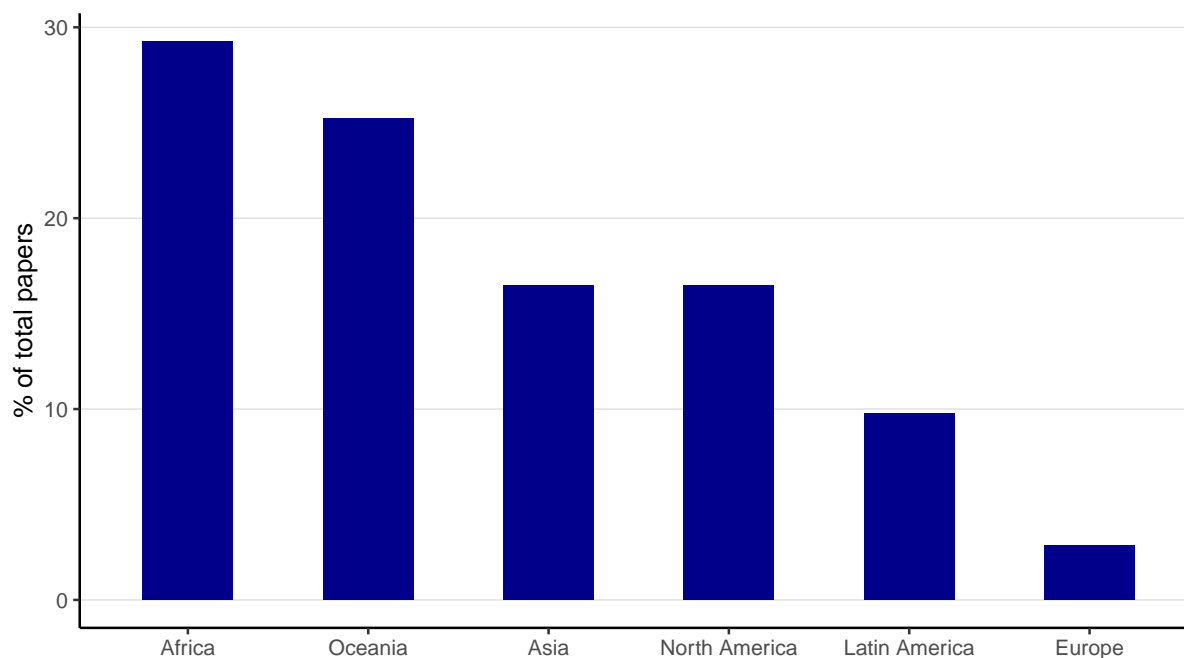
**Figure 2.** Continents (in % of total papers) where the research was carried out that we found via a literature mapping exercise (for details see Appendix A).

The creative methods and art forms used are very diverse (Fig. 3). Photography is the most-used method (mentioned 63 times), followed by music & song (59 times), other forms of visual art (48 times), drama (46 times), storytelling (43 times), and video & film (37 times). Art forms such as dance and poetry are used less (17 and 12 times, respectively). One reason

140   for the large amount of papers on photography is that it is often used as a participatory research methodology. Photovoice (or Photo-Elicitation Methods or Camera-User-Study) is often used to explore communities' view on HIV / AIDs (e.g. Jacobs and Harley, 2008; Mitchell et al., 2005; Umurungi et al., 2008; Wood, 2012; Fournier et al., 2014; Adegoke and Steyn, 2017), environmental issues (e.g. Belcher and Roberts, 2012; Bennett and Dearden, 2013), conservation (e.g. Beh et al., 2013), water use and governance (e.g. Fantini, 2017; Bisung et al., 2015), and hazards and disasters (e.g. Yoshihama and Yunomae, 2018;

145   Schumann et al., 2018). This means that photography is mostly used as a research method asking participants to develop new material. Papers on music and song, on the other hand, mostly study existing traditional songs and music on a variety of topics (e.g. Stone, 2003; Saroli, 2005; Wu, 2016; Grant, 2018; Dirksen, 2019). They are rarely used to co-create new material; some examples where new material is created are: Steiner (2015), Anderson et al. (2018) and Plush and Cox (2019).

We also looked at the degree of co-creation between the researchers and communities, because we were interested to see

150   how much the researchers were involved in the creative practice, including initiating, supporting, guiding or even leading the creative practice, and how much of the creative practice was pre-existing in the community prior to the research or was completely carried out by the community without researcher involvement. The degree of co-creation is very variable between
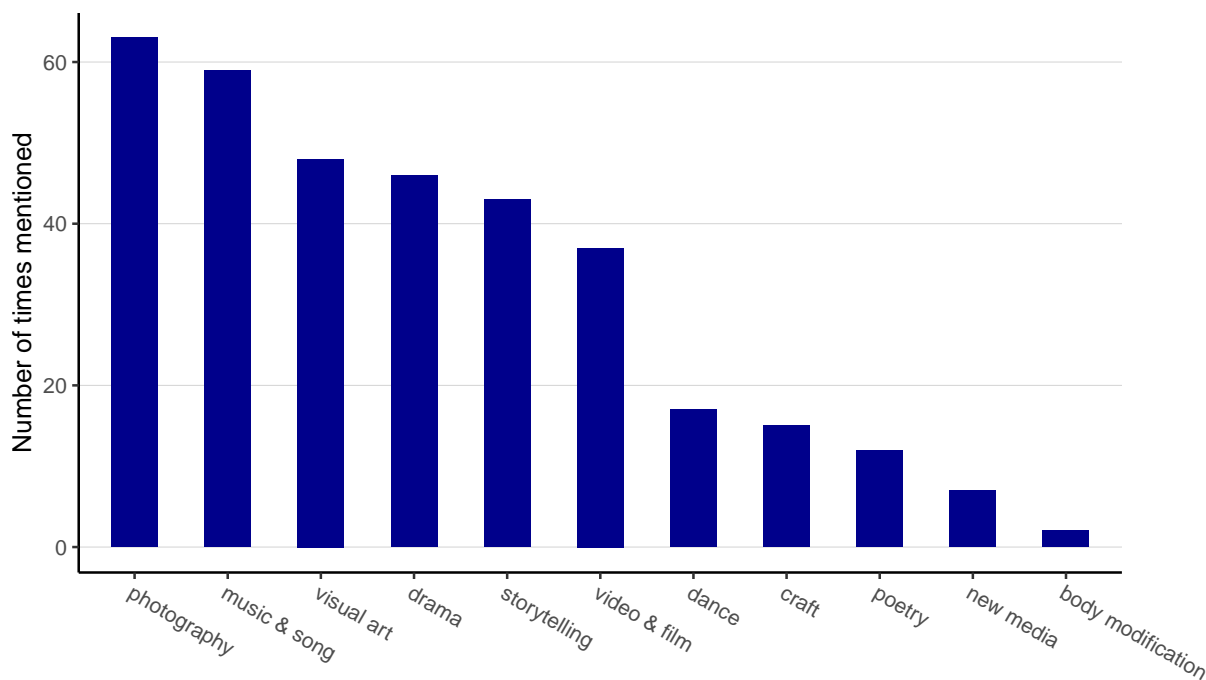
**Figure 3.** Art forms / creative methods used or researched (in no., multiple art forms per paper possible) in the journal articles that we found via a literature mapping exercise (for details see Appendix A).

papers. In some cases, the methodology is given to a community by researchers (for example in participatory photography), but the resulting product was made without the researcher's involvement (e.g. Belcher and Roberts, 2012). In other cases,

155 the participants communicated to the researchers what the greatest environmental threats to their community are, and then artists develop this into an artistic product (e.g. Steiner, 2015). There are also many examples of researchers observing and documenting creative practice traditionally used in Global South communities to pass down traditional knowledge on natural hazards or environmental issues, for example using storytelling (e.g. Swanson, 2008; Cashman and Cronin, 2008; Johnson and Beamer, 2013; Troll et al., 2015; Fepuleai et al., 2016). These have a low degree of co-production, because they work with

160 existing material, often in a form of participant observation. Others build on traditional creative practice to develop new stories (e.g. Fuertes, 2012; Somerville, 2014; Ayala et al., 2016; Fernández-Llamazares and Cabeza, 2017). These often have a high degree of co-production with the researcher guiding the process.

The aim of the art-based research also strongly affects the degree of co-production. In many papers, the goal of developing an artistic product is communication, for example to raise awareness of an environmental issue and its impact on vulnerable

165 communities. There is a wealth of projects aiming at raising awareness of the general public on climate change and its impacts (Nurmis, 2016; Galafassi et al., 2018). Papers on the topic of climate change generally have a lower degree of co-production (62% medium or high). In other research, the goal of the creative practice is instigating some kind of action, for example to

| GOAL | awareness | | both | | action | |
|---|---|---|---|---|---|---|
| | D1 F4 F2    F5 | | F1    D2 | | CS    F3 | |
| METHOD | community-led | | co-creation | | academic- / artist-led | |
| | D2   F5   F4 | | CS   F3 F1 | | D1   F2 | |
| AUDIENCE | participants | others in community | decision makers | general public | researchers | |
| | F3 CS D2 F1 | CS | CS   F5 | D1 F2 | F4 F5 | |

**Figure 4.** Papers on drought and flooding classified in three categories: goal of the creative practice (GOAL), doer of the creative practice / creator of the end product (METHOD), audience of the creative practice / the end product (AUDIENCE). Abbreviations: see Table 1.

bring about behavioural change in relation to health (for example HIV / AIDS). Papers on the topic of health generally have a higher degree of co-production (90% medium or high).

170     Only rarely is the effect of the creative practice evaluated. Fantini (2017) highlights that creative participatory methods such as Photovoice are claimed to be effective in communicating community concerns, but that empirical evidence for these claims is missing. There are some examples where results are reported. In Contreras et al. (2018), theatre-based workshops were a significant success, encouraging almost half of the participants to seek out government-provided health services after a disaster. However, a comparison with a control case, in which other, non-creative methods were used or in which no activity was done

175   at all, is hardly ever done.

    In our search, we found only two papers focusing on drought and/or water scarcity (Table 1). Barontini et al. (2017) used arts as a communication tool. They documented traditional irrigation techniques to cope with water scarcity in the Mediterranean and, together with other researchers and students, developed a travelling exhibition for students and the general public. In this example, the exhibition was used to raise awareness and understanding of historical water conservation techniques. In contrast,

180   Rigby et al. (2011) used arts as a tool to change behaviour and coping capacity. They investigated the use of creative and artistic practice in response to drought and discuss how encouraging Aboriginal arts in Australia can increase resilience to drought as it enhances the connection with the land. They mention a whole suite of art forms used traditionally to highlight the Aborigines connection to land, e.g. painting, printing, photography, film, theatre, music and dance. This research did not develop new artistic products or ask participants to engage in new forms of creative practice. Instead, they studied how traditional art can

185   help people cope with drought by reconnecting them to the land.

    Five papers focusing on flooding were identified (Table 1). They ranged from studies on using community workshops to merge scientific and local knowledge of flooding (Ikeda et al., 2016) to a researcher/poet developing poems from interview transcripts of older people's lived experience of flooding (Miller and Brockie, 2015). Three studies used participatory creative methods: participatory theatre to help young people cope with mental health issues related to flooding post-disaster (Contr-

**Table 1.** Papers on drought (D1, D2) and flooding (F1-F5) found in the literature mapping exercise focusing on creative practice and Global South communities, and the case study (CS) described in Sect. 3

| No. | Title | Author(s) & Year | Journal | Region |
|---|---|---|---|---|
| D1 | Bridging Mediterranean cultures in the International Year of Soils 2015: a documentary exhibition on irrigation techniques in water scarcity conditions | Barontini et al. (2017) | Hydrology Research | Europe, Africa |
| D2 | If the land's sick, we're sick:* the impact of prolonged drought on the social and emotional well-being of Aboriginal communities in rural New South Wales. | Rigby et al. (2011) | The Australian Journal of Rural Health | Oceania |
| F1 | Knowledge Sharing for Disaster Risk Reduction: Insights from a Glacier Lake Workshop in the Ladakh Region, Indian Himalayas | Ikeda et al. (2016) | Mountain Research and Development | Asia |
| F2 | The disaster flood experience: Older people's poetic voices of resilience | Miller and Brockie (2015) | Journal of Aging Studies | Oceania |
| F3 | Community strengthening and mental health system linking after flooding in two informal human settlements in Peru: a model for small-scale disaster response | Contreras et al. (2018) | Global Mental Health | South America |
| F4 | Social practices of flood (risk) management – a visual geographic approach to the analysis of social practices in an empirical case in Chiapas, Mexico | Stephan (2018) | Erdkunde | Central America |
| F5 | Displacement: Critical insights from flood-affected children | Mort et al. (2018) | Health & Place | Europe |
| CS | Hydrological modelling as a tool for interdisciplinary workshops on future drought | Rangecroft et al. (2018) | Progress in Physical Geography | Africa |
| | Using a narrative method to imagine preparedness to future droughts in South Africa | Rohse et al. (in prep.) | Geo: Geography and Environment | Africa |

eras2018), participatory photography to explore questions of flood management (Stephan, 2018), and participatory drawing to understand flood impacts on young children (Mort et al., 2018).

We have classified these seven papers on drought and flooding (Table 1) into in three categories, following the three dimensions introduced in Sect. 1: i) the goal of the creative practice (raising awareness, instigating action, or both), ii) the doer of the creative practice / the creator of the end product (completely led by the community, an academic or artist, or co-created between community and academics / artists), and iii) the audience of the creative practice / the end product (the participants themselves, other community members, decision makers, the general public, or researchers). Figure 4 shows that the papers generally fall into two categories. Firstly, those discussing creative practice aimed at communicating the impacts of drought or

flooding to the general public (D1, F2) or to researchers (F4, F5). And secondly, those discussing creative practice aimed at instigating action in the participants themselves, either pre- (D2, F1) or post-disaster (F3).

200    Compared to the wider literature on environmental issues and health described above, these studies on floods and droughts show limited co-creation (Fig. 4), leaving an opportunity to explore this aspect further. Additionally, despite the mention of how the artistic products could travel to other communities and could be used to inform decision making, this has not yet been investigated in these studies (Fig. 4). This shows that there is a gap in the use of co-created creative practice both for awareness raising / communication and for instigating action, especially with a broader audience. In the next sections, we show

205    an example case study of how this gap might be filled.

## 3   Pilot study

The pilot project CreativeDrought (https://creativedrought.wordpress.com/) aimed to develop approaches to local level preparedness to future drought. According to Biggs et al. (2012), important aspects of resilience building are maintaining diversity and redundancy, managing connectivity, managing slow variables and feedbacks, fostering complex adaptive systems thinking,

210    encouraging learning and experimentation, broadening participation, and promoting polycentric governance systems. In this project, we focused on participation, learning and experimentation, and connectivity, and wanted to explore how creative practice could support these. We designed an approach that allowed members of the community to actively engage with potential futures including sharing of existing local knowledge, experience and strategies ('imagining futures'; Anderson, 2010), and inclusion of scientific information ('calculating futures'; Anderson, 2010). The goal was to create stories about potential future

215    drought impact and preparation/adaptation via a multiple method approach developing text-based narratives, performance, and visuals (video). We used this process to increase dialogue between groups in the community and used the visuals to make the voices of the community members 'travel' to policymakers' circles, where they would not normally be routinely heard (see CS in Table 1 and Fig. 4).

### 3.1   Methods

220    As case study region we selected a village in Limpopo Province in South Africa. This (anonymous) village was chosen because of its vulnerability to drought and because the villagers get their water supply from a number of different sources and use it for a range of different purposes, i.e. a groundwater borehole for domestic water supply, two reservoirs for irrigation of agricultural land, and a river for washing, bathing, brickmaking, etc. (Rangecroft et al., 2018). The village has a population of c. 2800 (StatsSA, 2017) and is led by a chief and his royal council. Drinking water supply is organised by the Department of Water

225    and Sanitation and irrigation water is regulated by the Department of Agriculture (Makaya et al., in review).

    We developed and tested an interdisciplinary approach with, as final output, videos of narratives produced by groups of community members in the village (Rohse et al., in prep.). These were produced in small-scale workshops guided by an interdisciplinary team of researchers and local research assistants, in which the participants were asked to reflect imaginatively on future drought scenarios produced by a hydrological model. Focusing on narratives as the creative method was a pragmatic

230 choice related to participants' preference for storytelling compared to other (more visual) methods, for example maps or games, and familiarity with these methods by the research team. Additionally, because we focused on imagining of future events, we could not use methods that are rooted in the current or past situation, such as Photovoice.

The development of the narrative videos happened in three phases. In the first phase, we carried out group narrative interviews on the topic of past drought events (Rohse et al., in prep.). These allowed us to collect rich and contextualised information on

235 past droughts and their impacts on different groups in the community, but also to surface hidden voices and explore the potential for future drought narrative workshops. We used oral history techniques in small group conversations. We did 12 groups interviews with 2 to 7 participants each covering a range of different groups within the village (occupation, gender, age). The interviews were recorded, transcribed, and translated from Venda (the local language) into English.

In the second phase, we set up a hydrological model for the area that could be used to model future scenarios (see Range-

240 croft et al., 2018). We used the SHETRAN hydrological model developed from available datasets and catchment observation. Topography was based on DEM data, precipitation and potential evapotranspiration input came from climate datasets, geology, soil type, land use, and information on location and amount of water abstraction was derived from field observations, dam level and release data, and discussions with knowledgeable locals. The model was qualitatively validated with water level data and with information about the drought events shared by the participants of the narrative interviews in phase 1. The model was run

245 for a baseline run and for three different scenarios (Rangecroft et al., 2018). The scenarios were designed based on conversations with the villagers and with a number of government representatives. The "Warmer Temperatures" scenario was based on an increase of 3C compared to present day temperatures representing a climate change expectations for the region. The "Larger Irrigation Scheme" scenario represents a possible increase in water demand in the future with the area of the irrigation scheme expanded to be twice as large as present day. The "No Dams" scenario was based on the expectation that without maintenance

250 the dams, which were built in the 1960s, might not be available for the community any more in the future. On the model results for the scenarios a drought analysis was performed and the resulting drought characteristics were compared with the baseline scenario to determine the difference between future and historic droughts (Rangecroft et al., 2018). These results were then translated into storylines for easy communication with the community.

In the third phase, we organised 6 workshops, in which we brought together different groups in the community. Our aim was

255 to have around 4 people per group, so 8 per workshop, but due to various reasons attendance was low for some groups. These are the workshops we organised (for more information see Rohse et al., in prep.):

- 2 workshops with orchard farmers and livestock farmers

- 2 workshops with young married mothers and elderly women

- 1 workshop with irrigation farmers (older and younger generation)

260 - 1 workshop with traditional leaders

In these workshops the participants first listened to the storylines of the possible future droughts. They then discussed what the impacts of these droughts would be on them and their community and developed these into 'stories' that were filmed. Next,

the groups within each workshop exchanged these stories and had a discussion with the whole group about possible responses and preparedness measures. They then went back to their smaller groups to develop this into a story about coping strategies
265 to future drought, which was also filmed. This resulted in two stories about the future for each group, one on future drought impacts and one on future drought preparedness (which took into account the exchange with the other group).

After the narrative videos were produced, the results of the workshops were discussed in a community forum, shared with community via YouTube, USBs and transcripts, and used in conversations with water management actors.

### 3.1.1 Results

270 The first phase provided very useful information in preparation for the second and third phases. It gave understanding of historic drought events and their impacts on the community. The group stories, for example, showed how different groups in society were influenced by different types of drought (livestock farmers by meteorological drought, irrigation farmers by hydrological drought, and drinking water supply by groundwater drought), which all had their different timings. The community members, however, did not show understanding of how these types of drought were linked in space and time, but their responses were
275 very helpful in setting up and validating the hydrological model in phase 2. Phase 1 also yielded useful observations for the preparation of the workshops in phase 3. It provided contextual understanding of the challenges the community faced. It highlighted the importance of faith in framing their stance towards possible future drought ("God decides") and difficulties to imagine and talk about the future. We also found that there was seemingly little intergenerational exchange of drought coping strategies, although there were some ambiguous testimonies on this point. And importantly, we tested which creative method
280 would resonate most with the community. We talked about visual methods like artistic maps or other methods like board games for the community to interact with potential future changes in water availability and use. However, from the start it was clear that the idea of 'stories' was most resonant with the community. The participants of phase 1 and the village elders of the royal council indicated their interest in developing stories.

In phase 2, the information collected in phase 1 and during catchment observation was used to set up and test the model.
285 Because the model was used for the development of scenarios, which were then used as starting point for discussion in the workshops, accuracy of model results was not our main aim. We wanted the model to represent the past droughts relatively well so that we could trust the modelled potential futures. From phase 1, we found that farmers and elderly men and women talked mostly about the 1983 drought, whereas the young people, married mothers and civic group discussed the impacts of the 1992 and 1994-95 droughts on the community (Rangecroft et al., 2018).

290 The model was then used to extrapolate and calculate several scenarios that were mentioned by community members and government representatives. Instead of predicting the future, we were exploring plausible futures. Droughts were calculated and compared between the scenario and the baseline. These were transformed into storylines including information on the duration and severity of future droughts compared to previous experience (e.g. more severe than has been experienced in the past 40 years or twice as long as the drought in the early 1980s). We used both a climate change scenario and scenarios related
295 to human activities (i.e. increased water use for irrigation and decreased water availability due to lack of dam maintenance),
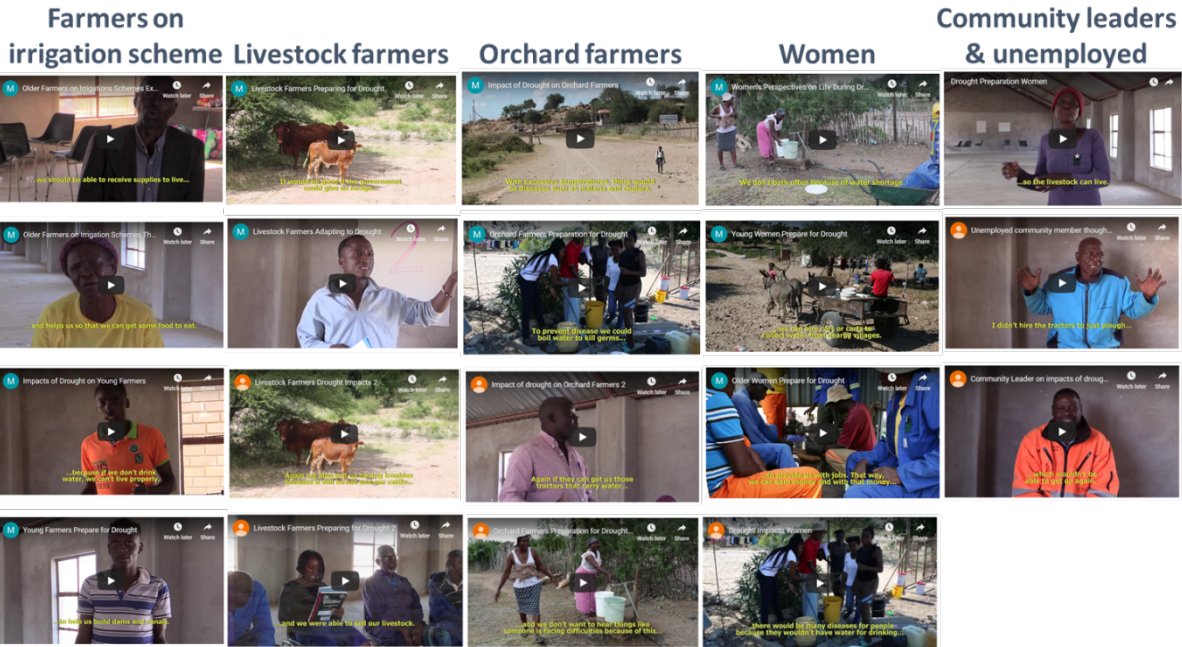
**Figure 5.** Recorded and edited future drought narratives developed in community workshops in the CreativeDrought project (see https://creativedrought.wordpress.com/videos/).

but found that the latter were more difficult to communicate so we ended up mostly using the climate change scenario in the workshops.

The workshops generated very rich information on potential future drought impacts and possible coping and preparedness strategies. These did not necessarily develop into fully-formed stories, but they did clearly communicate strong emotions and allowed for imagining positive options. Compared to the first phase, in which narrative-style answers were also used but where people found it hard to engage with uncertain futures and referred mostly to God or their own death, in the workshops the narrative approach supported by data from the model scenarios allowed participants to use their imagination and exchange ideas. Some participants now made the link between water use for irrigation and water available for domestic purposes, which did not happen in the phase 1 group interviews (Rohse et al., in prep.). We found that the intergenerational exchange was very powerful, with older farmers willing to share traditional techniques and younger farmers eager to learn. The exchange between participants with different professions also worked well, although there was already an awareness of the needs of different groups in the community, mostly because these are not strictly separated with for example livestock farmers also having a small plot to grow vegetables and being domestic water users as well. We also found that there were very different preparedness and coping strategies brought forward in the different workshops, including individual actions (digging for water in the river bed, selling livestock, saving food), community actions (collective maintenance of the irrigation system, drilling a new borehole), and government support (providing food, fodder, drinking water, and jobs).

The approach allowed participants to use their imagination and consider future drought events, their impacts and preparation, and to exchange ideas between different intergenerational groups and across different professional occupations. The research assistants who carried out the bulk of the facilitation in the local language, reported that whilst some participants were a bit
315 concerned with how long the workshops were, there was general enthusiasm for the topics discussed and participants had many ideas to contribute, and valued the opportunity to have a platform to exchange and learn from their peers, in particular those from the younger generation.

The recorded and edited narratives (Fig. 5) were given back to the community with the idea that these could be used in schools and community gatherings. The narratives were also a useful tool for creating space for conversations with government
320 representatives about local perspectives on drought management. Whilst on the outset the local policymakers we interacted with were uncertain about the videos and their content, through careful facilitation, they acknowledged the value of the videos in sharing the concerns of the community. The videos proved to be stimulating prompts for conversations on drought preparedness and on the current situation facing the community. In addition, the policymakers found some of images useful as illustrations of the specific conditions facing the villagers, as explained it is sometimes difficult to get reliable information on villagers'
325 situations.

## 4  Reflections & perspectives

Through mapping existing literature on using creative practice to build resilience to droughts and floods by Global South communities, we identified a clear research gap. The seven studies we found either focused on creative practice as research tool, for raising awareness of the general public, or for instigating action by the participants. There was relatively little co-
330 creation and little evidence of how the end products could travel or be used in decision making. The 267 studies with a wider focus than solely drought and flooding selected in our literature mapping exercise, showed a similar pattern with most art-based climate change communication focused on raising awareness with little co-production, and most creative practice in the field of health focused on encouraging behavioural change with high co-production. Our case study on developing narratives to increase preparedness to future drought in southern Africa was most similar to the second type, but we felt that there was
335 potential to explore the middle space between these two contrasting types. By filming and editing the stories developed by the community, we could use them as a discussion starter with decision makers. Unfortunately, due to the short nature of the pilot project funding, we have not been able to evaluate the effectiveness of communicating via stories compared to more traditional ways of communicating. This is a common feature among much of the research on art and creativity in environmental and health-related issues. Most papers are merely describing a methodology and promoting a potential beneficial method without
340 clear evaluation of its efficacy.

Both in the reviewed literature and in our case study, we encountered many barriers and practical challenges to using creative practice in resilience-related research in the Global South. These practical challenges include:

- language: in cases where the researcher does not speak the local language or is not from the area being researched, know-
ing the full breadth of traditional art-based methods or translating the details of creative practice activities and intended

345     outcomes can be challenging. However, language might be less of a problem in some non-verbal art and creativity than
        when using other more verbal methodologies, such as interviews or archival research.

        – time: creative methods often take a lot of time, both from the participants and from the researchers. Researchers need to
          gain in-depth insights of their case studies and if translators are involved (see language), they need to be well-briefed.
          Also, if art-forms are used that the community is not familiar with, a thorough explanation is needed.

350     – unfamiliarity: participants are not always comfortable in engaging in creative practice and some decision makers tend to
          prefer quantitative outputs with a specified (un)certainty instead of contextualised stories, photographs, songs or other
          art products (Owens, 2005).

To overcome these challenges, good facilitation is crucial. Ideally, the research team is interdisciplinary and including local
researchers and the work is guided and facilitated by creative practitioners / artists speaking the local language and familiar with
355   participatory art-based research (see 'social volcanology'; Donovan, 2010). Some scholars have critiqued the use of art-based
methods, for example by noting that art distances the problem (Miles, 2010) or by questioning whether art-based methods can
actually achieve any change (see Nurmis, 2016). Apocalyptic climate change art, for example, can lead to fatalistic views that
are not helpful for instigating action and behavioural change (Nurmis, 2016).

    Whether creative practice leads to action improving resilience to droughts and floods in marginalised communities is an
360   unresolved question. It is widely recognised that improvements in flood and drought resilience need to come both from com-
munities and government as a shared responsibility between public and private partners (Trim, 2004; Amaratunga et al., 2009).
However, Global South communities often face many challenges and barriers for actions include lack of resources (land and
financial resources), unemployment, and lack of information (such as drought early-warning) and creative practice on its own
is unlikely to be able to solve these. However, if the creative practice is part of a larger programme that integrates local and
365   scientific knowledge and combines community-focused activities with activities aimed at decision makers, it may have greater
impact potential.

    McMillen et al. (2016) showed, based on an example from Hawai'i, that arts-based approaches to community resilience have
alternating phases of being more and less important, in relation to socio-ecological shifts over time. We feel that globally we
are now living in a time that asks for more creativity in relation to environmental issues and disasters. Traditional methods for
370   natural resource management are either forgotten (Janif et al., 2016) or inadequate in the Anthropocene (McDowell and Hess,
2012; Kareiva and Fuller, 2016; Head, 2016). Adaptation based on experience might have worked in the past. For example, the
process of sharing oral history accounts can contribute to community resilience (Osterhoudt, 2018), but how does it apply to
future events? There is evidence that damage from natural hazards decreases after repeated events due to adaptation (for floods:
Kreibich et al., 2017). Memory of a previous event has been found to decrease damage in the next event (Viglione et al., 2014),
375   but this memory decreases over time (Lopez et al., 2017). A big question is how to increase resilience if the previous extreme
event was very long ago or when future events are outside of previous experience? Alternative ways are needed that require
out-of-the-box thinking to imagine how the future might be different from the past and what actions are needed to prepare

for this future. Creative methods might be able to enhance this process, especially if they are embedded in or making use of traditional ecological knowledge (e.g. Laidler, 2006).

380    However, much more research is needed on various aspects of using creative practice to build resilience to future drought and flooding.

–   Firstly, we believe that more knowledge on traditional ways of using art and creativity for coping with environmental issues is useful. Indigenous knowledge systems have had to deal with climatic and anthropogenic change (McMillen et al., 2016; Gibson and Gordon, 2018) and might show ways to use art and creativity for natural resource management
385       under changing conditions (e.g. Berkes et al., 2000; Whyte, 2018). An interesting example is Aboriginal use of art for connecting to the land in Australia (Rigby et al., 2011; Zurba and Berkes, 2013).

–   Secondly, research is needed on evaluating the three dimensions of creative practice (goal, doer, audience; see Sect. 1). Is the aim to communicate information or awareness, or to instigate action? And who needs to have more awareness or take action: the participants of the creative practice or others, such as the general public, researchers or decision makers?
390       It is especially important to evaluate whether the methodology of the creative practice fits the intended outcomes.

–   Thirdly, we want to encourage more research on co-production during the creative process. How can artists and researchers work together with local communities to ensure mutual learning? Can / should decision makers be included in the creative process and not only be receivers of the end product? We feel that the use of participatory art is currently underexplored. As Rathwell and Armitage (2016) noted: "collaborative art making is a platform for knowledge
395       coproduction, whereby novel ideas or products emerge from different ways of knowing".

–   Fourthly, more evidence is needed on the effectiveness of creative methods. Only in (mental) health research, where art-based methods are used therapeutically, there is some evidence for their effectiveness (e.g. Stuckey and Nobel, 2010; Van Lith et al., 2013). We call for empirical research comparing creative methods to more traditional methods of doing research, communicating information, or instigating action in relation to droughts and flood. For example, it is as yet
400       unclear whether narrative workshops, like those used by Rangecroft et al. (2018) and Rohse et al. (in prep.), have more effect than traditional workshops, as used by Ikeda et al. (2016). Research is needed on the drivers of any observed change: is the reason for change that the members of a community are coming together and exchanging ideas, or is it the creative practice allowing participants to think outside the box? One of the methodological challenges in evaluating effects and drivers is that change can happen many months after an intervention. Longitudinal studies and being embedded
405       in the communities would be needed (Donovan, 2010).

–   And finally, we suggest research to investigate how creative practice can be embedded in a holistic strategy for building resilience. Can creative practice support communities in Global South settings to communicate their worries or traditional methods of dealing with environmental issues more effectively? How can art-based non-structural methods be combined with more traditional structural measures to mitigate drought and flooding? Like Whittle et al. (2012), we argue that
410       creative side of resilience cannot be separated from the physical and socio-economic aspects of resilience.

## 5 Conclusions

Our literature mapping and case study have indicated that there is a potential for artistic and creative methods to be used more for building resilience to drought and flooding. Currently, research on this topic is limited, especially on creative co-production of the end product and on audiences beyond the participants themselves and the general public. Several advantages
415 of using creative practice are mentioned: it has been suggested to surface hidden voices, communicate issues on a deeper, more emotional level, travel to wider audiences, increase engagement and behavioural change. Potential challenges are language barriers between researcher and participants, time investment of both researchers and participants, and possible unfamiliarity of participants with artistic or creative methods or products.

Based on the literature mapping and pilot study we call for more research on the use of creative practice in building re-
420 silience to extreme events. It is especially important to investigate how the use of creative methods compares to other methods, and how effective creative practice is at bringing about change, either in people's behaviour or in measures implemented by decision makers. We also think future research should address the question how to combining creative methods with more traditional scientific methods and decision making. For decision makers a combination of quantitative, qualitative, and creative information might be most successful in supporting marginalised communities in coping with drought and flooding.

425 *Data availability.* The literature review database (Sect. 2 and Appendix A) will be made openly available upon publication of the article.

*Video supplement.* The narrative videos developed in the pilot study (Sect. 3) are available here: https://creativedrought.wordpress.com/videos/

## Appendix A: Appendix A

In the literature mapping exercise, we reviewed peer-reviewed journal articles. We searched the databases of Science Direct, Web of Knowledge, JSTOR, Taylor and Francis Online, ProQuest, Academia.edu, Project MUSE, and Dimensions. We limited
430 our search to the period 2000-2018, as in previous reviews on related topics art-based research has been found to be limited before 2000 (Coemans and Hannes, 2017; Galafassi et al., 2018). When searching these databases we used a combination of keywords describing different sectors, different art and creative forms, specific regions in the Global South, and words like 'participatory', 'indigenous', 'community'. The search process was iterative, with search terms adapted when they did not yield the expected results. Like Coemans and Hannes (2017), we found that searching by specific art type works better than using
435 'art' in general. This yielded many papers on the 'state of the art' in certain research field. The same holds for geographic area: most researchers do not use the keyword 'Global South' in their titles or keywords, but rather mention the specify region or country/countries. We focused our search on Low and Middle Income Countries and on vulnerable (indigenous) groups within High Income Countries. We limited the search to papers in which art was used as research process and art was developed as product from the research. Articles on art therapy and projects using art therapeutically were excluded. This required a

440 manual and iterative search process of removing duplicates and irrelevant articles by screening titles and reading abstracts. We then further explored the articles using a descriptive coding scheme to filter out information (aim, art form, amount of co-production). This coding scheme was designed based on the first few papers and then refined during the analysis. Data were extracted from the abstract and rest of the paper if needed. The papers on the topics of drought and flooding were classified into a matrix based on the following categories: goal, doer, audience. Finally, the papers were summarised to easily extract

445 information.

*Author contributions.* AVL conceived the study with input from MR, PJ, and RD. AVL, PJ, and RD designed the literature mapping exercise and ILM carried it out. MR designed and carried out the community workshops in the pilot study, supported by AVL and RD. AVL prepared the manuscript with contributions from all co-authors.

*Competing interests.* The authors declare no competing interests.

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