Land Policy for Flood Risk Management-Toward a New Working Paradigm

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COMMENTARY
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Key Points:

- Flood risk management needs more focus on processes to plan and implement measures
- Comprehensive and inclusive land policy is crucial for flood retention
- Starting with the local scale is essential throughout the whole process of planning and implementation of flood management measures

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Land Policy for Flood Risk Management—Toward a New Working Paradigm

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Abstract Flood risk management (FRM) aims to integrate necessary technical measures with environmental and societal approaches. Focusing on the process and governance of how to plan, implement, and maintain solutions therefore becomes essential. Among the different stakeholders, landowners are a key group to be considered. This contribution elaborates on the interconnections between land policy, FRM and private land ownership. It is based on the European COST Action network LAND4FLOOD, which brings together academics and stakeholders from various disciplines and more than 35 countries. We argue for a less project oriented and more process oriented approach, a focus on land management and more emphasis on small-scale measures. This represents a break with some of the recent working paradigms of FRM.

Plain Language Summary Flood risks are expected to increase in the future due to the combined effects of climate change, land use change and population growth. New approaches are needed to complement conventional flood risk management (FRM) based on engineering solutions and project-based approaches. In this Commentary we present the findings of the LAND4FLOOD project, which is based on 4 years of research by academics and stakeholders from diverse backgrounds and disciplines: engineering, societal and environmental. We identify three main issues that should be considered to gain support from different stakeholders for the successful implementation of flood risk measures. First, more process orientation in planning and preparing measures is needed. Second, a comprehensive and inclusive land policy is crucial for flood retention. Third, it is important to start at the local scale.

1. Introduction

Flood risks will increase in the future. The intensification of extreme precipitation events, and changes in their spatial distribution, are expected to multiply flood risk by 2050 in some regions (Hettiarachchi et al., 2018; Jongman et al., 2012). In addition to the atmospheric factors mentioned, flood risk is also influenced by the combination of land use changes and socio-economic factors such as population growth (Merz et al., 2021; Pattison & Lane, 2012; Rogger et al., 2017). Conventional flood protection, based on a hydro-engineering approach, is focused on keeping the water away from spaces where it is not wanted. However, this appears to be insufficient to reduce increasing flood risk (Grünewald, 2005; Klijn et al., 2008; Moss & Monstadt, 2008).

Since the late 1990s, flood risk management (FRM) has emerged as the prevalent paradigm in Europe (Patt & Jüpner, 2020) but also in the USA (Thomas, 1995). Flood risk management, starting with an exclusive focus on protection from the hazard of flooding, has evolved to utilizing risk-based approaches, which take vulnerability into account. A main trigger for Europe were the major flood events in 1993 and 1995 along the river Rhine, which revealed the limits of contemporary flood protection at the time (Warner et al., 2012). In the aftermath of the major flood event in 2002 at the river Elbe, the institutionalization of flood risk management was formalized in a European directive (Hartmann & Jüpner, 2014), the Floods Directive (2007/60/EC). From this point on, flood risk management became the state of the art approach to flood risks—in Europe and beyond. FRM questions the institutional separation of water management and spatial planning (Hartmann & Driessen, 2017). This is in line with the academic debate in Europe (Moss, 2004; Wiering & Immink, 2006), and the USA (Calder, 2005; Dyckman & Paulsen, 2012), where the institutional divide seems to be even more

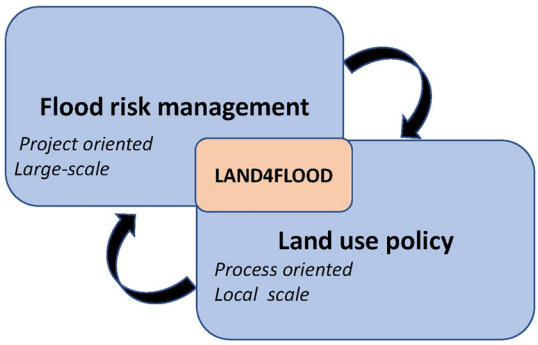

Figure 1. Schematic representation of interactions between land use policy and flood risk management as represented through findings in LAND4FLOOD project. Figure inspired by Hartmann and Spit (2014).

entrenched than in Europe (Suykens et al., 2019; Tarlock, 2012). FRM thus echoes the call for more integrated water management (Gleick, 2000) in flood risk management (Hartmann et al., 2022). FRM is not making flood protection obsolete, but it rather is complementing it. More recently, flood resilience has increasingly been explored as the next evolution in flood risk management (Disse et al., 2020; Fekete et al., 2020). So, ultimately, adaptation and mitigation became highly relevant and generally acknowledged principles not only for fluvial, but also for pluvial floods (Merz et al., 2010). Adaptation as well as mitigation, however, require measures on land. Adaptation involves property-level protection measures (Attems et al., 2020) as well as catchment-wide perspectives on the use of land (Merz et al., 2010; Thaler et al., 2017). Mitigation measures hold a promise for reduction of damages caused by inundations on very small local scales.

The IPCC confirms there is a relation between land management and flood risk (IPCC, 2019). Consequently, a top down support for implementation of Natural Water Retention Measures (NWRM) or nature-based solutions (NBS), into the Floods Directive, has emerged, presenting the concept of Sustainable Flood Management (SFM) or nature-based flood management (Collentine & Futter, 2018; EC, 2007; EC-DGE, 2015; Hartmann et al., 2019; Keesstra et al., 2018; World Bank, 2017). Therefore, nature-based flood risk management additionally incorporates solutions based on NWRM and NBS in FRM, from smaller scales such as urban areas (Ferreira et al., 2021) to large river basins (e.g., natural river retention areas and wetlands; Potočki et al., 2021). In spite of this shift of focus, there are still significant obstacles to overcome in order to coordinate the benefits of risk reduction measures with implementation costs (Calliari et al., 2019; Maes & Jacobs, 2017). FRM measures involve changes in land use, which in turn requires a process and structure for coordination between landowners and beneficiaries (Hartmann et al., 2018; Schanze, 2017). In some cases, the beneficiary and the landowner may be identical (i.e., measures on public land by public flood mitigation authorities) but more commonly the beneficiaries are not organized in a sole purpose institution and the landowners are individual private entities (Collentine & Futter, 2018; Crabbé & Coppens, 2019; Tarlock & Albrecht, 2016).

There is a need to understand and to share experiences, not only of FRM solutions based on water engineering, but also of dedicated nature-based flood risk management measures on private land. This inspired the European COST Action program LAND4FLOOD (https://www.cost.eu/actions/CA16209). Concluding 4 years of sharing experiences in meetings and workshops with representatives from more than 35 countries three key messages have been identified to increase implementation of mitigation measures on private land. The following three messages challenge the existing working flood risk management paradigm which is often very project-oriented, driven by water engineering, and large in scale (Hartmann & Driessen, 2017).

1. Less project orientation and more focus on processes to plan and prepare measures
2. A comprehensive and inclusive land policy is crucial for flood retention
3. Starting from the local scale is vital (Figure 1).

2. From a Project to a Process-Based Approach

Nature-based flood risk management goes beyond merely designing and financing the construction of engineering measures. It aims to integrate necessary technological measures with environmental, traditional, and societal approaches (Jakubínský et al., 2021; Veidemane, 2019). It combines natural features, actively involves a wide range of stakeholders, and incorporates and adapts all relevant regulations and management plans. In this way, a fertile environment is created for the co-creation of integrated management plans. It thus becomes essential to focus on the process (how to plan, implement, and maintain solutions), rather than relying on finding and deciding on the measures alone. An appropriate process will inherently clarify, identify and establish measures (Thaler et al., 2020; Warner & Damm, 2019).

The term Flood Risk Governance (FRG) (Bergsma, 2019; Hegger et al., 2014; Heintz et al., 2012) includes:

1. Describing a complementary approach to FRM as a means to overcome the limitations of structural protection approaches (Kundzewicz & Takeuchi, 1999), by providing general goals, responsibilities and directions—and by facilitating normative debate (Matczak & Hegger, 2021)
2. Preparing FRM measures and engaging with private landowners, requires concerted efforts and dedicated finances to support iterative processes from the initial step to final completion—and beyond
3. Cooperation and coordination, along with communication of flood risks are considered essential to implement solutions in a sustainable way (Kellens et al., 2013; Priest et al., 2016)

Landowners, public authorities, and all other relevant stakeholders must be welcomed and actively engaged into processes of addressing flood risk challenges and into planning cost-effective solutions (Bark & Acreman, 2020). Getting landowners on board is a time-consuming process, due to efforts needed for trust-and consensus-building, mobilization, and co-development (Tempels & Hartmann, 2014). Identifying, mapping and analyzing landowner and stakeholder interests and their potential for commitments are key steps in such processes (Blazquez et al., 2021). However, it is even more important to ensure that the engagement is inclusive, transparent, and persistent over time (Fekete et al., 2021; Zilans et al., 2019).

With regard to stakeholder involvement, FRM should be regarded as an iterative and adaptive process (Pasquier et al., 2020). Although the goal may be the realization of an individual project, this realization will require not only participation in planning and preparation, but continued active governance once measures have been implemented. The experience gathered from each process must be treated as an input to the next one forthcoming, so subsequent quality depends upon what has come before.

3. Comprehensive Land Policy Is Crucial

Access to land is essential for nature-based flood risk management. Space is needed to retain and detain water. Agricultural land is needed—in upstream areas and in the hinterlands (Collentine & Futter, 2018). However, agricultural landowners often resist changes and restrictions to their land use, especially when it comes to changing the use of their land. They do not want to lose control over how they manage their land or to be forced to change farming practices, because their land is the foundation of their income—and often their identity. Flood mitigation policies thus need to incorporate a multifaceted understanding of landowner perspectives, how they influence support for flood mitigation strategies and to identify potential conflict and to develop policies that minimize it (Milman et al., 2018).

Over the last 4 years, LAND4FLOOD found that there is a need for comprehensive and inclusive participatory processes, seeking feasible solutions for reducing flood risk. This is more similar to handling general land use issues, requiring similar representative policy processes (Hartmann & Spit, 2015). Moving to process-based interventions recruits a wider stakeholding public, both upstream and downstream, making it impossible for (public) authorities to implement measures without consultation or involvement.

Several approaches have been proposed in land policy and research—from informal processes or incentives, to top–down command and control solutions (Crabbé & Coppens, 2019; McCarthy et al., 2018; Suykens et al., 2019). Stakeholder participation in processes is often offered as a way to address flooding problems, but when it comes to agricultural land, negotiating such approaches often can be stalled by the issue of land scarcity. Monetary compensation is not the only issue. Keeping and increasing the extent of appropriate land could represent the key value. Further, not all agricultural landowners are farmers and not all farmers own all the land they manage. If alternative solutions to lost production and satisfactory income compensation cannot be guaranteed over the long term, even money cannot circumvent the reluctance of landowners and farmers to engage in a flood risk management program. Experience in the LAND4FLOOD project and presented in case studies shows this (Hartmann et al., 2019). Landowners and farmers represent an important constituency group, so public agencies may be reluctant to use interventionist policy instruments—such as expropriation or direct regulation (Löschner et al., 2021).

One effective way to alleviate the problem of land scarcity is to increase the provisioning of land in the solution. "Land for Land," that is, offering suitable and attractive land in exchange for the constrained land, can be a successful means to alleviate such an impasse (Albrecht & Hartmann, 2021; Crabbé & Coppens, 2019). Promoting multifunctional uses of land represents another strategy. However, these approaches require strategic thinking

and long-term land management and governance. This approach requires a shift toward integrated flood policies to address cross-cutting issues, particularly to incorporate the agricultural sector in policy coordination processes (Löschner & Nordbeck, 2020).

4. Starting From the Local Scale Is Vital

Flood risk assessment methodology and application is strongly linked to spatial scale (de Moel et al., 2015) and therefore has impacts on land use management and land owners. A catchment perspective is important to adequately access land for flooding. It has been argued that retention measures should be planned at the large scale to take into account effects throughout the entire river basin (EC, 2007; Hartmann & Spit, 2016; Rouillard et al., 2015). The implementation of water retention measures, however, must be done with direct support from the local level, with reference to perspectives of the involved landowners, who may own small pieces of land or have their land fragmented across the catchment. In addition, upstream farmers and landowners will be asked to provide retention services to downstream settlements (Macháč et al., 2018). All these situations involve cross-scale interactions, therefore cooperative efforts should be taken in order to manage the trade-offs resulting from differing perceptions of scales of environmentally suitable and socially acceptable nature-based flood risk management measures.

Our experiences in the LAND4FLOOD network across Europe brought us several curious findings. In one area comprehensive regional or river basin plans struggle with implementation due to non-cooperative landowners who are afraid of decreased land values and of increased administrative and management duties if the FRM measures are implemented on their land. At other area, active farmers, non-governmental entities or small municipalities acting on their own to retain more water on their properties, are criticized by experts for the lack of hydro-morphological soundness or they face bureaucratic barriers while applying for changes in designation of land in spatial plans. At the same time, we found several successful, local initiatives, where water retention measures were implemented through stakeholder and inter-municipal cooperation. Additionally, we found that the implementation of FRM measures may also generate mismatches in temporal scales related to how we understand persistence of the measures and their effects. While landowners are frequently incentivized by short-term financial instruments to implement measures, the importance of long-term persistence of collaborative efforts and the long-term flood mitigating effects of the measures under climatic uncertainties, are underestimated.

Thus, while starting with locals is essential, the cross-scale effects must be accentuated throughout the whole process of planning and implementation of the measures. Our collective experiences in LAND4FLOOD suggest a need for communicative FRM. Articulating scales that would be effective for bridging the spatial, institutional and temporal variations across stakeholders will help with finding the common understanding of proposed measures and their effects and will support implementation (Raška et al., 2019).

5. Conclusions

LAND4FLOOD has demonstrated the need to create wider and more inclusive FRM processes, which include the active and crucial involvement of local stakeholders in all stages. Examples brought to LAND4FLOOD by participants from member country representatives point both to the limits of a strictly top-down approach or a technical management process, and demonstrate the opportunities made possible by working with local stakeholders, especially land owners. Working together comprehensive FRM policies can be developed which can help mitigate subsequent damage from extreme climate events. The challenges of climate change, and in particular extreme climate events, requires comprehensive responses—from reducing the core causes of the events to building resilience and mitigating their impact. FRM processes which mobilize the wider society to participate in solutions is only one part of this, but it can be a key component of creating security and stability in the face of a changing environment. However, ultimately, the lessons learned from the combined expertise of LAND4FLOOD suggest that it may be time for a break with the current working paradigms in FRM.

Conflict of Interest

The authors declare no conflicts of interest relevant to this study.

Data Availability Statement

No additional data were used as part of this study.

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