

Mitigating hydro-meteorological hazard impacts through improved transboundary river management in the Ciliwung River Basin

A LITERATURE REVIEW ON COMMUNITY PARTICIPATION IN FLOOD EARLY WARNING

April 2020



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About the Project

The project Mitigating Hydrometeorological Hazard Impacts Through Improved Transboundary River Management in the Ciliwung River Basin will examine how the current transboundary river management arrangements in the Ciliwung River Basin, Indonesia influence flood hazard impacts. The interdisciplinary project will bring together expertise in flood modelling, disaster risk reduction, urban planning, public policy, and behavioural science with the objective of identifying the environmental, socio-economic, political and organisational landscape associated with flood risk in the Ciliwung River Basin. The results will be used to inform improved transboundary river management arrangements for the Ciliwung Basin and provide a model for urban and peri-urban river basins elsewhere.

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Lead Authors

Georgina Clegg, Richard Haigh, Dilanthi Amaratunga, Harkunti Rahayu

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Preface

This work was conducted as part of the project *Mitigating hydrometeorological hazard impacts through improved transboundary river management in the Ciliwung River Basin*. This UK-Indonesia collaborative project, funded by NERC and Ristekdikti, aims to inform plans for improved transboundary river management to tackle flooding in the Ciliwung River Basin (CRB), Indonesia. Effective early warning is an important aspect of transboundary flood risk management, as it contributes to saving lives and livelihoods and reducing flood impacts within the basin. As such, the project will be investigating how more effective early warning can be achieved in the transboundary setting of the CRB.

The CRB suffers from frequent flooding during the rainy season. The banks of the river are heavily populated, which means the population are highly exposed and an early warning system is essential. Although there have been efforts to improve early warning in the downstream capital city of Jakarta, recent floods have indicated insufficiencies in the system, as highlighted in the Jakarta Post Editorial 'An Early Warning Too Late' (25th February 2017) (The Jakarta Post, 2017).

This document provides a starting point for the investigation into improved early warning for the CRB by presenting a review of existing literature on community¹ participation in early warning systems and flood risk management. This work is framed within the context of the project's research question 13: **What policy interventions and incentives would strengthen community understanding and preparedness for flood risk along the Ciliwung River?** The review outlines how participatory approaches may be used to improve community understanding and preparedness for floods, and what interventions and incentives may need to be considered when designing approaches for the CRB. It builds upon the previous review presented in the Conceptual Framework (Clegg *et al.*, 2019).

¹ The term community is used throughout this document. It is used to refer to members of the public who live in flood risk areas within the CRB. This is distinguished from the 'authorities' that is used to refer to those with decision making powers and responsibility for flood risk management/ early warning. This could be a government agency for example.

1. Introduction: Early warning, preparedness and participation

The aim of Flood Risk Management (FRM) is to reduce the likelihood and impacts of flooding (Schanze *et al.*, 2006). Early warning systems (EWS) are an integral part of FRM (Kundzewicz, 2013) as they contribute to saving lives and livelihoods, and help to reduce flood impacts. An EWS can be defined as “an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities, systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events” (UNDRR, 2020a). In terms of protecting communities within transboundary river basins, the goal of an EWS is to communicate a warning to those at risk and to generate a response (United Nations, 2006; Garcia and Fearnley, 2012).

An effective EWS is generally understood to include four elements: risk knowledge, monitoring and warning, communication and dissemination and response capability (known as the four elements of effective people-centred early warning) (United Nations, 2006). The **risk knowledge** element provides an understanding of flood risk and vulnerability. **Monitoring and warning** include the monitoring and measurement of different parameters, for example, water levels and precipitation amounts to produce a warning. **Communication and dissemination** concern the communication of risk information and the warning itself in a timely manner to those at risk. Finally, **response capability** is the ability of people at risk to take action following a warning (United Nations, 2006). Although EWS have improved greatly over time in terms of their technical aspects (e.g. monitoring, telecommunications networks), there are persistent issues with the more social components, such as the generation of a response within the community (United Nations, 2006; Garcia and Fearnley, 2012; Cools *et al.*, 2016; Dutta and Basnayake, 2018). **Response capability** consists of “actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected” (UNDRR, 2020c). Even if the other elements of the EWS work well, the system will be ineffective if it does not lead to response action.

The effectiveness of the response element is linked to the concept of preparedness, understood to be the “knowledge and capacities developed... to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters” (UNDRR, 2020b). Being prepared increases the likelihood that response actions will be taken (United Nations, 2006; Cools *et al.*, 2016) as it provides those at risk with the capacity to respond in a timely fashion once a warning is received (Paton *et al.*, 2008; Scolobig *et al.*, 2012; Giron Lopez *et al.*, 2017; Kelman *et al.*, 2018). It has often been thought that a lack of awareness and understanding was the main barrier to preparedness, and that the greater people’s awareness of risk, the more effort they will make to prepare themselves for disaster. This is sometimes known as the Information Deficit Model (IDM), and it led to the belief that simply providing those at risk with information would lead to preparedness (Abunyewah *et al.*, 2020). However, a growing body of research has shown that this is not necessarily the case. Information campaigns have been noted to be ineffective and often, the knowledge of risk does not lead to people taking action against it (Paton *et al.*, 2008; Scolobig *et al.*, 2012). This has led researchers to suggest the need for more active participation of people at risk in order to foster greater awareness and preparedness for flooding and other disasters (Wachinger *et al.*, 2013; Maskrey *et al.*, 2019).

There are several reasons why participation is thought to lead to greater preparedness (McEwen and Jones, 2012; Mehring *et al.*, 2018). Firstly, it helps to build understanding of the flood problem more holistically. Floods are complex phenomena, and to tackle them successfully a comprehensive understanding of the issue is required. This includes both expert and local knowledges. Participatory processes can be one way to combine different knowledges from both ‘experts’ and ‘the community’. Secondly, trust is thought to be important for early warning, as communities that trust authorities are more likely to deem warnings credible and therefore, to respond (Molinari and Handmer, 2011). Wachinger *et al.* (2013) note that too much

trust in authorities can have negative impacts on preparedness, as people may transfer full responsibility for flood protection to authorities. However, when communities participate alongside authorities, they can appreciate their abilities and limits, while developing trust. Through active engagement individuals begin to understand their own agency to take action and prepare themselves. Furthermore, participation can build and leverage social capital (Mimaki and Shaw, 2007), which can contribute to greater preparedness (WMO, 2017). Social capital is defined by Mimaki and Shaw (2007) as “the factors which promote useful cooperative actions such as the social organisations, and systems, norms, networks, peoples’ sense of values, consciousness and beliefs held by members of the community and/or concerned external parties”. Social capital allows individuals to draw on community networks and resources to support preparedness. It is also thought to increase the dissemination of warnings among communities due to the associated trust and interconnectedness (Dokhi *et al.*, 2017; Han *et al.*, 2019).

Although participation is thought to be beneficial for preparedness and early warning, achieving successful participation is not straightforward. The problem is that participation is not well defined, the term is understood in different ways by different disciplines, and there is no single approach to achieving successful participation, as it is subjective to what is to be achieved (Huitema *et al.*, 2009). In order to understand participation, and how it can be applied to increase community preparedness and response in the CRB, a literature review was conducted. The remainder of the review is structured as follows: The methods for the literature review are first given in Section 2. The document goes on to provide a review on how participation can be understood, the factors that influence it, and examples of previous initiatives. The document then considers the context of the Ciliwung River Basin, and examines the current arrangements in terms of policy and existing examples of participation. A summary and discussion of findings are given in Section 5.

2. Methods

The literature review was conducted with the following focus questions in mind:

- How is community participation in FRM and EWS understood?
- What interventions and incentives are commonly used?
- What might influence the effectiveness of community participation in FRM and EWS?
- How does/might participation in EWS play out in the context of the CRB?

The choice was made to include literature from the field of FRM as well as EWS. This was because participation in EWS is a relatively new area of research, while it is much more developed in FRM. Thus, the inclusion of FRM literature helps to provide a richer understanding.

The review included both academic and grey literature. The literature sources were retrieved through online searches using Google, Google Scholar and the University of Huddersfield's online portal 'Summon'. The following key terms were used as search terms: 'participation'; 'early warning system'; 'flood risk management'; 'people-centred'; 'community-based'. These terms were then searched in conjunction with 'Ciliwung'; 'Jakarta'; 'Indonesia'.

Participatory forms of EWS are sometimes referred to in different ways, such as 'community-based' or 'people centred' (Marchezini *et al.*, 2018). These terms were used in the literature searches. However, for consistency throughout the review the terms 'participation' and 'participatory EWS' are used. This is because the different terms are sometimes used to mean different things (Marcherera and Chimbari, 2016). 'Participation' is used to encompass the different varieties of community involvement.

The 'lessons learned' overview (Section 3) draws upon literature from around the globe (although it should be noted that a great deal of literature regarding participation in FRM is from the European context, where it has gained the greatest attention). Section 4 focuses specifically on literature referring to the CRB, Jakarta and West Java Province.

3. Lessons learned from participation in FRM and EWS

3.1. How can participation be understood?

Participation can be understood in different ways. It is often used to mean public involvement in decision making, and there have been various attempts to define different 'types' (Reed, 2008). Throughout the literature, the seminal work of Arnstein (1969) is commonly cited. Arnstein presents a 'ladder' of participation, the rungs being degrees of decision-making power held by citizens. At the bottom of the ladder are 'tokenistic' forms of participation, where participants have no real influence over the decision made. At the top of the ladder are forms where citizens have greater power and control. However, this model is generally considered outdated, as it makes the assumption that forms of participation at the top of the ladder are better (Reed *et al.*, 2018). Participation has also been viewed in terms of dialogue. For example, it may be more consultative, with one-way communication, or more deliberative, with greater dialogue between participants and authorities (Rowe and Frewer, 2000).



Figure 1. Volunteers respond to flooding with brooms and buckets. Germany, 2002. (dpa picture alliance/ Alamy Stock Photo)

In FRM participation might be in decision making, but people may also be participating in physical action, knowledge generation and advocacy activities (Forrest *et al.*, 2020). Therefore, participation is used here to refer to involvement in both decision making and action. Participation in the FRM literature is commonly represented by the top-down/ bottom-up distinction. This refers to how participation is initiated or led, either by authorities (top-down) or a more grass-roots community led model (bottom-up) (van Buuren *et al.*, 2019). Others employ different terms, but refer to broadly similar arrangements such as 'invited',

or 'created' participation (Denters, 2016), or formal/official and informal/unofficial (Parker and Handmer, 1998; Hassenforder *et al.*, 2019). More recently in the FRM literature, attention has been given to more 'collaborative' and 'coproduced' forms (Mees *et al.*, 2016; van Buuren *et al.*, 2019; McLennan, 2020). This is where there is a greater focus on equal partnership between authorities and communities, with the acknowledgement that neither government action or community action alone is sufficient (Mees *et al.*, 2017; Hassenforder *et al.*, 2019; McLennan, 2020). Current thinking is that both community action and government action are important, and a balance should be drawn between the two, where actions complement each other instead of competing.

To provide a starting point, the typology of participation by Reed *et al.* (2018) is presented here. This typology was chosen as it encompasses various common conceptualisations, such as top-down vs. bottom-up and one-way communication/deliberation, and classifies them into four ideal types. Although the typology regards participation in decision making, participatory action can also be added to the descriptions. The four types of participation suggested by Reed *et al.* (2018) are:

I. Top-down one-way communication and/or consultation

Led by authorities or an organisation which holds decision-making power. Communities may be consulted or have the decision communicated to them (generally not considered true participation).

II. Top-down deliberation and/or coproduction

Led by authority or organisation which engages the public in two-way dialogue. In coproduced forms of this type, the decision is jointly developed and owned

III. Bottom-up one-way communication and/or consultation

Led by stakeholders/public who seek to persuade the authorities to open up decision making, or to overrule decisions.

IV. Bottom-up deliberation and/or coproduction

Led by stakeholders/public who engage in two-way dialogue with other stakeholders/ members of the public. this may be by a small group, or it may be coproduced by the whole group.

It is generally acknowledged that information provision alone is not sufficient to build preparedness and response capacity (see Section 1). This suggests that more active forms of participation are required. Thus, this document focuses predominantly on types 2-4 of Reed's typology.

Participation in EWS has received less attention in terms of attempts to typify different forms. However, often some of the same distinctions are made, such as the top-down bottom-up model. Baudoin *et al.* (2016) identifies three different forms – a 'top-down' authority led approach, a 'community-centric' model, where the community take the lead, and a 'hybrid' model, that combines elements of both. Other authors refer to the last-mile/first mile. In the top-down EWS chain, the communities at risk are the last to be reached (last-mile). Some suggest the need to reconceptualise this, to place those at risk at the beginning, making the community the 'first mile' e.g. (Kelman and Glantz, 2014). This often comes with the notion of 'embeddedness' of the EWS within the community. It also suggests a high degree of community involvement, with the community taking the lead across design, implementation and management.

3.2. Policy interventions and incentives

Policy interventions include programmes or activities taken or mandated by national authorities or non-state actors. This may include for example, regulations, incentives, information schemes or the provision of infrastructure (IIIIEE, 2019). This section aims to describe some common interventions used in FRM and EWS.

3.2.1. Examples from FRM

In some places around the world participation in FRM has been institutionalised as a legal requirement. Prominent examples include the EU Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC). These are deemed significant as they made it mandatory for states to implement public participation in river basin and flood planning in Europe (Wright and Fritsch, 2011; Jager *et al.*, 2016). Hassenforder *et al.* (2019) identify some benefits and downsides of this type of initiative. Institutionalising participation can help provide dedicated resources and guarantee budgets. It can also make clear the responsibilities of different actors, and can help set out requirements for monitoring and assessment. However, it can also lead to a 'box ticking' mentality, where participation is conducted to meet requirements rather than aiming for the best quality participation. Several authors have identified similar issues with the EU Directives. For example, it has been suggested that the requirements are not specific enough, which has led to different EU countries implementing participation in different ways, some more effectively than others (Euler and Heldt, 2018). Further details of the EU Directive can be found in the project report on FRM in Europe (Clegg *et al.*, 2020b).



Figure 2. River level measure near the Manggarai floodgate, Jakarta, indicates water height (Pacific Press Media Production Corp./Alamy Stock Photo)

Alternatively, there are examples of more bottom-up FRM initiatives. These may be stand-alone community-based initiatives or be linked with authorities to various degrees. Community institutions are often prominent actors in community-based flood management activities (WMO 2017). The literature

suggests that community institutions can be useful for providing a focus point within the community, as well as a link between the community and authorities (Seebauer *et al.*, 2018; Hassenforder *et al.*, 2019). However, there can be issues scaling up these community efforts as there may be a limit to the availability of resources and knowledge. Moreover, these initiatives can emerge as responses to weak institutional capital and may exist at odds with official programmes (Thaler and Seebauer, 2019). When participation is led by a community institution, caution is needed to make sure it fully represents the community it claims to (Seebauer *et al.*, 2018).

3.2.2. Examples from EWS

Within the EWS literature, there have been various programmes and initiatives, sometimes by governments, and frequently non-governmental organisations (NGOs), to initiate participation in EWS (Marcherera and Chimbari, 2016; Marchezini *et al.*, 2018). Many participatory EWS are developed on the four elements of effective people-centred EWS (United Nations, 2006; Marcherera and Chimbari, 2016) (see Section 1). Previous reviews have shown that typically the community are only engaged in one or two of the elements. This is most commonly *risk knowledge* and often includes participatory risk mapping activities (Clegg *et al.*, 2020a; Sufri *et al.*, 2020). Although there are examples of community members being engaged in monitoring, and communication, dissemination and response activities. This has included conducting monitoring such as gauge reading, communicating warnings to authorities, or directly to the community, and evacuation planning (Clegg *et al.*, 2020a; Sufri *et al.*, 2020). Some propose that the community should be engaged across all four elements (Sufri *et al.*, 2020). The appropriateness of participation in all four elements needs to be carefully considered, as some aspects may not be viable or safe in all conditions (e.g. monitoring in bad conditions) (Clegg *et al.*, 2020a).

Examples of participatory EWS can be drawn from across the globe. Examples of different participatory flood EWS are presented in Boxes 1 - 5. This is to provide an understanding of the different approaches that can be taken.

BOX 1

A PARTICIPATORY EWS EMBEDDED WITHIN LOCAL GOVERNMENT IN THE PHILIPPINES

Espinueva and Nilo (2011) present a case of a participatory flood EWS in the Philippines. The case provides an example of a top-down system implemented by a government department with community participation featuring in monitoring and communication elements.

The system was designed and implemented by the Philippines Meteorological Department (PAGASA) in consultation with Local Government Units (LGUs). The consultations enabled local conditions and indigenous practices to be understood. This included an assessment of the technical and economical capabilities of the community, and the availability of local volunteers to operate, maintain and support the system. A monitoring network of water level and rain gauges was set up by PAGASA and composed

of locally sourced instruments so that they could be easily replaced by the community. Volunteer observers were recruited and trained to take measurements using the installed equipment. Readings are sent to the Disaster Operations Center (municipal level) who analyse the data and disseminate the warnings to the wider community. To ensure agreement, all stakeholders signed a Memorandum of Understanding. In addition, local ordinances were put in place by the municipal council agreeing to allocate budget for the operation and maintenance of the system for sustainability over time. An identified issue was that because the system was embedded in the LGUs, the turnover of local officials in office and political agendas hindered the smooth operation of the EWS.

BOX 2**AN NGO INITIATED PARTICIPATORY EWS IN NEPAL**

A community-based EWS was developed for the Karnali River basin in Nepal by the NGO Practical Action (Practical Action, 2016). The system included significant participation across all four elements of the EWS. Overtime, the system became more integrated with other government-led systems.

Smith *et al.* (2017) highlighted how the community participated in all four elements of the predominantly community operated system. Risk knowledge was developed through community mapping of past flood events and drawing on community experiences. Gauges were supplied by the government and maintained by part-time government staff (who are also members of the community). The community were responsible for manual monitoring of the river using the gauges. Gauge readers then disseminated the warnings

via SMS according to predefined communication charts. Contacts include Community Disaster Committees who disseminated the warnings further. Response capabilities were strengthened by, for example, clearly defining roles and responsibilities, implementing an awareness raising programme and practice drills. Over time, the original community system became more institutionalised and integrated with official systems. Flood hazard mapping conducted by the Nepal Department of Meteorology (DHM) was incorporated to increase flood risk knowledge. A more 'top-down' system from automated gauges was added to provide redundancy in case of failure in the community system. A probabilistic forecasting element was also added. This was to address the issue that the community gauge system had a short lead time which was a limiting factor (Smith *et al.*, 2017).

BOX 3**A TOP-DOWN BOTTOM-UP INTEGRATED SYSTEM IN THE NIGER RIVER BASIN**

Tarchiani *et al.* (2020) present an example of a participatory EWS for the Sirba River, a tributary of the Niger. This EWS addressed all four elements of early warning with both a technological and participatory aspect to each.

The EWS, was an initiative by the Niger Government with technical assistance from the National Directorates of Meteorology and Hydrology and overseas collaboration from Italian Universities, funded by the Italian Agency for Development Cooperation (AICS). Risk knowledge was developed through a combination of hydraulic modelling, and meetings with community members to understand past events, flood levels and local resources. A monitoring system was developed with automatic river gauges and forecast modelling. In addition,

coloured hydrometric staffs were installed. An appointed volunteer observer was trained to make observations of water levels. They communicate any rise in water levels to the Hydrology Directorate, the municipal monitoring observatory and community response teams downstream. There is a multi-tiered communication system through Government to the municipal Mayor, who then disseminates the warnings to the population and the municipal monitoring observatory. Response capability was enhanced through preparing community flood risk reduction plans. In addition, 'Roving Seminars' were conducted in the villages with community members to increase awareness. This also helped to increase interaction between the community and the hydro-met service.

BOX 4**A TRANS-BORDER PARTICIPATORY EWS BETWEEN INDIA AND NEPAL**

Shukla and Mall (2016) present a case of an EWS across the border between Nepal and India in the Karnali-Ghaghra Basin. The EWS was implemented by Christian Aid and a local partner (PGVS). Although information is shared between government departments in Nepal and India, the information tends to not reach those at risk. Therefore, the system was implemented to improve early warning at the community level. It has aspects of both technology and community-based participation. Water level information is communicated across the border via an electronic display located in the downstream area. The screen is updated real-time with information received

from the Department of Hydro-meteorology on water levels upstream in Nepal. Information is also shared to key contacts within the community and district and state functionaries for further dissemination. A further network of river gauges was installed and is operated by trained village Task Forces. The automatic and village level data is collected by PGVS, authorised and warnings are disseminated. The village Task Force also operate sirens and flags to aid dissemination. Christian Aid are currently working on connecting civil society groups both sides of the border to accelerate information sharing.

BOX 5**ENGAGEMENT ACTIVITIES FOR STRENGTHENING AWARENESS AND KNOWLEDGE AMONG YOUTHS IN BRAZIL**

Marchezini *et al.* (2017; 2019) document activities that were conducted by Cemaden (National Early Warning and Monitoring Centre) Education Project in Brazil. The aim was to raise awareness and knowledge among school students on flood risk. The project targeted the four elements of early warning via interdisciplinary activities in schools. Activities were primarily delivered via workshops run by agencies such as Cemaden and historians and geographers from local universities. Risk knowledge activities included oral histories, risk mapping and vulnerability assessments. Sessions were run by meteorologists on hydrometeorological

monitoring. This included building rain gauges and installing rulers along the river to measure water levels. Other workshops were designed to promote intergenerational dialogue and learning between elders and the students, with the students interviewing elders on their flood experience. Response capability was built through disaster imagination games where students had to develop a rescue plan for the local area and identify resources they may need. The workshops were aimed to increase awareness among younger generations, but also helped to build linkages between civil defence and other local institutions through the schools.

The examples of participatory EWS presented in Boxes 1-5 demonstrate how there can be different degrees of community across the different elements of early warning. They also show how integration and institutionalisation can be achieved in different ways and to different degrees. The EWS and the activities that are conducted are often tailored to meet the local requirements, whether that is increasing awareness among youth or improving cross-border information sharing. Although these examples show efforts to integrate top-down and bottom-up aspects of EWS, it has been noted elsewhere that in general participatory EWS are not well integrated with official systems (Sufri *et al.*, 2020). Integration can be important as the community may not have the capabilities to conduct the EWS under all hazard conditions (some may require greater technical intervention for example).

3.3. Influencing factors

It is generally understood that there is no one way community participation can be implemented (Pelling, 2007). As a result there is a lack of standard operating procedures (SOPs) for participation in EWS (Sufri *et al.*, 2020). Despite this, the FRM and EWS literature point towards some commonly cited factors that may influence the process in terms of how it is designed and the effectiveness of implemented measures.

In the development of an evaluation framework for participation in FRM Maskrey *et al.* (2019) identify that the effectiveness of participation can be influenced by 'context criteria' and 'process criteria'. Context criteria are indicative of the area where the participation takes place. Although they generally exist outside of the process, they exert influence over the process and its outcomes. In terms of participation, context criteria can indicate a locations predisposition to participation and can be used to guide the design and implementation of the process. Process criteria on the other hand are those which all participatory processes should aim to achieve to be effective. This section outlines some of the potential context and process criteria that may need to be considered in designing an EWS, drawing upon Maskrey *et al.* (2019) and building upon this with other literature.

Firstly, the perceptions of both authorities and communities can influence the effectiveness of participation (Wehn *et al.*, 2015). If both authorities and communities perceive and appreciate the benefits of participation, and are willing and motivated to act, then participation is likely to be easier to achieve (Wehn *et al.*, 2015; Maskrey *et al.*, 2019). However, some issues have been noted around perceptions of responsibility (Mees *et al.*, 2017). In some cases, communities perceive FRM to be the responsibility of the state. Therefore, they are less inclined to become involved. They may also not perceive their own agency to act, or their own power (Wachinger *et al.*, 2013; Mees *et al.*, 2017). This can also be linked to differing opinions on what constitutes 'good' governance, and issues surrounding liability, competency and justice (Thomalla and Larsen, 2010; Begg, 2018; Gladfelter, 2018; Thaler and Seebauer, 2019). Some may perceive participation as fairer and just, while others may view it as a 'scape-goat' for government responsibility. For example, Gladfelter (2018) discusses, in reference to a community-based EWS in Nepal (see Box 2), how the system may be increasing the precarity and vulnerability of the community, rather than empowering them by allowing the state to renounce responsibility. Similar arguments are made by Begg (2018) in reference to participation in FRM in Europe.

Characteristics of the community may also have an influence. Socio-economic factors (e.g. poverty, gender, ethnicity, migration etc.) can have an enabling or constraining influence on participation (WMO, 2017). This might include resource availability (including financial, knowledge and time) that can dictate what forms of participation are possible (Evers, 2012; Thaler and Levin-Keitel, 2016). Authors have noted that sustaining participation over time can be an issue when the resources that support it (e.g. a funding grant) end (Baudoin *et al.*, 2014; Liu *et al.*, 2016). Thus, any participation needs to be designed within the limits of available resources. The degree of social capital within the community may also affect the uptake of participation, as it can help mobilise knowledge and resources amongst the community, thereby enabling greater action (Mees *et al.*, 2017). Disempowered communities, who lack trust with authorities, may view participatory EWS implemented by outsiders as an intrusion and may be unwilling to share their knowledge (Marcherera and Chimbari, 2016). Experience of a flooding event may also increase the likelihood that people will take action, as experience is thought to increase awareness (Geaves and Penning-Rowsell, 2015). Therefore, the frequency of the flood hazard may also have an influence.

Governance arrangements also need to be considered. For example, participation may be incorporated into policy to different degrees. Some suggest that to make participation work, it needs to be institutionalised (Reed, 2008). But regulations may also impose barriers. The use of participation to implement policy may open participation up to 'tokenism', where participation is implemented as a mere formality to comply with the rules (Wesselink *et al.*, 2011). It may be important to consider the design of policy instruments (Benson *et al.*, 2012) to achieve desired outcomes. Recent FRM literature advocates more collaborative modes of participation (Mees *et al.*, 2017; O'Grady *et al.*, 2019), including strong networks and complementary action between communities and authorities. This is suggested to be beneficial as

it combines the positives of both top-down and bottom-up action (Scolobig *et al.*, 2012; Maskrey *et al.*, 2019). Suggested ways to build collaboration sustainably is to building upon existing networks and community interventions (Thaler and Levin-Keitel, 2016) or to use interfacing, or 'mid-actors' to bridge between the community and authorities (Seebauer *et al.*, 2018; Rahayu *et al.*, 2020).

Maskrey *et al.* (2019) define several process criteria that, whichever EWS design is chosen, the process should aim to achieve. These are accessibility, deliberation, representation, responsiveness and quality. Other authors on the topic tend to echo similar aspects, as well as others, such as the need for transparency, clear objectives and clear responsibility distribution (Reed, 2008; Mees *et al.*, 2017).

It is clear that participation can be strongly affected by context i.e. the socio-economic, cultural and institutional characteristics of the place in which it is implemented (Reed *et al.*, 2018). This is because communities are heterogenous, thus a 'one-size-fits-all' approach is unlikely to be effective (Mehring *et al.*, 2018). Ultimately, it is understood that the form of community participation needs to be tailored to the situation and the problem being addressed (Reed, 2008). Ideally contextual influences will be identified prior to the participatory process to support the design and to ensure it meets the needs of the area in which it is implemented (Maskrey *et al.*, 2019).

4. Community participation in the Ciliwung River Basin

In light of the above review, this section discusses the current governance arrangements and community participation initiatives in the CRB and Jakarta.

4.1. Participation in the current framework

In 1999 Indonesia underwent rapid decentralisation that distributed responsibility across multiple levels of governance (Asdak *et al.*, 2018). One of the normative rationales for decentralisation is that it leads to more accountable local planning and greater opportunities for public participation (Grady *et al.*, 2016). However, for the most part, Indonesia has tended towards a top-down approach to governance that has not included community participation to a significant degree (Garschagen *et al.*, 2018; Hellman *et al.*, 2018). However, the views of more recent Jakarta governors (Sagala *et al.*, 2018) and changes in disaster management policy (Das and Luthfi, 2017) have suggested increasing acknowledgement for community participation. The current framework includes the regulation on Public Participation in Disaster Management (11/2014), issued in 2014 by BNPB (Das and Luthfi, 2017). This indicates a desire for greater public participation. However, Das and Luthfi (2017) note that it included little guidance on how participation should be implemented. The rationale behind encouraging greater community participation is largely economical, rather than for the purpose of greater inclusivity. In terms of early warning, national capacities were reviewed by the ASEAN Risk Monitor and Disaster Management Review (ARMOR). This study found that Indonesia had relatively weak fulfilment in the legal and policy aspect, which included assessment of laws and regulations, contingency planning and Standard Operating Procedures for warning dissemination (Bustanul and Bisri, 2019).



Figure 3. A riverbank settlement on the banks of the Ciliwung River, Jakarta (Credit: the authors).

4.2. Community-flood interactions

The most vulnerable members of the community to flooding in the CRB are riverbank settlers (Rahmayati *et al.*, 2017). The river bank communities are characterised by low socio-economic status and high levels of ethnic diversity and migration, although many have lived there for many years (Hellman, 2015). Flooding has become part of their everyday lives, with many riverbank settlers choosing voluntary exposure to floods (Lassa *et al.*, 2013). This is when residents make adaptations to 'live with floods', as opposed to relocating. This often involves building a second story onto houses, and moving belongings upstairs in case of flooding. Texier (2008) suggests that living with floods is not a result of low risk perception, but because of other daily constraints such as poverty, the need to be located in the city for work, as well as social and cultural ties (see also Rahmayati *et al.* (2017)). Riverbank communities in Jakarta exhibit aspects of resilience and self-organisation that enable them to live with floods. For example, strong social networks have been identified (Hellman *et al.*, 2018). This allows community members to draw upon resources and support in times of need, such as during a flood (Hellman, 2015). There is a strong tradition of mutual assistance, known as 'gotong royong'. Surtiari *et al.* (2017) note this is an important cultural aspect that helps people to self-support, learn and adapt. Furthermore, Rahmayati *et al.* (2017) suggest that cultural and historical connections allow the residents to 'connect to place', which contributes to an increased ability to survive and adapt. However, they also highlight that although these communities exhibit some resilience, they are not thriving and interventions are still required.

4.3. Examples of participation

One way residents participate in decision making in Indonesia is through the process of '*musrenbung*'. This is described as a process where residents meet annually to discuss key issues in their community and draw up priorities. They then submit these to BAPPEDA (Regional Department of Planning and Development) who then allocate resources and funds to initiatives. However, the system is noted to face significant problems, as not all are able to voice their opinions, and there is no way to track actions (Sari and Prayoga, 2018). It is not clear from the literature whether this system has led to any flood related measures being taken.

An example of a participatory EWS developed for Jakarta is that of the PROMISE programme implemented in 2008 by the Institute of Technology Bandung, Jakarta Provincial Government and the Asian Disaster Preparedness Centre (ADPC) (Iglesias, 2010). As described by Rahayu and Nasu (2010), this included an initiative to improve the flood EWS in Jakarta. To help the EWS reach most vulnerable in the community and increase response capacity, the design included a community-based 'culture' element that was developed through multi-stakeholder participation and various interventions. It included a Training for Trainers programme with community-based organisations, community representatives and school teachers. 'Town watching' was also employed, which involved a disaster management expert guiding activities with community members to identify hazard exposure and vulnerability. For example, this included the development of risk maps and evacuation plans (Iglesias, 2010). These activities were implemented to enhance understanding and awareness, and to harness the benefits of local knowledge. To increase response capacity, SOPs for the community level were developed using participatory techniques such as a table-top exercises. A simulation at village level was conducted to test the SOPs. Part of the current project's future work will include assessment of these actions and whether they have had impacts ten years on.

In addition to these authority-led initiatives, the literature points to various examples of the community participating in EWS in a more bottom-up form. Traditional examples of community participation in flood EWS include the use of bamboo gongs ('*Kentongan*'), which have been used widely across Indonesia. Community members act as watchers along the river bank and alert others using the gong when water levels become high (Budiyono, 2018) (p84).

More modern versions of community networks for early warning are also noted. There is evidence that riverbank residents along the Ciliwung have developed a self-supported early warning mechanism. This involves the use of a handy talkie (walkie talkie) network that community members use to communicate with sluice gate keepers and acquire information on water levels (van Voorst, 2014; Padawangi and Douglass, 2015). The owners of the handy talkies then contact village (kampung) leaders, bang on doors and shout to spread the warnings to other residents. This shows that communities are actively involved in the communication and dissemination aspect of the EWS. However, the handy talkies have to be purchased, which can be a significant personal cost (van Voorst, 2014). Furthermore, van Voorst (2014) also identifies a network of 'Orang Ajar', described as a 'person who lectures fellow residents about the topic of safety'. She notes that these actors play an important role in the pre-warning system, as they share local knowledge and disseminate information about risk to others, raising awareness and contributing to the development of risk knowledge.

In addition, the literature also shows that there are various community organisations involved in aspects of early warning. Faith-based Organisations (FBOs) in particular are noted to be active in risk knowledge and dissemination elements. They are known to disseminate risk information during meetings, and work with the government to disseminate warnings via mosque loudspeakers (Mulyasari and Shaw, 2017; Sari and Prayoga, 2018). There are multiple other examples of the involvement of community organisations. For example, Women's Welfare Associations (WWAs) have also been active in risk communication, as described by (Mulyasari and Shaw, 2013). The authors identify that the WWAs in Bandung (West Java Province) have been involved in awareness raising, data collection and drills in the establishment of an EWS. In particular, the groups were noted to communicate with officials, and provide an important link between governments and the community as a point of contact.

There are further community organisations working on river and flood management more broadly in the CRB. Community activities include river monitoring, clean up, eviction resistance, housing, health, sanitation and livelihood support (Padawangi and Douglass, 2015). For example, the organisation *Kommunitas Anak Ciliwung (KANCIL)* operates along the Ciliwung River. They are involved in river maintenance, planting trees and other environmental interventions (Tampi *et al.*, 2017). A list of other community initiatives along the Ciliwung River can be found in Padawangi and Douglass (2015).



Figure 4. Volunteers routinely clear waste and debris from the banks of the Ciliwung River in the area of Bogor (Pacific Press Media Production Corp./Alamy Stock Photo)

4.4. Potential challenges

There are several potential challenges that may be faced in the development of community participation in the CRB. Firstly, governance issues have been found to hinder EWS progress in Indonesia such as inter-agency 'wrangling', funding delays and heavy bureaucracy (Thandlam *et al.*, preprint). This may present a barrier to the effectiveness of any top-down measures. In addition, local governments have varying capacities and frequently do not have the resources needed to implement action (Grady *et al.*, 2016; Das and Luthfi, 2017). This could hinder any participatory processes conducted in collaboration with, or supported by, local government.

Furthermore, the way people perceive floods may present a barrier. Approaches to FRM in Indonesia have been largely focused on structural mitigation measures (Garschagen *et al.*, 2018). Flooding is largely viewed as a force of nature, rather than a result of human action (Padawangi and Douglass, 2015). If flooding is presented as something separate from communities, the focus may remain on structural measures and impact negatively on the uptake of participation. There may need to be a shift in discourse to one where softer measures and local knowledge are seen as equally beneficial.

In recent years, the Government of Jakarta have been seeking to implement relocation schemes to move riverbank residents to other locations in an attempt to reduce flood impact (Texier, 2008; Padawangi and Douglass, 2015). Many residents have rejected relocation as many of their livelihoods rely on being located within the city, as well as cultural and social ties (Rahmayati *et al.*, 2017). This has led to tensions between authorities and communities and growing distrust. Many of the existing community initiatives along the Ciliwung have appeared as a result of increasing frequency and severity of flood events, but also as a response to a lack of trust in the government (Padawangi and Douglass, 2015). Although this lack of trust has resulted in community action, it may hamper the scaling up of, existing community initiatives and impair collaboration between authorities and communities. Moreover, van Voorst (2014) raises concerns over the community-based systems, for example the handy talkie network, as this may allow the government to pass responsibility to communities and discourage them from taking action.

5. Summary and Discussion

This document presents a review of participation in FRM and EWS to understand potential participation initiatives and incentives to strengthen community understanding and preparedness for flooding in the CRB. The review sought to answer the following questions: How is community participation understood? What interventions and incentives are commonly used? What might influence the effectiveness of community participation? How does participation in EWS play out in the context of the CRB? The findings relating to each question are discussed briefly below.

How is community participation understood?

It was found that there are various different ways community participation can be understood. Participation in FRM and EWS can be best understood as community involvement in decision making and implementation. Participation is commonly conceptualised as top-down authority-led or bottom up community-led. Although the degree to which communities participate can vary. Alternatively, participation can be more collaborative with communities and authorities working in equal partnership.

What interventions and incentives are commonly used?

Section 3.2 describes some of the common participation initiatives used in FRM and EWS.

It was found that initiatives can range from more institutionalised (for example, a policy, regulation or government-led programme), to more bottom-up action, led by the community. Recent FRM literature tends to point to more collaborative forms of participation, where authorities and communities work together to be the most effective, as the benefits of both top-down and bottom-up action can be realised (in theory). As demonstrated by the examples of participatory EWS (Boxes 1-5), there can be varying levels of interplay and integration between top-down and bottom-up systems. Top-down and bottom-up action may be complementary, or may exist at odds. Furthermore, initiatives are often designed around the four elements of effective EWS (risk knowledge, monitoring and warning, communication and dissemination, response capability). A participatory initiative may aim to include all four elements, or may target specific ones. Which route is chosen may be a reflection on the needs of the community and the context (see next section).

What might influence the effectiveness of community participation?

There are many different factors that can influence the effectiveness of community participation. These can be broadly distinguished as factors that are internal to the process that can influence its effectiveness (process criteria) and factors that influence the process and its outcomes externally (context criteria) (following (Maskrey *et al.*, 2019)). Process criteria are more general, and are likely to be applicable to various participatory initiatives. These include, accessibility and inclusiveness of participatory activities, representation of the wider community, responsiveness to change, and transparency of decision making, as well as clarity on roles and responsibilities. Context criteria, on the other hand, are more specific to the location in which the initiative is being implemented. Based on the FRM and EWS literature, several commonly cited context related factors were identified that may need to be considered. These are the perceptions held by communities and authorities, characteristics of the community (including socio-economic factors, availability of social capital and levels of trust), capacity and resources held by both authorities and the community, and experience of flooding. Linking to the previous question, these factors need to be considered in the design of a participatory initiative and can be used to help match the participatory initiative to the needs of the community, for example, whether it takes a more top-down or bottom-up approach.

How might participation in EWS play out in the context of the CRB?

The literature suggests that there are both top-down and bottom-up participatory processes at play in Jakarta and the CRB. There is evidence that there are attempts to increase participation in policy and through government and partnership programmes. There is also evidence of initiatives led by the community as well as initiatives aiming to integrate the two (such as the PROMISE programme). Community members are participating in various elements of EWS such as risk knowledge, communication and dissemination and response capability. Based on the influencing factors identified in Section 3.3 and an understanding of existing arrangements, several challenges and opportunities facing participation in the CRB were identified. Firstly, bureaucratic processes and lack of local government capacity may pose a barrier to successful top-down initiatives. Secondly, the way people perceive flooding may be a challenge in fostering motivation of both communities and authorities. In addition, relationships and trust between authorities and the most at-risk communities may have been damaged by previous interactions over relocation. This suggests that future initiatives may need to consider strengthening capacity and support for participation within government, raising awareness for the need for participation and its benefits, and building positive relations between authorities and communities. However, there are several potential opportunities that can be made use of. Communities exhibit social capital which can be beneficial for participation and for increasing preparedness. There are also various existing initiatives, and linkages between authorities and communities that could be built upon. This is suggested to be a good way to foster sustainable, collaborative participation (Thaler and Levin-Keitel, 2016).

A conceptual model summarising the key concepts linked within this literature review is presented in Figure 5. The central component represents the design of the initiative. It will likely include the four elements of effective EWS (risk knowledge, monitoring and warning, communication and dissemination and response capability). The degree to which the community is involved and who leads the initiative can vary. This is depicted in the figure by the arrow showing a scale from top-down (authority-led) to bottom-up (community-led). More collaborative forms sit in the middle, where authorities and communities have balanced power and work together. Which of the four elements is included and where the participatory initiative sits on the scale will be influenced by the context in which it is implemented. The diagram lists some commonly cited contextual and process influences (based on Maskrey *et al.* (2019)), although there may be others depending on location. Finally, the initiative should aim to achieve certain process criteria for effective participation, for example accessibility, transparency and inclusiveness.

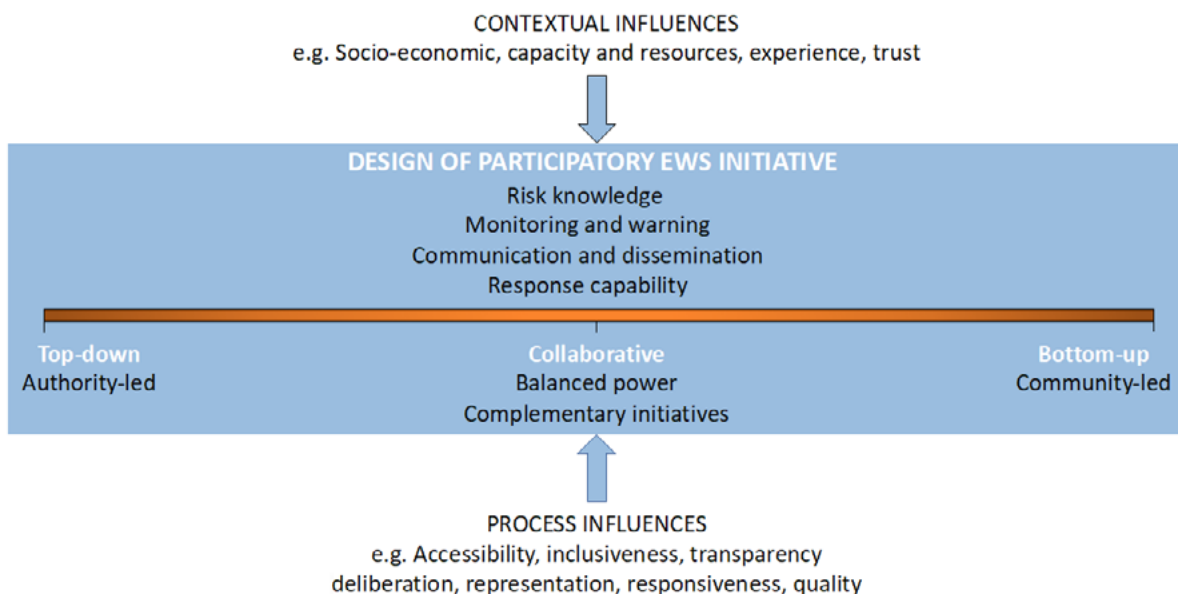


Figure 5. Conceptual model for the design of a participatory EWS initiative.

Due to the choice to 'live with floods', a suitable EWS and improved preparedness may be even more important for riverbank communities, so that they can prepare themselves ahead of a flood (Lassa *et al.*, 2013). To ensure appropriate design of future participation initiatives a careful assessment should be made of the contextual factors that may influence the process in order to select the design of the initiative that meets the needs and capabilities of the locality most effectively.

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