ORIGINAL ARTICLE

Actor-specific adaptation objectives shape perceived roles and responsibilities: lessons from Mumbai's flood risk reduction and general considerations

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Abstract

Adaptation efforts need to be advanced significantly, involving multiple actors and a diverse portfolio of options. Despite this being well established, there is little understanding of different actors' perceptions of adaptation goals and their associated expectations regarding roles and responsibilities to achieve them. In this analysis, we seek to address this gap by elucidating the diverging viewpoints held by various actor groups concerning adaptation objectives, target beneficiaries, and the distribution of roles and responsibilities for adaptation. Here, we use the case study of flood risk in Mumbai, drawing upon qualitative interview data collected through key informant interviews with diverse stakeholders including state, civil society, and academic actors. Interviews revealed stark disparities between state and non-state actors, in particular on the objective of efficiency, largely emphasized by state actors for physical infrastructure measures. Other contested objectives included ecosystem protection and fairness for vulnerable populations. The findings showed consensus on the importance of planning. Non-state actors heavily debated the lack of planning and implementation of institutional changes and ecosystem-based measures. They called for a stronger role of the state in caretaking and fairness for vulnerable populations, mainly through deeper institutional changes. Overall, the findings point to the urgent need for understanding how actors navigate competing priorities, make trade-offs, and negotiate conflicting viewpoints on the distribution of roles and responsibilities. This paper makes an empirical and conceptual contribution to the debates on "social contracts" for adaptation, offering an operationalization of the concept and application to a real-world example through an actor lens.

Keywords Adaptation objectives · Actor-oriented · Roles and responsibilities · Social contract · Flood risk · Mumbai

Introduction

The urgency and need for advancing adaptation efforts significantly in the face of climate change has been well established—in many respects calling for fundamental transformations in the way societies adapt to climate risks (IPCC 2022; Pelling et al. 2015; Revi et al. 2020; Solecki et al. 2017). Cities, in particular, face huge adaptation challenges, not only due to their high exposure to hazards but also because they are characterized by high path dependency, socio-cultural diversity, competing economic and political interests, and multi-actor constellations with very heterogeneous groups (Adelekan et al. 2022; Dodman et al. 2022). Adaptation to the increasing impacts of climate change requires a mosaic of different adaptation measures and collective efforts involving various societal actors, including the state, private sector, civil society, academia, and citizens (Petzold et al. 2023; Wannewitz and Garschagen 2023). In an ideal setting, actors have a shared understanding of common adaptation goals and visions as well as a clear distribution of roles and responsibilities. However, in reality, multi-actor set-ups often reveal conflicting perspectives on the objectives as well as roles and responsibilities for adaptation. Hence, it is important to understand how actors negotiate diverging viewpoints and contestations around adaptation priorities and the associated roles and responsibilities to achieve them.

Previous research has identified conflicts in adaptation priorities and unclear divisions of roles and

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responsibilities as major barriers to adaptation governance (Garschagen 2016; Juhola 2019; Mees et al. 2019; Nalau et al. 2015; Reckien and Petkova 2019). Related literature in this area has identified the concept of "social contracts" as a useful lens for understanding how societies navigate conflicting visions and clashes in roles and responsibilities for adaptation (Adger et al. 2013; Blackburn and Pelling 2018; Doshi and Garschagen 2023a). In assessing social contracts for adaptation, an urgent but often lacking understanding is of the gaps between actors on their perceived adaptation objectives and expectations of roles and responsibilities for adaptation. While it might not be possible to fully align these gaps between actors' perceived objectives and the mutual allocation of roles and responsibilities, we suggest that making explicit the often tacit and implicit differences to at least identify them and become aware of them would allow actors to mediate the differences and deal with the gaps. Hence, laying open these gaps and engaging with the differences would help inform the process as actors navigate competing priorities, make difficult trade-offs, and ideally align their viewpoints and close these gaps.

Given the need for coherent social contracts for adaptation especially in cities, this paper takes the case study of the coastal megacity Mumbai, not only because it is at high risk of flooding due to its exposure to heavy rainfall but also because of socioeconomic and political drivers that contribute to stark disparities in exposure and vulnerability of different actors. Although Mumbai ranks among the top 10 coastal megacities at risk of flooding and is characterized by high pressure to adapt, research shows that adaptation efforts have been inadequate (IPCC 2019; Singh et al. 2021). Studies have emphasized the need for more fundamental, transformative efforts in adaptation to flood risk in Mumbai and a shift away from the status quo (Adam et al. 2021; Mehta et al. 2021a, b). Whether risk reduction and adaptation is deemed transformative or not strongly depends upon whether it brings about "fundamental change in the system configuration" of risk management and is "putting the core of formerly established system configurations into question," particularly regarding the drivers of risk and vulnerability in existing political economies (Solecki et al. 2017). The temporal and spatial extent of the change can be wide-ranging, depending on the context and system in question (see Solecki et al. (2017) for examples). Complex governance constellations, contested socio-economic and political priorities, striking socio-economic inequalities, and unequal power relations make the process of adaptation challenging (Parthasarathy 2016; Weinstein 2019; Zimmermann et al. 2023).

The empirical analysis in this paper expands on our previous analysis (please see Doshi and Garschagen (2023b)) that sought to understand how different actors evaluate

different adaptation options making up their perceived adaptation solution space, in terms of desirability and feasibility. The analysis was guided by a multi-dimensional assessment framework and applied to the context of flood risk management in Mumbai and provided important insights on the way to assessing and shaping coherent social contracts for adaptation. The study presented here builds on this analysis and assesses actors' desired adaptation objectives and expected roles and responsibilities for the different adaptation options identified in the previous analysis (ibid.).This analysis aims to operationalize and assess the core pillars of social contracts for adaptation—adaptation objectives and roles and responsibilities. Please see Doshi and Garschagen (2023a) for the overarching conceptual framing of social contracts for adaptation guiding this analysis.

Against this background, this paper aims to elucidate this issue by addressing two related questions: (1) how do different actor groups evaluate the perceived adaptation solution space in terms of desired/intended objectives and for which target actors, and (2) which roles and responsibilities do they ascribe to which actor(s)? In answering these questions, the paper operationalizes the concept of social contracts into four components: adaptation objectives, target beneficiaries (actors and systems), roles and responsibilities, and ascribed actors. Therefore, this paper aims to contribute to and advance current scientific debates in the following ways: First, to understand social contracts for adaptation by operationalizing the concept and assessing the elements by applying it to a real-world example in the context of flood risk management in Mumbai. Second, to advance the debates on the evaluation of "perceived adaptation solution spaces" by going beyond desirability and feasibility. Third, to contribute to adaptation governance literature, where ambiguity in adaptation priorities and related roles and responsibilities has been identified as a barrier. Finally, it contributes to science-policy debates on the Global Goal on Adaptation, especially informing approaches to understanding actor-oriented perceptions of local adaptation objectives and target actors.

The overall structure of the paper takes the form of six sections. The next section provides the conceptual background and introduces the elements of the conceptual framework guiding this study. The third section gives a brief overview of the case study of Mumbai within the context of its flood risk management drivers and response measures. The fourth section describes the methods employed in this analysis. The fifth section presents and analyses the findings of the research, following the four key elements of this analysis. The final section summarizes the main findings and draws together the empirical and conceptual contributions of the paper with its implications.

Conceptual background

The paper aims to conceptually advance the understanding of social contracts for climate change adaptation, which are crucial for a coherent and transformative approach to adaptation. The study uses a social contracts lens, which is anchored within governance thinking and in which urban risk and adaptation governance are defined as "all modes and institutions by which a city's individuals, social groups and organizations of the state sector and the private domain negotiate their interests, exercise their influence and distribute as well as act upon their responsibilities to manage and reduce urban risk and to enable adaptation across all scales and actors in a city" (Garschagen 2015, p. 608–609). Social contracts have been argued for in the literature as an analytical lens for understanding key issues of adaptation governance (Blackburn and Pelling 2018; Hayward and O'Brien 2010). We define a social contract for climate change adaptation as "a collective arrangement between different actors of a society on the overall vision and goals as well as the mutual distribution of roles and responsibilities to achieve those goals" (Doshi and Garschagen 2023a). In other words, a social contract describes the collective arrangement of what a society wants and the distribution of tasks through which they will be achieved. The definition is inspired, for instance, by Hayward and O'Brien (2010) who asked "what should be secured, for whom and how" (p.211) as well as by Blackburn and Pelling (2018) who highlighted that social contracts are about the contested question of "who" is responsible for "what" in risk governance (p.2). We build on these questions and argue that the "collective" nature of social contracts and the "mutual" distribution of roles and responsibilities emphasize the importance of justice and fair governance while acknowledging that such arrangements require trade-offs that will have to be made between different adaptation goals and visions and trigger negotiations around the distribution of roles and responsibilities. Hence, coherent social contracts for adaptation are understood to be embedded within the boundary concept of risk and adaptation governance.

While the conceptual framing adopted in this paper acknowledges the classical contractarian theory's proposition of the social contract as an outcome of consent (Cress 2006), it suggests a differentiation of two types when applied to the context of adaptation since adaptation often takes place in a socially contested space. A Type 1 social contract describes an arrangement where "actors' visions and perceptions of mutual roles and responsibilities do not align but where actors seek a social contract to precisely mediate these differences" (Doshi and Garschagen 2023a, p.1). This describes the situation in which actors negotiate their potentially diverging goals and visions as well as roles and responsibilities to form a coherent social contract for adaptation. A Type 2 social contract describes an arrangement in which "actors' visions and perceptions on mutual roles and responsibilities align and actors seek a social contract to explicate and formalize this agreement" (ibid.). Each type of social contract may have three dimensions, i.e., the imagined social contract, the practiced social contract, and the legal-institutional social contract (Blackburn and Pelling 2018). The "imagined" dimension describes actors' envisioned goals and expectations of roles and responsibilities. The "practiced" dimension describes the "real-life" goals pursued and the observable distribution of roles and responsibilities (de facto). The "legal-institutional" dimension describes the formally defined goals and visions and legally encoded distribution of roles and responsibilities (de jure) (ibid.) In this paper, we focus on the "imagined" dimension in particular, i.e., the perceived and expected objectives and allocations of roles and responsibilities.

Gaps may exist between the three dimensions, i.e., the practiced, legal-institutional, and the imagined as well as within one dimension, for example, between different envisioned goals and distributions of roles and responsibilities. We acknowledge that while it might not be possible to fully resolve the gaps and contestations, we suggest that making actors' perceptions explicit would at least lay open the gaps and allow actors to engage with these differences and find an arrangement to deal with the gaps (i.e., form a Type 1 social contract) or ideally even inform the process of closing these gaps and aligning the diverging views (i.e., a Type 2 social contract). Hence, by conceptually operationalizing the understanding of social contracts for adaptation into these four elements in this analysis, the paper aims to inform the debate and "formation of at least Type 1 and ideally Type 2 social contracts on climate change adaptation in cities and beyond" (Doshi and Garschagen 2023a). For more details on the conceptualization of social contracts for adaptation, please see Doshi and Garschagen (2023a).

The above definition is operationalized in terms of four key elements that guide the empirical analysis in this study: desired adaptation objectives, target beneficiaries—actors/systems, roles and responsibilities for adaptation, and actors ascribed with roles and responsibilities. These four elements are assessed here in the context of the adaptation options identified and evaluated by actors described in the previous analysis (Doshi and Garschagen 2023b). The conceptual framework below (Fig. 1) provides an overview of how the four elements together with the previous analysis on the multi-dimensional evaluation of adaptation options (Doshi and Garschagen 2023b) contribute to the overarching aim of the study in understanding and assessing social contracts for adaptation.
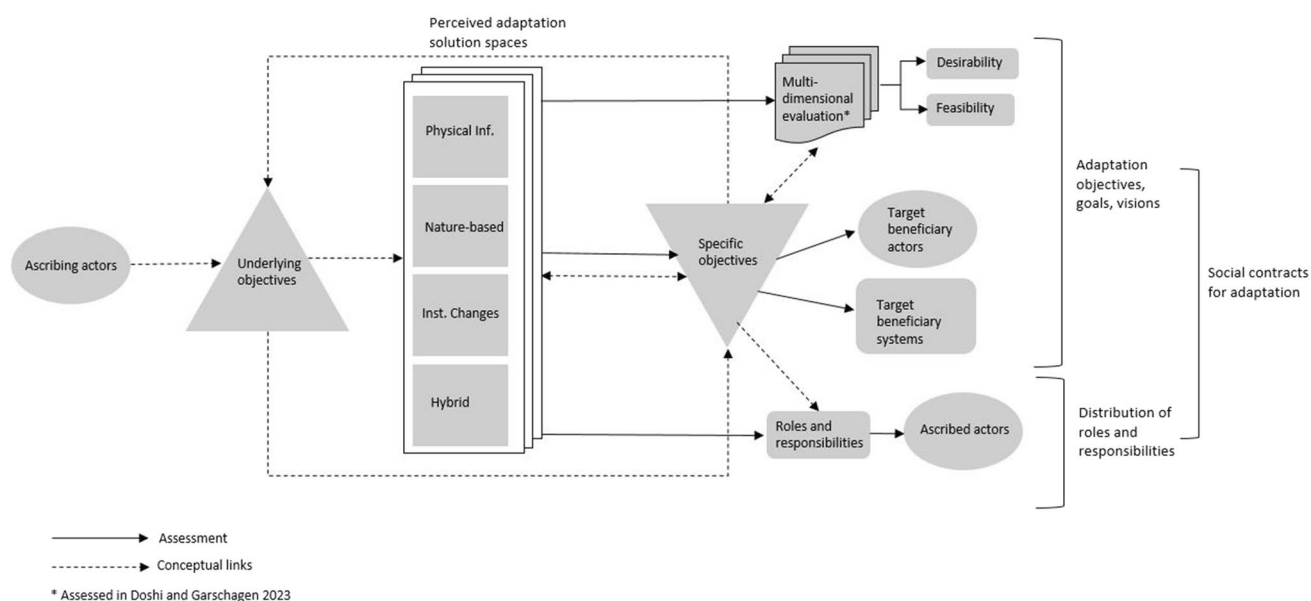
Fig. 1 Conceptual framework guiding the actor-specific assessment of social contracts for adaptation

The adaptation options could be broadly categorized into physical infrastructure, natural infrastructure, institutional changes, and hybrid measures (referring to a combination of one or more of the previous categories). Given the context-specific and "socially constructed" nature of adaptation solution spaces, we adopt an actor lens in this study (Haasnoot et al. 2020). Hence, the above-mentioned four elements are assessed from the perspectives of different actors in the empirical context of flood risk management in Mumbai.

Overall goals and visions for adaptation are operationalized through understanding actors' desired adaptation objectives, or in other words the question "adaptation for what." These objectives are seen to reflect the normative understanding of what actors want to achieve through adaptation or the process of adaptation, acknowledging that the goals of adaptation can be both to "be well-adapted" or to "adapt well" (Downing, T, cited in Tschakert and Dietrich 2010, p.2). Actors' desired adaptation objectives reflect their adaptation needs and priorities, which may stem from political, economic, social, and cultural factors. We differentiate here between two types of objectives: one, actors' underlying objectives that might influence the identification of adaptation options that make up the perceived solution space of an actor in the first place. Second, specific objectives that actors might have for the identified adaptation option. We focus on the specific objectives in this analysis, i.e., the objectives that actors might have for individual different adaptation options. Actors' objectives for adaptation might be influenced by their values, beliefs, and priorities that relate to other development challenges as well. For example, civil society actors working in the environment sector might have

different objectives than those working in the humanitarian sector. Similarly, for state actors, competing priorities for urban development, political feasibility, and financial constraints could influence adaptation objectives. Furthermore, objectives can be both process-based, e.g., fairness through an emphasis on procedural justice, or output-based, e.g., efficiency in terms of minimizing costs. Adaptation objectives are closely linked to effectiveness and depending on which objective is pursued, influence how the effectiveness of adaptation options is evaluated and interpreted (Singh et al. 2022). The eleven frames of effectiveness deductively inform our assessment. Please see the "Methods" section and "Results" section for deductively and inductively identified adaptation objectives from the empirical findings.

It has been well established that climate change impacts different actors and systems differently (due to differing exposure and vulnerability) and that different actors and systems have different capacities to adapt to the impacts of climate change (Araos et al. 2021). Closely related to the element of actors' desired adaptation objectives is the question of "adaptation for whom" (equity-related) (Reckien et al. 2023). These questions are operationalized through "target beneficiaries—actors/systems." Here, by "whom" we refer to actors for whom the objectives are intended to benefit rather than counting individual beneficiaries. In order to avoid taxonomical confusion with "for what" (used above for actors' desired adaptation objectives), "for whom" refers to both actors as well as systems that are intended to benefit from the adaptation measures. This could refer to different actors such as the state, citizens, private sector, and academia or systems such as the natural ecosystem.

Previous literature suggests that clearly defined roles and responsibilities for actors are an important prerequisite to delivering effective adaptation (Fünfgeld 2010; Juhola 2019; Garschagen 2016; Mees et al. 2012). While it is important to clarify which adaptation objectives are sought and for whom, it remains equally important to address "what constitutes the fair governance of those adaptive transitions" (Pelling et al. 2015). In other words, the question then becomes, who is ascribed with which roles and responsibilities to achieve those objectives. Roles and responsibilities have been used differently in various studies in the adaptation context and remain fuzzy, e.g., often used interchangeably or without a clear definition (Juhola 2019; Mees et al. 2012; Reckien and Petkova 2019). In the context of this study, roles refer to "an actor's general position or function within a larger social system and in a certain process, here, climate change adaptation." (Petzold et al. 2023) Responsibilities are defined as the "specific tasks and duties that come with roles" (ibid.). In order to structure the assessment of roles and responsibilities, we draw on the categories by Petzold et al. (2023) which identifies seven categories—assessing, awareness raising, planning, financing of measures, implementing, coordinating interaction, and monitoring and evaluation. At the same time, being open to new impulses emerging inductively from the empirical data, we include categories of roles and responsibilities such as capacity building, maintenance, regulation and enforcement, engagement and communication, and "not mentioned" for ambiguous descriptions of roles and responsibilities (see Table 2).

The element "ascribed actor(s)" here refers to the actor or actor constellations that the ascribing actor assigns the identified adaptation role to. Actors may ascribe roles and responsibilities to different actors, ranging from state, private, civil society, citizens and academia, constellations thereof, or even to themselves (self-responsibility). The specific actor or actor groups may vary across different adaptation options, spatial scales, over time, etc., and be influenced by contextual factors such as institutional arrangements of the place, risk perception of the ascribing actor, and own capacities. Given the political and financial implications of adaptation (e.g., who bears the burden of the impacts of climate change in terms of economic losses or health damages, costs of adaptation interventions), actors may often remain ambiguous on the mutual allocation of roles and responsibilities for adaptation to different actors. Unclear distributions of roles and responsibilities have been identified as a major barrier in adaptation governance. Therefore, it is of urgent importance to make explicit and understand actors' expectations of roles and responsibilities for adaptation from different actors or themselves.

Case study

We use the case study of Mumbai, a high-risk coastal megacity in India that ranks among the top 10 coastal megacities with the highest exposure of population and assets to flood risk globally—both in today's as well as in future rankings (Hanson et al. 2011). The city experienced its worst flood in 2005 when 944 mm of rainfall fell within 24 hours (Hallegatte et al. 2010). However, flooding is a regular phenomenon during the city's annual monsoon season (The Guardian 2014). Not only is Mumbai at high risk driven by changes in hazards and exposure but also because it is confronted with high vulnerability (Chatterjee 2010; de Sherbin and Bardy 2016; Weinstein 2019). The city is characterized by stark inequality, with a highly powerful and wealthy small urban elite on the one hand, while on the other hand, over 40% of the city's socio-economically vulnerable population lives in informal settlements, often in flood-prone areas (Census of India 2011). This inequality is reflected in the differences between individuals' exposure and vulnerability as well as adaptive capacities to flooding (Patankar 2015). Besides being characterized by high adaptation pressure, Mumbai being the commercial capital of India receives a lot of attention in political and financial terms—suggesting high adaptive capacity in principle (The Financial Express 2022). However, while Mumbai's flood risk is driven by climate change, it is also strongly influenced by the political economy of urban development in the city, for example, market-driven interests (Adam et al. 2021; Movik et al. 2023; Parthasarathy 2003). Examples of anthropogenic drivers of flood risk in Mumbai include surface soil sealing that resulted in a loss of natural ecosystems and floodplains, inadequate solid waste management, and drainage infrastructure that leads to waterlogging (Gupta 2007; Hallegatte et al. 2010; Pattaroni et al. 2022).

Our previous analysis showed that the current landscape of flood risk management in Mumbai is highly contested—embedded in deep divides between different actors and their perceptions of adaptation solution spaces (Doshi and Garschagen 2023b). State-led formal flood risk management approaches are heavily based on physical infrastructure measures such as the maintenance and upgradation of the stormwater drainage system (BRIMSTOWAD) that acts as the city's central response mechanism to flooding. While this is important in the city's flood risk management, civil society and academic actors strongly emphasize the need for institutional changes in urban governance such as reforms in land use planning that prioritize ecosystem services and policies for affordable and safe housing for vulnerable populations who are often displaced in the implementation of large infrastructure projects. Vulnerable populations are often adapting autonomously, employing

informal measures such as raising floor heights, elevating valuable goods, and building temporary flood barriers at the door entrance. While there is convergence between different actors on the desirability of ecosystem-based measures in principle, such as protection of mangroves, wetlands, and salt pan lands, civil society and academic actors also highlight the major constraining role of political and economic interests in implementing such measures.

Against this background, understanding actors' adaptation objectives and priorities and how they envision achieving them, i.e., the distribution of roles and responsibilities, is of high importance. Most recently, conflicting priorities became visible in the case of the Coastal Road, a highly contested infrastructure project, that was advocated by the state in reducing congestion and acting as a seawall (Movik et al. 2023). However, civil society and citizens perceived it as a project benefitting the urban elite and meeting real estate interests at the cost of harming shoreline ecology and disrupting fishing communities (Mumbai Mirror 2019). Questions of whose voices hold influence are shaped by processes such as political-economic relations and of high relevance in a city like Mumbai where almost half of the population lives in informal settlements and is characterized by heterogeneity and related societal fragmentations along the lines of religion, language, gender, caste, income, migrant status, etc. (Shaban and Aboli 2021).

Contestations in formally defined plans and policy documents, i.e., gaps between the "legal" and "practiced" / "imagined" dimensions of social contracts, can also be seen. Gaps between formally defined objectives in different policy instruments are a challenge—such as the aim to reduce the effects of flooding in Mumbai's Vision 2030 but the absence of demarcating flood-prone areas in the Development Plan 2034 or dilution of the CRZ regulations that intend to protect coastal areas. Gaps and ambiguities in formally defined roles and responsibilities for disaster management have also been questioned, most recently visible during the pandemic (Bhide 2021). Similarly, the division of roles and responsibilities of state and non-state actors, for example, between the core national legislation on disaster management and national urban flood management guidelines, also suggests some mismatches (Chhotray 2014; GoI 2010; Pandey 2016).

Methods

The empirical findings presented in this paper draw on qualitative data collected through 37 semi-structured interviews with key informants and stakeholders across actors from the state (11), civil society (12), and academia (14), working on flood risk management in Mumbai. Key informants were initially identified based on a literature review and then

through purposive and snowball sampling. State actors were specifically selected as informants because they form the key decision-makers that drive the dominant paradigm of flood risk management in the city and to understand firsthand their concerns, priorities, challenges, and perceived roles and responsibilities in flood risk management. These included officials, for example, from the city's civic authorities (Municipal Corporation of Greater Mumbai), planning organization (Mumbai Metropolitan Region Development Authority), and departments of the state government of Maharashtra that could provide expertise in relation to planning, legal regulations, infrastructure development, etc. Civil society actors were selected as informants as they can speak to the concerns of some marginalized groups. While they are taken as proxies in this case, it is essential to acknowledge that they might have their own political agendas and biases that are hard to identify. Hence, the voices of the civil society actors, mostly including NGOs working at the local level, cannot be read as representative of "public opinion." For this, it is important to triangulate the findings from this analysis using different methods to capture other groups, for instance, using social listening for large Twitter data (Doshi and Garschagen 2023a), household surveys, participatory observation, etc. Civil society actors interviewed were individuals working across a range of issues, such as environmental justice, social vulnerability in informal settlements, and ecosystem protection, mostly from NGOs working at the local level. Academic actors were selected as informants in particular because they could probably be the closest to innovative and new approaches for adaptation to flood risk and provide an overview of changes from past to current, and directions for the future. Academic actors interviewed were often professors and senior researchers at universities and think tank organizations. While the study could not include perspectives of at-risk communities at this stage due to COVID-19 pandemic–related travel restrictions for fieldwork, in the next step of this research, we aim to triangulate the findings with data collected through a household survey with communities and surveys with small- and medium-sized enterprises that are at risk of flooding. The sampling process could not identify specific private sector actors as key informants (especially looking for larger companies that might play a role through "corporate social responsibility" initiatives); yet, this is acknowledged as a step for future research.

The transcribed interviews were analyzed using in-depth qualitative content analysis (Mayring 2000) and coded following a grounded theory approach with inductive as well as deductive codes in Maxqda (Glaser and Strauss 1967). The findings from individual adaptation-related measures identified by actors are aggregated to broader categories of context-specific adaptation options such as BRIMSTOWAD drainage infrastructure,

ecosystem-based adaptation, and measures targeting improved governance. The multi-dimensional evaluation framework is presented at the broader level of adaptation options (219 in total). These categories of options are further combined into meta-level categories of options— grey/physical infrastructure, green/natural infrastructure, institutional changes, and hybrid. These categories are inspired by the IPCC's Sixth Assessment report (IPCC 2022) but informed by the data.

The interpretations of the findings are also informed by participant observation at various stakeholder consultations conducted in the frame of this research project and the development of the Mumbai Climate Action Plan (MCGM 2022). This paper does not impose normative criteria or understandings of what adaptation objectives should be or for whom. Instead, adopting a grounded theory approach, the analysis is informed by both the deductive application of guiding principles for effectiveness (Singh et al. 2022) and roles and responsibilities (Mees et al. 2012; Petzold et al. 2023) discussed in the literature. But equally importantly, it aims to understand inductively what objectives and roles actors in the Mumbai case emphasize for the different adaptation options that they identified in their perceived adaptation solution space. This allows us to capture context-specific and actor-oriented gaps and contestations. It also allows us a more granular understanding of where gaps lie in local adaptation contexts. Hence, the approach differs from most previous studies that apply only normative criteria identified in the literature to large N studies against which adaptation options are assessed by the researchers. Here, we aim to show how actors assess different adaptation options for objectives they prioritize and for whom. Furthermore, we assess which roles

and responsibilities actors identify and ascribe to whom for the different adaptation options.

Results

In this section, we present results from the Mumbai case study to illustrate and explore the conceptual elements introduced in the "Conceptual background" section.

Adaptation objectives

Overall, we observed eight main categories of adaptation objectives (see Table 1). Actors identified two types of objectives—one, as normative goals (e.g., to protect ecosystems) and some emphasizing process-based objectives (e.g., fairness through participatory planning). Despite the overlaps and potential synergies between some of the objectives, given that the specific focus of each objective is sufficiently distinct, we present them separately. It is important to point out that some objectives are not at the same taxonomical level, e.g., reduced risk and transformative change.

In total, across all three actor groups, the strongest emphasis was on ecosystem protection and improved governance. However, we observed large gaps in the extent to which different actors emphasized different objectives, reflecting the diverging priorities of different actor groups. For civil society and academic actors, caretaking, ecosystem protection, fairness, and improved governance accounted for a large majority of their desired objectives. In contrast, the same objectives were emphasized to a much lesser extent by state actors. Overall, non-state actors indicated the strongest desire

Table 1 Overview of adaptation objectives, indicator and relevant adaptation options identified in the analysis

	Type of objective	Indicators identified	Examples of adaptation options
1	Caretaking	Ensuring physical and social safety, livelihood security, improving health and well-being	Improved early warning systems, safe and affordable public housing, and social protection measures
2	Ecosystem protection	Restoring ecological health and services, valuing ecosystem functions, strengthening environmental legislation	Protection of mangroves, creeks, wetlands; rejuvenation of the Mithi river, re-evaluation of land use plans for ecosystem protection
3	Efficiency	Halting capital-intensive projects, shifting away from the profit motive, optimizing resource allocation	Upgrading of the drainage system, investment in large infrastructure projects, optimizing allocation of resources for flood protection infrastructure
4	Fairness	Distributive justice, procedural justice, spatial equity, inter-generational equity	Investment in public transport, participatory planning, inclusive policies for housing
5	Improved governance	Accountability, policy coherence, transparency, strengthened institutions	Increased collaboration between stakeholders, changes in planning norms, broadening skills for risk management
6	Reduced risk	Reduced exposure, reduced vulnerability, addressing increasing hazard intensities	Retrofitting infrastructure, changing building regulations, flood barriers such as dykes
7	Transformative change	Change from a resistant approach, change from a colonial mindset, broaden approach of understanding the problem and solution space, shift from superficial changes to deeper, long-lasting measures	Revision of the bureaucratic view of risk management, open and participatory process for debates on transformation, change in risk perception
8	Not mentioned/Unclear	Where the desired objective was not clear	NA

for transformative change, through suggestions of major institutional changes in the way flood risk is managed and governed. State actors largely prioritized risk reduction primarily by addressing exposure to flood risk, with measures that did not call for fundamental changes or shifts from current approaches to flood risk management. However, we also observed ambiguity or absence of explicit objectives in some cases.

Efficiency was the most common denominator in the contestations between state and non-state actors. State actors argued for efficiency largely through physical infrastructure measures, whereas non-state actors argued against efficiency through physical infrastructure measures because of its focus on increasing profit and achieving short-term impacts at the cost of their desired objectives of ecosystem protection, fairness, caretaking, improved governance, transformative change, and even increasing risk in some cases. One civil society actor succinctly captured the conflict between efficiency and ecosystem protection and said "Mumbai's solution is to allow soak to take place – but the real estate business cannot make money from soak. They can make money only from cement" (R4, a leading activist and founder of a national level NGO). However, justifying the objective of efficiency, one state interviewee emphasized the need to optimize the allocation of limited resources in consideration of India being a developing nation and having other priorities as well. Pointing out the contestation between efficiency and fairness in terms of procedural justice, one civil society actor emphasizes the need to make trade-offs (R25, a leading member of a locally based NGO). The actor suggested that instead of making the Mumbai Climate Action Plan quickly within a few months, state actors should have made it a longer process but ensured that diverging sections of society were consulted and provided a space where contradictory voices could be played out. The emphasis here is on achieving fairness in the process—"and either people agree with it or don't agree with it and then that will be a different process but that means opening yourself up..that means being able to accept that we will have vulnerable points..where people can attack us on some of these solutions.." (R25, a leading member of a locally based NGO).

Ultimately, one academic actor noted "we are working towards a very different goal and I think that is the way development planning in Bombay is happening because certain interests.. and if that is the case" then all adaptation efforts are "just kind of a greenwash" (R29, senior researcher at a major institute). This view of "so-called adaptation projects" such as river beautification or re-development of informal settlements and their relocation as ways to open up "prime land" which were rather geared towards profit-making and maintaining the status quo (R29) was also shared by some other non-state actors. Thereby resulting in the actor's desired objective for transformative change, e.g., through strengthened legislation and planning norms. While most actors emphasize the need for

having clear goals and visions, one academic actor also cautions against having vision statements that are "too centered around the aspirations of a very small group of people or one person" and calls for a more collectively informed expression of what the city wants driven by goals and targets as opposed to "catchy statements" (R10, another senior researcher at a major institute). Hence, these findings underline the need in the literature for increased attention to the politics of adaptation and the "geographies of power and agency," i.e., the processes that influence who gets to decide whose desired objectives count, whose voices are heard, and whose oppositions would make a difference (Blackburn and Pelling 2018).

The conflicting views between actors suggest the need to make trade-offs and negotiate competing priorities, discussing questions such as "how do you arrive at a fair and just exchange of land that's needed for public infrastructure projects to the people that are living there?" (R20, assistant professor at an international university) These negotiations bring to the fore important issues of equity such as entitlement and who deserves what—e.g., should slum dwellers get better, affordable, and secure housing, paradigmatic shifts in mindsets of viewing the informal populations as the "other" and viewing them as "encroachers" and not as citizens, and ultimately power structures of whose objectives and for whom matter, despite whether middle-class groups or marginalized communities oppose them. The findings showed that laying out clearly what actors' adaptation objectives are and for whom they are envisioned can inform the discussion on the distribution of roles and responsibilities.

Target beneficiaries—actors and systems

On the question of targeted actors or "for whom" the desired objectives were identified, our findings revealed significant patterns. While target actors such as people, state, and civil society formed the largest share, a significant share of desired objectives were envisioned for entities such as ecosystems and the city of Mumbai in general. In many cases, actors remained ambiguous or did not identify specific target actors. While some actors used "people" as a homogeneous category, other interviewees specified distinct sub-categories such as citizens, vulnerable people (e.g., migrants, slum dwellers, fishing communities), and rich people (e.g., middle classes, elites). Most actors wanted improved governance mainly for the state, people, and civil society organizations. The desired objectives of fairness and caretaking broadly showed consensus among ascribing actors and were almost unanimously envisioned for people, particularly vulnerable populations. Similarly, ecosystem protection was unsurprisingly emphasized for different ecosystems such as creeks, wetlands, and mangroves. In comparison, efficiency, transformative change, and reduced risk revealed more contested and unclear patterns. For increased efficiency, while half the cases were associated with the state, the remaining cases were ambiguous. Target actors for

transformative change have been mixed, with no clear pattern emerging among diverse actors. Finally, the desired objective of reduced risk (in terms of hazard intensity and exposure) was the most unclear in terms of target actors. This ambiguity could be due to multiple reasons, e.g., the political nature of the question (as it indicates potentially who benefits and who bears the burdens of adaptation) or it remains contested.

Many civil society and academic actors noted the conflict between the state and private sector actors whose interests around real estate, profit-making, large infrastructure projects, etc. are largely intended to benefit the state, real estate groups, and elite or upper middle-class residents of Mumbai. On the other hand, they raised concerns on the question of entitlement and who deserves what. They argued for caretaking and fairness for vulnerable populations by providing affordable housing, social safety nets, and preventing livelihood disruptions, fair resettlement and relocation, etc. To that, some civil society actors pushed for recognizing slum dwellers as citizens and not "encroachers" or "encroachments," as is the common vocabulary referring to informal settlements or slum dwellers in practice as well as formal policy documents. In this regard, some civil society actors noted the deeper change required in this regard of dismissing the limits of imagination, viewing the informal as the "other," questioning the role of the city and its fundamental configurations, and constructing compassion and

respect for people living in urban slums. Hence, while these debates revealed the contestations around target beneficiaries, they also underlined the importance of making explicit not just the desired objectives but also the associated beneficiaries.

Roles and responsibilities

In total, we identified eleven major categories of roles and responsibilities from the data. While we found significant overlaps with categories identified by Petzold et al. (2023), our inductive coding also yielded three additional categories—capacity building, regulation and enforcement, and engagement and communication. Table 2 provides an overview of the different roles, responsibilities (types of activities), and examples of adaptation options in the context of which they were expressed.

We observed significant differences between different ascribing actors in terms of the roles that they emphasized for the different adaptation options they identified. Academic actors strongly emphasized planning within their perceived solution space, followed by assessing, implementation, and ambiguity. Among all actor groups, academia placed the strongest emphasis on awareness raising, capacity building, and monitoring and evaluation for adaptation to flood risk in Mumbai. Civil society actors strongly emphasized

Table 2 Overview of roles, responsibilities, and relevant adaptation options identified in the analysis

	Categories of roles and responsibilities	Types of activities	Examples of adaptation options
1	Assessing	Research; impact assessments; knowledge generation	Climate stress tests for infrastructure projects; research on "sponge city" measures; social impact assessments for projects
2	Awareness raising	Action-oriented research; engagement with other stakeholders;	Early warning systems; sensitization of citizens and state actors on climate change
3	Capacity building*	Training; engaging with stakeholders	Training people in following early warnings
4	Maintenance*	Repair, rejuvenation, cleaning	Revival of drainage system; lake cleaning
5	Planning	Policy-making; coordination; collaboration	Social security support for migrants; provide affordable housing; land use planning regulations to prioritize urban green spaces
6	Monitoring and Evaluation	Controlling; evaluation	Re-evaluation of land use plans, monitoring of drainage cleaning
7	Regulation and Enforcement*	Stronger enforcement of existing regulations; changes in planning norms	Legal protection for the urban poor; declaration of low lying flood plain areas as no development zones
8	Engagement and communication*	consulting; influencing; pushing governance	Creating a dialogue between civil society and city planners; encouraging youth participation in politics
9	Implementation	Execution; construction; setting up	Waste management system for informal settlements; (stop) implementation of retention walls along drainage lines
10	Financing and Investment	Allocation; budgeting	More investment in disaster preparedness; more investment in mangrove protection
11	Not mentioned*	Ambiguous description of roles and responsibility; not mentioned or unclear	NA

*Categories that emerged inductively from the data

planning, similar to academic actors, followed by an emphasis on implementation. In comparison to other actors, civil society actors placed the strongest emphasis on regulation and enforcement. Both actor groups placed stronger emphasis on the importance of engagement and communication, financing, and maintenance in comparison to state actors. Many state actors placed significant emphasis on implementation and planning for adaptation. In contrast to academic and civil society actors, we found a weak prioritization of awareness raising, capacity building, engagement and communication, financing, and maintenance by state actors.

Overall, we found the strongest emphasis and consensus among all ascribing actors on the role of planning for adaptation in the context of flood risk management in Mumbai. Under planning, examples of typical responsibilities that actors mentioned were policy-making, coordination, collaboration, etc., and referred to options such as social security schemes for migrants, providing affordable housing for slum dwellers, changing land use planning regulations to prioritize urban green spaces, etc. The role of implementation was the most contested by different actors. For physical infrastructure options, civil society and academic actors expressed their strong disagreement on the implementation of physical measures such as the Coastal Road and drainage retention walls which they viewed as ineffective in reducing flood risk, with even the potential for increasing exposure and vulnerability of fishing communities living along the coast and informal settlement along drainage lines. Non-state actors heavily debated the implementation of institutional changes and ecosystem-based measures, highlighting challenges confronting land use planning and governance reforms that are deeply entrenched in the political economy of Mumbai, such as path dependencies, commercial interests, and political relations. Civil society and academic actors identified the broadest range of roles and responsibilities for institutional adaptation measures, such as assessments for designing "climate stress-tests" for infrastructure projects, awareness raising for sensitizing citizens to early warning systems, planning and monitoring, and evaluation of land use reforms. Finally, we identified a certain degree of ambiguity for roles and responsibilities in the case of roughly 10% of the perceived solution space. The contestations and gaps in ascribed roles and responsibilities can be linked back to actors' objectives (both underlying and specific).

Ascribed actors

Our findings reveal significant patterns in terms of which actors were ascribed to take on what role. Overall, state actors were the most frequently mentioned actor group perceived as responsible for different roles in adaptation to flood risk in Mumbai—especially planning, implementation, financing, and regulation and enforcement. Not only were they ascribed roles and responsibilities by other actor groups, i.e., civil society and academia, but they also perceived themselves being the main actor that plays a role in adaptation to flood risk in Mumbai. The difference, however, lies in the type of adaptation options that the actor groups identified and ascribed to the state. Civil society and academic actors mainly assigned different roles and responsibilities for nature-based options and institutional changes to state actors. They frequently assigned the city authority (Municipal Corporation of Greater Mumbai) with the primary responsibility as many drivers and impacts of flooding related to civic infrastructure and services such as drainage, waste management, and water supply. Some academic and civil society actors emphasized the role of planning departments to be of central importance and especially the need to understand the heterogeneity between planning for a "basti" (slum) vs a housing society. They called for a stronger role of the state in planning, financing, and caretaking for vulnerable populations and not expecting or leaving it to the private sector under their CSR mandate or some NGOs to give money. Some academic actors questioned the larger overall role of the state in looking out for the vulnerable and called for investigations into why the role of the state has shrunk under the influence of World Bank policies and other international aid programs. State actors themselves self-ascribed roles and responsibilities such as planning, implementation, and financing for physical infrastructure measures. One state actor viewed the role of the state, especially the MCGM as the only and main actor that plays a role in flood risk management in Mumbai (R8, leading official in the municipal authority). The wide gaps in roles and responsibilities ascribed to the state originate largely due to the different perceived adaptation solution spaces.

The roles and responsibilities associated most frequently with civil society actors included engagement and communication, and planning. Actors overall called for a stronger role by citizens in planning, and civic engagement in the form of holding state actors accountable beyond expressing their frustration on social media and awareness raising. Some civil society actors attribute the weak role of citizens, especially of the middle-class and elite groups to a sense of apathy, lack of clear instructions for citizens, lack of belongingness or ownership of the city, etc. However, civil society actors also share their concern for the most vulnerable people who are just struggling to survive in the city, to "ensure that your daily bread is in place" (R3, a journalist and writer at a think tank organization) which leads people to get used to problems and continue working despite hardships, often referred to as the resilient "Mumbai spirit" (R1, a leader in a locally based NGO). The findings revealed little mention of the role of private sector in adaptation, suggesting that actors did not perceive the private sector to have major responsibilities in adaptation. These findings underline the importance of a clear distribution of roles and responsibilities for adaptation.

The role of academia was largely seen in raising awareness and conducting and supporting risk assessments, monitoring and evaluation, consulting state actors, and supporting coordination, collaboration, and capacity building in planning processes. Finally, actors also acknowledged the challenge of ambiguity and clarity in who is responsible for what in flood risk governance. One civil society actor for example raised concerns about assigning the private sector to take responsibility for maintaining a stretch of the Mithi in the Bandra Kurla Complex under the CSR mandate but acknowledges the problem of formally defined ownership—"…but who do it? And when to do it and how to execute it? This is the question. Because the ownership of the river itself is not clear in the country" (R13, assistant professor at a major institute). Another source of ambiguity lies in the gaps between what roles and responsibilities may be formally defined and assigned to actors and what happens in practice on the ground. One civil society actor suggests that the ambiguity may even remain "you keep that grey area, the ambiguity, and everyone is taking advantage of that ambiguity, you know, because it's lying there and everyone wants to just push the ball in each other's court" (R13, assistant professor at a major institute).

Discussion and conclusion

The findings presented in this paper help to improve the understanding of actor-oriented adaptation objectives and roles and responsibilities for adaptation in the context of urban flood risk in Mumbai. The study shows that adaptation objectives and the distribution of roles and responsibilities to achieve them are negotiated in a contested space. This research is embedded in the context of the emerging need to understand how societies will achieve a coherent social contract for adaptation—by agreeing not only on which goals and visions different actors want for adaptation but also how they want to get there—i.e., who is expected to play which roles and responsibilities.

The findings demonstrate that there are currently huge mismatches in adaptation objectives, target actors, perceived roles and responsibilities, and ascribed actors between state actors on the one hand and civil society and academia on the other. The findings suggest that these contestations are rooted in the political economy of the overall development of Mumbai. Confirming previous literature, a major driver shaping urban development in Mumbai is asymmetric power relations that influence land use planning and policy-making (Pattaroni et al. 2022). Past studies show that the heavy pressure on land uses in the city results from competing demands due to vested interests of powerful real estate lobbies, housing shortages for almost half of the population that lives in informal settlements, protection of ecosystems such as mangroves and wetlands, and infrastructure projects to meet the

civic needs of the city (e.g., the diversion of the Mithi River for the construction of the airport) (Chattaraj 2019; Doshi 2019; Mehta et al. 2021a; Weinstein 2019). State actors prioritized physical infrastructure measures such as drainage retention walls and underground holding tanks to ensure efficiency and reduce physical exposure to flooding. Although not explicitly mentioned by state actors, civil society and academia indicate that these measures are largely intended to benefit middle-class and elite residents of the city and closely connected real estate builders and contractors. This prioritization of "grey" infrastructure measures is in line with the current literature that shows how such measures dominate and constitute the traditional approach to flood risk management (Jones et al. 2012), yet received concerns for potentially giving a false sense of security, requiring significant investments and potentially having drastic impacts, for example, in the case of a collapse of dams or dykes (Apine and Stojanovic 2024; Depietri and McPhearson 2017). Empirical data also suggests that a major challenge in urban development for planners and policy-makers is dealing with path dependencies of past developments, such as land reclamation projects and built-up areas that generate high runoff and are "locked in" due to the difficulty of easily undoing "hard" infrastructure developments. At the same time, it is certain that state-led top-down structural adaptation is required for a city like Mumbai. Nevertheless, the findings show that it should not be the only one and rather complemented with bottom-up soft adaptation.

In contrast to state actors, civil society and academic actors laid a stronger emphasis on ecosystem-based options such as mangrove protection and institutional changes such as changes in land use planning regulations for achieving the objectives of ecosystem protection, caretaking, fairness, and improved governance. These objectives are intended for ecosystems and vulnerable groups such as slum settlements, migrants, and fishing communities. The findings emphasize the urgent need for two things in designing effective adaptation portfolios for achieving coherent social contracts for adaptation—first, arriving at the "right mix" of measures (Doshi and Garschagen 2023b; Jongman 2018). Second, the "right mix" will vary across space and time and differ for different actors—because of this, understanding and negotiating different and potentially divergent actor perspectives will be crucial. These aspects pose a central challenge for risk and adaptation governance (Molenveld et al. 2020).

In total, across all adaptation options, planning was the most strongly emphasized role by all actors. The biggest contestation on roles and responsibilities for adaptation was identified around the planning and implementation of physical infrastructure measures and institutional changes. The findings reflect the divide between civil society and academic actors on the hand, who call on state actors to stop planning and implementation of such physical infrastructure options and strongly

modify land use planning norms, for example. On the other hand, state actors recognized themselves (self-responsibility) as playing the most important role in flood risk management through their roles in planning, implementation, and financing of physical infrastructure measures. However, while formal planning is an important and intrinsic part of adaptation governance, informal arrangements will also play a crucial role in Mumbai, given that almost half of the city's population lives in informal settlements (Chattaraj 2019; Satterthwaite 2011). In terms of ascribed actors, the largest expectation was from the state actors. Civil society and academia were ascribed different roles such as awareness raising, engagement and communication, assessing, and capacity building to themselves and citizens. While actors were more explicit on what needed to be done (roles and responsibilities), there was more ambiguity on the question of who should do it, especially noted in planning, assessing, regulation, and enforcement.

These findings are problematic given that the current approach of formal state-led flood risk management dominated by physical infrastructure measures is currently highly contested and in stark contrast to what civil society and academic actors are calling for—namely major institutional changes and ecosystem-based adaptation (Chouhan et al. 2016; EPW 2015; Movik et al. 2023). The gap between the non-state actors' envisioned objectives and their enforcement could be explained by a strong gradient in power relations, for example, through differences in the capacity to envisage and enact, the lack of power to make decisions, determine financial priorities and allocations, and lack of opportunities and spaces for meaningful participation and voicing concerns in formal planning processes. This is important considering that actors currently need to negotiate entirely different, and potentially even conflicting underlying priorities of securing efficiency, reducing physical exposure, and addressing flood hazard intensities that are aimed at benefitting actor groups such as the state, private sector, and wealthier citizens vis-à-vis caretaking, ecosystem protection, fairness, and improved governance that are targeted towards protecting the environment and vulnerable groups. This implies the need for a more explicit negotiation of roles and responsibilities between state, civil society, and academia in achieving the different adaptation priorities. Finally, findings from Mumbai demonstrated the challenge of ambiguity in terms of unclear desired objectives that lead to unclear roles and responsibilities.

An important consideration for future research here could be to triangulate the findings with a review of grey literature including planning and policy documents to map out the gap between the "imagined" social contracts and "legal-institutional" social contracts. The next step would be to identify the concrete opportunities that exist or could be created to enhance the effective engagement of non-state actors in major decision-making processes for flood risk management in Mumbai. In line with previous literature,

the findings suggest the need for critical attention to power relations in societal structures that will potentially influence which goals, objectives, and visions get translated into practice.

While the study could identify and make explicit the gaps and divergences between different viewpoints, in order to understand if and how actors navigate and negotiate these gaps, a deeper analysis of the reasons for these gaps and divergences is required. The findings suggest some strong hypotheses to explore further in future research through further empirical testing. Furthermore, the empirical data also points to the persistence of gaps (e.g., path dependencies in planning), leading to reinforcement of the status quo and, in some respects, a reproduction of risk. Hence, the findings raise critical questions for further research—what explains the existence of these gaps and divergences in the first place? In this regard, it would be worthwhile to explore the temporal dimension of these gaps and whether they are a matter of time lag or persistence. In case of the latter, what are the potential reasons for the observed inertia in the city's flood risk management approach that actors perceive as a reinforcement of the status quo, and why might it be difficult to overcome? One senior academic actor from a leading think tank organization highlighted the challenge of building capacity and awareness for climate change concerns when working with state institutions largely comprised of engineers who have undergone very different training wherein their first response is always of defense and a focus on extreme events. The finding suggests that mainstreaming climate change concerns in formal institutions will require intensive engagement and identifying appropriate tools for supporting decision-making. This identified challenge resonates with Hewitt (1983), who critiques the technocratic style of work, including the tendency to focus on "controlling" disasters and neglect the everyday nature of relations that shape risks and disaster events. Hence, the findings caution against an easy interpretation of the task of forming and negotiating coherent social contracts for adaptation, which will be difficult to achieve without deeper institutional changes and enforcement of different objectives.

On a conceptual level, these findings suggest that making explicit actors' desired adaptation objectives and allocations of roles and responsibilities would at least lay open the gaps and potentially enable actors to engage with these differences to allow the process of forming a Type 1 social contract where actors may find an arrangement to deal with their gaps and diverging viewpoints on both objectives and roles and responsibilities. Ideally, however, actors would find a way to resolve these gaps and potentially close them to shape a Type 2 social contract. The question, therefore, becomes: how do/could actors negotiate and resolve those gaps to close them and move towards a Type 2 social contract? The combination of these findings from the case study analysis provides some support for the conceptual premise that aligning actors' desired

adaptation objectives and for whom they are envisioned could be a potential entry point and step in the direction of shaping a Type 2 social contract. This is because having shared objectives essentially shifts the negotiation of roles and responsibilities from the question "who does (or should do) what" to "how do (or should) we get there." In other words, actors no longer negotiate competing or conflicting goals; instead, they negotiate the distribution of roles and responsibilities towards the shared goal(s). However, despite shared objectives, the gaps and contestations in roles and responsibilities might still remain, but the negotiation is a different one. For example, one civil society actor underlined the value of being on the same page in bringing about transformative change with the state, which may still be "messy" and involve debate between diverging viewpoints but still expedite the process by almost 50–60% (R25, a leading member of a locally based NGO). Findings from Mumbai support the premise that actors may have entirely different ideas of what needs to be done and who is responsible for what and in which intensity, but having an aligned shared objective will change the direction of that negotiation.

The study makes a conceptual and empirical contribution to advance the understanding of social contracts for adaptation by adding actor perceptions on the questions of desired adaptation objectives, target actors, and roles and responsibilities in real-world settings. The paper argues and contributes towards making explicit actors' adaptation objectives and expectations around roles and responsibilities in order to identify where potential gaps and divergences lie. Unclear roles and responsibilities have been identified as a barrier to adaptation governance (Garschagen 2016; Juhola 2019; Mees et al. 2012). At the same time, the study argues that although clearly defined roles and responsibilities might not directly translate to a coordinated response, it is an important step on the way to achieving coordinated and comprehensive adaptation planning and implementation. Furthermore, clarity of roles and responsibilities strengthens accountability. This is seen as a necessary but not sufficient step towards shaping coherent social contracts for adaptation.

As a next step, further analysis is required to understand the reasons for those gaps and divergences, why they might persist and are difficult to overcome, and finally, how this gulf might be addressed. The findings from this analysis suggest that aligning objectives could be an important directional turn in negotiating coherent social contracts for adaptation. On the way to overcoming gaps and aligning divergences in objectives, roles, and responsibilities for adaptation, it is important to acknowledge the inherent challenges of social relations that contour the capacity of any particular actor to envision and enact adaptation objectives for themselves or others and power relations that play an important role in influencing whose priorities are translated to practice. Furthermore, the findings also call for a deeper exploration of factors that shape the attribution of responsibility—both to themselves (such as imagined capacity, felt agency) as well as to others. Hence, the study argues for coherent social contracts for adaptation that push for a more inclusive risk governance approach "which collects the voices of all stakeholders and mediates their interests as well as their potential contributions and responsibilities" (Garschagen 2016, p.48).

The findings from this study and future research recommendations are further highlighted by their timeliness and relevance to global debates at the science-policy interface, in view of the seventh assessment cycle of the IPCC and its planned special report on cities and climate change. The assessment aims to inform policy processes on the Global Stocktake (GST) under the Paris Agreement (UNFCCC 2015). In particular, the analysis aims to contribute to debates on the Global Goal on Adaptation, especially in the design of a Monitoring, Evaluation and Learning (MEL) system for assessing collective progress on adaptation (UNFCCC 2015). The divergences in adaptation objectives question the feasibility of a universal definition of adaptation success or effectiveness, concurring with Dilling et al. (2019) and calls for critical attention to power relations and dynamics that shape the definition and enforcement of adaptation objectives of different actors. The GST also reviews the adequacy and progress in adaptation finance. The conceptual discussion in this analysis suggests that which objectives are pursued, for whom, and who is ascribed with what roles and responsibilities ultimately has implications on what gets financed and how—thereby significantly influencing the progress on adaptation.

Declarations

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