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Adaptation pathways to inform policy and practice in the context of development

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ABSTRACT

Adaptation pathways are a decision-focused approach to account for future uncertainties and complexities in planning and implementation of adaptation actions. The pathways approach incorporates flexibility into decision making to accommodate for changing conditions over time, and to reduce undesirable path dependencies and maladaptive consequences. While the pathways approach for adaptation planning has received great interest from both climate scientists and practitioners, there has been little specific guidance on how to implement them and how to sustain the resulting outcomes. Accordingly, pathways approaches include diversified methodologies, with scope for reorienting and adjusting methods for different decision contexts. This special issue explores both theoretical and empirical cases of adaptation pathways in different contexts. A learning framework on adaptation pathways has been developed from a systematic review of adaptation literature. In this editorial, the framework is used to characterize the twelve case studies presented in the special issue, followed by a synthesis of lessons which point to some critical research gaps in adaptation pathways.

1. Introduction

Adaptation processes must be dynamic to address uncertain future conditions in the face of climate change. Adaptation pathways embrace this context of uncertainty by providing decision-focused approaches that incorporate flexibility and opportunity for learning in uncertain and ambiguous conditions. They are most broadly understood as a planning approach, which allows for the progressive implementation of actions depending on future dynamics (Werners et al., 2021a). Pathways may identify 'no or low regrets' interventions that avoid undesirable path dependencies and maladaptive consequences. In addition, the participatory process of developing pathways potentially 'primes' stakeholders' capacity for change and facilitates transformations that are necessary to reduce the adverse impacts of climate change (Colloff et al., 2021; Roy et al., 2021).

Researchers and practitioners have applied adaptation pathways in different domains, including development, disaster risk reduction, and climate adaptation planning. As the use of pathways has expanded, practitioners have diversified methodologies, reorienting and adjusting approaches for different decision contexts. This special issue presents examples of adaptation pathways taking various approaches to different challenges with a range of stakeholder groups (see the characterization of the cases in Table 1). It, therefore, gives an overview of how pathways approaches are applicable and adaptable across various contexts. It

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takes special interest in development contexts.

In this editorial, we use the learning framework presented in the introduction paper to this special issue by Werners et al. (2021a) to characterize and synthesize lessons across the case studies of pathway development presented in the special issue. Section 2 gives a brief overview of the learning framework. Section 3 characterizes the special issue papers according to the learning framework, considering the approach they took and the dominant propositions in the cases. Section 4 then concludes with emerging insights from the synthesis of examples and future research directions.

2. A learning framework for adaptation pathways development

The learning framework outlined by Werners et al. (2021a) was developed from a systematic review of literature. The authors drew out lessons from 76 peer reviewed texts, and included six non-peer-reviewed, publicly available technical reports and guidance documents that were identified from dedicated sessions at conferences. Werners et al. (2021a) find three non-exclusive clusters of approaches for adaptation pathways development, each with its own desired outcome:

(i) *Performance threshold-oriented approaches* inform planning by providing alternative sequences of actions in response to projected future scenarios and broadly correlate with the outcome of meeting short and long-term adaptation needs. Actions are quantified concerning how they perform in relation to specific, well defined metrics. Adaptation actions are triggered by system performance dropping below a defined level, known as the adaptation tipping point. These approaches are often expert driven and applied in data rich situations, where goals are quantified and there is a clear mandate among stakeholders.

(ii) *Multi-stakeholder-oriented approaches* incorporate participatory methods that include multiple drivers and contested stakeholders' goals, interests and values in the adaptation process. These approaches broadly correlate with the outcome of promoting collaborative learning, adaptive planning and adaptive capacity. The pathways are often framed as the actions needed to manage trade-offs and risks for achieving mutually agreed upon societal goals. There is often acknowledgement of system ambiguity and recognition of the importance of non-expert knowledge embedded throughout the process. As such, multi-stakeholder approaches promote co-creation and capacity building.

(iii) *Transformation-oriented approaches* use the idea of pathways as a metaphor for wide-ranging directions of change, across a range of strategic aims and future visions, acknowledging the increasingly novel dynamics of societal, community and individual values in response to large-scale changes in climate and ecosystems. These pathways broadly correlate with the outcome of accounting for complexity and long-term change, including the potential need for transformation.

In terms of what contributes to the utility of adaptation pathways as an effective planning approach under uncertainty, Werners et al. (2021a) present seven propositions. The intention of this learning framework is to provide guidance for systematic reflection about the framing and use of adaptation pathways approaches in different decision-making contexts (Fig. 1). The authors expect that the application of the learning framework in different contexts would generate empirical evidence to enable the refinement of pathways approaches for the full use of its potential. The seven propositions span critical elements of pathways thinking and practice and are as follows:

2.1. Target a specific decision or decision maker

This proposition assumes that adaptation planning and pathways are more effective when focused on concrete decisions, particular decision-making needs, and/ or policy goals. To support this and account for local realities, it is important to scope the decision context, stakeholders, geographic scale, sectors, adaptation possibilities and performance metrics in pathways planning.

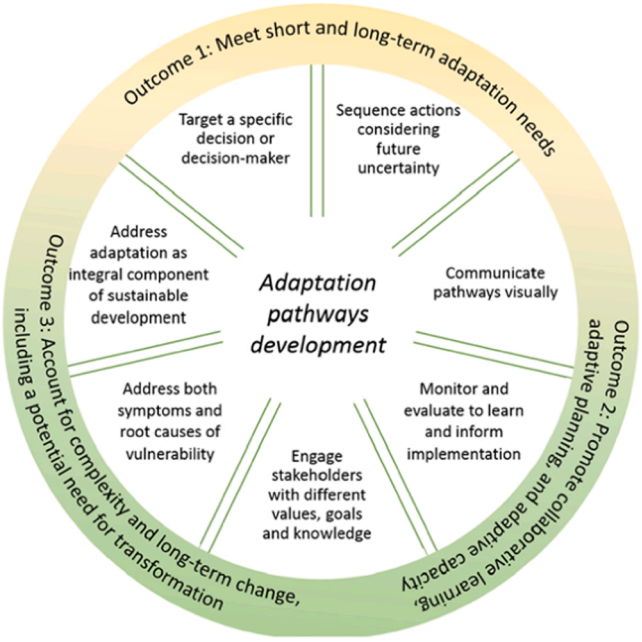

Fig. 1. Propositions and outcomes in the learning framework on adaptation pathways development (Werners et al., 2021a).

2.2. Sequence actions considering future uncertainty

The proposition considers that adaptation pathways prepare for future risks by specifying which measures can be taken now and which are planned for the future to be implemented once a certain scenario unfolds. Due to uncertain future conditions, it is rarely useful to guide implementation by fixed dates, but rather when circumstances are right for implementation, such as when an adaptation tipping point is expected to be passed.

2.3. Communicate pathways visually

Visualisation of pathways supports decision makers to imagine dynamic responses to changing conditions under uncertainty, which helps to guide the adaptation process. Equally, visualising disaggregated decision making over time can enable decision makers to overcome barriers associated with making long term climate adaptation decisions.

2.4. Monitor and evaluate to learn and inform implementation

The use of adaptation pathways implies an intention to adaptively learn about a system to inform future decision making. Monitoring dynamic conditions, evaluating decision making and learning from experience should all inform adaptation decisions. It is important to consider who is involved in monitoring, evaluation and learning from pathways design and implementation.

2.5. Engage stakeholders with different values, goals and knowledge

It is important to respond in an equitable and just way to climate change. The inclusion of stakeholders with different worldviews in pathways processes is not only fair, but it diversifies the framing in which decisions are made, enhances the quality of decisions and opens up the decision-making space, which avoids 'blind spots' and the taking of decisions that may contribute to ongoing inequality.

2.6. Address both symptoms and root causes of vulnerability

Adaptation is most effective when responding to the symptoms of

vulnerability as well as the root causes of it. This is especially the case where current practices and societal functioning are grounded in a complex social, historical and economical context that interplays with climate change. In such situations, enabling transformation would require a deep understanding of both causes and symptoms of vulnerability, which offers more room for effective and just responses.

2.7. Address adaptation as an integral component of sustainable development

The proposition suggests that adaptation should not be addressed in isolation but rather as an integral component of broader development planning and sustainability goals. Rapid and uncontested economic development and climate change are interlinked. Adaptation pathways should consider the long-term sustainability of development ambitions.

3. Characterizing pathways cases in the special issue

This section relates the papers in the special issue to the learning framework in two ways: the approach that the cases take; and the learning propositions that they illustrate.

3.1. Pathways approaches

Of the twelve cases reported in the special issue, three employ multi-stakeholder-oriented approaches, six prioritize transformation-oriented approaches, and three are more comparative, combining approaches. None of the cases presented in this special issue could be classified as performance threshold-oriented. Table 1 summarises the classifications and briefly summarises each case.

3.2. Articulation of the learning propositions in the cases

Table 2 maps how each of the seven propositions from Werners et al. (2021b) are reflected in each case study of the special issue. We observe that all propositions are touched upon. However, some are engaged more so than others. Furthermore, no paper engages with all seven, which suggests that there are trade-offs regarding how, and to what extent. propositions are covered in the case.

3.2.1. Target a specific decision or decision maker

Four studies apply methods that are targeted towards a decision or decision maker. Authors generally reflect that this enables a more decision focused approach, keeping pathways 'on track' towards desired goals. Totin et al. (2021) focus on food security in their Mali case study, identifying access to agricultural land and irrigation water as key points. They targeted community priorities as a central focus of the project. Bruley et al. (2021) target local stakeholders from their case study region in the French Alps, specifically identifying levers for ecosystem-based adaptation. Butler et al. (2022) target three possible deep sea mining, oil palm and tourism prospects for the government of Papua New Guinea's conservation and environmental protection authority and Pearson and Dare (2021) engage with 28 irrigation farmers to explore water scarcity issues.

3.2.2. Sequence actions considering future uncertainty

Consideration of future uncertainty in adaptation processes is central in seven papers. There is less focus on methods that model deterministic sets of actions to navigate climate uncertainty, with papers focusing more on identifying collective actions to adapt to climate change and enhance social learning, thereby progressing towards shared goals through multi-stakeholder and participatory processes. For example, Bruley et al. (2021) facilitate participatory knowledge production through their backcasting scenario and serious game, arguing that an agreed perspective on adaptation aligned with a desired vision is the first step to initiate change dealing with uncertainty. Cradock-Henry and Frame (2021) note that much research uses regional climate models that downscale global projections, which increases uncertainty, and therefore local level adaptation planning can benefit from the pathways approach as it is well suited to deal with implementing decisions based on how future conditions unfold. Future uncertainty is considered in the remaining five cases, although not explicitly, as it is recognized as inherent to the pathways approach.

3.2.3. Communicate pathways visually

Pathways are visually communicated in three papers. These papers use visuals as a tool to communicate the possible directions that pathways can head (Butler et al., 2022), as a way of presenting action and decision points in short, medium and long-time intervals (Pandey et al., 2021), or as a method of engaging stakeholders with low literacy rates with the pathways approach (Totin et al., 2021).

3.2.4. Monitor and evaluate to learn and inform implementation

Only one empirical paper actively integrates monitoring and evaluation into its research approach. Totin et al. (2021), who apply the learning framework from Werners et al. (2021a) for a transformative scenario planning approach, do so through a reflexive evaluation process with stakeholders to foster lessons learned and assess outcomes. It is important to note that due to the methodological approach of some of the papers (i.e. literature review, stakeholder interviews, case study reviews), monitoring and evaluation activities may not have been necessary for the context. However, we still observe a lack of engagement with the process of monitoring and evaluation in authors' analysis and reflections, with only Werners et al. (2021b) noting it as a central component of pathways approaches.

3.2.5. Engage stakeholders with different values, goals, and knowledge

All 12 cases explicitly acknowledge that it is important to engage with multiple and different groups of stakeholders in adaptation pathways approaches. Although various different participatory and co-creation methods are applied across papers, authors generally highlight that incorporating different values, goals and knowledge across levels and sectors enriches pathways processes. Diversity in pathways approaches enables decision makers to better understand how decisions and actions have trade-offs for different groups and support more comprehensive decision making. However, because adaptation is intertwined with societal transitions, identifying and implementing pathways involves the governance of knowledge and different world views, including how power and resources influence the decision making space, and is therefore inherently political (Butler et al., 2022). Colloff et al. (2021, 165) highlight that intentional transformative adaptation stands in tension with existing political structures and processes: it is inherently political because it is a societal activity requiring people to change the status quo, thus challenging existing power relations. Leal Filho et al. (2021) argue that the pathways should give particular attention to the vulnerable and that the involvement of all relevant stakeholders is necessary to yield the expected benefits. These select examples highlight that stakeholder engagement is critical to enable collectively designed adaptation pathways, which can also inform and strengthen development processes by identifying specific challenges and opportunities, building on the collective expertise and knowledge, and building capacity and trust for future decisions.

3.2.6. Address adaptation as an integral component of sustainable development

Six studies in the special issue integrate a systems approach to respond to climate change, assuming that climate change is only one of the drivers shaping livelihoods. There is a greater focus on adaptation than mitigation, with only one paper, from Werners et al. (2021b), emphasizing the need for both if pathways are to achieve sustainable development. Many of the drivers of change identified by Pandey et al. (2021) in their research in Nepal are related to climate change, although

Table 1
Characterisation of the cases in the special issue.

	Multi-stakeholder oriented approaches	Reference
Article title	**Matches, mismatches and priorities of pathways from a climate-resilient development perspective in the mountains of Nepal**	Pandey et al. (2021)
Article description	The authors use a four-step back-casting and visioning approach, which identifies stakeholders' desired futures and the actions and decisions that are needed to reach those desired futures. Actions are mapped out through the construction of pathways over short, medium and long timeframes. The paper concludes that future development priorities should be formulated based on the specific needs of different groups of stakeholders and that future development cooperation in the study region should be brought under one umbrella system.	
Article title	**Whose voices, whose choices? Pursuing climate resilient trajectories for the poor**	Leal Filho et al. (2021)
Article description	The authors reflect on the recent literature and propose areas of action for climate resilient trajectories, which they define as the ways in which choices and actions lead to climate resilience over time. They call for a more central role for the aspirations of marginalised and vulnerable people in development planning and argue that issues surrounding equity, justice, ethics and power are fundamental for climate resilient trajectories.	
	Transformation-oriented approaches	
Article title	**Adapting transformation and transforming adaptation to climate change using a pathways approach**	Colloff et al. (2021)
Article description	Through a review of case studies, the paper examines how researchers and participants engage with: 1) co-producing future visions; 2) shifting decision contexts by reframing values, rules and knowledge; and 3implementingnt actions using adaptation pathways and theories of change. They conclude that promoting pluralism, contesting values, rules and knowledge, and politicising adaptation can help to shift power imbalances and enable change.	
Article title	**From present to future development pathways in fragile mountain landscapes**	Karpouzoglou et al. (2020)
Article description	Through analysing present and historical agro-pastoral practices in three case studies in Peru, Nepal and Kyrgyzstan, the authors apply a pathways lens to focus on the future scope and the direction of development regarding how actors prioritise development goals under environmental and socio-economic change. They conclude by examining how agency, power, historical factors and feedback between social and ecological features of mountain landscapes shape future development across the three cases.	
Article title	**Achieving sustainable future objectives under uncertain conditions- Application of a learning framework to adaptation pathways in rural Mali**	Totin et al. (2021)
Article description	The authors develop a transformative future scenario planning case study for climate adaptation in dry land regions of southern rural Mali. In two workshops, they engage with participants to observe system changes, construct storylines of possible futures and explore low/ no regret options that could transform the system. They conclude that connecting stakeholders and a strong understanding of the local context is important to shape transformative adaptation plans.	
Article title	**'Walking with development': climate resilient pathways planning for resource curses in the Coral Triangle**	Butler et al. (2022)
Article description	The authors integrate a three-step methodology to engage with decision-making and power relations relevant for climate resilient development pathways in Papua New Guinea. The paper discusses developing safe 'political spaces' through participatory pathways planning, which they argue levelled power asymmetries, evaluation and learning. They conclude that many pathways approaches overlook the importance of engaging with multiple stakeholders' world views and political motives, and that in regions with 'resource curses', analysing politics and power in decision-making is key.	
Article title	**Participatory identification of actions and leverage points for ecosystem-based adaptation pathways in a mountain social-ecological system**	Bruley et al. (2021)
Article description	The authors identify and analyse levers that are required to implement ecosystem-based adaptation in the French alps. Using a participatory backcasting scenario and a 'serious game' approach, they focus on co-production actions to achieve climate adaptation objectives that were defined as important to maintain local quality of life, and assess how communities can leverage actions to navigate desired adaptation pathways. They conclude that ecosystem-based adaptation requires substantial transformation that is ultimately in the hands of competing individuals.	
Article title	**Farmer pathways to sustainability in the face of water scarcity**	Pearson and Dare (2021)
Article description	The authors develop and apply a framework to unpack potential pathways to achieve sustainable water management in conditions of water scarcity. They propose four pathways: absorb, exploit, adapt and transform; and find that all four are used, either singularly or simultaneously. They conclude by highlighting the importance of embedding multiple pathways in planning for transformative sustainability, and that a focus on a single pathway or technological fix will likely fail to deliver.	
	Comparative studies	
Article title	**Social differentiation in climate change adaptation- One community, multiple pathways in transitioning Kenyan pastoralism**	Ng'ang'a and Crane (2020)
Article description	The authors conduct ethnographic research to understand how wealth, age and gender differentiate adaptation pathways for agro-pastoralist in Kenya. They argue that these factors are highly influential, and therefore analysing social differentiation of adaptation pathways facilitates understanding of diverse trajectories and rationales for decision making.	
Article title	**Advancing climate resilient development pathways since the IPCC's fifth assessment report**	Werners et al. (2021)
Article description	The authors reviewed literature published since the IPCC fifth assessment report (2014) and held reflexive learning sessions with experts to understand conceptual and empirical advances made on climate resilient development pathways. In their analysis, they discuss the interrelationships and differences in the papers regarding climate action, resilience, development and pathways. They conclude that operationalising climate resilient development pathways requires explicit engagement with aspirations of actors, working with multiple pathways to embed flexibility, anticipation and learning into planning and that more focus is needed on justice and equity issues.	
Article title	**Balancing scales: Enhancing local applications of adaptation pathways**	Cradock-Henry and Frame (2021)
Article description	The authors reflect on the use of adaptation pathways at scaled down, local contexts, to understand their utility for more immediate and non-climate-related issues related to planning processes. They conclude that while pathways focusing on large-scale issues are technically robust and well suited for models, probabilities and decision thresholds, these technical parameters do not readily transfer across scales and are less relevant at the local level.	

Table 2
How the seven propositions are reflected in the cases.

Cases	Targeting a specific decision or decision maker	Engage stakeholders with different values, goals, and knowledge	Address adaptation as an integral component of sustainable development	Address both symptoms and root causes of vulnerability	Sequence actions considering future uncertainty	Monitor and evaluate to inform implementation	Communicate pathways visually
Pandey et al. (2021)		- Engaged with communities and NGOs to elicit current and future challenges	- Stakeholders determine solution space for desired future development objectives				- Represent pathways for climate-resilient development to achieve desired future goals
Leal Filho et al. (2021)		- Need to account for differentiated impacts and risks - Consideration of flexibility to accommodate diversity	- Climate Resilience Trajectories (CRTs) account for climate actions, equity and sustainable development	- CRTs use a system perspective	- CRTs consider susceptibility to ecosystem changes.		
Colloff et al. (2021)		- Intentional Transformative Adaptation (ITA) brings a diversity of stakeholders together to envision the future and priorities			- ITA empowers participants in anticipating future constraints		
Karpouzoglou et al. (2020)		- Engages diverse actors across individual consultations	- Considers that pathways development includes continued interaction of social, technological and environmental systems				
Totin et al. (2021)	- Transformative scenarios planning (TSP) conducted to identify no-regret anticipatory responses to agricultural production under climate change	- TSP involved stakeholders across different social groups to explore "no-regret adaptation options."	- The study assumes that farmers' responses to climate change conditions would also interplay with social, economic and political contexts	- TSP approach failed to consider under-ground challenges that are likely to affect food production in the future	- Participants select what appeared to be the most likely "no-regret" strategy for achieving future food security under uncertain, changing climate	- A monitoring process was put in place to foster reflection on lessons learned	- TSP approach considers visual representations (drawings) of storylines
Butler et al. (2022)	- Focuses on possible options for conservation & environmental protection	- Participatory planning through workshops used to understand complex problem solving processes and promote participation by marginalised stakeholders in the co-production of knowledge.		- During the set of six workshops, participants explored drivers of changes and their intersections with broader development initiatives	- Participants examined potential future system configurations in 2050, given trends and uncertainties.		- Visual representations of plausible scenarios like 'Fat Cats, Skinny Rats'
Bruley et al. (2021)	- Targets local stakeholders for ecosystem-based adaptation	- Various mechanisms used for community engagement, including vision designed workshops, gaming, interviews, etc.	- Explored the linkages between the overarching adaptation objectives, nature's contributions to adaptation bundles, sets of co-production actions in the communities.		- Shared adaptation priorities and a shared future vision is the first step for transformative change under uncertainty.		
Pearson and Dare (2021)	- Proposes a framework that elucidates farmers' choices to achieve a range of sustainability outcomes when facing water scarcity	- Engaged farmers from divers profiles to capture their perspectives					

(*continued on next page*)

Table 2 (*continued*)

Cases	Targeting a specific decision or decision maker	Engage stakeholders with different values, goals, and knowledge	Address adaptation as an integral component of sustainable development	Address both symptoms and root causes of vulnerability	Sequence actions considering future uncertainty	Monitor and evaluate to inform implementation	Communicate pathways visually
Ng'ang'a and Crane (2020)		- Based on key informant interviews to elaborate emerging adaptation practices. A range of 10–20 participants were also selected per village to capture the diversity					
Werners et al. (2021b)		- Involvement of multiple stakeholders is critical to explore the diversity of perspectives	- Recognises that mainstreaming climate actions into development paths at every level is critical. - Adaption and mitigation actions need to be considered in climate resilient development pathways.		- Support the assumption that pathways should consider uncertainty and embed flexibility to accommodate emerging issues	- Note that monitoring, evaluation and learning should be a central component of pathways approaches	
Cradock-Henry and Frame (2021)		- Co-creation with different stakeholders, including community actors.			- Take into account multiple possible future pathways and also foresee adjustments to plans.		

specific responses to climate shocks and stresses are not elaborated. Bruley et al. (2021) engage most concretely with this proposition, using participatory processes to identify 11 adaptation objectives, presenting how they are dependent on nature's contributions to adaptation and discussing the role of nature-based adaptation for transformative climate change.

3.2.7. Address both symptoms and root causes of vulnerability

Although the content and context of all papers touch upon vulnerability reduction, either to climate change impacts or development challenges, only three papers strongly focus on the symptoms and root causes of vulnerability. Of these papers, Butler et al. (2022) and Leal Filho et al. (2021) present methodological approaches and arguments that most concretely focus on root causes, emphasizing the social-political and economic factors driving vulnerability in their respective cases of focus. Leal Filho et al. (2021), for example, highlight that poor and vulnerable communities are heavily reliant on ecosystems and ecosystem services for their lives and livelihoods. Climate resilient trajectories, therefore, must take into consideration ecosystem changes in the context of global warming scenarios, providing an example of coral bleaching beyond 1.5 degrees and the cascading effects this will have on fisheries and tourism.

4. Future research directions

There is growing research around adaptation pathways. However, based on the analysis of the cases in the special issue against the learning framework and propositions, we can identify emerging research gaps that need to be addressed to further progress pathways approaches.

First, several cases indicate that power structures and diversity of values, including cultural dynamics and social norms, shape risk management and adaptation capacity and processes (Ng'ang'a and Crane, 2020; Totin et al., 2021; Karpouzoglou et al., 2020, Butler et al., 2022). Although the existing literature shows that engaging a diversity of values in a participatory process generates a power dynamic, there is a lack of integrated methodological approaches to document how adaptation interventions interplay with social norms and values. Adaptation planning does not always integrate power dynamics and social beliefs in a systemic way, creating conditions that sometimes worsen the situation leading to maladaptation (Schipper, 2020). Determining the interaction between adaptation capacities and the diversity of social context systematically is thus a priority for future pathways development.

Second, pathways development underestimates the complexity of the path dependencies in pathways development. The common assumption across cases is that a pathways approach would accommodate the changing aspirations of different social groups by being flexible and inclusive. However, this does not adequately consider the increasingly differentiated adaptation and development needs among stakeholders, influenced by varied future expectations and past path dependencies. In practice, communities are not homogenous blocs with the same priorities. Therefore, more attention is needed towards methodologies that identify and address each social group's needs, agencies, history and social relations to meet local credibility, legitimacy, and relevance and engage with trade-offs of different actions (Cradock-Henry and Frame, 2021).

Third, one gap highlighted in these cases is the relative absence of monitoring and evaluation. Hence there is a need to consider how structured monitoring and evaluation can be applied to approaches (Bosomworth and Gaillard, 2019; Butler et al., 2016). Due to the decision-focused nature of pathways and explicit engagement with dynamic and multi-dimensional components of climate risks, there is a need to further elaborate on integrated monitoring and evaluation processes that can be applied in complex environments for reflexive learning to better inform adaptation planning processes. However, how to do this and capture how pathways influence important systems information such as feedback and resilience is not yet well understood or documented.

Adaptation pathways are increasingly recognised as a flexible planning approach to accommodate uncertainty that can be applied in various contexts. Pathways also variously embrace the inclusion of

multiple stakeholders in the process, providing opportunities for capacity building and sharing values. This is reflected by the diverse set of papers in the special issue. Through our analysis using the learning framework put forward by Werners et al. (2021a), this editorial highlights that different types of pathways approaches embody the propositions, suggesting that the learning framework has cross-cutting relevance. Context specificity is important in adaptation planning. However, flexible tools are needed to guide the adaptation process across scales and for different challenges. We believe that the learning framework has relevance for different methodological approaches across a range of contexts and can be considered a useful tool in adaptation pathways planning.

CRediT authorship contribution statement

Conception and design of study: Edward Sparkes, Edmond Totin, Saskia E. Werners, Russell M. Wise, James R.A. Butler, and Katharine Vincent; Acquisition of data: Edward Sparkes, Edmond Totin, Saskia E. Werners; Analysis and/or interpretation of data: Edward Sparkes, Edmond Totin, Saskia E. Werners, Russell M. Wise, James R.A. Butler, and Katharine Vincent. Revising the manuscript critically for important intellectual content: Edward Sparkes, Edmond Totin, Saskia E. Werners, Russell M. Wise, James R.A. Butler, and Katharine Vincent, Approval of the version of the manuscript to be published: Edward Sparkes, Edmond Totin, Saskia E. Werners, Russell M. Wise, James R.A. Butler, and Katharine Vincent.

Declaration of Competing Interest

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

Data Availability

No data was used for the research described in the article.

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