

REVIEW

Maladaptation as a concept and a metric in national adaptation policy- Should we, would we, could we?

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Abstract

Implementation of national adaptation policy is advancing. There also appears to be a shift, albeit slow, from monitoring of implementation to evaluation of outcomes of the policy. However, there is an absence of an agreed definition or metrics to indicate when national level implementation fails or goes wrong. The concept of maladaptation remains elusively defined in the adaptation policy sphere but is often evoked in national adaptation plans. Empirical research on maladaptation related to national adaptation policies is lacking, despite claims of it increasingly taking place. This review discusses whether maladaptation should be operationalised as a concept in national adaptation policy, how it would be done and what could it take to make it happen. The paper argues that unless failure of adaptation policy is considered, understanding the adaptation gap, for example, becomes even more challenging.



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1. Increasing need to assess national adaptation

National level adaptation policy (We define national adaptation policy here as the planned adaptation undertaken by a national government and published as a strategy or a plan, which is renewed as regular intervals and steers the country's adaptation efforts.) is at the centre of the adaptation governance with responsibilities for global reporting and strategic vision and resources for the local level. Evidence shows that governments increasingly take action focused on the identification of risks, policy actions to reduce that risk, and increase capacity to deal with climate change [1, 2]. This action is typically planned in 3–5-year planning cycles [or longer, with countries that have less developed adaptation policy], with a focus on mainstreaming actions across the national government and its sectors [3].

National level implementation has naturally been followed by intense efforts to develop approaches, frameworks and indicators for monitoring and evaluation [M&E]. So far, most of the M&E efforts have focused on capturing whether or not the policy itself has been implemented, rather than the production of the desired outcome as outlined in the policy. Thus, monitoring has assessed the implementation or integration of adaptation policies, often using statements of intended measures [3].

Outcome-based evaluation is mainly focused assessing reduction of climate risk and vulnerability but only rarely (if ever) on avoiding failure (Failure is often interpreted as failure of

implementation, failure of produce desired results or both. To be more precise, the degree of policy failure can range from tolerable (i.e., marginal failure) to conflicted (i.e., conflicted success resulting from partial achievement of objectives, or from the opposing stands on the aims, values and means of the programme), to outright (i.e., marginal success) [4].) of the policy to produce the desired results. The concept of maladaptation, defined by the Intergovernmental Panel on Climate Change as “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” [5, p.7], is often mentioned in the assessments and acknowledged as an important indicator of unsuccessful adaptation in national adaptation plans. However, failure of adaptation policy is rarely addressed nor operationalised in these assessments.

Despite no commonly agreed definition on maladaptation, according to the IPCC, maladaptation is increasingly taking place [6]. Several frameworks attempt to shed light on it (see Table 1). Many papers published on nationally relevant maladaptation so far are either pointing toward gaps in knowledge and action [7–9], or are in a form of a commentary [10, 11] or focus on empirical research at the project or community scale case studies [12–15].

So far, maladaptation literature has considered the unintended and harmful outcomes of adaptation, often focusing on rather direct physical impacts [20–22], and increasingly emphasises the politics of maladaptation as a process as well as an outcome [23, 24]. Somewhat absent have been approaches that define maladaptation in the different types and phases of policy processes, particularly beyond the community scale. Recently, the IPCC raised the concept of ‘response risk’, including maladaptation [25], placing it in a central role in the climate risk framework.

This review considers the concept of maladaptation and explores its explanatory power in relation to national adaptation policy, given that it is frequently considered to take place but

Table 1. Frameworks of maladaptation and implications for national policy.

Frameworks of maladaptation	Reference	Interpreted in terms of national policy to be
Pathway framework Maladaptation is ‘an action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups’, [p. 211]	[16]	National adaptation policy is taken to avoid or reduce [overall] vulnerability but in fact adversely impacts other systems beyond the national governance realm [e.g., other states, environment globally], or individual sectors and social groups within the national jurisdiction
Precautionary framework No explicit definition of maladaptation but claiming that ‘since climate models and observation cannot provide what current decision-making frameworks need, the only solution is to amend these frameworks to make them able to take this uncertainty into account’, [p. 242]	[17]	As maladaptation is considered a process to be avoided through acknowledgement of uncertainty, according to this definition, national adaptation policy ought to be flexible and account for uncertainty to avoid maladaptation.
Assessment framework ‘[M]aladaptation as a pathway, limits it to the detrimental effects of an adaptation initiative on the system’s vulnerability to climate variability and change, links it to the necessity for flexibility in order to face current and future climate-related extreme events and gradual environmental changes, and emphasizes its multi-temporal nature’, [p. 3]	[18]	Maladaptation of national adaptation policy here would be considered a policy pathway increasing the state’s vulnerability to climate variability and impacts that can be avoided by [iteratively] applying <i>ex ante</i> policy assessment.
Feedback framework ‘[M]aladaptation could be defined as a result of an intentional adaptation policy or measure directly increasing vulnerability for the targeted and/or external actor[s], and/or eroding preconditions for sustainable development by indirectly increasing society’s vulnerability’, [p. 135]	[19]	Maladaptation here would be an outcome or a result of national adaptation plan and its implementation by either increasing vulnerability of the state itself in the future by rebounding it or other shifting it to the neighbouring states, and finally by decreasing general sustainability of the state.
Constructivist frame ‘[M]aladaptation as, inextricably, both a social/political and scientific process’, [p. 3].	[12]	Maladaptation here would apply to the entire process of producing a national adaptation plan and negotiating the implementation, which is an intertwined social and political process, in case it does not facilitate the key functions of adaptation.

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left undefined and unassessed. In particular, we ask if we should (In this review, we consider the three guiding verbs to mean as follows: “[S]hould is used to say that something is the proper or best thing to do, or to say that someone ought to do something or must do something. Would is used to talk about a possible or imagined situation. Could is used to say that an action or event is possible” [26].) operationalise maladaptation as a concept in national adaptation policy, and if we should, what would that look like as an *ex ante* or *ex post* analysis, and finally, whether we could operationalise it and what kinds of resources it could take.

The main message from this perspective is that there is a need to clarify what unsuccessful or failed adaptation at the national level looks like, irrespective of whether maladaptation is used to refer to this. Moreover, a focus on the national level perspective can contribute to the overall evaluation of adaptation. National level maladaptation may on the one hand involve trade-offs between policy sectors and goals that are not visible in a local level assessment and, on the other hand, it may lead to more fundamental level failures than at the local level. We argue that ignoring failed national adaptation, irrespective of what we call it, runs the risk of under- or overestimating the adaptation gap and the state of adaptation globally.

2. Should we?

Should we use maladaptation as a concept and a metric in national adaptation policy? This question is somewhat moot, as maladaptation is already mentioned in many national adaptation plans, for example, Finland, Sweden, the United Kingdom [UK] and Canada [27]. However, while these plans do not provide a detailed definition of what constitutes maladaptation in that particular plan, they frequently caution against it or state that it is something to be avoided and what should be focused on to avoid it. For example, the UK plan [28] states that ‘*There has been much work to determine cost-effective adaptation responses at the house scale, but scaling up to population-wide changes to housing stock is a complex issue and industry guidance is needed if maladaptation is to be avoided*’ [p. 53]. Also, the National Issues Report informing the Canadian plan [29] states that: ‘*Integrating the geographical, social and cultural context of a community, as well as risks posed by climate change, in policy may improve relevancy and help to avoid maladaptation*’ [p. 122]. The Finnish plan [30] states more implicitly that insufficient and excessive adaptation, as well as poor investments can be avoided by timely and careful implementation of adaptation measures [p. 21].

Empirical evidence of maladaptation with regards to national level implementation has been limited. To date, research articles have pointed out the harmful outcomes of national adaptation policy on communities. For example, planned resettlement due climatic extremes and consequential disasters have raised concerns about the unequal and discriminatory treatment of vulnerable populations [31] and the long-term societal consequences of relocation via its impacts on health [32], cultural integrity and livelihoods [33], and housing security [34]. In addition, Milhorange et al. [35] (p.183) describe the Brazilian mainstreaming of national adaptation policy resulting ‘in the layering of existing sector-based instruments [and becoming] a mix of loosely coordinated and inconsistent strategies, lacking a common implementation approach’. Research on adaptation as government activity [and not, for example, as private or autonomous actions] has shown that the failures identified as maladaptation relate to the pre-conditions of adaptation, the adaptation processes and the outcomes [23].

While these examples above demonstrate a need to account for national adaptation not achieving its objectives, how helpful is maladaptation here as a concept? There would need to be an explicit decision as to what constitutes maladaptation in national adaptation policy. This depends in large part on how maladaptation itself is defined, as there is no consensus on the matter as of yet.

[Table 1](#) presents five proposed frameworks with definitions for maladaptation in the literature and considers what they imply for national adaptation policy. The definitions have been presented as a way to operationalise the concept in several papers, including pathway framework, precautionary framework, assessment framework, feedback framework [36, 37], as well as a post-positivist way of viewing maladaptation [12].

The definitions above, while naturally differing from each other, can be considered to focus on three things. First, most frameworks imply that the negative impacts associated with maladaptation are predominantly linked to vulnerability (either on one's own or others) which in this case refers to the national level vulnerability. Second, one difference is that some frameworks explicitly consider the outcome of an adaptation action (pathway and feedback frameworks), while others perceive the whole process of adaptation planning as potentially maladaptive if the role of politics and power are not accounted for (constructivist frame). Third, some of the frameworks are more solution-oriented, presenting ways to address maladaptation by focusing on enabling conditions for successful adaptation (precautionary and assessment frameworks) or identifying harmful outcomes (feedback framework), indicating a difference between descriptive and prescriptive definitions.

3. Would we?

Would it then be appropriate to operationalise maladaptation as a concept to assess national adaptation policy either *ex ante*, *ex post* or both and what would that look like? This long outstanding question gets to the heart of M&E of adaptation [see e.g., [38]]. Much effort has been spent on developing monitoring, reporting and evaluation frameworks/ systems at the national level, and also on their mapping and reviewing [3]. These M&E systems can be categorised, for example, based on whether they track the implementation of measures or policies, the so-called process indicators or the so-called outcome indicators that are used to measure policy impacts [39]. None of the existing M&E systems attempt to capture maladaptation, which raises the questions whether maladaptation is a suitable concept to include to begin with and if operationalised, what would a national M&E system that captures maladaptation look like?

First, the focus and aspects of measurement of a national M&E system to capture maladaptation would depend on the definition of maladaptation that was adopted in a particular plan [Table 2]. The table shows each definition's characteristics horizontally in a row and then shows ways to assess nationally each of these characteristics in the following row below. These suggestions are based on generic policy processes and tools used in national policy and discussed in adaptation literature. To populate the table, we build on theoretical and empirical policy analysis literature on policy processes and impacts, adaptation justice indices, *ex-ante* and *ex-post* policy assessments, climate risk and vulnerability assessments, and environmental impact assessments.

Irrespective of the definition, the scope of the system to be assessed would be the national plan, i.e., covering the nation state with a designated public entity responsible for its coordination. A baseline to examine adaptation against would need to be established (The establishment of a baseline does not necessarily mean that the current adaptation would not be maladaptive, i.e., the baseline does not mean there is no maladaptation at the moment. Rather that the assessment begins from a point in time and the focus is on measuring trends in development instead of the overall amount.), along with a decision about timescales. To capture maladaptation, which timescales are reasonable and necessary to assess positive or negative trends in national adaptation?

When would a national level assessment be carried out and how? An *ex-ante* assessment is a dominant approach in the precautionary framework, which aims to identify the least harmful

Table 2. Characteristics and ways to assess maladaptation.

Framework of maladaptation		Characteristics of maladaptation within each framework ¹								
<i>Pathways framework</i>	<i>Increasing emissions of greenhouse gases</i>	<i>Disproportionately burdening the most vulnerable</i>	<i>High opportunity cost</i>	<i>Reduce incentive to adapt</i>	<i>Path dependency</i>					
Ways to assess nationally	National mitigation plan and carbon accounting	National climate risk assessment	Cost-benefit analysis of national plan	Consultation of actors, Willingness to pay assessment, Assessment of the actor network	Assess the flexibility of initiatives/ actions, potential irreversible changes					
Precautionary framework	No-regret strategies	Reversible strategies	Safety margin strategies	Soft strategies	Strategies that reduce decision-making time horizons	Taking into account conflicts and synergies between strategies				
Ways to assess nationally	Ex-ante qualitative assessment of policy	Ex-ante qualitative assessment of policy	Cost-benefit analysis of national plan	Multi-criteria decision tool for weighing between technical, financial and institutional policy	Ex ante scenario and backcasting analyses	Trade-off analysis between policy fields				
Assessment framework	<i>Environmental maladaptation: Avoid degradation in situ Support ecosystem services for adaptation Integrate ecological uncertainties Reduce greenhouse gases</i>		<i>Sociocultural maladaptation: Account for local characteristics and cultural values Build on and develop local skills Call on new skills</i>		<i>Economic maladaptation: Promote reduction of inequalities Support relative diversification Integrate potential changes in economic and subsistence activities</i>					
Ways to assess nationally	Environmental impact assessment of national plan, National climate risk assessment, National mitigation plan and carbon accounting	Environmental impact assessment of national plan, National climate risk assessment	Collaboration of stakeholders and wide consultation during the national plan development phase and the sectoral mainstreaming. Adoption of novel type of climate governance that is based on the principles of adaptive governance.		National Gini coefficient, The Global Economic Diversification Index (EDI) aims to fill this gap. (The EDI examines economic diversification from a multi-dimensional angle, exploring activity, trade and government revenue diversification)					
Feedback framework	Rebound vulnerability		Redistribute vulnerability		<i>Erode the common base</i>					
Ways to assess nationally	National climate risk assessment	National climate risk assessment	National climate risk assessment		National mitigation plan and carbon accounting, Environmental impact assessment of national plan					
Constructivist frame	<i>Equitably represent the varied social interests and viewpoints around adaptation.</i>		<i>Foster the reasoned confrontation of all existing scientific arguments, reinforcing an evidence-based (albeit not evidence settled) process.</i>		<i>Maximise the future adaptability of current decisions in order to reflect changes in actors' positions as well as the emergence of new information.</i>					
Ways to assess nationally	Deep coproduction process at the heart of national adaptation planning	Deep coproduction process at the heart of national adaptation planning	Discussion forums throughout the national adaptation planning process		Continuous assessment of adaptation implementation					

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adaptation pathway. However, the frameworks that are based on a criterion for maladaptation avoidance or enabling conditions for successful adaptation are inherently *ex post* oriented. It is obviously preferable to identify as much of the potential harmful processes and outcomes in advance and this could be done with established methods such as strategic/ environmental assessments, trade-off analyses, scenario and backcasting analyses, cost-benefit analyses, multi-criteria analysis adopted to adaptation context (see, e.g. [40–44]) that show promising results. The *ex-ante* assessments are, however, not always possible nor meaningful. Some of the process indicators, for instance, can be identified *ex-ante* (e.g., a participatory phase integrated into the planning process), while the qualitative and outcome assessment of participation e.g., the representativeness of the actual group of participants and whether the participation resulted in changes in the plan, see, e.g. [45]) is meaningful *ex post* (see ‘justice index’, [27]). An iterative *ex post–ex ante* assessment is a reasonable way to develop a meaningful M&E system in most of the frameworks. In practice, this is often how the national adaptation policy processes also ensure with more or less regulative reporting policy that mid-term and final assessments of the NAP and related processes (see, e.g. the UK ARP and CCRA processes, [46, 47]) inform the planning of the new NAP.

What would then be measured in a national assessment? In the frameworks where maladaptation is defined as an increase in vulnerability, the most obvious way to address it is to consider the use of the national climate risk assessment to monitor change in levels of national vulnerability. In addition, the risk assessments would need to adopt a global perspective in order to identify potential redistribution of vulnerability across national borders (see, e.g. [48]). To capture the increase in vulnerability over time or space, would require the integration of the national climate risk assessment (which tracks vulnerability) with the national adaptation plan into a system in which actions are assessed in relation to the level risk. In addition, the national adaptation plan would perhaps be considered in relation to the national mitigation plan and carbon accounts to see to what extent the adaptation measures increase greenhouse gas emissions. Other parallel monitoring tools could be, for example, related to air quality, biodiversity, and ecosystem services [49], or the United Nations Environmental Statistics, depending on how the common pool is defined. In addition, monitoring tools to address NAP contributions globally, in particular, with regards to the unequal distribution of vulnerability, would include the SDG target reporting (see [50]) and the Human Development Index [51]. In principle, a signal of maladaptation could then be detected in the risk assessments and corrective policy action could be taken when the plan is due to be revised.

There are also many economic characteristics identified in the frameworks for which statistics and indexes already exist and could be harnessed to assess to what extent a signal of maladaptation can be seen in the economic system. For example, issues of unequal distribution of resources are frequently assessed at the national level with various methods, including the national Gini coefficient and advanced adoptions of it (see [52]) and the SDG reporting (SDG10, in particular) and this could be linked to the assessment of the national adaptation policy. Also, frameworks identify many socio-cultural and political aspects from which maladaptation may arise during the planning process. These include issues of inadequate representation, lack of inclusion of varied worldviews and values, and absence of skills. These types of processual factors would need to be understood and addressed by those leading the process (see, e.g. [12]). Therefore, there would need to be some level of arbitration or neutral facilitation, deep coproduction (see [24]) to ensure that the process of national adaptation itself is not maladaptive. While many of the frameworks stressed the overarching nature of maladaptation, stemming from the adaptation planning phase to the implementation, it is unlikely that a national M&E system would be able to account for these issues, at least quantitatively. It is

more likely that issues related to power imbalances and politics in national planning would be identified by actors included in the processes and addressed during the process itself.

4. Could we?

The final question we address here is given the above discussion, what could we do? To begin with, the question needs to be asked whether this type of system would be meaningful, given the well-known issues with quantitative assessment of policy outcomes [53, 54]. In addition, the temporal dimension maladaptation is challenging to capture, meaning that something might be considered maladaptation but found later to be useful and vice versa [19]. Second, the above type of extensive integration of climate risk assessment and M&E is probably beyond the capacity of most countries to implement. Literature already shows that there is a gap in the understanding of the success of national adaptation plans in relation to the climate risks faced by a particular country. This is due to the fundamental challenges of planning, monitoring, and evaluating adaptation i.e., temporal and spatial variation and dynamics of the needs and impacts of adaptation, and the disconnect between the risk assessments and adaptation planning [55–57]. In addition, the characteristics of the national adaptation plans and related processes set preconditions to the planning and its evaluation that are not yet thoroughly understood.

However, if the idea of maladaptation as trend to be tracked is nevertheless appealing, the next steps could also focus on conceptual development within the scientific community. It is generally acknowledged that for a concept to be measured, there needs to be a scientific consensus on its meaning [58]. Further conceptual work here could include merging existing definitions and further breaking maladaptation down into different phases and features of national adaptation, for example into preconditions, processes, and outcomes of national policy (see Fig 1). These could then be connected with potential indicators, process- or outcome-based to see how they might be operationalised. This conceptual consolidation could be followed with development and empirical testing of frameworks and models that include empirical data.

Finally, to answer how could the different types of maladaptation assessment and monitoring take place at the national level, three entry points can be identified based on how maladaptation is understood (see Fig 1). First, as the global stock-take on adaptation evolves, the maladaptive outcomes will be increasingly tracked, which pushes for the development of national *ex post* policy assessment and accounting tools. The outcomes may become an ethical or liability issue for the state in terms of cross-border impacts, for one, and an issue of distributive and restorative justice nationally. This may raise motivations to take proactive measures and to take up a broader spectrum of *ex ante* analyses. Furthermore, the processual framing of maladaptation could raise the need to address also processual justice issues and to develop deeper participation in the national planning and M&E cycle. In addition, to address maladaptation also as a precondition would require the development of the vulnerability and risk assessments to involve more diverse methods and stakeholder engagement.

5. Concluding remarks

We have explored the role of maladaptation as a concept in national level adaptation planning. While it is increasingly claimed to be taking place also at the national level, there continues to no be clear view on what the concept offers for national policy making. While the M&E of adaptation is inherently complex, it is fundamentally important to continue to advance the understanding of national level maladaptation. As we have demonstrated, there are ways to define and identify maladaptation at the national level that involves a broader and deeper view

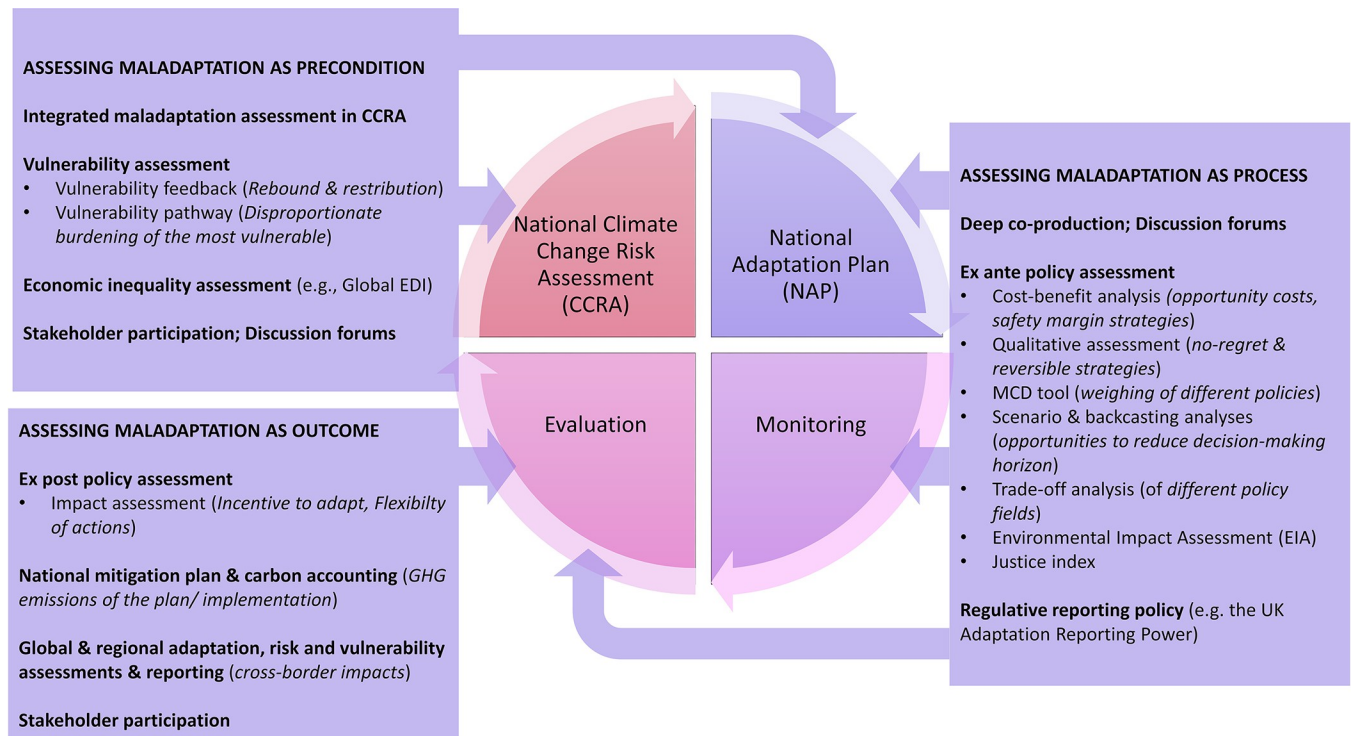


Fig 1. The National adaptation planning, M&E and CCRA cycle integrated with the maladaptation assessment of three features of the national adaptation policy.

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of maladaptation than with local level focus. From the viewpoint of precautionary, feedback and pathway frameworks, this is mainly a matter of scaling up, e.g. by advancing the understanding of adaptation outcomes and enabling conditions at national level, but also of a more fundamental re-thinking of what national vulnerability means. The constructivist framework would suggest a more fundamental consideration of how power and politics may shape the national adaptation planning process in ways that (re)produce vulnerability.

It is perhaps important to clarify that policy implementation failure also takes place, and it may in fact be what happens, rather than maladaptation, however it is defined. If we are only tracking implementation to see if we are reducing the adaptation gap, it may result in an oversight as inevitably some of that implementation will fail or result in negative outcomes, to some, sometime, somewhere. This may, over time, lead to situation where maladaptive policy and planning continues to, in fact, deteriorate the situation for some, while the overall situation may look as if the Global Goal on Adaptation is being achieved. Thus, we should, and we would if we took warning against maladaptation seriously. However, we probably could not, at least to the full extent discussed in this review, given the current capacity to enact national level monitoring and evaluation in the context of national adaptation policy.

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