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# Implementing catchment-wide flood risk management plans: futures and justice conflicts

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ABSTRACT

Climate change is projected to heighten flood risk. To adapt to this higher flood risk, catchment-wide flood risk management (FRM) plans have become increasingly popular. These plans aim to implement risk reduction measures (RRMs), usually in rural areas on privately owned land, with the goal of reducing the vulnerability of downstream/urban regions. These interventions can have ramifications for rural/upstream areas as they restrict such areas' spatial and economic growth. Despite these unequal outcomes of distributive justice, reasons for using the countryside/upstream areas are multifaceted, such as lowering the costs of implementation or attaining further co-benefits. In this paper, we aim to analyse how anticipated futures are used to legitimise the unequal distributive consequences of catchment-wide FRM. We combine insights from future studies involving a future perspective (expected, preferable, and probable futures) and the distributive justice literature to examine the debate on large-scale catchment-wide FRM plans in Austria and the Netherlands. In both countries, the debates remain rather implicit, even though the subsequent decisions can have substantial repercussions for the distribution of burdens and benefits. Whereas in the Netherlands expected futures are contested, in Austria desired justice implications are contested between authorities and locals. On the one hand, futures are harnessed by quanitifying desired futures and by embedding expected futures in decision-making tools. On the other hand, credibility of expected futures is descreased by framing them as more uncertain.

## 1. Introduction

Flood risk management (FRM) has undergone a significant transformation in recent decades (Wiering et al. 2017; Thaler & Penning-Rowsell, 2023). Responses to flooding have changed from the main goal of flood protection to FRM (Thomas & Knüppe, 2016). Flood protection is characterised by a strong focus on engineering solutions that aim to reduce the probability of flooding and 'fighting against nature' (Hartmann & Spit, 2016; Paul & Milman, 2017; Booth & Patt, 2018; Seebauer et al. 2023). In contrast, FRM provides a more comprehensive understanding of risk and considers a broader view of selecting measures to reduce the consequences of flooding (as opposed to technical mitigation measures only). Such actions include the use of non-structural concepts—such as early

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warnings (Cumiskey et al. 2018), property-level flood risk adaptation (PLFRA) measures (Attems et al. 2020), land use policies, and planned relocation (Thaler et al. 2020; Hartmann et al. 2022; Serra-Llobet et al. 2022)—as well as Nature-based Solutions (NbS, Raska et al. 2022; Thaler et al. 2023; Davids et al. 2024). This shift from flood protection to FRM includes new forms of decision-making as other actors (e.g. non-engineers and the non-water sector) are becoming increasingly involved. Consequently, these new modes of governance create challenges in regard to organising the decision-making process (Thaler & Levin-Keitel, 2016). Furthermore, this shift implies a different anticipation of the future. Instead of seeing the future as predictable and designable, guided by quantifiable knowledge of engineering, the future is perceived as uncertain because of hydro-physical and societal developments. The impacts of climate change have become increasingly evident given that the magnitude and frequency of flood events are changing (IPCC, 2022). Absolute safety is considered impossible to achieve in the context of these grave problems, and the need to accept and address residual risk has become increasingly acknowledged. Additionally, various societal developments expand the complexity of FRM and require changes in these management strategies. In terms of policy, the European Commission has played an important role. The introduction of diverse directives and strategies—such as the Water Framework Directive (European Commission, 2000), the European Union (EU) Floods Directive (European Commission, 2007), the EU Restoration Act (European Commission, 2023), biodiversity strategies (European Commission, 2020), and the promotion of NbS (European Commission, 2015)—prompted a shift in how to deal with floods (Thaler et al. 2023; Stoffers et al. 2024). For example, the European Water Framework Directive and the Restoration Act initiated a new chapter for FRM since dikes and dams actually decrease the positive ecological status of water bodies (Republic of Austria, 2024; Stoffers et al., 2024; Republic of Austria, 2017). In addition, numerous societal groups have explored whether other measures would be more effective for flood management than technical mitigation measures (Thaler & Priest 2014).

To respond to the increased complexity of the broader circumstances, catchment-wide FRM plans have become prominent (Hartmann et al. 2019; 2022; Thaler et al. 2023); they include a wide range of options. One such option is NbS in urban areas (e.g. green roofs, urban trees, ponds, lakes), agriculture and forestry (e.g. afforestation, buffer strips, wetlands), rivers (e.g. renaturation; Thaler et al. 2023), or natural and technical retention basins (Seher & Löschner, 2018; Hartmann et al. 2022; Nordbeck et al. 2023). Catchment-wide FRM is seen as an optimal concept for reducing current and future risks caused by climate-related hazards because it encompasses a broad range of co-benefits such as carbon storage, improved biodiversity, and enhanced well-being (Dadson et al. 2017; Pagano et al. 2019; Ommer et al. 2022; Thaler et al. 2023). Catchment-wide FRM is used to deal with different hazards; for example, green roofs deter urban floods and heat waves (Busker et al. 2022). Catchment-wide FRM can also improve the landscape and urban aesthetics (Apostolaki, 2024) and can be less expensive than technical mitigation measures under certain conditions (Fennell et al. 2023; Vogelsang et al. 2023). Hence, catchment-wide FRM may also resolve problems linking the climate with biodiversity crises (Dadson et al. 2017; Xie et al. 2022; Thaler et al. 2023). However, decision-making for catchment-wide FRM plans requires acknowledging and balancing a wider set of future goals and consequently anticipating a broader set of hydrological as well as societal trends.

Catchment-wide FRM plans also include a range of challenges within the implementation process, such as issues involving privately owned land, uncertainty in terms of hydrological efficiency, or the unclear distribution of responsibilities between the public administration and citizens (Thaler et al. 2023). One of the greatest problems is related to land. In particular, upstream risk reduction measures (RRMs) are implemented in rural areas with the goal of reducing the risks facing downstream communities; such measures often require the use of privately owned land. This means that someone upstream has to provide land with the goal of reducing the risk to others downstream (Thaler et al. 2020, 2023; Hartmann et al. 2022). Private land owners who offer their land for RRMs often benefit little from the resulting protection (Thaler et al. 2023). Consequently, someone sacrifices his/her land for someone else. Here, the question arises of whose interests and desired future (e.g. flood protection vs. development) are prioritised, as well as whose assumptions and rationale are considered in decision-making. This factor raises two key concerns: (1) the implementation of a catchment-wide FRM plan has strong implications for justice; (2) the focus on a catchment-wide FRM strategy has strong implications for the future development of a given region as spaces designed for RRMs cannot be used for other purposes, such as building residential or non-residential properties. Research on FRM has sometimes adopted a future-based lens. Studies tend to involve (1) predicting potential future impacts on flood risk (Masood & Takeuchi, 2016; Croxatto et al., 2020). We present the results from the first year of the project. Next year, we plan to provide additional information and support to biosphere reserves to help them take a more active role in hydro-meteorological risk management (Daniels et al. 2021); (2) envisioning the collective future of FRM (Flood et al. 2023); or (3) imagining scenarios to develop plans for FRM (Sircar et al., 2013). However, these studies tend to focus on an explicit sense of the future in the form of scenarios, models, or visions but neglect the implicit assumptions and anticipation of the future that underlie decision-making in FRM, and how such anticipation might be strategically used to legitimise certain outcomes of distributive justice. Hence, we assessed how an anticipated sense of the future is used to legitimise the unequal distributive consequences for upstream and downstream communities.

## 2. Conceptual framework

We combined insights from futures studies and the literature on environmental justice because future processes (i.e. creating and using one's future) relate to justice. Justice-related studies focus on inequality, among other factors, within society. Inequality can entail the distribution of wealth, environmental issues, a lack of engagement in planning and decision-making, or ignorance by public administration. Overall, we distinguish between three types of justice: (a) distributional, (b) procedural, and (c) recognition justice (Page, 2007; Walker, 2012). In this paper, we focus on distributive justice, for which we pursued the following questions:

(1.1) Who has distributive entitlements and who is bound by duties to guarantee these entitlements?

(1.2) What financial compensation does the state provide and what are the current protection measures implemented to ensure safety?
(1.3) Who is affected by providing the land for reducing risk for downstream communities?

We examined several principles for the distribution of burdens and benefits: (1) Merit-based principles argue that individuals should be rewarded in proportion to their contributions or sacrifices (McDermott et al. 2013). (2) Needs-based principles emphasise that the most vulnerable people (or the ones most in need) should be favoured in terms of (re)distribution. In contrast to these two rule-based principles (McDermott et al. 2013), (3) utilitarian-based principles consider the consequences of actions when weighing justice-related concerns. Utilitarian-based principles assert that the objective should be to achieve the greatest utility or good for the greatest number of people, emphasising goals (Davy, 1997; Kymlicka, 2002; McDermott et al. 2013).

Futures studies argue that 'the future is always active, even in the most mundane decisions, expectations and stories about the future…' (Selin, 2008, p. 1886). Actors anticipate a pluralistic set of alternative futures, which influences and guides decision-making in the present (Inayatullah, 2008; Veenman et al. 2023). This set of alternative futures represents certain values, assumptions, and worldviews, also with regards to distributive justice (Masini, 2006). Futures studies distinguish between the process of 'using the future' and 'making the future'. Using the future refers to anticipating a future that is 'below the threshold of consciousness (…) active within the system without the system itself being aware of it' (Poli, 2010, p. 773). This process is the precursor to 'making the future'. Making futures describes the process and actions taken in the present that create a future. Every action (or non-action) will have an impact on the future. Designating spatial areas for FRMs for downstream communities and restricting development represents the process of 'making the future'.

The process of 'making of futures' may be considered as unjust or unfair as material burdens and benefits might be unequally distributed. This links to critical futures studies that discuss the colonisation of the future, arguing that the future represents current power structures that reproduce present injustices (Sardar, 1993).

In this paper, we focus on the process of using futures. To conceptualise the process of using futures, we distinguished between expected, preferable, and probable futures (Amara, 1981; Inayatullah, 2008). (i) A preferred or (un)desired future favours normativity rather than trying to be 'neutral'; it aims to develop a single picture of a desirable future (Utopia, see also Thaler 2022) and from there to reason backwards in time to explore how to achieve it. The Paris Agreement's goal of limiting global warming to 1.5 °C is an example of a desirable future. Justice-based principles are normative and take on the form of a desired future; for example, the desire to protect every citizen of a country embodies the principle of egalitarian justice, which envisions everyone as receiving the same support from the government (Cuillo et al., 2020). (ii) An expected sense of the future can often be seen as the logical outcome of extrapolating past and present patterns and trends to the future (Nowotny, 2010). An expected future might involve the expected consequences of climate change (e.g. floods, droughts, heat waves, expected demographic changes). (iii) A probable future describes an uncertain future. A probable future is often presented in a scenario. Because multiple alternatives are considered possible, it is uncertain which trends will develop, continue, or stop and which unexpected events might occur. An expected future and a probable future can be used to legitimise particular justice-based principles. For example, the expectation of climate change, in combination with the anticipated financial costs required for protection from the impacts, can be used to justify a more efficiency-based approach to flooding that focuses on maximising utility (a utilitarian principle).

## 3. Method

### 3.1. Case selection

We chose Austria and the Netherlands as case studies. Austria is affected by a wide range of different types of flooding, such as river (e.g. the large Danube, Mach, or Thaya rivers), flash, and pluvial and torrential flooding (with more than 12,500 mountainous torrent catchments; BML, 2024). Austria has a long tradition of FRM since the Middle Ages (Hohensinner et al. 2013; Sonnlechner et al. 2013; Hohensinner & Schmid, 2016; Hohensinner, 2021).

River regulations have tended to focus on large rivers like the Danube (Hohensinner et al. 2013). Individuals used to be responsible for smaller or torrential catchments, but this changed at the end of the 19th century with the introduction of the 1884 regulation law regarding mountain rivers (Österreichisch-Ungarische Monarchie, 1884), which was based on previous large flood events that took place across the Eastern Alps (Mevissen, 2020). In the Austrian lowlands, river regulations were implemented after the end of World War I (WWI) and World War II (WWII); the goal after each war was to ensure food security and reduce the loss of life within the country. Over time, FRM evolved from 'purely' technically-oriented RRMs to include a wide range of different risk management concepts such as planned relocation, the use of early warning systems, the implementation of NbS, the utilisation of land use instruments to limit the building of new, more residential and non-residential properties within floodplains, and the encouragement of individual PLFRA measures (Attems et al. 2020; Thaler et al. 2020).

Today, the Austrian federal system ensures that FRM is organised within the country's nine different states, including numerous options and strategies (Thaler & Penning-Rowsell, 2023). Federalism has encouraged many different actors to take relevant steps across the nine states (Rauter et al., 2019). At the national level, there is a focus on providing large amounts of financial resources to implement technical mitigation measures or to send reports to the EU, among other initiatives. Consequently, we selected one state to better understand the discourse of using a catchment-wide FRM plan because there is no larger debate at the national level; the states are the key actors in fostering the execution of catchment-wide FRM plans. However, not every state uses this strategy. Some states are more open to carrying out a catchment-wide FRM plan. Thus, at the regional level, we focused on Upper Austria as this region is highly

prone to flood risks and includes a wide range RRMs within peripheral regions to reduce the risk of larger urban areas being affected (Thaler et al. 2016). The Aist catchment was especially impacted by the 2002 flood event and has a long history of implementing upstream RRMs to reduce the risk of flooding for downstream communities (Thaler et al. 2016; Seher & Löschner, 2018). The Aist catchment entails more than 20 years of discussion and conflicts about the perspective on upstream-downstream risk reduction.

The Netherlands also has a long history of FRM**,** starting in the Middle Ages; 59 % of the country is susceptible to flooding, 55 % of which is safeguarded by technical protection measures, such as embankments and dunes. The flood risk is projected to increase because of climate change, land subsidence, and increasing socioeconomic development. In particular, the economically valuable and population-dense western part of the country (Randstad) would be most exposed to flood hazards. Providing flood protection is considered a state responsibility. This is visible in legal safety standards for the technical infrastructure of the nation's main water bodies; designated national and regional authorities are responsible for building and maintaining such infrastructure, and national and regional financing (regional water authorities have their own income tax) is fairly secure (Kaufmann et al. 2016); this led to a new approach to FRM (for an overview, see e.g. Kaufmann et al., 2016; Kaufmann & Wiering, 2022). One element of this approach is discussions on (i) emergency flood areas, i.e. areas that are inundated in a controlled manner as a last resort during a flood to reduce the impact of a flood downstream; and (ii) water retention areas, i.e. natural and agricultural areas that are used to prevent damage downstream and that may be regularly flooded but less severely than emergency flood areas (Diermanse, 2002).

### *3.2. Data collection and analysis*

Applying our analytical concept (the future and justice), we reconstructed the political debate regarding retention areas for FRM in Austria and the Netherlands. We conducted a discourse analysis on policy documents and newspaper articles, which is also a common approach in FRM (e.g. Kaufmann et al. 2016). We chose these two kinds of documents for two reasons: (1) they enabled us to develop an overview of the discourse from the 2000s until 2020, and (2) they allowed us to identify arguments and counterarguments, rationales, the language that was being used, and the policy decisions this led to. The level of debate in the two countries differs slightly because of their administrative and political organisation (i.e. federalism in Austria vs. the centralised approach in the Netherlands).

For the Austrian case, we analysed the national and regional discourse about implementing FRM strategies in peripheral regions. At the regional level, we selected 20 policy documents and strategies at the regional and local levels, 2 press statements from local authorities, 5 research reports, webpages from the 'Hochwasserverband Aist' (Aist Flood Association) and civic society groups, and 18 regional and local newspaper articles from 2002 (after the 2002 flood event) to 2023. As for regional and local newspaper articles, we focused on national newspapers. At the national level, we selected 22 policy and legal documents that define the legal framework for designing retention areas for flood risk reduction, including the justification of using retention areas as well as how to organise compensation.

For the Dutch case, we analysed the national discourse, but with a focus on Rijnstrangen (the former riverbeds of the Rhine) in the eastern part of the country. This area is considered both an emergency flooding area and a retention area. We decided to focus on a specific locale because the discourse and its consequences could differ substantially across areas. Hence, this approach allowed us to be more precise. We used the online database Tweede Kamer for policy documents and parliamentary debates with the following search terms (in Dutch): emergency flooding area, which led to 29 results, and *retention area and Rijnstrangen* (6 results). We subsequently employed the database nexus Uni to find newspaper articles on the discourse on this specific area, which resulted in 36 articles. We analysed these data chronologically, reconstructing the policy debate and the use and development of the future.

We analysed the data deductively; this means that we employed our conceptual framework for the different views of the future mentioned in this paper (expected, uncertain, and probable; making and using the future) and distributive justice as a list of codes to filter and sort the material and identify passages that were relevant for our research. We did this with the software program ATLAS.ti. We subsequently specified the codes further (e.g. an expected future of climate change, future regional and individual development, spatial justice in FRM, etc.) and used them to reconstruct the discourse in the two countries.

## 4. Results

### *4.1. The national debate on retention areas in Austria*

The threat of flooding has been prevalent in Austria for a very long time. Since the end of WWII and the flood events of 1953, 1965, and 1966, the government has tried to reduce the potential risk of flooding. A dominant desired future emerged centred around preserving human life and property. Hence, the core strategy for reducing risk is the realisation of engineering solutions to lower the potential for it (Republic of Austria, 1959, 1975, 1985). In the 2000s, this desired future of safety was reconsidered, especially after the two large flood events of 2002 and 2005 (Lebensministerium, 2010). The future-based discourse changed from purely thinking about safety to accepting residual risk as well as avoiding the transfer of flood risk to downstream communities. Furthermore, the policy shift predicted the need for proactive FRM instead of a reactive policy, including greater engagement with non-state actors.

Retention areas or emergency flood areas with a catchment-wide perspective intended to avoid the transfer of flood risk to downstream communities. This strategy was enforced by the implementation of the EU Water Framework Directive in 2000 and the EU Floods Directive in 2007. First, the execution of the EU Floods Directive encouraged debate on how FRM strategies need to be designed to fulfil the requirements of the directive. The implementation of technical mitigation measures created the challenge of moving risk from an upstream community to a downstream community, which is a central argument within the directive to avoid such a transfer. Here, catchment-wide management concepts can avoid this challenge. However, future expectations (such as the impact of a warmer

climate on future flood events) are usually excluded from the decision to select a catchment-wide FRM plan. After the 2002 and 2005 flood events, a few catchments within rural areas (such as the Aist catchment) were initially reserved for exploration for catchment-wide FRM plans.

Second, the execution of the Water Framework Directive influenced Austrian FRM policy more recently. In the 2010s (after the first national water strategies were published in 2009; Republic of Austria, 2009), Austrian FRM policy described how to integrate the Water Framework and Floods Directive. A core issue is that large parts of Austrian water bodies do not have good ecological status in terms of the morphology of a given river, especially within areas where technical mitigation measures were carried out. In 2017, the national policy led to the creation of the 'Gewässerentwicklungs und Risikomanagementkonzepte' (GE-RM) strategy with the goal of integrating both directives (Republic of Austria, 2024; Republic of Austria, 2017). The key problems lie in which measures can and should be implemented. Due to a lack of space in terms of topography as well as urbanisation of the country, removing large portions of current technical protection entails strong political infeasibility as rural communities are especially affected by this notion. Furthermore, the national policy entails the implementation of measures for privately owned land, which includes the question of how to obtain the land. This can be understood as the process of making the future. The use of retention basins includes restrictions on the development of upstream communities, with the primary goal of reducing the risks for downstream communities as well as fulfilling further policy goals, such as the ecological status of water bodies. This policy direction involves a utilitarian approach to FRM. Communities with a low cost—benefit ratio must provide the land needed to ensure retention basins for communities with a high cost—benefit ratio. This utilitarian making-of-the-future strategy can create unequal distribution, where the countryside (scope) must provide the risk reduction benefits (currency) for downstream communities (scope).

Thus far, the national strategy involves buying the land (usually for the renaturation of rivers) or compensating private landowners who still own and use the land. In terms of justice, the orientation towards privately owned land includes the question of why landowners need to provide their land for downstream residential and non-residential properties. In terms of the future, the design of retention areas refers to a probable future as it highly influences private landowners' freedom in deciding how to use their land as well as individual development and, of course, the growth of the community. Most retention areas are restricted in terms of building new residential or non-residential properties or agricultural land. However, neither debate is directly addressed within policy documents at the national level.

This goes hand in hand with the decision-making process, which is designed for retention areas. First, decision-making is grounded in the status quo. For example, in analysing cost—benefit assessments, future developments (such as sociodemographic shifts or climate change) and justice-based perspectives are not explicitly included. Furthermore, uncertainty regarding the potential impact of climate change on future flood events and therefore on the design of retention areas are often not directly addressed within various policy documents and strategies. The issue of whether a retention area might be adequately designed for future developments (such as climate change) has not been dealt with. The aspects of overtopping and residual risk are encompassed within the national discourse, but the aspect of designing larger retention areas due to larger extreme weather events is excluded from the current planning process. Second, the current national political agenda shows a strong understanding of egalitarianism in terms of providing equal chances to everyone across the country, which can contradict the use of retention areas. One reason is the lack of a national political agenda on how to address declining rural regions, where most of the retention areas are planned for implementation. Consequently, the realisation of retention areas is one potential strategy within the Austrian FRM plan but is rarely implemented across the country or only following large debates with local authorities and private landowners. One reason is that private landowners protest being compelled to provide their land for carrying out retention measures to protect downstream communities because of conflicting visions of a desired future. Overall, both strategies show strong distributional effects as well as the corresponding visions of a desired future. Both debates are indirectly addressed but largely excluded and ignored in the policy discourse and decision-making process.

### *4.2. Regional and local debate on retention areas in Upper Austria*

In 2002, the Aist catchment was heavily impacted by a flood event. Directly afterwards, the public administration designed the first risk reduction scheme. The first FRM strategy in the Aist catchment in Upper Austria included the realisation of 25 retention areas. The primary goal of the Aist catchment-wide FRM plan was to reduce the potential risks to downstream communities (Puchinger N.Y.). The goal was to create retention basins in the upper part of the catchment, which is characterised as a rural peripheral region with the 'classical' challenges of rural areas such as population decline, an ageing community, lower socioeconomic growth, and less of an expected future. Hence, the idea was to implement retention basins on privately owned land, which is used for agricultural grassland production. However, the design for the FRM plan was based on the 2002 flood event, excluding future developments (such as future projections, models, or scenarios) in terms of climate change or land use changes in the catchment.

According to the strategy, landowners received direct compensation from the public administration in exchange for the use of their land in the case of flooding. Compensation was based on a voluntary purchase scheme; the level of compensation for individual negotiations between the public administration and landowners depended on reaching a voluntary agreement without the potential for expropriation. In almost all cases, the retention areas included a handful of different landowners to whom the public administration would provide the same compensation. The underlying idea is to avoid unequal treatment between different private landowners to prevent conflict based on different visions of an expected future.

The second aspect of justice entails the matter of who contributes to the level of payments. National, regional, and local authorities partially contributed to payments for compensation; usually, the share involves a ratio of 50 %:30 %:20 % (national/regional/local). In the case of the Aist, local authorities' share of the financial provision is distinguished between different local authorities. Consequently, there was a plan for local authorities downstream to provide the largest share of compensation based on the potential for damage. The

central claim was that the design and use of retention areas were implemented in the upper part of the catchment, and local authorities in the lower portion were the ones who would primarily benefit from these measures.

In 2007, most of the local authorities within the catchment agreed on this 'making-of-the-future' perspective, even though upstream communities were restricted in terms of local growth. However, the citizens did not agree on this idea. The 'making-of-the-future' perspective encouraged the creation of a citizen group whose goal was to change the original FRM strategy in the Aist catchment. The citizen group aimed to build 'many small retention basins alongside the catchment to offer more effective protection against flooding, reduce soil erosion, and thus benefit the ecology of the catchment as well as taxpayers' (Initiative für einen ökologischen Hochwasserschutz – Aist N.Y.). In 2012, the public administration promoted stakeholder engagement with the goal of increasing social acceptance (Tatwort, 2012). The outcome of this consultation process was a reduction in the number of retention basins (Habersack et al. 2012; HWS, 2013). Notwithstanding, even when the different actors agreed on the catchment-wide FRM plan, the realisation of upstream-downstream retention areas largely failed within the Aist catchment, as the example of the city of Freistadt showed. In 2013, the agreement involved the realisation of two retention basins in Freistadt. However, private land owners largely reject the offer and risk management plan (BBfR, 2016), as we can see in this quote, 'Nevertheless, many landowners [were] sceptical and reject[ed] the project' (BBfR, 2016, p. 1). As such, only small technical mitigation measures and property-level flood RRMs were implemented, with a low impact on reducing vulnerability in the catchment (HWS Aist 2012a, b, c). The argument behind the public protest and lack of societal support were related to a negative expected and undesired future. Individuals felt disproportionately exposed to the burden on downstream communities, who would benefit from the retention basins in the upper part of the catchment. In addition, restrictions on land use, uncertainty about temporary reservations of retention areas, and the need to clean up debris afterwards could have placed a burden on private landowners (the making of the future). The fear was that the farmers had to cover the additional costs without being compensated by the public administration, even if the compensation scheme was offered by the public administration (BBfR, 2016). In general, private landowners disagreed with the government's anticipation of the future with respect to who should be protected; they did not accept the expected and desired future of the public administration.

### *4.3. The national debate on emergency flooding/retention areas in the Netherlands*

Since the storm of 1953, which caused more than 1800 fatalities, public authorities have considered flooding to be an existential threat that endangers nothing less than the habitability of the country (Kaufmann et al. 2018). A dominant desired future emerged that focused on safety and protection from flooding and the goal that something similar should 'never happen again', which is reflected in the famous Dutch saying 'the dikes make up the state' (Elzinga et al. 2006, p. 171).

In the 1990s, this desired future of safety was viewed as endangered by the expected future of climate change, sea level rise, and land subsidence, as illustrated by the following quote from the state-secretary de Vries: 'An average warming of 2 degrees is expected in the first half of this century. That's a lot. In the second half of the century, it could be as high as 6 degrees. Sea level rise could vary between 10 and 80 centimetres" (25th Assembly 2001). These expectations are also uncertain: 'Which scenario it will be, we don't know." We must be proactive in taking the precautionary principle into account instead of following the reactive policy approach of the past: 'We must anticipate the future now and not wait until damage is done or perhaps worse' (ibid.). The future is explicitly anticipated (using the future).

Emergency flooding areas are a response to the acknowledgement that there will always be residual risk and that it is 'impossible to eliminate uncertainties completely' (Commissie Noodoverloopgebieden, 2002, p. 13). To address uncertainty and the impossibility of fully preventing floods, emergency flood areas are considered 'airbags' (ibid., p. 1). It is expected that the controlled flooding of these areas will 'lower the water levels downstream sufficiently to avert flood hazards (20–70 cm)' (ibid., p. 15) and reduce damage: 'In a controlled flood, not only is the likelihood of casualties lower than in an uncontrolled flood at an unpredictable location, (im)material damage and social disruption will also be significantly lower' (ibid.). These visions of an expected future represent hydro-technical extrapolations and seem to be trusted. They also seem to imply a standpoint of utilitarian justice as the consequences of flooding are weighed against each other (i.e. controlled flood events in these areas cause less damage).

In 2000, several areas in the eastern part of the Netherlands (e.g. Ooijpolder, Rijnstrangen, Biesbosch) were initially reserved for further exploration as emergency flood areas; this can be understood as a process of making futures. A national cost—benefit analysis—including costs and benefits that are difficult to monetarise (e.g. biodiversity and fatalities)—formed the basis for these decisions. This pattern implies a utilitarian approach to FRM. Development in these areas was restricted: New large scale or capital-intensive spatial developments (such as residential areas and business parks) that could interfere with the emergency flood function or that could cause an environmental disaster (if an emergency flood area were actually used) were not allowed. This making-of-the-future based on utilitarian principles thus has unequal material consequences (currency) for the hinterland (scope) regarding the benefit of reduced risk (currency) for the western part of the country (scope).

Local authorities and citizens did not agree on this 'making-of-the-future'. In 2005, the abovementioned areas were no longer designated emergency flood areas due to public protests and a lack of societal support as well as because the expected effectiveness of these emergency flood areas was insufficiently demonstrated. This shows how the credibility of the expected future could not persist. Nevertheless, some of the areas (e.g. Rijnstrangen in the eastern part of the Netherlands) were still reserved for retention. The government argued that in the context of the expected future of climate change, the discharge capacity of rivers must be increased to 17.000 m3/s by 2050 and 18.000 m3/s by 2100, which might be understood as a quantification of a desired future to increase their manageability and formalise them via policy. The retention areas were, in turn, expected to lower water levels sufficiently to achieve these goals.

### 4.4. Regional debates on retention areas in Rijnstrangen (the Netherlands)

Owing to the uncertainty of climatological and socioeconomic developments from this long-term angle, no definitive decisions about these areas were made as they were deemed ineffective and unnecessary. However, areas such as Rijnstrangen in the eastern part of the Netherlands were reserved to keep all options open. This measure still resulted in consequences for the making of futures because it constrained spatial growth as no developments should take place that could make retention infeasible. After 2050, a decision would be made based on hydro-technical modelling to see what would happen to these areas. Considering this uncertain future, we still envision the 'making of futures' in the form of keeping options open.

Local authorities and citizens did not agree on the future, i.e. retention areas and arrested spatial development. During public participation (where the FRM plans were available for inspection in municipal and provincial offices), angry citizens responded. The complaints were related to a negative sense of an expected future. Individuals felt disproportionately exposed to economic burdens. A farmer was quoted in a newspaper stressing the negative economic outcomes of the ban on development: 'It would be a disaster if we are declared a retention area here for the 18,000 m3/s. Then, everything will go on lockdown, and no economic development will be possible [referring to plans to develop a touristic theme park]' (Media, 2005). Likewise, a dairy farmer described the expected future burdens that frequent flooding would cause: 'You don't just put this [technical equipment] in the attic when a flood comes. If all the equipment becomes flooded, I can throw it away. The area is expected to flood once every 10–20 years. That means I might lose everything every 10 years' (Media, 2005). These quotes suggest that justice concerns are not explicitly referenced in the discourse but that alternative expected futures (i.e. being flooded every 10 or 20 years) are used to discredit the plans of the national government.

Additionally, the uncertainty related to the temporary reservation of retention areas led to burdens (the making of the future). There was fear that the reservation would lower land prices, which would have repercussions for people wanting to sell their homes; a citizen was quoted in the media after an evening of public participation: 'I am left with a lot of questions. For instance, how is it going with compensation? People who have their houses for sale are already suffering damages. Who will buy a house with such future prospects'? (Media, 2005). Additionally, it was expected that farmers would have difficulty obtaining credit from the bank if they wanted to invest in their own companies because it was uncertain if farmers would be able to pay the money back (Media 2005). There were no compensation agreements in place because the measures were not actually implemented yet. Policymakers recognise this justice-based dilemma: On the one hand, compensating someone for shadow damage is undesirable if the damage subsequently disappears because the measure does not go into effect or in a different way. After all, that would mean 'enriching' a landowner at the taxpayer's expense. On the other hand, it is problematic for a citizen to be in limbo until the final choice on the measure is made and possibly suffer damage that is not yet eligible for compensation; this shows how uncertainty and non-decisions can lead to justice consequences, i.e. disproportionately negative consequences for the countryside (Deltaprogramma, 2014, p. 49).

Locals disagreed with the government's anticipation of the future regarding (1) the desired future of how the Dutch landscape should look and who should be protected; and (2) the expected future of the ramifications of climate change. First, locals were less focused on safety issues and the development of nature, which the government prioritised, but they wanted to keep the 'typical Dutch landscape' as a farmer summerised: '[I'm] saddened to see that farmland is increasingly giving way to nature and often wetlands. […] Thinking of Holland, [I see] wide rivers running through endless lowlands containing farms, knotted towers, churches and elms. No wetlands' (Media 2005). Additionally, the focus on protecting the economically valuable downstream areas in the west of the Netherlands is questioned as a representative of a farmer's organisation: 'The focus should not be too one-sided towards economically important areas like the Randstad. That there is differentiation in the plan I can understand, but green space also deserves protection' (Media, 2015). Second, the locals did not agree with the expected future of the national authorities and doubted them. In a newspaper article from 2005, Alderman Peter Putman is quoted as follows: 'Those 18,000 m3/s are based on possible climate change in the distant future. In other words, wet fingers work. Can you base your policy on such uncertain and unreliable expectations? My answer is clear: You cannot! This should not be a reason to designate Rijnstrangen as a retention area and lock it up for development'. Locals did not accept the expected future of the government. Instead of using justice implications to contest government choices, the government's visions of an expected future were doubted and framed as probable, i.e. more uncertain.

## 5. Discussion and conclusion

In this paper, we analysed how anticipated visions of the future (desired, expected, probable) are used to legitimise the unequal distributive consequences of catchment-wide FRM plans for upstream/downstream communities in the Netherlands and Austria. This paper contributes to, and connects, the literature on FRM and justice (e.g. Kaufmann et al. 2018, 2021; Thaler et al. 2020) and the literature on the future and uncertainty in FRM (Haasnoot et al. 2013; Hanger-Kopp et al. 2022). In particular, the issue of which strategies might be useful or selected for one community is strongly influenced by the use of futures, i.e., expected future developments (such as climate change or sociodemographic shifts) (Nordbeck et al. 2019; Clar et al. 2023) and desired futures (e.g., who should be protected). FRM plans have strong implications for distributional justice (Thaler et al. 2018, 2020a; Ciullo et al. 2020; de Göer de Herve, 2022). As for realising retention basins within river catchments, questions about justice and uncertain future developments remain unresolved.

Overall, both countries are similar: (1) flood risk is a serious problem, (2) FRM is considered the responsibility of the state, (3) the focus is on technical engineering measures, and (4) regions can be divided into core and peripheral (the countryside). However, in both countries, anticipated futures are used differently to legitimise the unequal distribution of the burdens and benefits of nature-based solutions between downstream and upstream communities. In the Netherlands, a high-level debate was launched about the potential danger of climate change and how to address it in the future; this future-oriented discussion at the national level is partially missing

in Austria as decisions are largely based on the current risk and not on new future developments (e.g. climate change, land use changes, or sociodemographic shifts) (Nordbeck et al. 2019; Clar et al. 2021). In other words, futures do implicityly play a role, but they are (1) not explicitly mentioned or considered in the decision-making process or (2) the expectation is that the future is like the present.

In both countries, upstream (rural) communities are supposed to shoulder a disproportionate burden of retention measures, such as restrictions on development. In the Netherlands, expected climate change projections, in combination with the desired future to prevent flooding as much as possible, are used to legitimise extreme RRMs (discharge capacity: 18,000 m3/s). The uncertainty of climate change is turned into a potentially apocalyptic risk that could threaten the habitability of the country (the expected future). These expected futures are legitimised by the precautionary principle as they stress the need to control and reduce uncertainty as much as possible. Such anticipations are harnessed in two ways: (1) the desired future is technically quantified (e.g. discharge capacity) to make it more measurable and credible, which helps formalise and stabilise it in policy; and (2) future expectations of climate change are embedded in established decision-making tools (such as cost—benefit analyses) to justify decisions.

The Austrian government, in contrast, has used the current challenge of dealing with flood risk without including potential climate change and land use changes within the designed areas to implement catchment-wide FRM plans. With respect to hydro-climate modelling, FRM plans did not consider a future perspective. However, the future perspective was further discussed in the case of compensation. The public administration and private landowners have hotly debated the issues of how to compensate private landowners as well as the level of compensation. Here, future developments of private landowners (such as the fear of covering additional burdens) are part of an implicit discussion. We also observed a strong linkage to the question of justice. Overall, justice implications have played a stronger role in Austria than in the Netherlands, in the context of compensations.

Local stakeholders in both countries have contested catchment-wide FRM plans; in the Netherlands, they are not explicitly based on implications for justice. It seems that a utilitarian justice principle is widely accepted and largely uncontested in the neo-liberal Netherlands (see also Kaufmann et al. 2018). Hence, locals contest plans by using the future (namely, by strategically framing the expected future as probable, i.e. a more uncertain future), which decreases their credibility. The debate on the anticipated future becomes a proxy debate for justice-based implications. In contrast to Austria, justice-based implications represent an important step in 'fighting' against the realisation of a catchment-wide FRM concept.

In conceptual terms, the implementation of cacthment-wide measures will cause material inequality in the 'making of futures'. In both countries, the debates on decision-making, i.e., 'using of futures' is framed differently. Whereas in Austria the focus is on contesting the desired future, i.e., justice implications; in the Netherlands, the focus is more on contesting the expected future. Still, in both countries the debate on futures and justice remains implicit. This lack of explicit consideration of justice-based concerns may reproduce injustice. This research shows that it is important to consider both justice and the futures in the context of catchment-wide FRM plans and hazard management more broadly. Decisions on the use of catchment-wide FRM plans have long-term consequences, which subsequently have long-term implications for justice.

## CRediT authorship contribution statement

**Maria Kaufmann:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Thomas Thaler:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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