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BEST PRACTICE FOR AUSTRALIA'S ADAPTATION MONITORING AND EVALUATION FRAMEWORK: CASE COMPARISONS IN THE UK, GERMANY, CANADA, AND FINLAND

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Abstract

Climate change adaptation has become a policy priority for over 170 countries, yet significant challenges remain in tracking and evaluating the effectiveness of National Adaptation Plans (NAPs) and National Adaptation Strategies (NASs). A robust Monitoring and Evaluation (M&E) framework is crucial for assessing adaptation effectiveness, but the establishment of such systems faces hurdles, including legal complexities, indicator flexibility, and institutional coordination. While international organizations and scholars propose various M&E frameworks, a gap exists in tailoring these frameworks to specific institutional and cultural contexts. Australia's adaptation M&E framework remains in its early stages, actively seeking input to refine its assessment structure, tracking metrics, and data collection approaches. This study aims to identify key components of effective adaptation M&E frameworks, analyze best practices from four countries—UK, Germany,

Canada, and Finland—that share institutional and cultural similarities with Australia, and synthesize their approaches for potential application in the Australian context. Through a comparative case study methodology, this research identifies six critical components for effective adaptation M&E: (1) theory of change, (2) sectoral-based approach, (3) risk assessment, (4) flexibility and iterative learning, (5) quality of indicators, and (6) accountability mechanisms. Findings indicate that while the UK and Germany have well-established M&E frameworks integrating these components, Canada and Finland are still refining their approaches. Based on these insights, this study provides a best-practice roadmap that can guide Australia in developing a structured, flexible, and comprehensive adaptation M&E framework, ensuring its effectiveness in tracking progress and fostering resilience to climate change.

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A. INTRODUCTION

Here is a pressing need for countries to formulate an adaptation plan due to the further widespread and intensified magnitude of climate change impact (IPCC 2022). Since Article 7 of the Paris Agreement has encouraged all countries to pursue national adaptation strategies, that of enhancing adaptative capacity, strengthening resilience, and reducing vulnerability to climate change for future natural and human systems, adaptation has become a policy focal point for over 170 countries (UNFCCC 2015; IPCC 2022). Yet, a limited understanding exists of the implementation of these National Adaptation Plans (NAP) or National Adaptation Strategies (NAS) and, critically, their effectiveness (IPCC 2014). For this reason, integrating Monitoring and Evaluation (M&E) in adaptation planning becomes crucial to track and assess adaptation effectiveness and performance. However, establishing an effective adaptation M&E system remains a significant hurdle due to its challenges, such as building a legal framework and creating flexible indicators (Vallejo 2017). To date, both scholars and international

organizations offer different M&E tools, approaches, or frameworks that focus on national practices, yet there is a gap observed in the absence of customized M&E to the specific institutional and cultural nuances of specific jurisdictions (Bours et al. 2014; OECD 2015; Klostermann et al. 2017; Price-Kelly et al. 2015; UNFCCC 2021). Australia's adaptation M&E framework is in its nascent stages, actively seeking input on its assessment structure, tracking metrics, and areas of data deficiency (CCA 2022).

In addressing the mentioned gap and contributing to Australia's adaptation M&E framework, this study aims to 1) identify key components of adaptation M&E frameworks employed by international organizations and scholars, 2) contrast and synthesize the national adaptation M&E system—specifically the UK, Germany, Canada, and Finland, which share Australia's institutional or cultural fabric—in terms of how they track NAP implementation and report the adaptation progress, serving as best practice for Australia.

B. LITERATURE REVIEW

Effective adaptation

The effectiveness of adaptation remains subjective due to the nation-specific contexts such as socio-economic and the absence of universally accepted frameworks. Adaptation, a strategic response to climate change's current and expected effects, involves changes within social-ecological systems and adjustments within human systems (Eisenack et al., 2010; Susanne and Julia 2010). Effectiveness in adaptation relates to the ability to achieve its intended objectives (IPCC 2022). However, there is a universally agreed-upon definition of effective adaptation. Unlike climate mitigation, climate adaptation aims for qualitative objectives of adaptive capacity, resilience, and vulnerability and involves challenging attributions from observed changes to adaptation actions (UNEP 2018). It also has indirect measurements of both socio-economic and bio-physical conditions within a specific context. Meanwhile, climate mitigation has quantifiable measurements, like temperature targets and universally recognized physical or chemical measurements of emission reductions (Pearce-Higgins et al. 2022; Adger et al. 2005). Therefore, the adaptation measures are unique, not easily replicable, highly site-specific, and challenging to quantify.

Prior to discussing the effectiveness of the adaptation plan, it is crucial to understand the goals of effective adaptation. Throughout 110 adaptation

initiatives, Owen (2020) finds successful adaptation strategies in risk and vulnerability reduction, societal resilience development, environmental improvement, and economic budgetary and institutional governance support. Similar principles are found during global stock takes and national and sub-national assessments (Singh et al. 2022). They reinforce the need to reduce vulnerability, boost resilience, enhance sustainability, and promote governance. In addition, they advocate for underlining the necessity for social justice and equity in adaptation approaches. Understanding the definition and goals of adaptation is crucial for implementing effective strategies.

Adaptation M&E system

Monitoring and Evaluation systems are crucial for countries to ensure the effectiveness of adaptation efforts. Monitoring involves an ongoing assessment process to track adaptation progress. Evaluation refers to the process of exploring deep causes of climate change adaptation, assessing the effectiveness, and taking lessons learned from the adaptation (IPCC 2022; Dinshaw et al. 2014; Vallejo 2017). Many studies highlight the vital role of M&E in tracking progress and ensuring accountability. For Harley et al. (2008), monitoring progress in the M&E system helps evaluate resource commitments and gain insight into what works. Both Dinshaw (2014) and Higham et al. (2016) narrow the importance of M&E to the accountability domain, with international donors favoring countries actively pursuing adaptation when allocating resources. Consequently, M&E is invaluable in ensuring transparency in resource allocation and verifying that adaptation projects align with their intended objectives. Furthermore, M&E is crucial in aiding national adaptation refinement through its iterative nature. The focus on continuous learning and improvement of indicator sets and the strategic plan has made it an integral component of climate change adaptation (Scott and Moloney 2022). Through consistent feedback and evaluation, M&E can pinpoint the effectiveness of adaptation intervention and highlight areas that require enhancement. However, establishing a robust M&E system is a challenging task. Paton (2011) argues that there is no 'one-size-fits-all' solution of M&E design to adaptation, as adaptation itself poses challenges to M&E. The nature of climate change issues—long-term, uncertainty, and non-linearity—results in adaptation decisions being made amidst future uncertainties; therefore, the established M&E should be flexible and context-specific to accommodate these characteristics. For example, some countries

develop their own versions of M&E strategies by incorporating adaptation key components from international benchmarks.

Both scholars' discussions and global organizations share common critical components of adaptation of the M&E system. Theory of Change is central to formulating climate change M&E adaptation plans. IPCC (2022) and Word Bank (2017) advocate for employing theory of change framework to map out the path from specific actions to expected climate resilience and well-being changes. Additionally, Reed et al. (2022) argue that countries need to strengthen political commitment and enhance coordination and collaboration among multiple government levels and stakeholders to make theory of change actionable. Secondly, the Intergovernmental Panel on Climate Change (IPCC 2022) seeks the integration of risk assessment—that is, identifying the likelihood of future climate hazards and their potential impacts on places and communities—within adaptation M&E systems. Such incorporation allows for a comprehensive understanding of potential challenges, vulnerabilities, and uncertainties and forms a solid basis for prioritizing adaptation actions and efficiently allocating related resources. Thirdly, Harrison et al. (2014) emphasizes the need to understand cross-sectoral interactions to fully capture the interconnection and interdependency of climate change with socio-economic scenarios. Furthermore, World Bank (2017) highlights the need for flexibility in M&E systems to adapt to evolving circumstances over extended time horizons and posits M&E as an instrument for iterative learning in building feedback loops beyond mere accountability and transparency. Aligned with this context, BRACED (2015) contributes an M&E guidance focusing on evaluation design that shows precise results or impact and promotes continuous learning and adjustment, especially when dealing with changing situations and factors that shape resilience. Also, as adaptation occurs in a multistakeholder environment across diverse sectors, with multiple organizations taking charge of it, accountability becomes a pivotal component of M&E to ensure that responsibilities are clearly defined. Then, regarding indicator quality, the World Bank (2017) introduced the SMART criterion (Specific, Measurable, Attributable, Realistic, and Time-bound) for selecting appropriate indicators to capture the effectiveness of adaptation measures. Together, these insights and principles weave key components for building effective adaptation M&E frameworks.

M&E development stage

Using this fundamental component framework as a foundation to develop the M&E system, countries vary in their progress regarding developing national adaptation M&E systems. While some countries have already implemented NAP or NAS, only 40 percent of these nations have successfully developed and implemented their adaptation M&E systems (IPCC 2022; Leiter 2021). Based on objectives, framework, institutional arrangements, and indicators, Leiter (2021) classifies six crucial development stages in the formulation of adaptation M&E systems at the national level: 1) early stage with tangible efforts, 2) stalled stage with tangible or advanced but stopped steps 3) advanced stage with developed details 4) approved stage with the approved final system 5) published stage with progress report 6) published stage with the evaluation report. The studies highlight that most studied countries are already in the advanced and published stages. For instance, the UK, Germany, and Finland are in the final stage, while only Canada is in the advanced stage. Their systems largely adopt theory of change through sector-based monitoring methodologies and involve relevant stakeholders, such as different levels of government, sectoral experts, climate change experts, and communities, including Indigenous people, in developing these M&E systems (Umweltbundesamt 2019; Hildén et al. 2022; Government of Canada 2023; CCC 2023). Hence, assessing the development stage is essential for designing a customized framework that aligns with each country's unique situation and specific needs during the NAP/NAS formulation process.

C. METHODOLOGY

This research uses the methodology of reviewing and synthesizing academic literature, international frameworks, and country reports. It allows a deeper analysis, interpreting contexts, contrasting frameworks, and identifying gaps, thereby yielding key components as analytical tools to analyze our comparative case studies. This process culminates in formulating best practice criteria that can be customized to Australia's' NAP M&E endeavors.

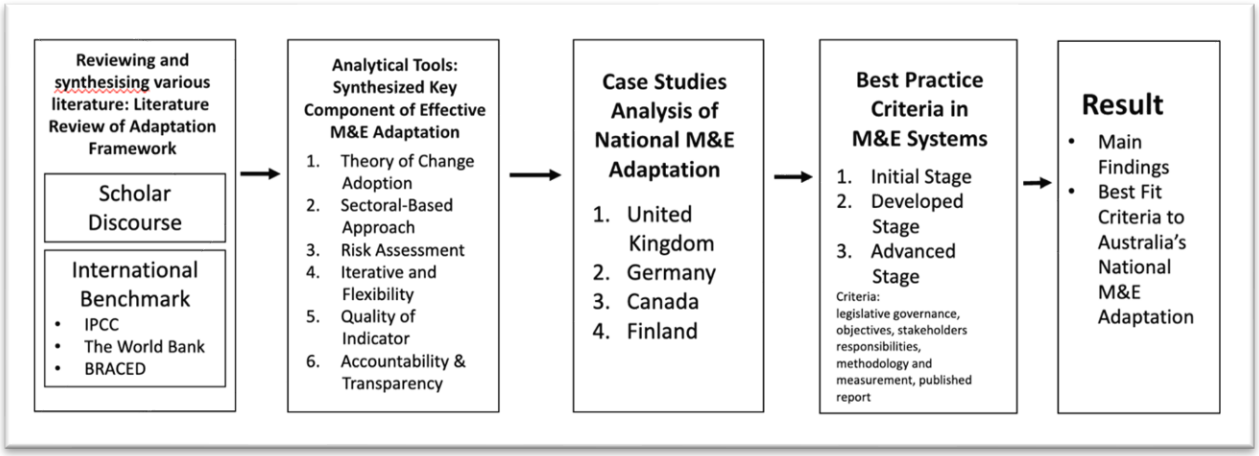

Figure 1. Methodological Approach

Data sources

For the foundation of our study, a comprehensive literature review was conducted. The data used is the existing resources, including books, journal articles, 'grey literature,' and official publications written in English. To streamline the search, the primary resources are ANU Library Super Search, Google Scholar, ProQuest, international organizations and other countries' document databases. Furthermore, specific terms like "climate adaptation," "resilience," "monitoring," "national adaptation," "evaluation," "reporting," "improvement," "policy evaluation," "assessment frameworks," "policy progress," "indicators" and "tracking progress" were used to refine the findings. For the foundation of our study, a comprehensive literature review was conducted. The data used is the existing resources, including books, journal articles, 'grey literature,' and official publications written in English. To streamline the search, the primary resources are ANU Library Super Search, Google Scholar, ProQuest, international organizations, and other countries' document databases. Furthermore, specific terms like "climate adaptation," "resilience," "monitoring," "national adaptation," "evaluation," "reporting," "improvement," "policy evaluation," "assessment frameworks," "policy progress," "indicators" and "tracking progress" were used to refine the findings.

Comparative case studies

The case study approach offers a significant strength in observing different stages of National Adaptation M&E across selected countries. The

UK, Germany, Canada, and Finland were selected due to their different spectrum of development stages and components in their adaptation M&E, as identified in Leiter's (2021) findings, providing a benchmark for the Australian best practice. Furthermore, the selection was also based on their comparable institutional landscape to Australia. Given that each nation's response to climate change and adaptation efforts is shaped by its unique policy frameworks and administrative structure, selecting countries that share these traits with Australia ensures that the findings will directly apply to the Australian context. This selection, further enriched by the Climate Change Authority's involvement, underscores the study's alignment with Australia's climate discourse. This study case diversity's stage allows for a comprehensive analysis of best practices tailored to Australia's specific development phase in the adaptation M&E process.

D. ANALYSIS AND DISCUSSION

Key components

Drawing upon scholarly discourse and international standard frameworks, we have identified six key components that underpin effective M&E adaptation: (1) theory of change; (2) sectoral-based approach; (3) risk assessment; (4) flexibility and iterative learning; (5) quality of indicators; and (6) accountability mechanism. These identified components are analytical tools for assessing and comparing case study practices in the UK, Germany, Canada, and Finland. To engender the clarity of our comparative analysis, Table 1 presents an assessment of these key components and their associated practices across these four countries:

Table 1: Key components in National Adaptation M&E framework

COMPONENT	United Kingdom	Germany	Canada	Finland
1. Theory of Change	Clearly stated; applied in 13 sectoral maps	Undefined; long-term goals with systematic strategies.	Unstated; goals for each key system.	Unstated; targets and evaluation change regularly.
2. Risk assessment	Independent 'Frequent Climate Change' assessment	Risk assessment covers 13 action and 2 cross-sectional fields	Risk assessments done in national and regional scale	Mid-term national climate risk assessment, mainly on key climate impacts relevant to country
3. Sectoral-based approach	13 sectoral monitoring focus.	15 sectoral monitoring focus.	5 sectoral monitoring focus	7 thematic focuses
4. Flexibility and Iterative learning	Continuous monitoring; Adjusts from progress reports.	Regular reviews with flexible M&E.	Updated with new data, national adaptation revisions.	Rolling indicator updates, data-driven publication timing.
5. Accountability mechanism	Adaptation Sub-Committee,	Federal Environment Agency	No specific entity	Coordination Group (Agriculture & Forestry Ministry)
6. Indicator selection	Quantitative & qualitative; milestone-based criteria.	Quantitative & qualitative flexible questions indicators	13 quantitative output indicators	Quantitative & qualitative; focus on policy process

Source: EEA 2020; DAS 2019; CCC 2023; Government of Canada 2023; Finnish Government 2022; Ministry of Agriculture and Forestry 2020.

Our main findings shed light on the significance of each component of effective climate change M&E adaptation within the countries' case studies.

First, applying theory of change (ToC) in national adaptation is significant as it fosters awareness and consensus on achieving long-term targets and risk assessment. ToC can straightforwardly assist in defining the long-term goals step by step in meeting the indicator target through risk assessment (Dinshaw, 2004). Thus, here reasonably observed a consistent pattern in applying ToC to NAP/NAS across the four countries. They invite a group of stakeholders and use ToC to reach a consensus on achieving long-term goals through the M&E systems. Germany and the UK have successfully crafted a flexible indicator and mechanism that measures immediate outcomes, resonates with mid to long-term objectives, and supports an iterative process. However, Finland and Canada still need help to develop M&E indicators within ToC that accommodate flexible and iterative characteristics of best practice adaptation. ToC in crafting Monitoring and Evaluation (M&E) indicators, precisely tailored to the unique contexts of various countries, has been evidently validated through our analysis.

Although ToC helps set objectives and outcomes, it must be combined with other approaches to operationalize stakeholder roles and responsibilities. ToC accommodates evolving contexts because it focuses on countries' program objectives, output, and outcomes. The UK and German cases demonstrate clear ToC since they conducted a specific risk climate change assessment to set clear objectives that enhance their outcome. Therefore, it ensures that actions taken today are relevant to present challenges and aligned with the vision of a resilient future. However, Canada and Finland still need to develop their methodology and mechanism for implementing M&E climate adaptation using the theory of change. As a result, ToC quality in both countries still needs to address the intended outcome. As a complemented approach, Dinshaw et al. (2014) argue that ToC can be used in the sectoral, clusters, or themes in the adaptation strategy and the different stages of the evaluation process. Both ToC and sectoral-based approach enable actionable adaptation planning that significantly impacts all levels of society in the long term and across geographic locations.

Secondly, conducting risk assessments during the initial stages of formulating adaptation M&E frameworks is significant as it aids in comprehending the complexity of climate change impacts. As Adger et al. (2018) propose, including risk assessment forms a solid foundation for formulating effective adaptation strategies and enables a holistic grasp of challenges, vulnerabilities, and uncertainties. This, in turn, facilitates effective prioritization and resource allocation in adaptation efforts. Notably, the UK conducted an independent risk assessment to develop clear vital principles that can be contextualized and tailored to address their specific climate adaptation challenges, providing flexibility in adaptation planning. Furthermore, by conducting risk assessment, Canada and Finland have clustered their priority sectors according to critical systems, including economy and workers, infrastructure, nature and biodiversity, health and well-being, and disaster resilience. Therefore, risk assessment can serve as a baseline in M&E operation, ensuring the effectiveness of adaptation measures.

Third, the sectoral-based approach allows countries to identify the interconnection between stakeholders and the socio-economic impact of climate change, providing clarity in responsibility assignment. Unlike natural hazard risk clusters, which often face challenges in quantifying climate change impacts, the sectoral-based approach presents a promising model for

measuring tangible outcomes among stakeholders. Harrison et al. (2014) emphasizes that comprehending cross-sectoral interactions is essential for a comprehensive understanding of climate change's complex, interrelated effects within the context of socio-economic scenarios. In the UK case, for instance, they have elements of funding and investment in their sectoral-based design. In their transportation sector, they clarify infrastructure development responsibilities for achieving a reliable net zero transport system. Therefore, this approach enables the equitable distribution of the roles and contributions of stakeholders associated with adaptation measures, fostering a collaborative and coordinated response. As Turnpenny (2004) found in the UK climate change assessment study, engaging stakeholders actively in the impact can build trust and user relevance, enhancing accountability and transparency. Significantly, adopting a sectoral-based approach in Adaptation M&E extends beyond immediate considerations, therefore offering long-term strategy.

Fourth, an effective M&E of adaptation at the national level needs flexibility and iterative learning in human system adaptation planning to address uncertainties and incorporate new insights for adaptive management. This often involves actively incorporating new learning into updated monitoring programs and guiding future strategies based on critical indicators (Klostermann et al. 2014; Leiter 2021; IPCC 2023). The findings across three case studies countries explicitly highlight the flexible and iterative nature of adaptation indicators development. On the one hand, indicator sets have been further developed and revised based on pre-existing experiences of applying indicators. The indicator development in the UK is drawn from pre-existing environmental sustainability frameworks and focuses on robust assessment of vulnerability, actions, and impacts. Also, Germany's progress is rooted in regular reviews of national adaptation for flexible M&E indicators. On the other hand, countries like Finland employed a unique approach to promote continual learning across adaptation policy implementation by allowing for either a science-focused or a more pragmatic strategy in designing a monitoring program. Although its initial set of indicators is limited, the selection process identified more relevant indicators for future inclusion in the national adaptation indicator set. Compared to European countries, Canada is only committed to updating M&E indicators as new data becomes available and adjusting national adaptation based on M&E results. As the field of

adaptation indicators is still emerging, the current database mainly acts as a living portfolio, open to refinement and expansion.

Fifth, accountability for M&E is required to oversee the roles and responsibilities across different sectors and mutli-stakeholders. Hilden et al. (2022) argue that accountability provides explicit coordination under the guidance of an overarching coordinator for a holistic information synthesis. Aside from Canada, which has yet to design an organization for the M&E system explicitly, the other three countries have their own specific body to monitor adaptation implementation to enhance their accountability. When the UK has established an Adaptation Sub-Committee under legislative guidance to ensure independent oversight and strategic continuity, the Federal Environment Agency in Germany plays a centralized yet collaborative model to liaise with both federal and regional entities for a unified response. In contrast, Finland's ad hoc Coordination Group is closely tied to the Ministry of Agriculture and Forestry. It is conceived based on a ministerial decision, making its function more flexible and internal. Each nation's approach mirrors its governance style: the UK's structured oversight, Germany's integrative centralization, and Finland's adaptive responsiveness, which provides deeper consideration of suitable accountability mechanisms within these institutional frameworks.

Lastly, the level of indicators' quality determines the quality of M&E. GIZ (2013) emphasized that having comprehensive and clear indicators supports more accurate assessments of adaptation effectiveness and results in more helpful information. Adaptation indicators can be subdivided into process, output, and outcome, each measuring the governance capacities, the implementation of adaptation measures, and the effectiveness of the adaptation measures (Klostermann et al. 2018). While Canada solely uses output-based indicators, such as the percentage of households with cooling systems, the UK and Germany have progressed further by also using outcome-based indicators, such as soil moisture levels in farmland soil or annual damage from climate impacts to non-residential buildings, examining the actual impacts, providing a comprehensive understanding of how adaptation measures contribute to the climate adaptation goal. Only Finland is concerned with the adaptation process to establish adaptation progress in different sectors. Although countries built their indicators system based on their main concerns, a combined focus on processes, outputs, and outcomes is needed to reveal the complex pathways that turn national policy into effective action.

Best practices of national adaptation M&E

Building upon the insights gained from the case studies and constructed through a thorough review of relevant literature, we developed categorization frameworks to define the best practices of the current M&E systems. Understanding key components is significant in analyzing case studies of different countries as it unveils insight into the nuances and strengths of each country's approach, serving as a reference for Australia and other countries in developing or improving their own adaptation M&E systems. Each key theoretical component strongly corresponds with practical aspects countries are employing.

Legal frameworks reflect the accountability component, as they cement the accountability mechanisms by legally mandating adherence to M&E protocols, thereby enforcing a system of checks and balances. It also ensures that the M&E system is politically supported and feasibly implemented. Hammill et al. (2014) found that a weak mandate delays the M&E system development. As the UK case shows, M&E implementation leads to consistent and systematic M&E development when stipulated by law. Thus, embedding the M&E mandate through law will be the strongest stipulation as it signifies the government's formal commitment, followed by an accountability mechanism.

M&E objectives correspond to theory of change, as it aligns with setting clear "Objectives" within national adaptation frameworks. Also, M&E objectives help map out the strategies and pathways of a sectoral-based approach to achieve desired outcomes and align national M&E systems for long-term adaptation needs. Therefore, the clarity and details of objectives determine the M&E components. For instance, Naswa et al. (2015) stated that M&E objectives strongly influence the development of the indicators. Canada's case shows that as the government intends its M&E system mainly to track the adaptation process, all its indicators are developed to measure the extent of adaptation done. Thus, the more transparent the objectives are, the clearer the M&E framework.

Stakeholder responsibilities in practice that employ a sector-based approach will enhance accountability. It ensures that tailored strategies are developed in consideration of the unique needs and challenges of each sector according to the roles and responsibilities of stakeholders. Stakeholder responsibilities offer clear mandates for the involvement of sector-based

institutions, enhancing multi-sectoral collaboration and ensuring that various sectoral entities are effectively engaged and coordinated. Klostermann et al. (2018) argued that choosing a responsible organization is crucial to ensure the credibility and legitimacy of the collected information, with independent bodies enhancing accountability. Examining The UK case, an independent body, such as the Adaptation Sub-Committee (ASS), allows for an independent assessment of national adaptation strategies, therefore facilitating unbiased reporting and recommendations. Therefore, a dedicated body could manage a complex stakeholder responsibility involving all key actors.

M&E methodology and measurement embody risk assessment, indicators' quality, and iterative learning and flexibility components. Firstly, effective M&E needs a risk assessment process. By identifying and evaluating potential risks, countries can establish robust methodologies and measurement techniques that are context-sensitive and capable of capturing the multi-dimensional aspects of climate risks. It allows for deploying more strategic, informed, and effective adaptation measures. Secondly, the effectiveness of an M&E system hinges on the relevance, accuracy, and reliability of its indicators. As such, there must be a stringent process for developing indicators that resonate with the ground realities and accurately reflect the progress and setbacks in adaptation efforts. The process will ensure meaningful and actionable monitoring and evaluation. Combining process-based, output-based, and outcome-based indicators with a clear data source will provide more feasible and comprehensive monitoring (Spearman and McGray 2011). Thirdly, a follow-up mechanism is also crucial for iterative learning, allowing continuous incorporation of new data and insights into the adaptation system. This rigorous monitoring system is reflected in the internal learning effort in Finland; however, it depends on the status of the responsible organization (Klostermann et al. 2018; Makinen et al. 2018). Flexible follow-up mechanisms will also support modifying and refining strategies in response to emerging evidence and changing circumstances.

The published M&E systematic reports are associated with accountability mechanisms. Regularly publishing M&E reports enhances transparency, providing all stakeholders with insights into the successes and areas needing improvement and reinforcing the accountability of all parties involved. Jere-Folotiya (2018) emphasized that the value of M&E activities is demonstrated through which the information gathered is used, and

publishing reports is an effective way to disseminate the information. Both Germany and Finland published monitoring and evaluation reports every five years, allowing the government to open communication between governments and the public to gain feedback that would help refine their adaptation efforts from time to time. Therefore, published reports are crucial in building accountability and trust between stakeholders, which opens the possibility of an iterative process.

To be easier understood, we have built a tangible roadmap of how M&E systems have matured over time (See **Table 2**), reflecting the collective efforts of the international community in refining adaptation M&E system and highlighting the current best practices within these frameworks, as below:

Table 2. Criteria for Defining Best Practices in M&E Systems

CRITERIA	*Initial*[1]	*Developed*[2]	*Advanced*[3]
1. Legal frameworks	Generic commitment to do the M&E	Formalisation through or in national adaptation strategy	Formalisation through national/sectoral/regional law or regulation
2. Objectives	Started to formulate the objectives	Clearly define the M&E objectives at national level	Clearly define the M&E objectives at both national and subnational levels
3. Institutional arrangements	Drafting the institutional arrangements	M&E is done by one of the relevant ministries	Established a dedicated body to implement M&E
4. Methodology and Measurement			
4.1 Indicators	Drafting the indicators	Has process-based and output-based indicators	Has process-based, output-based, and outcome-based indicators
4.2 Data sources	Started to inventorying data sources	Data sources available and indicated	Clearly indicate data sources with the detail on the responsible provider
4.3 Follow-up mechanism	Not yet having criteria to evaluate the progress	Not yet having criteria to evaluate the progress	Has set of criteria to evaluate the progress to build recommendation
5. Published report	Not yet published any reports	Towards publishing or has published progress report	Monitoring and evaluation report has been published in 2015 and 2020

Sources from DAS 2019; CCC 2023; Government of Canada 2023; Ministry of Agriculture and Forestry of Finland 2022; Ministry of Agriculture and Forestry 2020; Prime Minister's Office Helsinki 2023)

Notes:

1. *Initial: The M&E system has the basic structure to track the climate adaptation progress.*
2. *Developed: The M&E system has a more systematic approach, though it still needs to be comprehensive in scope and application.*

3. *Advanced: The M&E system is mature with a robust mechanism and integrated into the policy cycle.*

When we speak of the "Criteria for Defining Best Practices in current M&E Systems," this table serves as an epitome. For instance, the progression from generic commitments to the formal integration of M&E into regional and national regulations underscores the global shift towards institutionalizing climate adaptation efforts. Similarly, the maturation of objectives, from basic formulation to explicitly defined goals at national and subnational levels, echoes the global call for localized, context-specific adaptation measures. Moreover, the detailed specification of data sources, incorporation of various indicators, and establishment of evaluative criteria in the advanced stages clearly manifest the international community's emphasis on data-driven, evidence-based adaptation strategies. In bridging the gap between theories and practices, it is trustworthy to regard this table as a crucial link. While theoretical insights provide the "why" and the "what" of climate adaptation, this categorized progression offers the detailed steps of "how" to be best practices in the field of adaptation monitoring. It provides nations, policymakers, and practitioners with a structured pathway derived from global best practices to design, implement, and refine their M&E systems and ensure that adaptation measures are effective and efficient.

Best practice for Australia's National Adaptation M&E framework

Australia's approach to Monitoring and Evaluation (M&E) systems for its national adaptation plan is best characterized as being in its initial phase. Despite its prominent role on the global stage and notable efforts to address climate challenges, the country still struggles to find a specific M&E mechanism for its national adaptation strategy. This observation does not mean to diminish Australia's commitment to climate adaptation; rather, it underlines the complex and evolving nature of crafting such systems, especially for a nation with its unique climate, biodiversity, political systems, and socio-economic intricacies. Australia has undoubtedly signaled its intent to fortify its national adaptation in the National Climate Resilience and Adaptation Strategy 2021 – 2025 report. The country has delineated a timeframe to deliver national assessments of climate impacts and gauge adaptation progress. Further, there is a commitment to monitoring and independently evaluating this progress over time. However, the intricate

details remain hazy. Based on that report, critical elements such as the methodology for M&E, institutional roles and responsibilities, clear M&E indicators, and the mechanism for consistent and transparent reporting have yet to be defined clearly in a comprehensive and inclusive method. Moreover, after analyzing climate change strategies documents from ACT, Queensland, and Victoria, we found that they have produced their own climate change adaptation report without addressing M&E elements for tracking and evaluating adaptation interventions (The ACT Government 2019; DELWP 2021; DELWP 2017). This individual report demonstrates an opportunity to increase coherence, coordination, and collaboration between federal and state governments regarding M&E adaptation strategies.

Here, we recommend that the Australian government focus on developing the M&E system's basic structures. This includes committing to M&E practices to identify the data sources that can be used to monitor the progress of national adaptation. However, as continuous M&E development is essential to ensure a better system in tracking and evaluating adaptation progress, Australia can use the best practice table as a guide to further develop its M&E system beyond the initial stage. The table emphasizes a phased approach to M&E system development, allowing for gradual development of the M&E features. For instance, developing indicators can start using output-based indicators before advancing to outcome-based ones. This phased approach will ensure a meticulous development process, allowing periodic reviews and adjustments. This approach will also ensure that the M&E system has a robust and flexible framework, where each feature is well-developed and capable of measuring and evaluating the national adaptation progress.

E. CONCLUSION

This research sheds light on the critical components of effective M&E in climate adaptation strategies. Building upon scholarly discourse and international standard frameworks, the study facilitates a comparative exploration of M&E practices in the UK, Germany, Canada, and Finland through the lens of six key components—theory of change, sectoral-based approach, risk assessment, flexibility and iterative learning, accountability mechanism and quality of indicators. These findings bridge the gap between theoretical constructs and practical application in the realm of climate adaptation. While these key components are universally recognized as

fundamental, their manifestation and effectiveness have been influenced by individual nations' specific contexts and practices.

All four countries have acknowledged the significance of risk assessment, sectoral-based approach, flexibility and iterative learning, and indicator selection but at different stages of applying this theoretical construct. In detail, Canada and Finland have prioritized assessing risk in key sectors to establish a baseline for M&E operation, while the UK and Germany have laid a strong foundation for adaptation by conducting independent assessments across all sectors. Also, the UK's transportation sector showcases a well-established application of a sectoral-based approach to encourage coordinated response to challenges; on the other hand, Canada is still in the process of implementing this approach. Besides, theory of change is insufficiently stated in adaptation M&E frameworks among those countries, except for the UK. Additionally, only Canada lacks a politically dedicated body for monitoring adaptation implementation.

Based on experiences among four countries, bridges between key components and step-by-step practical pathways were built to offer a comprehensive lens to view, assess, and improve current and future M&E frameworks for climate adaptation in Table 2. Combining the current conditions in Australia's contexts with the best practice table, the Australian government is urged to prioritize establishing a robust M&E system by following the guidance of a phased developmental approach.

Our study examines the institutional framework within the federal government systems of the selected countries to align the design of the M&E framework with the Australian context. However, it is essential to acknowledge that our analysis does not fully capture the intricate and dynamic socio-economic and political factors within these systems that that could facilitate the framework formulation process. While the chosen case study countries offer valuable insights, they may not comprehensively represent the full spectrum of factors and considerations necessary for generalizing the M&E framework applicable to Australia.

Future research endeavors could extend their focus to encompass an in-depth analysis of the socio-economic and political dynamics within the federal systems. This approach would investigate how these dynamics impact adaptation initiatives' development, implementation, and success. Additionally, exploring a broader range of countries with varying institutional and contextual features would enhance the potential for deriving a more

universally applicable framework. The success of the M&E framework for adaptation strategies is highly context-specific, not only on institutional compatibility, but also on the intricate interplay of socio-economic and political factors. Given that, a more holistic research approach is warranted to ensure a comprehensive design of the M&E framework.

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