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Special Issue on Indigenous knowledge for water-related climate adaptation

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EDITORIAL

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Introduction

Of the many manifestations of climate change, changes in the hydrological cycle are the most all-encompassing impacts that the world's population faces and will increasingly face in the future. Anthropogenic climate change has increased the likelihood of extreme hydrological events such as floods and droughts (Douville et al., 2021). These events, together with melting glaciers and more intense precipitation, are climate-induced water-related disasters that annually affect millions of people (Greve et al., 2018). Marginalized communities, such as Indigenous Peoples, are especially vulnerable to the impacts of these events (Savo et al., 2016). Among these impacts are the deleterious effects of climate-induced disasters on water quantity and quality, which can increase the incidence of water-borne disease, particularly in places where access to water, health, and sanitation (WaSH) services is already poor (Levy et al., 2018). Diminished water quality can also have negative implications for Indigenous Peoples for whom freshwater and freshwater ecosystems have specific cultural significance (Berry et al., 2018). In addition to health and cultural impacts, climate change is a major driver of freshwater ecosystem loss and degradation (Ramsar Convention, 2018), which pose challenges to those Indigenous communities whose livelihoods depend on these resources (Pecl et al., 2017).

These examples echo the assessments of the Intergovernmental Panel on Climate Change (IPCC), which has emphasized the high vulnerability of Indigenous Peoples to climate change. It states that disadvantaged and vulnerable populations (including some Indigenous Peoples and certain local communities) are at disproportionately higher risk of suffering adverse consequences in a warmer world of 1.5C or more (IPCC, 2018). Globally, according to the International Labour Organization (2019), there are over 470 million Indigenous Peoples, who belong to some 5000 different groups, in at least 90 countries. Indigenous People live in every region of the world, with about 70 per cent residing in Asia and the Pacific, followed by Africa (16.3 per cent), Latin America and the Caribbean (11.5 per cent), North America (1.6 per cent), and Europe and Central Asia (0.1 per cent) (ILO, 2019).

In the context of the current and unfolding climate crisis, too much or too little water, and water in the wrong place at the wrong time, will continue to pose considerable and diverse societal challenges. Given that water insecurity is such an all-encompassing manifestation of climate change, planning and implementing adaptation measures that have water at their centre are crucial for sustainable development. In fact, many sustainable development goals (SDGs) are not within reach unless water security is ensured (Pradhan, 2019). Already, adaptation measures are being designed and implemented across the water sector, such as in agriculture, WaSH, and energy production. Many of these measures, however, tend to be framed and implemented according to top-down, technological, Western approaches (Ford et al., 2020). For instance, the introduction of new drought-resistant crops that require dietary changes or improved irrigation technology without the full engagement of local and traditional communities can result in failed adaptation (Caretta & Cheptum, 2021). Additionally, as Nalau et al. (2021) highlight, adaptation heuristics can be detrimental to vulnerable people, particularly when they are not consulted or when erroneous evidence is employed as the basis for adaptation planning.

The extent to which such adaptation measures might be enhanced by the inclusion of Indigenous Knowledge (IK), as well as Local Knowledge (LK) and Traditional Knowledge (TK), has also been assessed by the IPCC. The IPCC's Special Reports on Climate Change and Land (2019b), and the Ocean and Cryosphere (2019c), both stressed that the effectiveness of decision-making and governance is enhanced by the support and involvement of local stakeholders, particularly those most vulnerable to climate change such as Indigenous Peoples and local communities. Its Special Report on Global Warming of 1.5C identified IK and LK as among a wide range of adaptation options available to reduce the climate risks to natural and managed ecosystems and stated that responses informed by these knowledge systems can help to accelerate the wide-scale behaviour changes consistent with adapting to and limiting global warming to 1.5C (IPCC, 2018).

These findings follow from the IPCC's definition of IK, itself derived from UNESCO's definition (n.d.). According to the IPCC,

> Indigenous [K]nowledge refers to the understandings, skills, and philosophies developed by societies with long histories of interaction with their natural surroundings. For many [I]ndigenous [P]eoples, IK informs decision making about fundamental aspects of life, from day-to-day activities to longer term actions. This knowledge is integral to cultural complexes, which also encompass language, systems of classification, resource use practices, social interactions, values, ritual and spirituality. (IPCC, 2019a)

As this definition suggests, IK is dynamic and intergenerationally embedded in particular social institutions (Naess, 2013) in particular places, relationships, and practices (Muir, 2010), and with distinct methods of validation (Hill et al., 2020). The IPCC also recognizes the significance of LK, 'the understandings and skills developed by individuals and populations, specific to the places where they live', which 'is a key element of the social and cultural systems which influence observations of and responses to climate change' (IPCC, 2019a). The IPCC notes that there is inconsistency in their use, as well as with alternative terms for non-Western knowledge, such as TK

and traditional ecological knowledge (Castán Broto et al., 2019; Petzold et al., 2020).

The IPCC has actively sought to include IK and LK in its assessment processes since the Fourth Assessment Report in 2007 (Castán Broto et al., 2019). Yet, while there has been a push for evidence-based approaches in the integration of IK in similar formal academic assessments (e.g. the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, see Tengö et al., 2014; Tengö et al., 2017), practitioners of positivistic Western science still tend to devalue IK and neglect its centrality to the ongoing process of adaptation to climate change. In addition, Western scientists too often re-enact the extractive nature of colonialism through the dominance of the Western positivistic approach over different worldviews by writing on behalf of Indigenous communities, or trying to interpret their adaptation approaches without invitation (David-Chavez & Gavin, 2018).

Given these challenges, the aim of this Special Issue was to gather evidence either by Indigenous scholars or scholars collaborating with Indigenous Peoples on climate change adaptation in relation to water-related hazards from across the globe. This Special Issue developed in the context of the Sixth Assessment Report of the IPCC, in which the editors were a Coordinating Lead Author (Caretta) and a Lead Author (Morgan) of the Water chapter. Recognizing the urgent need to include IK in this chapter's assessment, and well-aware that 'IK/LK is not ready-made for the IPCC' (Castán Broto et al., 2019, p. 6), we invited Indigenous contributing authors to participate directly in the IPCC process. We then developed this Special Issue in order to foster further scholarship by IK holders and in collaboration with IK holders and Indigenous Peoples, which could be included in our chapter's assessment. In this Special Issue, we argue that explicit attention must be paid to water-related adaptation strategies informed by IK and practiced by Indigenous Peoples, as well as to the political and cultural sovereignty of Indigenous Peoples over water rights and use (see also Cameron, 2012; Ford et al., 2016).

In this editorial, we outline the contents of the six papers included in this Special Issue by focusing on the adaptation measures taken by Indigenous Peoples, as well as local communities and traditional peoples, in response to climate-induced water hazards. We then discuss the politics and ethics of researching such adaptation measures, focusing on the implications of water-related adaptation research for implementation and effectiveness.

Indigenous adaptation to climate-induced water hazards

This Special Issue consists of six papers by Indigenous scholars, and scholars working with Indigenous Peoples, in communities in Peru, Iran, Nepal, Finland, the United States, and Mexico. We are presented with a wide array of case studies of adaptation measures triggered by a diverse set of climate change-induced hydrological changes.

Floods and droughts, as at the global scale, dominate the studies presented here. A combination of floods and drought events affect the Tharu in the western Tarai of Nepal who see their agricultural-based livelihood at stake (Chaudhary et al., 2021). Floods and salt-water intrusion due to sea level rise is the cause of land loss, infrastructural damage, and water quality concerns for northeast and mid-Atlantic Tribal Nations in the US (Leonard, 2021). Glacier melting and subsequent recession are altering water availability for the Indigenous pastoral community of Quelcaya in Peru, where dwindling springs have led to droughts (Postigo, 2021). Droughts have also led to the decrease in groundwater for the Zapotec Indigenous communities of the *Valles Centrales* of Oaxaca, Mexico, posing a threat to their agricultural livelihood (Basel et al., 2020). Likewise, the communities of the Jiroft County Province in Iran have experienced climate-induced droughts, which have required them to shift their cropping and irrigation patterns (Ghorbani et al., 2021). Finally, in south-western Finland, traditional fishing patterns along the Kokemäenjoki River have changed in response to industrialization, particularly the development of hydropower. This case study prompts further consideration of the societal and water security impacts of climate mitigation strategies in the water sector, such as hydropower (Mustonen & Lehtinen, 2021).

The livelihoods of all the Indigenous communities represented in this Special Issue are dependent on the provision of natural resources – whether crops, alpacas, or fish. Here, in the cases shared in this collection, and at the global scale, agriculture emerges, as the predominant source of community sustenance. In order to adapt to changing hydro-climatic conditions, the Zapotecs, the Tharus, the agricultural community of the Jiroft county province of Iran, and the Quelcaya community of Peru have all put in place different agricultural adaptation practices.

In response to the deleterious impacts of floods and droughts on agricultural productivity, the Tharu of the western Tarai of Nepal have diversified their agricultural production, while also opting for off-farm income-generating activities and, in some cases, seasonal migration (Chaudhary et al., 2021). The Zapotec Indigenous community of the *Valles Centrales* of Oaxaca, Mexico have undertaken managed aquifer recharge and agroforestry to declining groundwater availability (Basel et al., 2020). The communities of the Jiroft county province of Iran have implemented a complex system of deficit irrigation through earthen water ponds and dredging of pools and canals to ensure the growth of their crops (Ghorbani et al., 2021). Irrigation is also a key adaptation measure for the Quelcaya community of Peru, which has dug new channels in order to create new wetlands – *bofedales* – where alpacas can find water and grass, while also moving them to new feeding areas all together (Postigo, 2021). Wetlands are a critical nature-based solution which the northeast and mid-Atlantic Tribal Nations in the US also created along coastal areas to respond to, and potentially halt, flooding and erosion due to sea level rise (Leonard, 2021). Meanwhile, in Finland, local fishers have maintained and renewed traditional fishing practices, which have ensured livelihood continuity and the survival of traditional knowledge (Mustonen & Lehtinen, 2021).

The politics of Indigenous knowledge and climate adaptation

These case studies present a wide array of adaptation practices that are either planned or implemented by Indigenous Peoples and local communities. Importantly, most of these measures are grounded on collective action and common pool resource systems. If we were to consider this Special Issue in its entirety, according to a Western scientific evidence-based assessment, we would find that we are not presented with analyses on the effectiveness or potential replicability of these measures and that, as a whole, Indigenous adaptation in the water sector lacks a coherent and common framework. This conclusion, however, derives from the application of Western perspectives to assessing the outcomes of IK, which erroneously expects 'effectiveness' to be a key measure of adaptation 'success'. Yet effectiveness, we argue, can mean different things for different groups as Indigenous Peoples, for instance, do not ground their adaptation actions solely on economic calculations, but rather on a wider, more complex set of dynamic culturally-specific, place-based understandings.

Accordingly, as Singh et al. (2021) demonstrate, there is no single framework for assessing the effectiveness of adaptation outcomes or implementation, but rather, several normative understandings that can all be problematic in their own ways. These frameworks are often grounded on tools and metrics that are not applicable nor relevant to Indigenous knowledge, but rather risk further sidestepping it (Goldman et al., 2018). Moreover, a single framework for assessing Indigenous adaptation could hardly be achieved given the uniqueness and context-based nature of the solution space in which Indigenous Peoples operate. Accordingly, this Special Issue supports the position of Singh et al. (2021, p. 10) that effective adaptation should 'reduce vulnerability and/or increase adaptive capacity, especially of the most vulnerable and those most at risk to climate change' and be 'co-produced with communities to ensure inclusive and sustainable adaptation'.

We go further to argue that effectiveness may not be the key issue at stake when examining the water-related climate adaptation of Indigenous Peoples. We call for researchers to reframe studies of effectiveness to account for and recognize the agency and sovereignty of Indigenous Peoples, the authority of holders of IK, and their rights 'to maintain, control, protect, and develop cultural heritage, traditional knowledge, and traditional cultural expressions', as per Article 31 of the UN Declaration on the Rights of Indigenous Peoples. Effectiveness, then, is on the terms of Indigenous Peoples themselves, such that Indigenous rights are centred throughout all research processes and any applications of IK-informed research. Water-related climate adaptation cannot be effective if it is not ethically co-produced with Indigenous Peoples and IK-holders. Co-production, importantly, must not resort to be an instrumental addition of Indigenous knowledge to a fundamentally Western knowledge framework based on data extraction further disempowering local communities, but it must truly integrate and accept the validity of Indigenous ontologies (Goldman et al., 2018). Nor can it be effective if it does not recognize the particular politics and histories of Indigenous Peoples, and their aspirations for collective self-determination and collective continuance (Whyte, 2018). As Potawatomi scholar Kyle Powys Whyte (2018, p. 63) argues, 'Indigenous [K]nowledges have *governance-value*. That is, they serve as irreplaceable sources of guidance for Indigenous resurgence and nation-building'.

The case studies in this Special Issue speak directly to these concerns across markedly different contexts, with each underscoring the significance to water-related adaptation of the specificity of IK, the communal institutions of Indigenous Peoples, and the communication of IK. Shinnecock water scientist Kelsey Leonard (2021) argues, for example, that existing adaptation frameworks to sea level rise in the northeast and mid-Atlantic of the United States serve to perpetuate 'adaptation oppression' because they are neither created by, nor for, Indigenous Peoples. She proposes the WAMPUM adaptation framework that is informed by eastern coastal IK systems and recognizes that water security is a question of multispecies relations (Leonard, 2021). In the context of the Quelcaya, Postigo (2021) emphasizes the importance of long-standing flexible communal institutions that must be sustained to ensure the adaptive capacity of Indigenous communities in the high Andes. Communal institutions among the communities in Iran's Jiraft county are similarly significant, which can be undermined by external centralized systems of water management (Ghorbani et al., 2021). Zapotec communities undertook self-organized, community-driven action to enhance their water security, which helped to revive trust in traditional practices, and strengthen Zapotec identity and sovereignty (Basel et al., 2020). Particular practices among the Tharu may not have scientific evidence for their 'efficacy', however, as Chaudhury et al. (2021) point out, they encourage cooperation as well as the transformation and transmission of IK. Sustaining certain fishing practices in Finland enable local peoples to remain attached to their home land, in spite of significant environmental change (Mustonen & Lehtinen, 2021).

In conclusion, this Special Issue calls for a reassessment of the framing of effectiveness in water-related adaptation that asserts the rights and sovereignty of Indigenous Peoples, and recognizes the complexities and nuances of IK. Notably, the richness of evidence presented in this Special Issue highlights the need for a systematic and ontologically-sensitive inclusion of Indigenous Knowledge in the assessment of climate change adaptation as it pertains to climate change water-induced disasters. The lived experiences of Indigenous Peoples and local communities cannot and should not be considered as an 'add-on' to Western positivist scientific evidence, but rather a cornerstone of how we understand climate change adaptation in order to move closer to a more cohesive and inclusive solution space.

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