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Conditions for citizen co-production in a resilient, efficient and legitimate flood risk management. A tentative framework.

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Abstract

Across Europe, there is an increasing trend towards citizen involvement in the implementation of flood risk governance. Policymakers increasingly advocate co-produced flood risk governance (FRG), whereby citizens are actively engaged in the implementation of flood risk policy, e.g. by taking property-level protection measures. In doing so, they aim to make FRG more resilient, efficient and legitimate (Mees et al., 2016a). Co-production, however, also raises important questions concerning these aims. In this paper, the opportunities and limitations of and barriers to citizen co-production in FRG in terms of resilience, efficiency and legitimacy are investigated by an extensive review of literature on citizen co-production in other public services and on individual and community-based climate change adaptation and FRG. Based on this, a tentative framework is developed on the required conditions to enable citizen co-production in FRG, which benefits both the resilience, efficiency and legitimacy of flood risk governance.

Introduction

Scholars across Europe and beyond describe a trend within flood risk governance (FRG) of increased citizen involvement in the implementation of flood risk measures (Meijerink & Dicke, 2008; Johnson & Priest, 2008; Bubeck et al., 2012). In the UK, communities and individual citizens are actively encouraged to take precautionary measures against the threat of flooding through funding schemes such as the ‘Flood Resilience Community Pathfinder Scheme’ (2012) (Johnson & Priest, 2008). In Germany, the Federal Water Household Act (2009) declares that every person who could be affected by flooding is obliged to undertake appropriate actions that are reasonable and within their means to reduce flood impacts and damage (Bubeck et al., 2012). Similarly, French policymakers included in the 2004 Act on Civil Security that ‘citizens are responsible for their own safety’ (Mees et al., 2016a).

Citizens can become engaged in the implementation of flood risk management through a range of different activities. Residents of flood-prone areas can take property-level protection (PLP) measures, to protect their property from flooding or to reduce flood damage (e.g. mobile water barriers, non-return valves, flood-resistant interior materials, etc.). Apart from this, citizens can prepare for flooding in a more organizational way, e.g. by developing individual/community evacuation and emergency plans. In general, citizens adopt these measures out of private interest but in doing so they also contribute to the public goals of FRG. Indeed, due to PLP measures, public spending in collective protection can be avoided, and through private insurance mechanisms, governmental recovery funds can become obsolete. Hence, by fostering these types of measures, authorities aim for a ‘co-produced’ FRG. Co-production implies ‘the involvement of citizens, clients, consumers, volunteers and/or community organizations in producing public services as well as consuming or otherwise benefiting from them’ (Alford, 1998). In the domain of FRG, the co-produced public service is the avoidance and reduction of flood damage at societal level through private and governmental measures. Mees et al. (2016a) found that by encouraging co-production, policymakers aim to increase the resilience, efficiency and legitimacy of their FRG. This way, public authorities intend to include new resources in their management and attain a redistribution of costs and benefits. Co-production, however, also raises important questions concerning these aims. Is it possible to make a society more resilient to flooding by encouraging individual and/or community-based action in FRG? Is co-production more cost-beneficial than FRG through public spending? And what is the impact in terms of social equity and legitimacy?

In order to answer these questions, this paper explores the opportunities and limitations of and barriers to co-production in FRG in terms of resilience, efficiency and legitimacy. By analysing these effects, it reflects on the conditions needed for resilient, efficient and legitimate co-produced FRG. Compared to citizen participation in FRG decision-making (studied amongst others by Rees, 2005; Petts, 2007; Benson et al., 2012), scholars have only recently started to describe the phenomenon of co-production in FRG (e.g. Tompkins & Eakin, 2012; Everett & Lamond, 2013; Geaves & Penning-Rowsell, 2015). Academic knowledge about the implications of a co-produced FRG is thus so far relatively underdeveloped. Existing studies provide insights into individual motivations and capacities to (not) co-produce (e.g. Harries, 2008; Chamlee-Wright et al., 2009; Lindell & Perry, 2012), and in some cases discuss how these can be addressed by policy (e.g. Few, 2003; Begg et al., 2015). What is missing, however, is a comprehensive framework on the required conditions for co-produced FRG, both within the affected population and in flood risk policy, and on how these conditions relate to each

other. Hereto, this research conducts an extensive literature review, combining insights from public administration literature on co-production in other public services and from research on individual or community-based climate change adaptation and FRG. The review examines how citizen co-production affects FRG in terms of its resilience, efficiency and legitimacy. Based on this, a tentative framework is developed on the conditions for co-production to enable resilient, efficient and legitimate FRG. The tentative framework offers a solid basis to investigate FRG co-production in future research projects.

The paper first gives an overview of the conceptual framework and the methodology used. Next, it presents insights from literature on how co-production affects resilience, efficiency and legitimacy. In the discussion, a tentative framework is presented on the conditions enabling resilient, efficient and legitimate co-produced FRG. In the last section, concluding remarks are made.

A conceptual framework for co-production

Co-production was first launched as a concept by Parks et al. in 1981 and has since been broadly applied in public administration literature, with varying interpretations. Several authors limit the use of the term to cases where citizens both produce and use services (Fotaki, 2011; Pestoff, 2012), while others apply it as well to describe citizen involvement in decision-making (Albrechts, 2012; Bovaird & Löffler, 2013). In this paper, we restrict the term co-production to the involvement of citizens in policy delivery. Based on Bovaird & Löffler (2013), we define two main sub-categories, namely co-delivery and comprehensive co-production. *Co-delivery* refers to co-production forms in which the participation of citizens is limited to the implementation of policy measures, e.g. regulations on PLP measures. In case of *comprehensive co-production*, citizens are involved both in the decision-making and implementation of FRG measures, e.g., the development of an flood risk management plan that results from deliberation between citizens and public authorities, and which outlines responsibilities for these respective groups.

Within FRG, citizens can co-produce in several ways. Table 1 provides examples of citizen co-production in FRG in different flood risk management strategies.

Table 1: Examples of co-delivery and comprehensive co-production according to flood risk management strategy

	Co-delivery	Comprehensive Co-production
Risk prevention (i.e. 'keeping people away from water' through spatial planning measures, etc.)	Moving out of a flood-prone area, installing green roofs, flood resilient building and property-level protection	Community Flood Action Plan, which is drafted by authorities and citizens, and implemented through public and private measures
Protection (i.e. 'keeping water away from people' through infrastructural measures, e.g. dams, water barriers)	Maintaining dike infrastructure and/or watercourse at property	

Preparation (i.e. adequate response during flooding through emergency planning)	Volunteering in crisis response, citizen monitoring	
Recovery (i.e. rapid (financial) recovery through insurance systems, etc.)	Property-level recovery measures, e.g. insurance	

Next to that, citizen co-production shows a large variety in terms of public-private interactions, interactions within the community, their role within FRG and citizens' input (see Table 2).

Table 2: Diverging types of citizen co-production in FRG

Public-private interactions (e.g. Watson, 2014; Milman & Warner, 2016)	Interactions among citizens (e.g. Needham, 2007; Bovaird et al., 2015)	Role within FRG (e.g. Needham, 2007; Ostrom, 1996; Osborne & Strokosch, 2013)	Citizens' input (e.g. Bovaird & Löffler, 2013)
<ul style="list-style-type: none"> • Imposed top-down via regulations and incentives • Initiated bottom-up from within the community • Result from deliberation between authorities and community (as is the case in comprehensive co-production) 	<ul style="list-style-type: none"> • Individual co-production • Community-based co-production 	<ul style="list-style-type: none"> • Complementary to governmental action • Substitutive to governmental action 	<ul style="list-style-type: none"> • Knowledge (e.g. monitoring) • Financial • Material • Human resources

Methodology

The paper is based on an extensive literature review. Hereto, approximately 70 papers have been scrutinized, stemming from public administration literature on co-production and from literature on individual or community-based climate change adaptation and FRG. The relevant papers have been retrieved from the Web of Knowledge and Google Scholar databases by searching for combinations of the following terms: resilien*, flood, citizen, community, social equity/justice, social capital, legitimacy, accountability, fairness, co-production, co-delivery, responsib* and water management. In addition, a snowball technique was used, whereby references in screened literature led to new sources. Additional literature has been suggested by the anonymous reviewers of this article as well.

Whether a literature source was selected for further reading or not, depended on a number of inclusion criteria:

- The title and abstract relate to information that can potentially contribute to answering the research question.
- The operationalization of the concepts used corresponds with our conceptual framework. Sources addressing citizen involvement in policy decision-making or evaluation but not in policy delivery have been excluded.
- The source is a peer-reviewed article or a scientific report.
- The geographical scope focuses on OECD countries, and thus on democracies with comparable socio-economic conditions.
- The source dates back no more than 15 years. Exceptions were made for seminal papers on co-production providing insights onto which other scholars have built.
- The search is limited to the English language.

Literature reviews always run the risk of being biased due to the author's own narrative (Bilotta et al., 2014). In order to avoid 'cherry-picking', the statements made in this paper are backed-up by plural references or explicitly refer to a specific article. The consulted literature contains both qualitative and quantitative analyses, next to more conceptual papers. In our analysis, we aimed for a balanced mix of sources in terms of methodology, in order to achieve an indirect form of data triangulation.

The selection of the criteria used to evaluate the impact of co-production has been based on previous research conducted by Mees et al. (2016a). In their comparative analysis, these authors observed that the main rationales for policymakers to foster co-production are to make FRG more resilient, efficient and fair/legitimate. In this paper, we adopt these rationales as a starting point for our evaluation to investigate whether these assumptions are supported by academic research. Hence, the evaluation criteria are inductively defined by previous research. This approach is not without risk, since it may disregard other core values of FRG. Resilience, efficiency and legitimacy are, however, criteria regularly used in policy evaluation, for example, by Alexander et al. (2016). Moreover, the broad interpretation we adopt for each of these criteria (see the following sections) allows us to also take related criteria into account, e.g. the principles of good governance¹ or the OECD principles on water governance² (OECD, 2015).

Co-production and resilience

The concept of resilience

Resilience as a concept found its way into the social sciences in the 1990s, introduced from ecological science (Alexander, 2013). Within social science, the most commonly used definition of resilience is the one developed by the United Nations Office for Disaster Risk Reduction (UNISDR, 2009):

¹ As defined by the UN: rule of law, consensus-building, participation, responsiveness, transparency, accountability, equitability & inclusiveness, effectiveness & efficiency (Crabbé & Leroy, 2008).

² These include effectiveness (clear roles & responsibilities, appropriate scales within basin systems, policy coherence, capacity), efficiency (data & information, financing, regulatory frameworks, innovative governance) and trust & engagement (monitoring & evaluation, trade-offs across users, rural & urban areas and generations, stakeholder engagement, integrity & transparency) (OECD, 2015).

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

In this article, the concept of resilience is similar to the framework used in the EU-FP7 project STAR-FLOOD (Alexander et al., 2016). This project concluded that a resilient flood risk governance arrangement needs to possess the capacity to resist, to absorb and recover, and to adapt (Hegger et al., 2016).

The *capacity to resist* refers to the strategies societies develop to reduce the probability of flooding, e.g. building dikes, flood retention zones, etc. (see also Walker et al., 2004; Davoudi et al., 2012). By building *capacity to absorb and recover*, a system acknowledges that floods cannot always be prevented and additional measures are needed to respond in a flexible way to flood events when they occur (Bahadur et al., 2010; Alexander et al., 2016). The *capacity to adapt* is fostered by effective learning processes. In a risk environment characterized by uncertainty and unpredictable change, these must allow rapid adaptation or even transformation when new internal and external stressors emerge (Bahadur et al., 2010; Davoudi et al., 2013; Pelling et al., 2015).

How does citizen co-production affect resilience?

In public administration literature, co-production is put forward as a way to improve service performance and allocative efficiency, and to increase user empowerment (Percy, 1987; Ostrom, 1996; Needham, 2007; Osborne & Strokosch, 2013). By co-producing public services, citizens can better reveal their needs and add new resources and knowledge to the production process. Consequently, citizen co-production has the potential to enhance the capacity to resist, and to absorb and recover from flooding. These assumptions have been confirmed by Twigger-Ross et al. (2015), who evaluated the English government's Flood Community Resilience Pathfinder scheme. Launched in 2012, this scheme awarded £5m to 13 communities to enhance their local responsiveness to flood risk. These pilot cases focused on a variety of activities to increase communities' resilience, ranging from awareness-raising and emergency planning to PLP measures. Twigger-Ross et al. (2015) found that these actions increased local communities' resources and capacity to prepare for flooding and thus reinforced their capacity to absorb and recover. Other authors have also described the beneficial impact of flood risk adaptation at property-level. Kreibich et al. (2005), for instance, found that individual PLP measures led to mean damage reductions of up to 53% during severe flooding of the Elbe (Germany) in 2002. Similarly, Bubeck et al. (2012) witnessed significant damage reduction due to improved citizen preparedness.

In theory, citizen co-production could also increase a society's capacity to adapt to flooding, because in contrast to large-scale public flood defence, individual or community-based actions include small-scale measures, which can be implemented and revised relatively quickly, e.g. by installing a mobile flood barrier. However, we did not find any description hereof in literature.

Despite its potential, the active contribution of citizens to flood risk mitigation encounters a number of barriers, which can severely hamper society's capacity to absorb, recover and adapt.

First, in order for citizens to seek information on and implement precautionary measures against flooding, they must be aware of the risk they are exposed to (Soane et al., 2010; Kievik & Gutteling,

2011). Many authors put forward flood experience as a crucial condition for citizen action in FRG (Bubeck et al., 2012; Geaves & Penning-Rowsell, 2015). In vulnerable areas without recent flood experience, it is therefore necessary to establish a ‘shared “corporate” memory to develop community resilience’ (McEwen & Jones, 2012). The issue becomes even more pressing with climate change, which is expected to also impact areas that have not been flood-prone before (Bubeck et al., 2012). In the past, policymakers have attempted to increase risk awareness by informative campaigns but their impact on the uptake of individual PLP measures is often low (e.g. Bichard & Kazmierczak, 2012; Kievik & Gutteling, 2011). Increased risk awareness does not automatically trigger precautionary action (Soane et al., 2010; Lo et al., 2015). Indeed, the new information can dissonate with residents’ assumptions of safety and well-being and therefore be neglected or denied (Harries, 2008). Researchers point out a second and third barrier towards pre-emptive actions by individuals, namely perceived responsibility and self-efficacy. Soane et al. (2010) found that residents who rated authorities’ responsibility as low were more likely to purchase PLP. Adger et al. (2013) observed that areas in which households were ascribed some responsibility demonstrated higher resilience. Mees et al. (2016b), in turn, found that high risk awareness is not a sufficient condition for residents to take self-protective action, due to a lack of perceived responsibility and self-efficacy. Inhabitants of flood-prone areas must feel (partly) responsible for flood risk mitigation, and must believe they have the capacity to mitigate this risk (Kievik & Gutteling, 2011; Everett & Lamond, 2013; Thomsen, 2015). Terpstra & Gutteling (2008), in turn, found that perceived responsibility did not correlate with the intention to implement preparedness measures in cases of a low ‘sense of urgency’. Hence, both risk awareness, perceived responsibility and self-efficacy appear key conditions for co-production.

Self-efficacy relates to a next barrier in the pursuit of resilience through co-production, namely the need for knowledge and resources at community/individual level. Taking individual or community actions requires a certain set of resources and knowledge (Few, 2003; Thielen et al., 2007; Norris et al., 2008; Lo et al., 2015). These resources contain both economic and social assets. Many authors stress the importance of social capital in the development of community resilience, including bonding, bridging and linking capital (Norris et al., 2008; Cosen, 2010; Twigger-Ross et al., 2011; Lo et al., 2015; Thaler & Levin-Keitel, 2016; Thijssen & Van Dooren, 2016). *Bonding* refers to the tight, close networks people build up around them (e.g. family and friends) (Putnam, 2000). It enables the mobilization of informal logistic and material support during a flood event (capacity to absorb and recover) (Hawkins & Maurer, 2009). In addition, it facilitates the spread of new knowledge within a community and thus increases the capacity to adapt. Also organized networks with looser relationships between members (bridging capital) can enhance absorption and recovery in case of emergencies, through the mobilization of resources and knowledge. Moreover, they can interact with governmental bodies (linking capital), which enables sharing information between state and societal actors and contributes to social learning (Norris et al., 2008; Whittle et al., 2010; Twigger-Ross et al., 2011; Pelling et al., 2015). Several authors therefore stress the importance of engaging the population in flood risk management planning (Norris et al., 2008; Steinführer et al., 2009; Pelling et al., 2015). Such collaborative approaches help to build trust between state and societal actors, which is found to be a crucial factor in stimulating individual and/or community actions (Soane et al., 2010; Twigger-Ross et al., 2011; Osborne & Strokosch, 2013).

Hence, instead of merely providing flood risk information, policymakers should strengthen the social capacity of the community to enable co-production (Lo et al., 2015). Several authors suggest

policymakers should build on pre-existing organizational networks in fostering community resilience (Norris et al., 2008; Twigger-Ross et al., 2011). But what about communities where these networks are lacking? The presence of social capital is, amongst other things, dependent on individuals' and groups' socio-economic status (SES) (Walker & Burningham, 2011). Research has found that people with lower economic resources tend to have less bridging and linking capital (Hawkins & Maurer, 2009). In combination with a lack of financial resources, this can lead to inequalities between individuals and groups to strengthen their resilience (Walker & Burningham, 2011; Geaves & Penning-Rowsell, 2015; Walters, 2015). The relationship between economic deprivation and social capital is, however, not straightforward, and in some cases a lack of specific resources can be offset by others. For example, Jakobson (2012) found in his study of parental co-production in education that the relatively larger availability of time among lower SES families could to some extent substitute a lack of socio-economic resources.

In order to strengthen the capacity to absorb, recover and adapt, Few (2003) suggests that flood policy interventions should be designed to build up the assets of the poor to withstand shocks. Multiple authors remark that enhancing co-production and community resilience requires policymakers to invest financial, human and material resources, for example, by providing grants for low SES households to buy PLP measures (Steinführer et al., 2009; Soane et al., 2010; Cosens, 2010; Twigger-Ross et al., 2011; Jakobson, 2012). It should be noted that these investments are of a mid- to long-term character. Building up a flood resilient community requires a development period of at least 3-4 years, in order for sufficient knowledge and trust to be established within and between the parties involved (Twigger-Ross et al., 2015).

If co-production is developed through a bottom-up (i.e. community-based) approach, it can strengthen the capacity of socio-economically vulnerable communities, thereby contributing to service delivery and at the same time empowering them (Mitlin, 2008). By stressing social capital, academics plead for a co-produced management at community rather than individual level (Ostrom, 1996; Few, 2003; Begg et al., 2015).

Concluding, co-produced FRG can increase community resilience but it requires sufficient risk awareness, self-efficacy and perceived responsibility by its members. In order to enable these conditions, citizens must dispose of sufficient knowledge, social capital and economic capacity. The relationship between these primary conditions and their enabling factors is presented in Figure 1.

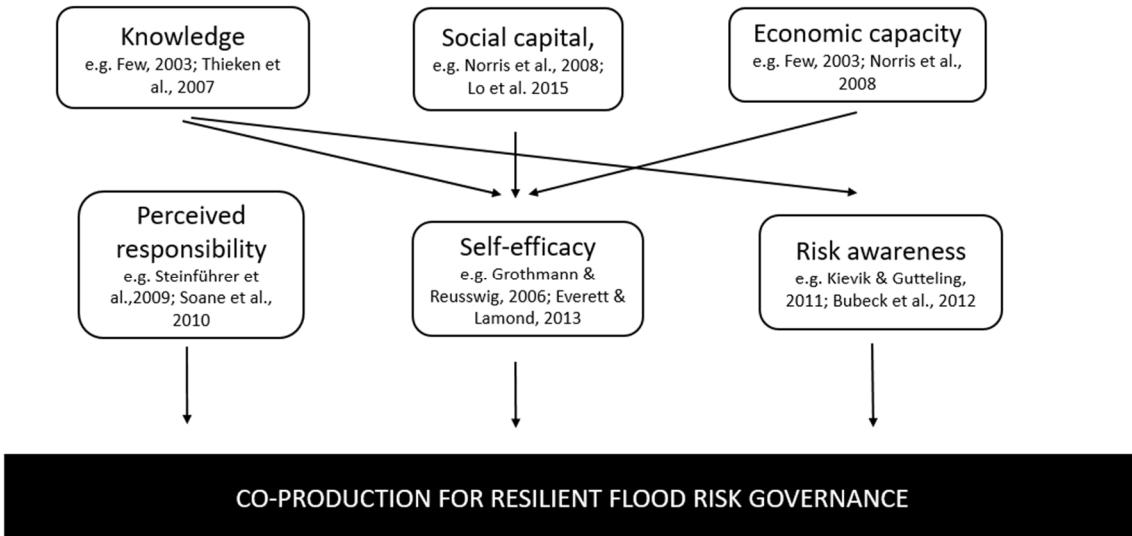


Figure 1: Conditions for co-produced, resilient flood risk governance

Co-production and efficiency

The concept of efficiency

Efficiency is one of the underlying dimensions of the OECD's water governance principles and is conceptualized as 'the contribution of governance to maximize the benefits of sustainable water management and welfare at the least cost to the society' (OECD, 2015). A more general definition relates back to the concept's use in physical science, i.e. 'the ratio of the output of work to the input of energy' (Larrue et al., 2013).

Whereas *economic efficiency* has a dominant financial focus, *resource efficiency* considers the in- and output of a broader set of resources, e.g. expertise, human engagement, technologies, etc. (Alexander et al., 2016).

How does citizen co-production affect efficiency?

Economic efficiency concerns appear to be one of the main driving forces behind policymakers' pursuit of co-production in FRG (Johnson et al., 2007; Mees et al., 2016a). Also in other domains, co-production is found to fit into a so-called neo-liberal retrenchment policy, e.g. in health policy (Fotaki, 2011). By including non-governmental resources in the delivery of a public service, authorities aim either to reduce public spending or to increase its return on investment. Scholars warn, however, that citizen involvement in policy delivery should complement instead of substitute the input of government (Ostrom, 1996; Osborne & Strokosch, 2013). In contrast, Bovaird et al. (2015) remark that good service performance by the state appears to have a negative effect on citizens' willingness to co-produce. Indeed, Mees et al. (2016a) found that Dutch policymakers struggle to pursue individual flood risk adaptation in addition to extensive public protection.

Today, community-based FRG is often used as a replacement rather than as an addition to public action by policymakers (Mees et al., 2016a). As Johnson et al. (2007) observed, the English government makes use of an explicit utilitarian approach to social justice in the management of flood risks. In its funding policy, a strong focus is put on investments that benefit the largest amount of people and assets.

Communities in less populated areas are expected to co- or self-fund the prevention of and response to flooding. This approach stands in contrast to the requirements for effective/resilient co-production stipulated in literature, namely the need to invest adequate financial and human resources in it (e.g. Steinführer et al., 2009; Soane et al., 2010; Cosens, 2010).

Twigger-Ross et al. (2015) found that PLP measures required a larger input of time and resources from the government than expected. The benefits of community-based FRG, in turn, appear hard to quantify because they concern long-term processes and intangible impacts, e.g. improved solidarity, social capital, etc.

The resilience and efficiency criteria appear to put adverse requirements on co-production. Replacing governmental actions by citizen co-production decreases public spending and thus strengthens a policy's efficiency. In order to be resilient, however, co-production should be complementary to public investment, which can make it less efficient.

Co-production and legitimacy

The concept of legitimacy

Legitimacy refers to 'the validity of an organization's authority to govern, whether conferred by democratic statute or acquired through social acceptance' (Lockwood et al., 2010). In this article, a sociological view on legitimacy is adopted, which entails that an institution and its policy is legitimate 'when it is accepted as appropriate and worthy of being obeyed by those affected by its policies' (Lindgren & Persson, 2010). This acceptance can be reached by:

- input legitimacy: the governing institutions are accepted as representative and accountable;
- throughput legitimacy: the governing process is accepted as accountable, transparent and inclusive;
- and output legitimacy: the policy output is accepted as a sufficiently effective solution (Scharpf, 1997; Schmidt, 2013).

From literature, a number of factors can be derived that enable legitimacy, namely accountability, transparency, procedural fairness and a perceived effective and fair policy output (Lockwood et al., 2010; Schmidt, 2013; Alexander et al., 2016). These enabling factors should not be considered prerequisites for legitimacy but as factors that increase the chances of a policy (process) to be accepted.

Accountability requires that citizens have the possibility to exercise control on those who possess public powers, by compelling officeholders to give reasons for their actions and by sanctioning them through protest, legal challenges and elections (Hahn, 2011).

Transparency means that citizens have access to information about the process and its decisions (Lockwood et al., 2010; Schmidt, 2013). Clarity is given about who made the decision, by which means and through which justification.

Procedural fairness implies that equal opportunities are given to all relevant stakeholders to participate in and influence the governance process and that decision-makers are not biased towards certain interests in their decision-making (Boedeltje & Cornips, 2004; Adger et al., 2006). *Substantive fairness*, on the other hand, requires that the final decision takes all interests into account (van Buuren

et al., 2014). A related concept is *social equity*, which is concerned with the distribution of costs and benefits of policy outputs. The distribution of who contributes and who benefits from the policy output should be considered fair by those affected by it (Walker et al., 2006).

Apart from fair, the policy output also needs to be perceived effective by those affected (Boedeltje & Cornips, 2004; Hartmann & Spit, 2016).

How does citizen co-production affect legitimacy?

Accountability

Co-production forms a challenge for traditional assumptions of accountability (Cosens, 2013). According to Klijn & Skelcher (2007), this type of governance network can be approached both from an incompatibility and a complementary ‘conjecture’. The *incompatibility conjecture* considers an inherent tension between representational democracy and the implicit rules of governance networks, which creates a democratic deficit. The *complementary conjecture*, in contrast, considers informal governance networks as an adjunct to representative democracy, which helps its institutions to deal with the increasing complexity of contemporary democracies. Empirical evidence can be found on both conjectures. Research by Hahn (2011) on self-organized governance networks in Sweden noted a shared accountability between the networks and representative democracy, which confirmed the complementarity conjecture. Willems & Van Dooren (2012) advocate a multi-dimensional approach based on divergent accountability fora. Conversely, Thaler & Priest’s (2014) assessment of Partnership Funding in England, relates more closely to the incompatibility conjecture. According to them, the increasing involvement of local private actors in the funding but also in the decision-making of FRG measures has changed the relationship between authorities and non-state actors, which threatens to hollow-out the state. The Partnership Funding approach tends to create disparity between communities of different socio-economic status, but also within these communities. The established community flood action groups (FAGs) are primarily drawn from the well-educated middle class, which raises questions of representativeness and fairness. Similar statements about English FRG are made by Watson et al. (2009). According to Cosens (2013), this type of accountability issue can be addressed by increasing local capacity and developing vertical and horizontal information networks.

Transparency

Related to accountability is the requirement for transparent decision-making and implementation processes in order to enable legitimacy. Hereto, light should be shed on the distribution of rights and responsibilities between the actors involved. Both Bergsma et al. (2012) and Mees et al. (2014) consider a clear definition and communication of flood risk responsibilities as a crucial condition for individual action in water management. Geaves & Penning-Rowsell (2015) state that the current contractual approaches between state and society should be replaced by a more flexible definition of responsibilities. Butler & Pidgeon (2011) criticize the fact that the current responsibility shift in England puts the question of who is responsible more central than how to achieve the required change in thinking and practice, which leads to a ‘blame game’.

Substantive fairness and social equity

The distribution of responsibilities between the different stakeholders involved should not only be clarified, but the resulting distribution of costs and benefits should also be perceived as fair. But what makes a fair cost-benefit distribution? Walker & Burningham (2011) remark that environmental

injustice is generally created by a disconnection between who benefits and who pays, but that with flooding, this relationship is not straightforward. Whether a policy output is considered fair is dependent on its normative assumptions (Adger et al., 2006; Johnson et al., 2007). When applying a *utilitarian* approach, a policy can be considered as fair if it generates the largest possible benefits for the whole of society. In FRG, this pleads for the use of decision-making methods that allocate resources to investments with the greatest returns in terms of the amount of people protected and economic damage avoided. A fair policy in the *egalitarian* tradition means that equal opportunities for all citizens are provided in the distribution of resources. This implies the provision of a guaranteed minimum level of flood protection or preparation for each citizen (Johnson et al., 2007). A *Rawlsian* approach adds to this that inequalities should have the greatest benefit for the least advantaged. This requires flood risk managers to pay specific attention to vulnerable groups and individuals in their policy planning, e.g. by providing (financial) aid to socially deprived residents to protect their property. A policy can never apply these three different approaches at the same time and thus trade-offs need to be made (Adger et al., 2006; Johnson et al., 2007).

Johnson et al. (2007) found that the efforts of the UK government to stimulate co-production in FRG are inspired by a utilitarian, rather than an egalitarian or Rawlsian approach. Several scholars claim that the pursuit of individual risk adaptation reinforces existing inequalities within society (Adger, 2005; Begg et al., 2015) and that it fits into a neo-liberal retrenchment policy (Fotaki, 2011; Walters, 2015). According to these authors, differences between population groups and individuals exist in terms of adaptive capacity, which are influenced by economic and social deprivation (Walker et al., 2006; Walker & Birmingham, 2013; Thaler & Priest, 2014; Thaler & Levin-Keitel, 2016; Geaves & Penning-Rowsell, 2016). As a result, deprived areas miss the social and economic capital needed to prepare themselves against flooding or to lobby for protection, which increases the distributional inequality of FRG. Twigger-Ross et al. (2015), for instance, observed significant difficulties to establish community-based FRG in areas with a high proportion of rental houses. Citizen co-production in socially deprived neighbourhoods is possible but it requires a considerable investment of time and resources, as was demonstrated in the Liverpool Pathfinder project. Academics therefore call on policymakers to pay close attention to the most vulnerable and most at risk (i.e. a Rawlsian approach) (Few, 2003; Johnson et al., 2007; Penning-Rowsell & Pardoe, 2014). In order to enable climate change adaptation at community or individual level, people's access to economic and social resources needs to be secured and they need to be empowered to make decisions (Friend & Moench, 2015).

Procedural fairness

Hence, to make distributional decisions legitimate, procedural fairness is needed (Adger et al., 2006; Nelson et al., 2007). It is an often repeated call in literature that the involvement of citizens in the funding and implementation of (flood) measures cannot take place without their involvement in its policy planning as well (e.g. Johnson & Priest, 2008; Watson et al., 2009). Besley (2010), for instance, found in his comparative case study on nuclear plant development that, all being equal, citizens were more willing to accept a decision if they perceived the decision-making procedure as fair. Multiple scholars in the UK have criticized the government for shifting responsibilities without shifting accompanying power as well (Watson et al., 2009; Begg et al., 2015). Twigger-Ross et al. (2015) stress that co-production should be led by the needs of the community. Authorities should be careful not to pre-define the objectives to be achieved by community involvement. At the start of a community project, the capacities and vulnerabilities within the community need to be carefully mapped and

targeted. If done adequately, community involvement in FRG can even improve the connectivity of vulnerable people within the community and thus enhance social capital (see also Mitlin, 2008).

Summarising, literature finds that citizen co-production impacts legitimacy both in terms of transparency, accountability, social equity, and substantive and procedural fairness. In order to enable a co-produced, legitimate policy, authorities need to provide a clear distribution of responsibilities, facilitate bottom-up co-planning and invest sufficient time and resources to raise a population's economic and social capacities concerning flood response. The relationships between these conditions and legitimacy's enabling factors are presented in Figure 2. One last important element of legitimacy is that the policy outcome should be perceived as an effective solution (Boedeltje & Cornips, 2004; Hartmann & Spit, 2016), i.e. that it increases citizens' resilience to flooding. Herewith, the conditions for legitimacy link into those defined for resilience.

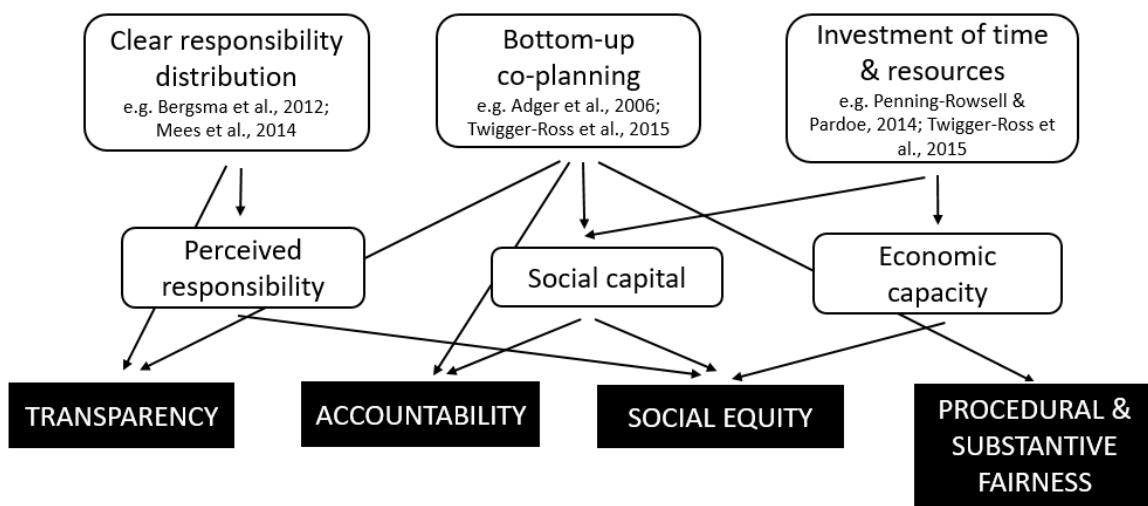


Figure 2: Conditions for co-produced, legitimate flood risk governance

Discussion

Insights from literature teach us that co-produced FRG can be resilient, efficient and legitimate but that it needs to take certain conditions into consideration. According to literature regarding citizens' motivation to co-produce, inhabitants must be sufficiently risk aware, perceive personal risk responsibility and believe that they are able to take effective actions (self-efficacy). Adequate knowledge, social capital and economic capacity among the population at risk appear key factors in the establishment of these primary conditions. If these conditions are lacking, citizens will fail to co-produce as is intended by governmental policy, and the population's resilience to flooding will be reduced. These primary conditions and their enabling factors also turn out to have a strong link with the conditions for legitimate FRG. In order for co-produced FRG to be legitimate, it is advised to define a clear distribution of responsibilities, enable citizens to become involved in decision-making and to invest in the social and economic capacities of the at-risk population. Hence, the conditions for resilience and legitimacy are closely intertwined, as is demonstrated in the figure below.

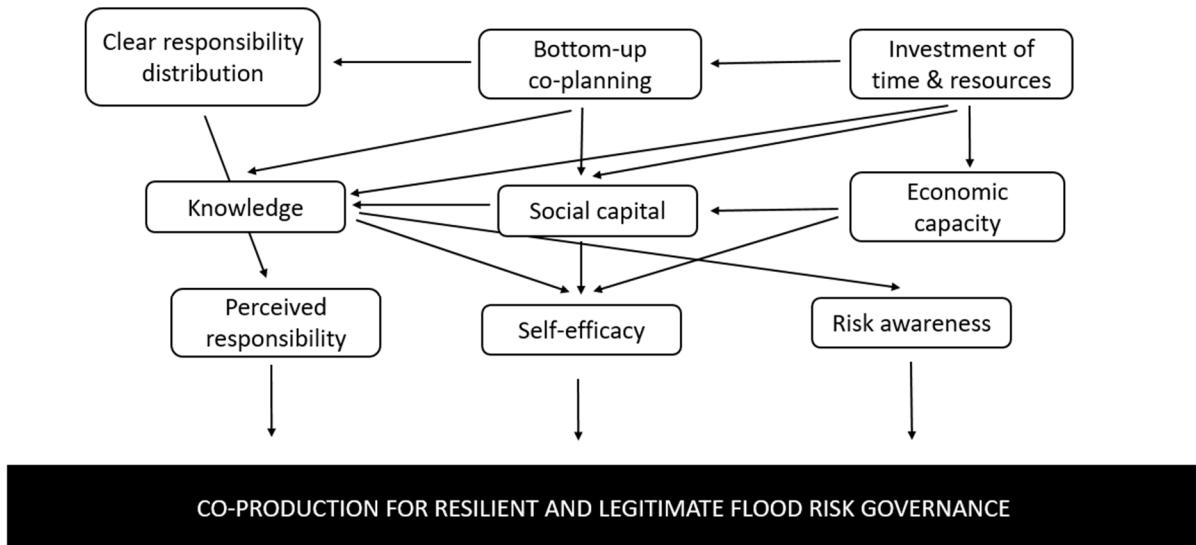


Figure 3: Conditions of co-production in FRG.

The conditions presented in Figure 3 are shaped by plural rows of building blocks. The row at the bottom presents the primary conditions needed within the population in order to co-produce. These are dependent on the available knowledge, social and economic capital, i.e. the second row of building blocks. The upper row focuses on policy initiatives to be taken by government to stimulate resilient and legitimate co-production. The first action, a clear distribution of responsibilities, has a direct impact on the perceived responsibility of citizens. Other governmental initiatives influence the primary conditions through their enabling factors presented in the second row. The arrows in Figure 3 present the main causal relationships between these different elements. Authorities can directly improve economic and social capacity and knowledge of citizens concerning flooding, and thereby their risk awareness and self-efficacy, through resource investment (information campaigns, subsidies, support for neighbourhood groups, etc.). Next to that, they can improve citizens' knowledge and social capital by investing in a bottom-up co-planning process. Moreover, this co-planning process should result in a clear distribution of responsibilities to increase inhabitants' perceived responsibility. Nevertheless, these relationships should not be interpreted too deterministically. For instance, communities with a higher economic capacity do not necessarily have a high social capacity, and vice versa. Also, feedback processes can be expected. For instance, governmental investment can strengthen the social and economic capacity of the population not only to co-deliver but also to participate in co-planning. Figure 3, however, only presents the main relationships in favour of its readability. Further research should investigate the relevance and strength of the conditions and their relationships.

Figure 3 clearly demonstrates the link between conditions for resilience and legitimacy but might at first sight seem to be at odds with conditions for efficiency. Indeed, a considerable tension exists between the requirements for a policy to be resilient and legitimate, versus efficient. Resilient and legitimate co-production requires adequate resources to be spent by government. An efficiency rationale, on the other hand, urges authorities to optimize their public spending. Alexander et al. (2016) state that if the criteria of resilience and efficiency contradict, priority should be given to requirements of resilience. An alternative, however, is to adopt an interpretation of the efficiency

concept, which is focussed on increasing public spending's return on investment instead of cost reduction. This way, authorities can strengthen efficiency, resilience and legitimacy goals simultaneously by 'maximizing the benefits of their water governance', as prescribed by the OECD water governance principles (OECD, 2015).

If we return to the different types of citizen co-production presented in the conceptual framework of this paper, it appears that the most beneficial to resilient, efficient and legitimate FRG is co-production based on deliberation between citizens and governments, which is community-based instead of individual and which is complementary to governmental action. Citizens' input can include knowledge, financial, material and human resources, but it needs to be supported by adequate governmental investment. The analysis has taken into account both co-delivery and comprehensive co-production. It can, however, be concluded that in order to achieve resilience, efficiency and legitimacy, a comprehensive approach to co-production appears indispensable.

Conclusions

Citizen co-production in flood risk governance (FRG) is increasingly present in the discourse and practice of multiple countries. Mees et al. (2016a) found that policymakers aim to increase the resilience, efficiency and legitimacy of their FRG through citizen co-production. This paper investigated the opportunities and limitations of and barriers to citizen co-production in FRG found in literature in terms of resilience, efficiency and legitimacy.

The analysis shows that resilient, efficient and legitimate co-produced FRG is possible but that it is dependent on a number of conditions. These conditions are addressed by the tentative framework presented in Figure 3 (p. 14). The framework consists of different building blocks. A row of primary conditions consists of risk awareness, perceived responsibility and self-efficacy. These conditions are highly dependent on a second row of building blocks, namely citizens' knowledge, economic capacity and social capital. In turn, these enabling factors can be strengthened by governmental initiatives such as the investment of financial and human resources (e.g. subsidies, expert support), bottom-up co-planning and by defining a clear distribution of responsibilities between authorities and citizens.

Tension exists between the efficiency criterion and resilience/legitimacy when it is applied with a definition strictly focused on saving costs. In the UK, for instance, policymakers use an explicit utilitarian approach to social justice, by limiting public spending to areas with the highest return on investment (Johnson et al., 2007). Based on our analysis, we argue that a combination of this approach with elements of a Rawlsian perspective would be more beneficial for resilient, efficient and legitimate FRG. This would imply that in areas where public structural measures are not sufficiently cost-efficient, authorities would allocate adequate resources to co-produce at community level instead, e.g. by establishing social capital through community engagement officers, financial support targeted at the most vulnerable groups, etc. This way, efficiency can be achieved in the sense that the benefits of the investments made are maximized.

The framework offers a simplified model of the conditions required within a population and within policy to enable co-production. More complex models on the willingness and capacity of citizens to co-produce have been developed, amongst others, by Grothmann & Reusswig (2006) and Lindell & Perry (2012). The framework presented here offers a contribution to these models by linking the conditions

at individual level with conditions for flood risk management policy. Moreover, this research does not regard co-production as a goal in itself, but as a means to achieve resilient, efficient and legitimate FRG. Hence, it offers a holistic framework for resilient, efficient and legitimate state-society relationships concerning FRG. Other scholars are invited to further test and refine this framework through comparative and in-depth case study research.

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