south to south JUST TRANSITIONS

CLIMATE Strategies

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Justice and equity in climate change adaptation: overview of an emerging agenda

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Key messages

- Just resilience is an emerging point on the policy agenda dealing with the unequal burdens of climate change impacts on people and places, and the potential for adaptation action to create winners and losers. While issues of justice and equity have featured in adaptation research since the early 2000s, in the past five years they have been increasingly discussed in adaptation policy and planning. The focus on just resilience has been driven by a) the increased need for and cost of adapting and responding to climate impacts in the face of uneven capacities and resources, and b) increased evidence of maladaptive practices and outcomes; that is, adaptation action that reinforces or creates new vulnerabilities for already marginalised groups.

- In the literature (e.g. IPCC AR6 report) a consensus has formed around three core, interrelated dimensions of justice in adaptation and resilience building: distributive justice (who is burdened and who benefits), procedural justice (who is involved and how), and recognition justice (what and whose values are considered). These principles, while sometimes critiqued for being too technical and carrying a risk of introducing new administrative burdens, can function as baselines when assessing justice in certain contexts and in considering certain impacts or risks.

- Structural vulnerability and social justice: the impacts of climate change interact with pre-existing structural inequities, such as those based on wealth, unequal opportunities, power dynamics, age, health, education, political capacity, gender and ethnicity. Accounting for the structural drivers of inequity in climate change impacts and adaptation is important since it provides a path to (1) safeguard those most in need and (2) enables just resilience. These differing capabilities and structural drivers of vulnerability and inequity need to be understood on a contextual and case-by-case basis.

- Recent policy developments: higher-income countries, with Canada, Australia, and European countries at the forefront, alongside South Africa, have led the mainstreaming of justice issues into adaptation and climate resilience strategies. These initiatives focus on vulnerable and marginalised communities and include Indigenous rights and perspectives. Additional approaches focusing on locally led and locally owned adaptation, agriculture, youth, cross-scale interdependence, global drivers of risk, responsibility, and the rights of nature are, also emerging. This emergence is being driven by actors in Africa and Latin America.

- Structural inequality: national and international adaptation interventions and financing mechanisms are embedded in social and economic structures with existing inequities. The development agenda is critiqued for its (1) unequal, dysfunctional and post-colonial structure and (2) the fact that it is situated in an interconnected global system that can intensify existing inequities. Efforts to address systemic and underlying drivers of vulnerability and marginalisation can contribute to transformative adaptation; adaptation action that results in or contributes to significant changes in the structure or function of existing practices.

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1. Introduction

The concept of "just resilience" (justice, equity and fairness in climate adaptation[1]) has become a subject of increased attention in recent years. This is because there is growing recognition that the impacts of climate change and future climate risk will affect people differently according to their income, ethnicity, age, gender, disabilities, and where they live. Social groups, communities and countries that are most vulnerable and have the least capacity to adapt to climate change will be disproportionately affected by its impacts, despite having contributed the least to causing the crises in the first place. There is also growing evidence that adaptation interventions that set out to reduce the negative impacts of climate change can often have unintended or undesirable outcomes. This is known as maladaptation, and it can shift, reinforce or even create new vulnerabilities for already marginalised people, communities and places. (Eriksen, et al., 2021; Magnan, 2016). Despite this, we are only beginning to develop a collective understanding of the implications of justice and equity within climate adaptation policies. Climate impacts are generally assessed and projected at global, continental, or national scales and therefore do not offer data or insights into how these impacts are felt locally, what the drivers of vulnerability are, or the consequences for adaptation needs and outcomes for different countries, communities and social groups (Paavola & Adger, 2006).

Unequal burdens
Climate impacts and risk affect countries, communities and people unequally

Leaving no one behind
Adaptation action can have unequal outcomes, creating "winners" and "losers"

Figure 1. Just resilience addresses both the unequal burdens that climate change places on countries, people and places, and the goal of leaving no one behind. It also takes into account that adaptation action has unequal outcomes and can create winners and losers. (Lager, et al., 2023).

1. In this paper we use the term 'just resilience', 'just adaptation', and 'justice in adaptation' interchangeably, following the trend in recent policy developments. There are considerable overlaps and differences between the concepts of resilience and adaptation, where the notion of resilience, roughly a system's ability to maintain its core functions during and after stress, allows for a potentially broader set of consideration than that of climate change adaptation. For a full discussion on conceptual developments of these terms, overlaps and what it means for the broader discussion of justice in climate change adaptation see chapter 2 in Lager et al. 2023. In this paper we use the term 'Just resilience', as an all-encompassing term for justice considerations within adaptation action and resilience building.

The interplay between inequity and vulnerability can create a vicious circle. Growing inequality can lead to a reduced capacity to withstand and recover from climate-related disasters or to effectively adapt. The disproportionate impacts of climate change can then deepen inequities even further. Just resilience emerged out of concerns that current adaptation planning does not consider such dynamics and is instead overly anchored in technocratic and managerial approaches that neglect justice, equity, and fairness (Juhola, Heikkinen, Pietilä, Groundstroem, & Käyhkö, 2022). Furthermore, climate adaptation, in contrast to mitigation, has been interpreted as a largely national concern. This framing ignores drivers of risk in globally interconnected systems, as well as the historical and geographical differences in responsibility for climate change and the capacity to adapt to it (Lager F. A., 2021).

Just resilience stresses how uneven exposure to climate hazards and inequities, alongside differences in adaptative capacity and capabilities, can exacerbate climate impacts, leading to maladaptation and increased vulnerability for certain people, social groups and countries (EEA, 2024). As a baseline, working to integrate justice considerations throughout the design, implementation, and evaluation of adaptation policy would help to ensure the effectiveness of adaptation action and safeguard those facing the greatest risks.

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1.2 Aim and overview

In this paper, we describe the current trends in how just resilience is understood, prioritised and implemented in research and policy.[2] In doing so, we aim to:

- Provide an overview and a practical starting point for practitioners to introduce and enact justice and equity considerations in research and policy on adaptation and resilience.
- Inform the development of a global just resilience agenda. Voices, perspectives and priorities originating in lower-income countries are currently less represented in the development of policy agendas for just resilience. Therefore, research and practice originating in the global south should inform and influence the development of priorities for just resilience.

This paper begins by providing the historical context of the just resilience agenda and evidence of maladaptation to date. We then focus on available conceptual tools and provide an overview of social and structural drivers of vulnerability in relation to climate change, focusing on geographical location and socioeconomic, gender, health, and age-related factors. We highlight a few cases from around the world in which considerations of social justice and equity have been embedded into adaptation policies, strategies and measures. The paper concludes with a discussion on trade-offs and barriers to implementation, recent trends and priorities in the development of the just resilience agenda globally, and a critical view of the links between structural inequality and adaptation.

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2. The scoping exercise for this report is based on literature review of scientific journals and policy documents, and supported by two interviews with prominent experts on just resilience, one focusing on the international context, and one focusing on African perspectives. The scoping was carried out in Jan-March 2024.

2. Development of just resilience

2.1 Historical backdrop

The idea of just resilience emerged from the convergence of two distinct rights-based movements: the climate justice movement and the Just Transition movement. The climate justice movement, initially pioneered by activists in the global south has, over the past 30 years, focused on raising awareness and contesting the unequal impacts of climate change. It and advocates for the equitable distribution of both the burden of climate impacts and mitigation efforts (Gabbatiss & Tandon, 2021). However, the scope of the climate justice movement has more recently broadened to encompass the unequal distribution of impacts on disadvantaged and marginalised groups, such as Indigenous people, people of colour, women, and people with disabilities. A notable turning point was reached at the United Nations Framework Convention on Climate Change in 1994, where it was recognised that inequity underlies both the causes and effects of climate change, with the Convention's acknowledgement that:

"Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities" (1993-1994), UN. General Assembly (48th sess. :, 1994).

Yet, up until 2000, climate change continued to be largely perceived as a singularly environmental issue as climate scientists and policymakers predominately in richer countries and the West focused their efforts on reducing greenhouse gas emissions. At the same time, lower income countries, alongside NGOs, became increasingly concerned about the effects of climate change on poor and vulnerable countries, and hence the need to support adaptation action where the impacts and risks are high and capacity is low (Reid, 2021). In 2007, another important milestone was reached on justice in adaptation when Desmond Tutu, then Archbishop of Cape Town, warned in a UN Human Development Report of "climate apartheid". He called on countries around the world to apply a human rights lens to adaptation frameworks and policies in effort to bridge the divide between developed and developing countries (United Nations Development Programme, 2007).

The Just Transition movement, on the other hand, is rooted in the workers' rights movement in the US in the 1970s and 1980s. The latter movement was sparked by increased environmental regulations on polluting industries that led to unintended job losses and calls to preserve jobs, retrain workers, and support communities. The Just Transition movement responded to these changes by calling on the federal government to invest in worker retraining and community support. In recent years, the concept of Just Transitions has begun to include the process of transitioning to a net-zero economy in a manner that is as fair and inclusive ("leaving no one behind"), through green investments, jobs, and the protection of workers' rights. Equity has since become a guiding principle within the Paris Agreement (United Nations, 2015) while the "leave no one behind" concept became a central promise in the UN Agenda 2030 and was operationalised in the Sustainable Development Goals (United Nations, 2017).

While Just Transitions have traditionally centred on countries' climate mitigation and wider sustainability efforts, their importance for adaptation and resilience has been elevated in recent years. An emerging body of evidence suggests that internationally funded adaptation interventions are not only failing to protect those most vulnerable to climate change but is in some cases making things worse (Eriksen, et al., 2021). In the 2021 IPCC Sixth Assessment Report, Working Group II highlighted the importance of embedding the different principles of justice (i.e. distributive and procedural justice, see section 3.1 below) into adaption planning and implementation across sectors to ensure their effectiveness and avoid the risk of maladaptation – both between and within countries (IPCC, 2022).

In Europe, "just resilience" was introduced as a core principle of the latest EU Adaptation Strategy in 2021, following the principle of "leaving no one behind." This policy, together with recent efforts to incorporate Indigenous perspectives and rights into climate strategies in Canada and Australia, as well as a push to incorporate local voices and perspectives into climate resilience planning in South Africa, are the latest policy developments to date. These examples are further discussed in Section 4.

2.2 The role of justice in avoiding maladaptation

Many climate risks are now guaranteed because of the greenhouse gas emissions already in the atmosphere. Even if the world successfully delivered on its net-zero targets in the near term, many significant climate impacts would still be unavoidable up to 2040 (IPCC, 2022). Already, around 40% of humankind is living in highly climate-vulnerable areas (UNEP, 2023). Because of this, strategic and deliberate climate adaptation action is urgently needed to ensure that unavoidable and irreversible climate impacts will not overwhelm economies, societies, and ecosystems around the world. To make matters worse, not only is there too little adaptation funding and action for current and future needs, some adaptation efforts have already been ineffective, leaving people and places in a worse position than before (UNEP, 2023).

The term maladaptation refers to "actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future" (IPCC, 2022). In short, maladaptation can reinforce, redistribute, or create new risks and vulnerabilities (Eriksen, et al., 2021; Schipper, 2020; Magnan, 2016). Maladaptation is more likely to take place when adaptation decision-making does not adopt holistic approaches to account for the interplay between climate risks and drivers of existing vulnerabilities – especially when these vulnerabilities are underpinned by structural and socioeconomic inequity, unequal power dynamics, and differentiated political capabilities. Such drivers can range from being local to global in scale (Schipper, 2020; UNEP, 2023).

2.3 Examples of maladaptation

Maladaptation can manifest in various forms at the local scale. Spatial planning can make some people more vulnerable to natural disasters while safeguarding others; infrastructure projects can involve relocating marginalised communities who are worse off as a result; and unsustainable practices can degrade local ecosystems and livelihoods over time. Existing vulnerability is often reinforced when privileged social groups are in a position to capitalise on the benefits of adaptation measures at the expense of people and communities with the greatest needs. For example, following a major flood in northern Colombia in 2010 that affected more than 42,000 peasant families, national authorities established an adaptation fund that was used for a housing project to support the relocation of the victims of the flooding to less vulnerable areas. (Camargo & Ojeda, 2017) However, one of the requirements for people to receive support from the housing project was that they had to be registered in a national census of disaster victims. This excluded some of the most vulnerable families who were unable to register, resulting in outmigration and further social marginalisation. This example highlights the importance of considering procedural justice in adaptation interventions in order for the outcomes to encompass a broad range of stakeholders from the outset.

Infrastructural and technical interventions aimed at adapting bodies of water and coastal areas to climate risks have often caused vulnerabilities to shift over time and across geographies. These can ultimately affect existing power dynamics between different groups of people. For instance, in Vietnam where floods and droughts are beginning to occur at unexpected times of the year, adaptation interventions intending to increase climate resilience in one area have been shown to increase vulnerabilities in others. The construction of dams and reservoirs has become increasingly common, not only for producing energy but also for their role in mitigating floods and saltwater intrusion. However, there have been cases when reservoirs and dams caused the resettlement of ethnic minorities whose livelihoods were compromised when reduced access to forest and fishing waters, diminished their income and food security (Beckman, 2011).

Maladaptation can also happen when adaptation measures introduce new risks or sources of vulnerability. This occurs when adaptation measures designed to address short-term climate impacts inadvertently increase long-term climate risks. One example is the construction and reinforcement of levees in Bangladesh which aimed to protect floodplain areas from frequent flooding. Paradoxically, these levees were associated with increased mortality rate and assets lost to flooding because better flood protection attracted more people and resources to flood-prone areas, thus increasing damage when the levees eventually failed. The flood protections were found to potentially lead to complacency which lowered the preparedness at the expense of human lives (Ferdous, Baldassarre, Brandimarte, & Wesselink, 2020).

On an international scale, adaptation action and responses to risk in one country can affect places and people thousands of kilometres away. This is because countries in the global economy are interdependent through trade, financial transactions, investments, migration, and shared ecosystems (Lager F. A., 2021). This was evident during the 2007-08 global food price crisis, and again during the crises in 2022-23, when food insecurity and poverty increased among vulnerable populations worldwide. Multiple interacting factors, including extreme weather events and prolonged droughts, coupled with Russia's invasion of Ukraine and Covid-19 repercussions, interacted to drive up food prices globally. These effects were exacerbated by trade policies restricting access to food on global markets.

When the drivers of vulnerability are international in scale and the power to influence or act lies outside the local context, failure to recognise and address connected drivers and risks can also result in maladaptation. One example is climate risk mitigation and action on adaptation and resilience in the global coffee supply chain. Coffee is a global industry worth USD 130 billion annually that engages 25 million smallholder farmers and up to 125 million people who depend on crop for their livelihoods. Coffee is a highly sensitive crop, and climate change is projected to reduce the global area suitable for coffee farming by 50% in the coming decades (Lager F. A., 2021). For companies in the coffee supply chain, responding to supply risks caused by climate change could, without deliberate attention to justice, mean simply shifting sourcing to less hazardous areas and abandoning vulnerable areas that would benefit from adaptation. This would lead to a loss in livelihoods and, in the long-run, contribute to an even faster deterioration of global coffee production and increased world market prices. A more connected approach to adaptation risks and contextual drivers of vulnerability could avoid leaving global producers behind.

Adaptation measures are less likely to be maladaptive when they account for specific contexts and drivers of vulnerability. These factors include structural inequality and power dynamics, and a dependence on infrastructure and institutional structures. Differentiated capabilities including inclusive stakeholder participation and the recognition of different values and interests in the design and implementation of adaptation interventions should also be taken into account. In an international context, adaptation outcomes would benefit from going beyond a retrofitting of past development projects, and considering feedback and drivers between local and global processes (Schipper, 2020; Eriksen S, 2011; Eriksen, et al., 2021). These considerations to avoid maladaptive outcomes are all contained within the priorities for the just resilience agenda.

3. Core dimensions of just resilience

3.1 Conceptual baseline

The importance of social justice in the context of climate adaptation has largely been underpinned by scientific evidence showing that:

- Climate risks exacerbate structural inequalities and injustice, and;
- Adaptation to these risks can be more effectively managed when justice issues are taken into account (IPCC, 2022b; Bednar-Friedl et al., 2022; Lager et al., 2023).

Conceptually, the latest IPCC definition of adaptation includes three core dimensions, namely:

- Distributive justice: Distributive justice relates to the unequal distribution of burdens (and benefits) arising from climate impacts and risk, as well as the allocation of resources, benefits, and burdens from adaptation action. In short, it asks the questions: who benefits and who is burdened? Practices of distributive justice in adaptation planning frequently target or assess poor countries and vulnerable or marginalised social groups. The focus and depth of distributive justice considerations vary, sometimes including historical contributions to climate change, structural and systemic inequality, and ensuring a fair allocation of costs and benefits.

- Procedural justice: Procedural justice refers to the extent to which those affected by climate risk and adaptation action are meaningfully included in shaping climate adaptation. Procedural justice is ensured by embedding justice, fairness and inclusivity in the institutional processes and procedures through which decisions on adaptation are made. It asks the question of who is involved and how. This includes giving a voice to the people and groups most vulnerable to climate impacts but who are often marginalised from economic and political power. This is done by ensuring that people have access to information and can meaningfully engage in influencing decisions that affect them.

- Recognition justice: underpinning both distributive and procedural justice, recognition justice focuses on acknowledging and respecting the identities, experiences, and rights of individuals and groups, particularly those who are marginalised or oppressed and whose livelihoods, way of life, identity, and history, are often particularly at risk of climate impacts. Recognition justice focuses on basic respect, fair consideration and a robust bottom-up engagement of diverse needs, cultures, and perspectives in assessing climate impacts and risks and in designing adaptation policies and measures. In short, it asks the question, what is at risk, valued and safeguarded – and according to whom? Recognition justice is instrumental in addressing the underlying causes of distributive and procedural injustices by broadening the scope of what is considered valuable and must be safeguarded to ensure fair adaptation outcomes.

It is worth noting that while these three dimensions of justice in adaptation form the current consensus baseline in published research, functionally, justice in adaptation planning and action is interpreted in a myriad of ways with no political consensus around definitions . While distributive justice is most commonly operationalised, several other dimensions of justice have been lifted as key in ensuring a fair and equitable resilience to the impacts of climate change (Coggins, 2021; Lager, et al., 2023). Below we therefore include three prominent discourses on justice considerations in the current international arena:

Restorative justice has recently emerged as a principle of increased relevance in the advancement of just adaptation in practice. Although a less developed aspect of just adaptation, the concept of restorative justice has a longer history as a central component in criminal law and reflected a shift in focus from merely punishing the offender to restoring the dignity of the victim and repairing harm (McCauley & Heffron, 2018). With respect to adaptation, restorative justice has largely been discussed in the context of loss and damage (Boyd, James, Jones, & Young, 2017), where the concept has been used to highlight the disproportionate losses and damages borne by those most vulnerable in society and call for reparations for those affected (McCauley & Heffron, 2018). An important part of restorative justice is to establish a dialogue and personal interactions between those who have been harmed and those who have been responsible for the harm, with the aim of creating empathy, ensuring accountability and identifying ways of compensating for the harm done (Forsyth, et al., 2021).

The idea of intergenerational justice has also been increasingly championed by youth-led grassroots movements because of their grievances over the actions – and inactions – of governments and businesses in perpetuating the climate crises (Wang & Chan, 2023).

Intergenerational justice stresses the importance of decisions made in climate change today, taking into account the long-term effects for future generations. While initially centred on mitigation, intergenerational justice has become increasingly recognised as a central tenet for a just adaptation, as decisions and actions on adaptation taken today should not be at the expense of the wellbeing of succeeding generations.

Many advocates for just adaptation have highlighted the importance of adaptive capacity and capabilities of people and communities to adapt to both the short and long-term impacts of climate change. This adaptive capacity and capabilities approach emphasises the need for the affected people and communities to access the resources, skills, institutions and opportunities necessary to withstand current climate impacts and manage future risks, as well as to sustain their functions, well-being and freedom with respect to increasing climate impacts and adaptation actions (Kronlid, 2014).

3.2 Structural vulnerability

Pre-existing structural inequities interact with the impacts of climate change, increasing the vulnerability of certain countries, communities and groups in society - often those already identified as marginalised or vulnerable. Examples are differentiated based on socio-economic status and wealth, age, gender, education, and ethnicity. Below, we describe groups that are most commonly identified in the literature as being disproportionately affected by climate change impacts. We will also discuss why these groups are often subject to specific consideration, and less likely to benefit from, be included in, and have their values recognised, by adaptation planning and actions.

It is important to note, however, that differing capabilities and structural drivers of vulnerability and inequity need to be understood on a contextual and case-by-case basis. In many cases, several drivers of inequity intersect, creating complex imbalances and vulnerabilities that need to be considered differently depending on the situation, people, and place. It is important to note that while there is value in appraising the specific outcomes and needs for different, pre-identified groups, this is by no means a one-size-fits-all activity and 'new' or unexpected groups or aspects might need to be considered in each case.

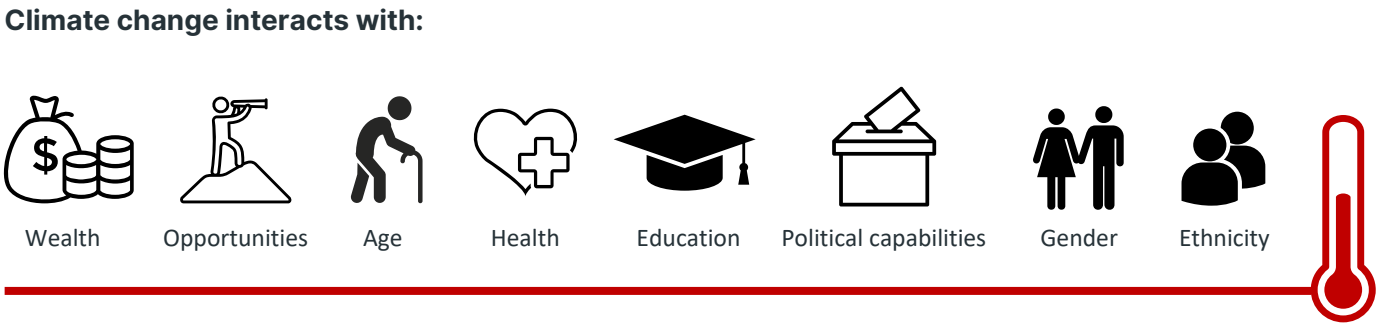

Figure 2. Climate change interacts with pre-existing drivers of inequity such as wealth (national, community, household), opportunities and power dynamics, age, health, education, political capabilities, gender, and ethnicity.

3.3 Historical and socioeconomic drivers

The impacts of climate change are superimposed on existing socioeconomic inequities and exacerbate vulnerabilities. Poorer countries and communities with the fewest resources are likely to suffer the greatest impacts on lives and livelihoods, investments, and economic development. A recent assessment showed that 74 of the world's poorest countries have experienced nearly eight times as many natural disasters over the last decade compared to the 1980s and a threefold increase in economic damage (International Development Association, 2021). At the same time, low-income countries have suffered the brunt of the economic costs of climate-related disasters according to the UNDRR (Wallemacq & House, 2018).

Within countries, households with lower incomes are likely to be more vulnerable to climate impacts, with poorer households severely affected even when the effects on the wider population are limited (Hallegatte & Rozenberg, 2017). Climate change has been shown to have a greater economic impact on low-income households compared to wealthier ones. Similarly, low-income households are less likely to receive support for recovery from friends and family, the financial system, and social safety nets. Poorer communities and people with a lower socioeconomic status are more exposed to the risks of affordability and are often constrained to cheaper housing options and jobs in flood-prone areas, (Rentschler, Salhab, & Jafino, 2022; Erman & Dallmann, 2022; Smith, 2023). Additionally, people with lower incomes may lack or have insufficient insurance coverage, severely hampering their ability to recover from climate-related disasters (EEA, 2024). Lower-income communities are also often more likely to be exposed to higher temperatures in dense urban areas due to urban heat island effects, (Hsu, Sheriff, Chakraborty, & Manya, 2021; Roberts, Deuskar, Jones, & Park, 2023) while at the same time have fewer means to afford adaptation solutions, such as air conditioning (Mann & Schuetz, 2022). Lower-income households may also be disproportionately affected by transport and trade disruptions. This is because temporary and alternative transportation options are often beyond their affordability and have fewer financial buffers to absorb price increases that arise from climate-related reductions in agriculture production and other supply chain disruptions (UK Climate Change Committee, 2022). These and other climate risks can create negative feedback loops; the cost of these climate impacts can exacerbate existing vulnerabilities by lowering income levels and worsening socioeconomic inequality.

Because climate risk assessments and research usually focus on economic sectors (e.g. water, agriculture, infrastructure, etc.), as opposed to different groups of people and communities, climate impacts climate on vulnerable social groups have often been ignored. Yet, immigrants, ethnic minorities and Indigenous groups are subject to structural and historical inequalities and discrimination that make them particularly vulnerable to climate risks and maladaptation (EEA, 2024). In India, a series of inclusion assessments and surveys showed that Dalits, a minority group of 170 million people, were unable to anticipate, cope and recover from the unusually severe Bihar monsoon floods on account of their economic and social marginalisation of the current caste system (Baird, 2018). The chronic exclusion of Indigenous communities from decision-making processes risks sustaining or exacerbating existing vulnerabilities, as well as reinforcing maladaptive pathways (EEA, 2024). This is evident from the case of the Sámi population in Northern parts of Europe where land-use policies and practices have compromised the adaptive capacity for Indigenous reindeer herders to preserve their livelihood and traditions (Löv, 2013; Rasmus, o.fl., 2022). Immigrants are also particularly vulnerable because they cannot access citizenship rights and housing tenures, and in some cases, due to local language and literacy levels (Kjellström et al., 2019).

Gender-based inequities

Gender inequalities have been identified as one of the most common forms of group-based vulnerabilities due to the disproportionate climate impacts that women, girls and gender minorities face, as well as their marginalisation from decision-making processes (EEA, 2024). These vulnerabilities often stem from unequal access to resources, limited political influence, social norms and cultural practices, as well as institutional constraints. Gender roles and expectations have a significant influence on women's experiences and adaptive responses to climate risks and impacts. This is because gendered social norms often burden women with greater family caregiving responsibilities, restrict their mobility, and grant them fewer educational and training opportunities. These factors, individually or in combination, can lead to women being disproportionately affected by climate change. As an example, recent gender-sensitive climate risk assessments carried out in Montenegro and Morocco found women in rural areas to be most acutely affected by extreme weather due to structural limitations in their access to land, livestock, and natural resources (Satta, Puddu, Elisa, Snoussi, & Cois, 2022; Petar Raičević, 2022). The assessments also showed that women-led businesses are more vulnerable to climate impacts due to their smaller size, access to less capital, and the inherent vulnerability of the sectors in which they operate (i.e. tourism, fisheries, and agriculture).

Conversely, gendered norms also expose men to certain climate risks in other circumstances. Recent climate risk assessments have identified heat stress from extreme temperatures and heatwaves as one of the greatest climate threats to outdoor workers in Southern European countries. This is particularly concerning for high-risk sectors such as agriculture, construction, and emergency services, where outdoor labour is predominantly performed by men. (EEA, 2024). Other assessments show that outdoor workers in many places across the Global South are already at risk from heat stress and other heat-related health complications (Venugopal, Shanmugam, & Kamalakkannan, 2021; Petropoulos, et al., 2023; Moda, Filho, & Minhas, 2019). Extreme temperatures are also expected to reduce total working hours worldwide by more than 2% each year by 2030, which could disproportionately affect men and households with sole-income earners (EEA, 2024; Gamble et al., 2016).

Age and health-based drivers

Elderly people are particularly vulnerable to the negative health effects of climate change, including extreme heat, air pollution, and infectious diseases, among others. In fact, the 2020 report of the Lancet Countdown on health and climate change found older populations to be subjected to excess morbidity and mortality relating to extreme weather, including heatwaves, wildfires, and violent hurricanes (Watts, et al., 2020). For instance, older adults are more sensitive to heatwaves and high temperatures because of age-related health conditions and medications that can affect their body's ability to respond to heat (Gamble & Balbus, 2016). This puts elderly people at a substantially greater risk of heat-related illnesses and death. Many older people also lack the physical, mental, social and financial resources necessary to avoid or adapt to the impacts of extreme weather events, especially in the global south where poor health infrastructure, limited access to healthcare services, and other environmental risk factors are more common (Sarkar, Dhar, Fahlevi, Ahmed, & Hossain, 2023; Chen, et al., 2024; Charveriat, Bodin, Cartier, & Haq, 2023).

Children and adolescents are also uniquely vulnerable to the health impacts of climate change due to a wide range of anatomical, immunological, physiological, and psychological factors (Stanberry, Thomson, & James, 2023). Children and infants are particularly susceptible to dehydration and heat stress. Heat-related mortality during heatwaves is more prevalent among infants, while children are also more affected by climate-related increases in allergens and air pollution owing to their underdeveloped respiratory and immune systems (Kakkad, Barzaga, Wallenstein, Azhar, & Sheffield, 2014; Landrigan, et al., 2017; D'Amato, et al., 2015). Extreme temperatures also place pregnant individuals at a heightened risk of early labour, preeclampsia, and miscarriage (Chersich, o.fl., 2020; Shashar, o.fl., 2020).

People with disabilities and pre-existing medical conditions face a greater risk of serious health complications and death from climate change impacts like heat, poor air quality and extreme weather events (Daalen, o.fl., 2022; United States Environment Protection Agency, 2016). People living with obesity and those receiving medicines for cardiovascular disease (e.g. diuretics and beta-blockers) are especially at-risk from extreme temperatures because of their increased sensitivity to heat stress. People people suffering from asthma and other respiratory disorders are likely to be more affected by poor air quality (United States Environment Protection Agency, 2016).

4. Examples of just resilience in current policy

In recent years, several international and national efforts have been initiated to translate the principles of just adaptation into practice on the ground. In this chapter, we elaborate on the only international and national policy frameworks that account for just resilience or justice in adaptation explicitly to date. The examples elaborated in the boxes below showcase priorities for efforts based in Australia, South Africa, the European Union and Canada. These strategies and initiatives reflect the context-specific and broad range of topics for just resilience practices for each region.

An Australian National Strategy for Just Adaptation

Future Earth Australia, based out of the Australian Academy of Science, launched the "National Strategy for Just Adaptation" in 2022. This strategy sets out to reshape the national adaptation and resilience agenda to more broadly encompass the diverse voices, experiences and ambitions of the many people who make up Australian society today, with a strong emphasis on Indigenous people (Future Earth Australia, 2022). The strategy was developed by a cross-disciplinary team of 32 climate adaptation experts from across governments, academia, and the private sector, and charts a blueprint to support public authorities across national and subnational levels, community leaders, indigenous community and cultural organisations, and civil society, to embed a justice framework into their work on climate change. The strategy identified five priority areas for reform:

- Empowering Indigenous leadership: Entails listening to and incorporating Indigenous people's knowledge and promoting rights to resources, livelihoods and ways of life. Cornerstones of this priority are promoting Indigenous voices across all levels of government and supporting the development of national, Indigenous-led climate change adaptation (and mitigation) strategies and measures.

- Embedding a just adaptation framework across governments and sectors: Involves purposeful review, reforms and the coordination of policies, regulations, and practices across different levels of governments to address structural injustices. It also includes investments in cultural capabilities to support the self-determined adaptation priorities of all Peoples. Social justice considerations should be embedded into infrastructure and urban design processes as well as project option development, assessment, and implementation.

- Including the voices and experience of diverse stakeholders across areas of marginalisation in just adaptation processes: Involves the mandatory inclusion of diverse stakeholders in policy debates and decision-making across all levels of governance. It also specifies that the development of accessible communication tools and processes is put forward as a solution to enable a more inclusive and empowered engagement and just adaptation outcomes.

- Supporting communities and community groups to drive transformation: Includes agency, trust and legislative support as cornerstones for empowering locally led and just adaptation action. It also calls for support for collaborative networks, approaches and actions for community leaders, policymakers and practitioners to report progress towards just adaptation. Equitable and longer-term funding mechanisms are key to ensuring the longevity of capability-building programmes that amplify the voices of communities and community groups.

- Advance research agendas that promote just adaptation: Includes the promotion and uptake of research in policy targeted at overcoming barriers to just resilience action. It also involves identifying leverage points for effective interventions and the development of relevant metrics for successful just adaptation. Indigenous-led research and collaborative intercultural programmes and projects that facilitate knowledge exchange and coproduction can inform transformative adaptation practices.

South Africa's Presidential Climate Commission on Just Transition

The Presidential Climate Commission (PCC) was established by South Africa's President Cyril Ramaphosa in 2020 with the aim of overseeing and facilitating a just and equitable transition towards a low-emission and climate-resilient economy. While situated within the Presidency, the PCC is a multistakeholder initiative comprised of government ministers and 22 commissioners representing diverse perspectives: including local authorities, businesses, labour organisations, civil society, and climate justice advocates (The Presidential Climate Commission, 2024).

The PCC's first assignment was to develop a Just Transition Framework to guide efforts to manage the social and economic implications of mitigation and adaptation policies, as well as place concerns regarding human development at the heart of decision-making (Presidential Climate Commission, 2022). The Just Transition Framework highlights the importance of identifying the communities at the greatest risk of climate change impacts and applying targeted interventions to mitigate its consequences. This includes identifying people residing in low-lying river basins, coastal communities, and in poorly designed, informal settlements. The framework also identifies agriculture and ecotourism as sectors that are subject to severe climate risks and

outlines high-level needs assessment and actions to ensure just adaptation in these sectors. This includes improving the understanding of climate trends across different regions, climate impacts on workers and communities in agriculture regions and ecotourism sites, and developing effective and coordinated strategies to drive just adaptation in order to safeguard the most affected communities in these sectors.

The PCC has also published a conceptual framework and methodology, known as the Climate Resilient Development Pathways (CRDP), across four reports, with the aim of facilitating South Africa's transition to a climate-resilient and net-zero society in a just and inclusive manner. The CRDP approach sets out to guide future knowledge production and anticipatory planning across sectors and scales to capitalise on synergies and minimise trade-offs between climate adaptation and mitigation (Taylor, o.fl., 2022). It includes decisions and actions that leverage climate adaptation and mitigation measures to pursue sustainable development that promotes human and environmental health and well-being, equity, and justice. It is showcased through several case studies and directives on how it can be operationalised on the ground.

The incorporation of Just Adaptation in EU Adaptation policies

The latest EU Adaptation Strategy, launched in 2021, acknowledges the unequal exposure and vulnerability to climate impacts across different regions and social groups and stresses the importance of achieving resilience in a just and fair manner. The strategy commits the European Union to support a just transition towards climate resilience through a range of policies and financial instruments, but also to enforce existing employment and social legislation. So far, European policies relating to just adaptation have largely focused on the international dimensions of justice, societal transformations, employment, and worker's rights (Lager, o.fl., 2023). A year after the launch of the strategy, the European Parliament adopted a resolution on the consequences of drought, fire, and other extreme weather phenomena, which recognised the disproportionate impacts of climate change on Mediterranean countries, socioeconomically disadvantaged people, women, and outdoor workers (European Parliament, 2022). The resolution also called on the Commission to develop a proposal for a comprehensive, ambitious and legally binding climate adaptation framework to address the social implications of climate change both in Europe and internationally.

The EU Climate Laws that took effect the same year as the launch of the adaptation strategy include provisions consistent with the EU strategy that require Member States to adopt and implement adaptation strategies and plans on national levels. In alignment with guidelines published by the EU Commission, the law also articulates expectations for the quality of national adaptation policies and their outcomes This requires national adaptation plans to ensure a just transition to reduce the unequal burdens of climate risks and ensure equal benefits from adaptation measures. As an example, the guidelines require the development of adaptation plans to include input from communities and people most affected by climate change, including low-income and marginalised social groups, the elderly, pregnant women, people with pre-existing medical conditions and disabilities, outdoor workers, and children (European Commission, 2023).

The EU Cohesion Policy has been the cornerstone of the EU's efforts to address regional disparities and inequities across the EU, with almost one-third of the total EU budget (€392bn) allocated for the 2021-2027 period (European Commission, 2023). The policy leverages several

different financial instruments to close the gap between EU member states and different communities and regions within them. For instance, the European Regional Development Fund and the Cohesion Policy are required to dedicate a minimum of 33% and 56% to climate-related activities, respectively. They are thus expected to play a key role in facilitating adaptation investments and reforms to enhance resilience to climate impacts while addressing the unequal exposure and vulnerability to climate change within different regions and socioeconomic groups. These funds are being mobilised to assess the impacts of climate change on workers, working conditions, health and safety and other distributional effects. They also serve to address these impacts through education, training and reskilling initiatives and economic diversification strategies (European Commission, 2021).

The role of Indigenous people in the Canadian adaptation policy

The Arctic has been warming much faster than the rest of the world over the last few decades. These conditions leave Indigenous communities at risk of widespread disruptions to their everyday life due to the close ties between their culture and livelihood and their local ecosystems. The retreating permafrost is already threatening the safety and livelihoods of entire villages of Indigenous communities, as residents have been forced to relocate due to increased risks of flooding and erosion (Luke, 2021). In addition, rising temperatures and the retreat of icesheets have upended many hundred years of customs and ways of life for Indigenous populations, such as Inuit communities. In recognition of the particularly harmful effects of climate change to Indigenous people, Canada embedded indigenous experiences and perspectives into its National Adaptation Strategy and National Action Plan. The strategy's first guiding principle is a commitment to respect Indigenous jurisdictions and rights with the aim of creating an opportunity for Indigenous communities to take on leading roles in Canada's climate adaptation efforts (Government of Canada, 2013).

The strategy also recognises the rights, governance, and self-determination of Indigenous communities - such as First Nations, Méti Nation and Inuits - to use, develop, conserve, and protect the environment of their land and resources. This strategy, in turn, sets the mandate for Indigenous communities to take leadership on climate adaptation. To support the self-determination of Indigenous communities on adaptation, the Canadian government also launched various initiatives, including the First Nation Adapt programme. This programme aims to support First Nation communities and organisations in assessing the impacts of climate change on their communities, and in designing and implementing context-specific adaptation solutions (Government of Canada, 2023).

The Canadian government's recognition of the unique impacts of climate change on Indigenous communities and the inclusion of these communities in leading adaptation efforts in their territories has also fostered greater engagement and empowerment of Indigenous youth. For example, in 2021 the Assembly of First Nations Yukon Region and the Council of Yukon First Nation assigned a fellowship of people under 30 years of age, called "Children of Tomorrow", to develop the nation's climate action plan for the coming decades. This plan was subsequently ratified by Yukon First Nations leadership a couple of years later (Wood, 2023). The plan includes specific climate actions such as building homes from local materials, incentivising a shift away from lawns, promoting natural ecosystems and de-commodifying food. The initiative has also been leveraged to mobilise a youth-led movement of future climate leaders to work on a transformation that aligns local climate actions with indigenous values, communities, and land.

5. Emerging trends and priorities for the just resilience agenda

5.1 Emerging themes

Recent policy advancements of the just resilience agenda are predominantly influenced by perspectives from richer countries, particularly European countries, Canada, and Australia. These countries are at the forefront of integrating justice into climate adaptation and resilience strategies, with South Africa also playing a pivotal role, as shown by the examples of policy developments mentioned earlier in the paper. Current developments have been focused on vulnerable and marginalised groups, considering factors such as socioeconomic status, gender, age, and ethnicity, while also championing the inclusion of Indigenous rights and perspectives.

Beyond this, alternative approaches are gaining momentum, driven by international negotiations and internal policy developments from countries in Africa and Latin America. Diverse global perspectives can enrich and inform the just resilience agenda, ultimately leading to more comprehensive and inclusive adaptation policies. Prominent developments emphasise a broader definition of rights, extending beyond human rights to include community rights and the rights of nature. Significant developments in the rights of nature began with Ecuador incorporating these rights into its constitution in 2008, followed by similar developments in Bolivia, India and New Zealand. These developments stem from the recognition of Indigenous relationships with the earth and natural resources; their legal development could have significant consequences for future adaptation and justice practices.

In Africa, there is a growing emphasis on the importance of a just transitions for the agricultural sector, particularly considering the gendered and intergenerational aspects of future farmers and in light of the increasing youth population in most African countries. The continent is expected to comprise 42 % of the world's youth by 2030 (WEF, 2022). There is also a growing awareness and concern about cross-scale interdependencies and global drivers of risk (Interview, 2024; Adaptation Without Borders, 2023). These include aspects of justice and fairness in shared resources and ecosystems, trade dynamics and dependencies, and the movement of people, including large traditional transhumance (pastoralist) movements across Africa.

Lower-income countries across the globe have increasingly advocated for adaptation to be locally led and owned. There are also calls for sufficient financial support from developed countries, contrasting with the top-down structure of dominant international funding mechanisms. The principles of locally led adaptation are closely connected to the core values of a just resilience agenda, focusing on enabling participation, recognition and a more equal distribution of adaptation benefits and burdens. This approach focuses on grounding adaptation action in the lived realities and priorities of local communities. In practice, however, there are significant risks of maladaptive outcomes for such intervention design if the intersections of power and justice are not accounted for. Practices need to be contextually informed to make sure that the concept of locally led adaptation does not simply enable governments to abandon their responsibilities and simply leave the 'local' actors to organise themselves, further entrenching inequities and power imbalances at the 'local' scale (Rahman et al. 2023).

On the global policy agenda, the Global Goal on Adaptation (GGA) was initiated under the Paris Agreement to help enhance adaptive capacity, strengthen resilience, and reduce vulnerability to climate change. The operationalisation of this goal involves integrating considerations of equity into all aspects of adaptation finance and planning, ensuring that international support addresses the specific needs of the most affected populations. The targets, priorities and implementation strategy for the GGA is under technical negotiations under the UNFCCC process, and is expected to shape the goals and priorities for global adaptation ahead.

5.2 Equitable finance mechanisms

One critical aspect that will shape the implementation of the just resilience agenda, especially among lower-income countries, is the incorporation of social equity into international finance and especially climate finance mechanisms. Priorities for equitable climate finance mechanisms include ensuring that funds for climate adaptation are accessible to those most in need and are distributed in a way that supports rather than undermines local governance structures. Under the Paris Agreement, high-income countries pledged an annual contribution of USD 100 billion in support of climate action in low-income countries, at least half of which was to be dedicated to climate adaptation. However, the funding provided until 2023 has not met the target, and it has also failed to reach the most vulnerable countries and communities (UNEP, 2023). During the annual climate change conference (United Nations Framework Convention on Climate Change) countries are continuing negotiations. Current developments are focused on ways countries can increase funding to match the scale of the needs, align with recipient countries' priorities, and be implemented fairly and effectively (Browne, 2022). A few prominent focus areas that will shape future global adaptation funding are:

- Reform of global financial structures: New initiatives under global financial structures are being explored and implemented to address the inadequacies of existing mechanisms. For instance, the Taskforce on Access to Climate Finance, co-chaired by the UK and Fiji, has been working on ways to streamline access to climate finance for small island developing states (SIDS) and least developed countries (LCDs). This includes efforts to simplify application processes and increase direct access to international climate funds.

- Focus on localised funding mechanisms: There is a growing trend towards localising climate finance. This consists of devolving funding decisions to the local level where the impacts of climate change are most directly felt. Initiatives such as the Local Climate Adaptive Living Facility (LoCAL) of the UN Capital Development Fund provide mechanisms through which local governments can access climate finance to implement region-specific adaptation projects.

- Integration of private sector investments: Efforts to leverage private sector investment for climate adaptation are increasing. The use of blended finance models, where public funds are used to mitigate investment risks for the private sector (also known as "de-risking"), has been promoted, mainly by richer countries, to increase resources available for climate action. These models aim to attract private finance towards sustainable development projects by offering financial incentives and risk-sharing arrangements. The approach has received substantial criticism from poorer countries and is seen as a way to avoid responsibilities on the part of the wealthier nations.

- Advancements in financial instruments: Innovative financial instruments such as green bonds, resilience bonds, and catastrophe bonds are being increasingly utilised. These instruments are designed to provide funding for climate adaptation projects while offering investors secure and profitable investment opportunities. Another new innovative funding model is the Just Transition Energy Partnerships (JET-Ps) where small groups of countries provide relatively large funding packages to help major emerging economies accelerate their energy transitions, explicitly accounting for the justice dimensions. While focusing on mitigation, the model is transferrable to adaptation funding as well. It has been spearheaded by funding to South Africa (8.5 USD Billion) at COP26 in Glasgow, followed by a second round of JET-Ps including India, Indonesia, Vietnam, and Senegal. The donor pool has since been expanded to include multilateral development banks, national development banks, and development finance agencies (IISD, 2024).

6. Discussion

Just resilience is an emerging agenda and will, in the years ahead, be shaped both by international, national and local developments. The following discussion provides an overview of trade-offs and barriers to implementation and a critical view of the links between structural inequities and adaptation to support researchers and practitioners in engaging in and shaping the future agenda.

6.1 Barriers and trade-offs to implementation

Although governments, practitioners and businesses increasingly acknowledge the importance of embedding social justice and equity into climate adaptation planning, there are several challenges that are hindering progress, in particular resource constraints, tensions between competing policy objectives, and knowledge gaps. Delivering just resilience requires navigating a complicated socioeconomic landscape that is riddled with competing demands and trade-offs. One key concern is that integrating justice and equity considerations into adaptation planning demands effort, time, and financial resources, whereas in practice, adaptation interventions often are implemented where there are resource constraints – especially in poorer countries (Byskov, et al., 2021). In such contexts, just adaptation might be regarded as an unrealistic ideal or aspirational principle that simply does not reflect the non-ideal conditions on the ground.

Another tension point is the potential trade-off between effective and just adaptation. The discrepancy emerges from situations when the most effective adaptation options are not necessarily the most socially just. Examples of the dilemma are cases of forced displacement of populations that might alleviate agricultural pressures or be justified out of concern for their own safety, which - while effective from a technocratic perspective - have serious justice implications for the people in question (Ibid.). Finally, potential synergies and trade-offs exist between measures imposed for the purpose of climate mitigation and the developmental potential for vulnerable communities. In some cases, decarbonisation efforts could stunt industrial development in less affluent and vulnerable countries and communities, which could ultimately compromise their adaptive capacity.

These potential trade-offs do not imply that just resilience cannot or should not be pursued; they merely serve as a reminder to critically assess the implications of a justice focus on adaptation in the context of a given project or policy framework. Potential trade-offs underscore the importance of designing and developing holistic mitigation and adaptation strategies in a manner that embeds developmental needs and factors in the wider socioeconomic context. Yet the current lack of research into the interplay between different policy goals and instruments in the context of adaptation makes it difficult to identify ways to leverage mutually reinforcing policies and manage policy trade-offs (Ulibarri, et al., 2021).

Knowledge gaps have also played a major role in the slow progress of just resilience. Despite advancements in climate risk assessment and climate impact models, less work has been done on the social drivers of climate vulnerability among certain social groups and communities. This has hindered the development of harmonised guidelines and tools that could support national and local authorities in tackling those vulnerabilities. Not surprisingly, marginalised groups and underserved communities, such as migrants and people with disabilities, are generally overlooked by adaptation policies (Ulibarri, et al., 2021). This insufficient understanding also makes it difficult to formulate a consolidated approach to define indicators to help monitor the social outcomes of adaptation interventions over time. Therefore, there is a need for adaptation research and practice that adopts more comprehensive multi-governance approaches and are anchored on interdisciplinary expertise.

6.2 Structural and systems change and the role of adaptation

Structural and systemic changes are central to the concepts of justice and resilience. Evidence indicates that pre-existing inequalities interact with adaptation feasibility and effectiveness (including limits to adaptation) and drive climate-related vulnerabilities. As the IPCC concludes in its latest adaptation report, adaptation solutions should not only recognise but also address existing inequities (IPCC, 2022 Section B). The connection to broader structural and systemic underlying drivers and policy objectives becomes particularly clear when it comes to avoiding maladaptation. According to the IPCC: "Maladaptation can be avoided by flexible, multi-sectoral, inclusive and long-term planning and implementation of adaptation actions with benefits to many sectors and systems." (IPCC, 2022b Section C4).

To effectively avoid maladaptation, assessing justice implications and outcomes of adaptation would thus need to become a common practice. This would involve assessing, measuring and monitoring plans, processes and implementation (the entire process of adaptation from design to implementation) to assess progress towards addressing these underlying structural drivers of inequities. However, doing so does not happen in a technical or practical vacuum. It would need to be integrated into a broader agenda aimed at transitioning towards a resilient society, which includes uprooting and confronting structural elements of injustice. Striving to strengthen such goals is perhaps not the most common interpretation of adaptation action but it is intrinsically part of transformative approaches. Inherently, the issue becomes a political question, while adaptation is seen as a 'technical' task. Awareness and consideration of structural barriers to positive change thus become a core part of enabling justice outcomes in adaptation action. It also means that action needs to be tailored to the political realities in which it is embedded, working both within structural and power inequities and working towards structural changes to reach those most in need. These issues are of critical concern for practitioners and policymakers working in areas affected by corruption, conflict, or challenging governance structures. They are thus of graver concern for marginalised communities embedded within these environments.

6.3 The road ahead

The current knowledge base and available tools are enough to start integrating just resilience and justice dimensions into the adaptation process, national monitoring systems and vulnerability assessments. An effective first step would be country-wide assessments of key policy priority areas, identifying key drivers of vulnerability and targeting groups in at-risk sectors. Such assessments should consider not only distributive effects from climate impacts and adaptation but also the meaningful inclusion of people who are often excluded or marginalised. It is also important to factor in people's and groups' different capacities and capabilities. Additionally, adaptation actions that have already been implemented should be monitored and assessed for justice considerations and risks of maladaptation.

While using available approaches can provide an important starting point, we also propose three guiding principles for the development of the just resilience agenda:

- Go beyond the no-harm principle and approach climate adaptation as an opportunity to substantially reduce systemic and underlying inequalities that contribute to increased vulnerabilities. This involves recognising these underlying inequalities, promoting resilience-building, and enabling practices such as strengthening social networks and enhancing political capacity among underrepresented groups.

- Navigate complex and unjust realities: Sometimes challenging structural and power inequities themselves is a way forward for just practices. In other contexts, working within existing dynamics in innovative ways may be crucial to ensure benefits reach the most vulnerable. Locally informed, led and owned solutions are often critical for such innovation to successfully reach those most in need.

- Enable opportunities for sharing good practices and lessons learned between adaptation practitioners, researchers and policymakers, with a focus on experiences from lower-income countries. This exchange is crucial for developing the just resilience agenda and ensuring the involvement of those with the greatest needs or those who are often underrepresented. This could greatly support the improvement of global, national and local measures, monitoring systems, and foster co-learning.

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