



Final Report Project 5.1

Defining success for CRC TiME: A collaborative governance approach to impact & evaluation

September 2021

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Foran, T. and E. Yuen. (2021). Defining success for CRC-TiME: A collaborative governance approach to impact and evaluation. CRC TiME Limited, WA, 6000. ISBN 978-1-922704-01-6

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1 Executive Summary

The Cooperative Research Centre for Transformation in Mining Economies (CRC TiME) aims to contribute to the integration of mine closure planning and post-mining development. At the time it was launched in mid-2020, CRC TiME had not yet elaborated a pathway to impact ('theory of change') for its proposed programs. This research project applies a participatory approach to impact pathway formulation, enabling multi-stakeholder collaboration. Motivating this study is the notion that diverse organisations take joint action over extended periods of time, when they can articulate (and re-articulate) a shared path to impact. We show how public and private organisations with diverse interests formulated a high-level pathway to impact for CRC TiME, engaging in deliberation during an important phase of the program.

This report presents a proposed high-level impact pathway for CRC TiME's regional economic development research program. Innovative aspects include direct stakeholder participation in formulating components of the pathway and explicit reference to theories of collaborative governance. The CRC plans for major research outputs to emerge over its 10-year program cycle and key outcomes achieved both during and beyond the 10 years. Such lead times imply a need for performance evaluation systems which allow a dynamic operating environment to be monitored, and a need for adaptive program design and implementation. In this study, we outline how CRC TiME can implement a monitoring, evaluation, and learning system informed by collaborative governance theory. Conducted during a formation phase of CRC TiME, this independent study aims to inform ongoing practices of program planning and evaluation.

Insights and key messages

Through the process of formulating an impact pathway for the regional economic development research program (Program 1), we found that:

- The iterative exchange of knowledge between stakeholder participants and the study team is a productive method (Sections 4 to 6)
- Stakeholder participants provided important statements of outcomes they desired of CRC TiME (Section 4)
- Stakeholders readily identified and discussed challenges in the policy and regulatory context complicating the development of planning methods and techniques proposed by the research program (Section 5)
- A potential for transformative synergy exists among proposed outputs of the regional economic development research program (Section 6)
- Realizing the above potential requires an inter- and transdisciplinary approach to regional planning, and integrative design and delivery of the CRC TiME research program (Section 6).

Regarding the monitoring, evaluation, and learning (MEL) system proposed by the project for CRC TiME, key messages are that:

- An MEL system informed by the theory and practice of collaborative governance is of interest to CRC TiME executive, board, and staff
- Implementation guidance (Section 7) addresses questions of scope, relevance, and practicality.

2 Introduction

This report aims to inform ongoing practices of program planning and evaluation at CRC TiME. The approach taken – a participatory application of collaborative governance theory to program planning and evaluation – may interest managers of cooperative research programs more generally.

CRC TiME’s vision is to position successful closure as a cornerstone of the mining industry, creating enduring value and benefit for all Australians. The program aims to innovate in the domains of mine closure planning, and regional development in mining regions, for the purpose of integrating these domains, and allowing more effective investment in post-mining development. At the time it was launched in mid-2020, the CRC’s initiating leadership had identified a series of long-term outcomes (Figure 3 below).¹ The proposed long-term outcomes were seen by the initiating leadership as emerging from a series of innovations in four² program areas. However, research managers had not yet elaborated a pathway to impact (‘theory of change’) for these programs – that is, a plan describing how the CRC would design research activities and other major actions in order to achieve desired outcomes, taking into account systemic circumstances which might constrain or enable its actions.

Program managers are familiar with ‘program logic’ approaches to impact pathway formulation which define target goals, and deduce necessary inputs, actions or outputs, and intermediate outcomes, along with critical assumptions. This research project was designed to demonstrate participatory approaches to impact pathway formulation, meeting a recognized need for multi-stakeholder collaboration. This report shows how public and private organisations with diverse interests formulated a high-level pathway to impact for CRC TiME, and in so doing, engaged in reflection and deliberation during the formation phase of the CRC.

In 2021, the project convened three multi-stakeholder workshops for representatives of CRC participant organisations. We invited participants to express in their own words outcomes they desired of the CRC, based on their understanding of the context of mine closure planning and regional development. Participants considered how innovations in regional planning (a major output proposed by the CRC’s regional economic development research program; Program 1) could contribute to intermediate and long-term outcomes.

This report presents a high-level impact pathway proposed for CRC TiME’s regional economic development program. Innovative aspects of the work presented include direct stakeholder participation in formulating components of the pathway, and explicit reference to theories of governance. We draw on the theory and practice of collaborative governance (Emerson et al., 2012; Foran et al., 2019). Collaborative governance is relevant because achieving the CRC’s vision and long-term outcomes requires multiple public and private organisations to work together in ways they have not previously. Collaboration is required to diagnose and to bridge the often unproductive disconnect and barriers to innovation which exist between the policy regime that

¹ This project was implemented during the formation phase of CRC TiME. During this period, the CRC’s management initiated a 2021–2024 research prioritization plan (CRC TiME, n.d.-c); an impact framework methodology document (CRC TiME, n.d.-a), and other strategic and functional plans.

²Regional economic development (Program 1); Risk, evaluation and planning (Program 2); Operational solutions (Program 3); and Data integration, forecasting, and scale (Program 4).

governs regional development, and that which governs the mining life cycle. The specific motivation for this project, from collaborative governance theory, is the notion that diverse organisations take joint action over extended periods of time, when they can articulate (and re-articulate) a path to impact, which they share collectively (Emerson & Nabatchi, 2015a).

An impact pathway developed with diverse stakeholder input is one component of research programming. Another essential component consists of a framework for evaluating how well processes, actions (outputs), and outcomes in which the CRC plans to invest, perform over time. Accordingly, this report presents a framework for monitoring, evaluation, and learning (MEL), which draws on the collaborative governance framework of Emerson and colleagues (Emerson & Nabatchi, 2015b).

Section 3 of this report describes our methodology, including the project’s conceptual framework. Section 4 summarizes workshop reflections on the system context affecting post-mining development, along with intermediate and long-term outcomes desired by participants. Section 5 presents participant reflections on innovations in regional planning techniques, and processes required to deliver desired outcomes (e.g. improved capability of stakeholders to participate in cross-sectoral regional planning). This is followed by a proposed high-level impact pathway for Program 1 (Section 6). The proposed pathway seeks to realize synergy between the development of regional planning decision methodology and supportive institutional arrangements. Section 7 outlines the core elements of a functional system for MEL, drawing on project participant discussion and collaborative governance theory. Section 8 provides a brief conclusion.

3 Methodology

3.1 Conceptual framework

This section introduces concepts and theory which inform the project’s approach towards participatory formulation of *pathways to impact*. For ease of reference, the conceptual framework for *monitoring, evaluation, and learning* (MEL) is presented below at Section 6, where it informs a proposed operational MEL system for CRC TiME. Together, these frameworks are based explicitly on theory and practice of collaborative governance as defined in Table 1.

Table 1 Definition of selected concepts

CONCEPT	DEFINITIONS & NOTES
Collaborative governance	“Processes and structures of public policy decision-making that <i>engage people constructively across the boundaries</i> of public agencies, levels of government, and/or the public, private, and civic spheres <i>in order to carry out a public purpose that could not otherwise be accomplished</i> ” (Emerson, Nabatchi, & Balogh, 2012) [emphasis added]

CONCEPT	DEFINITIONS & NOTES
Collaborative governance regime (CGR)	A “collaborative governance regime” can be understood as a policy regime ³ in which the prevailing activity involves autonomous actors representing different interests, who agree to work together. The actors interact repeatedly, working across their organizational or jurisdictional boundaries, to achieve a shared set of goals. This interaction is guided by a shared strategy (Emerson and Nabatchi, 2015).
Impact pathway	An impact pathway (‘theory of change’) is a high-level strategy. It includes actors’ goals (descriptions of future states in which values are realized), and initial arguments as to how goals can be achieved, in a manner consistent with understandings of the context of action, and underlying values (Fairclough & Fairclough, 2012; Foran et al., 2019).

Source: Authors.

3.1.1 Collaborative governance

Relevance. The challenge of harmonizing mine planning and regional development is conceived by CRC TiME’s leadership as one which requires multi-stakeholder collaboration. A central objective of the CRC is to motivate multiple groups to work together, in so doing generating a broad coalition to support changes to planning practices (at various scales), and changes to associated institutions.

The CRC believes it can facilitate such change by producing relevant knowledge, and by making it easier to communicate across organisational divides. These two actions can be mutually reinforcing. The ability to produce knowledge which addresses stakeholders’ particular concerns increases their confidence in taking innovative action. For example, the proposed structure of regional ‘hubs’ allows sites and groups experimenting with new technologies or approaches to be connected. The hubs could enable specific spaces for dialogue. The ability to facilitate dialogue will enable stakeholders to reach a mutual understanding of their roles and capabilities in a future scenario where mine planning and post-mining regional development are integrated.

The above considerations suggest the relevance of the field of collaborative governance (Ansell & Gash, 2008; Bryson, Crosby, & Stone, 2015; Emerson et al., 2012). This project conceives of the challenges of integrating mine closure planning with regional development as a problem of collaborative governance. We draw on the ‘integrative’ framework for collaborative governance proposed by Emerson and colleagues (Emerson & Nabatchi, 2015a; Emerson & Nabatchi, 2015b; Emerson et al., 2012).

System context. The system context includes social (broadly defined) and biophysical structural elements which interact to produce a series of outcomes in regions. Elements of the system context include:

- regional environmental and natural resource conditions
- public and private sector institutional arrangements
- understandings (normative, and epistemic) which different stakeholders have
- actors’ significant interests and differential resources
- histories of cooperation and conflict.

³ A “policy regime” is a mode or system of decision making which exists in relation to a given public policy issue. It consists of a set of core arguments which represent the issue in a particular way; institutional arrangements, which channel attention and resources to more or less effectively deal with the issue as defined; and different interest groups which support or oppose the governing arrangements as they unfold over time (Foran et al., 2017; May & Jochim, 2013).

(Source: authors, adapted from Emerson and Nabatchi [2015a]).

Drivers of collaboration. In a given system context, a number of forces may drive groups and individuals to explore the potential for collaborative action, across various public and private organisational divisions. Those driving forces include the recognition of uncertainty; recognition of interdependence; consequential incentives; and initiating leadership (Emerson & Nabatchi, 2015a).

Collaborative dynamics. Emerson et al. (2012) describe collaborative governance as working via three social processes with (a) behavioural, (b) interpersonal, and (c) functional (i.e. organisational and resource-related) dimensions. Each dimension or process may interact in a virtuous cycle with the other processes over time:

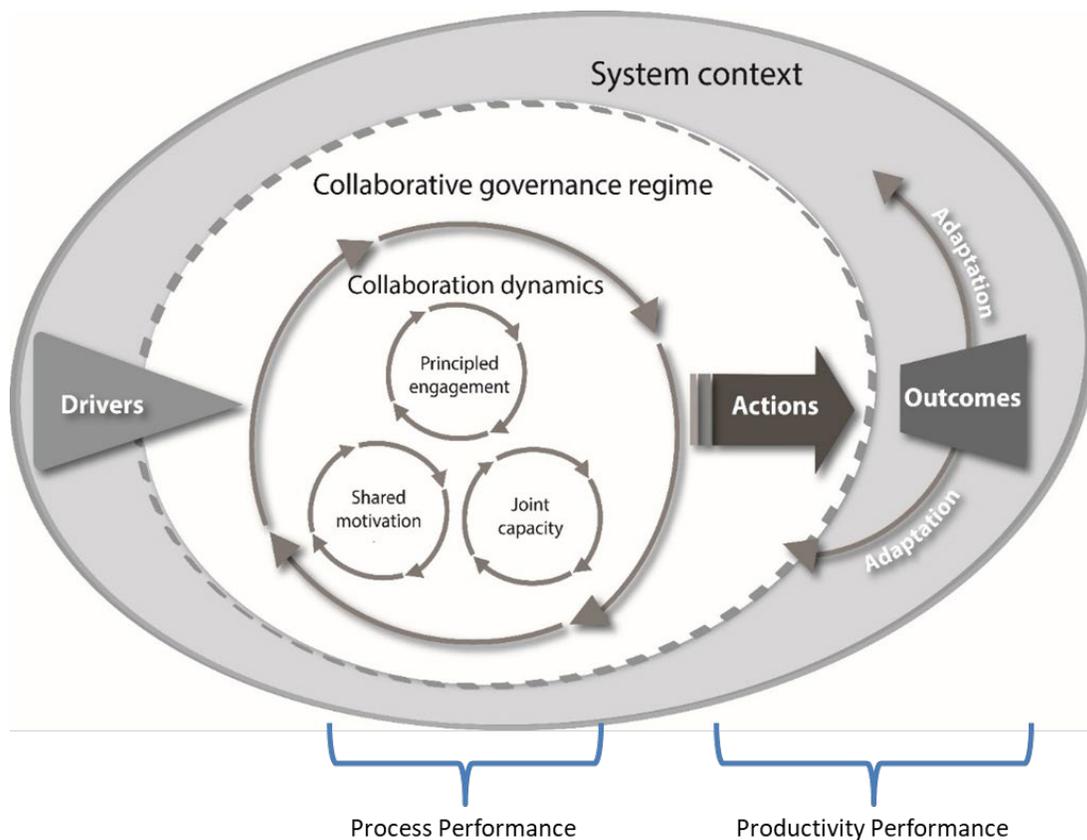


Figure 1 Integrative framework of collaborative governance

Source: Authors, based on Emerson and Nabatchi (2015a, 2015b). Note: Section 6 elaborates on ‘process performance’ and ‘productivity performance’.

- ‘Principled engagement’ refers to behaviour (especially cognitive and communicative behaviour), that leads to participants understanding each other’s interests and defining areas of shared interest. Principled engagement requires initial levels of trust. It emerges through the ability to communicate using reasoned argument, and to engage in deliberation focussed on defining problems and finding agreement together.
- ‘Shared motivation’ refers to interpersonal interactions that build trust, foster mutual recognition of interdependence, establish shared ownership, and create a sense of internal legitimacy.

- ‘Capacity for joint action’ refers to types of ‘functional assets’ which are required to support collaborative action: institutional arrangements; various kinds of functional leadership; ability to access high-quality information; and the ability to acquire other types of resources.

3.1.2 Pathway to impact

An impact pathway (‘theory of change’) is a high-level strategy which linguistically takes the form of a practical argument. It includes actors’ goals (descriptions of future states in which values are realised), and initial arguments as to how goals can be achieved (i.e. major actions), in a manner consistent with understandings of the context of action, and underlying values (Fairclough & Fairclough, 2012; Foran et al., 2019).

Figure 2 below depicts the components of that argument. Based on a stakeholder’s experience of the system context, and their position in it, the stakeholder has particular concerns (i.e. values). A goal is defined as an expression of what the future would look like if a stakeholder’s values were realized (Fairclough & Fairclough, 2012). The formulation of an impact pathway further requires identifying ‘means-to-goal’ actions (Figure 2). In the context of CRC TiME, these strategic actions are delivered by research projects or management projects.

The proposed approach to formulate impact pathways is through a combination of multi-stakeholder deliberation and analysis which considers the components of argument in Figure 2 (Foran et al., 2019).

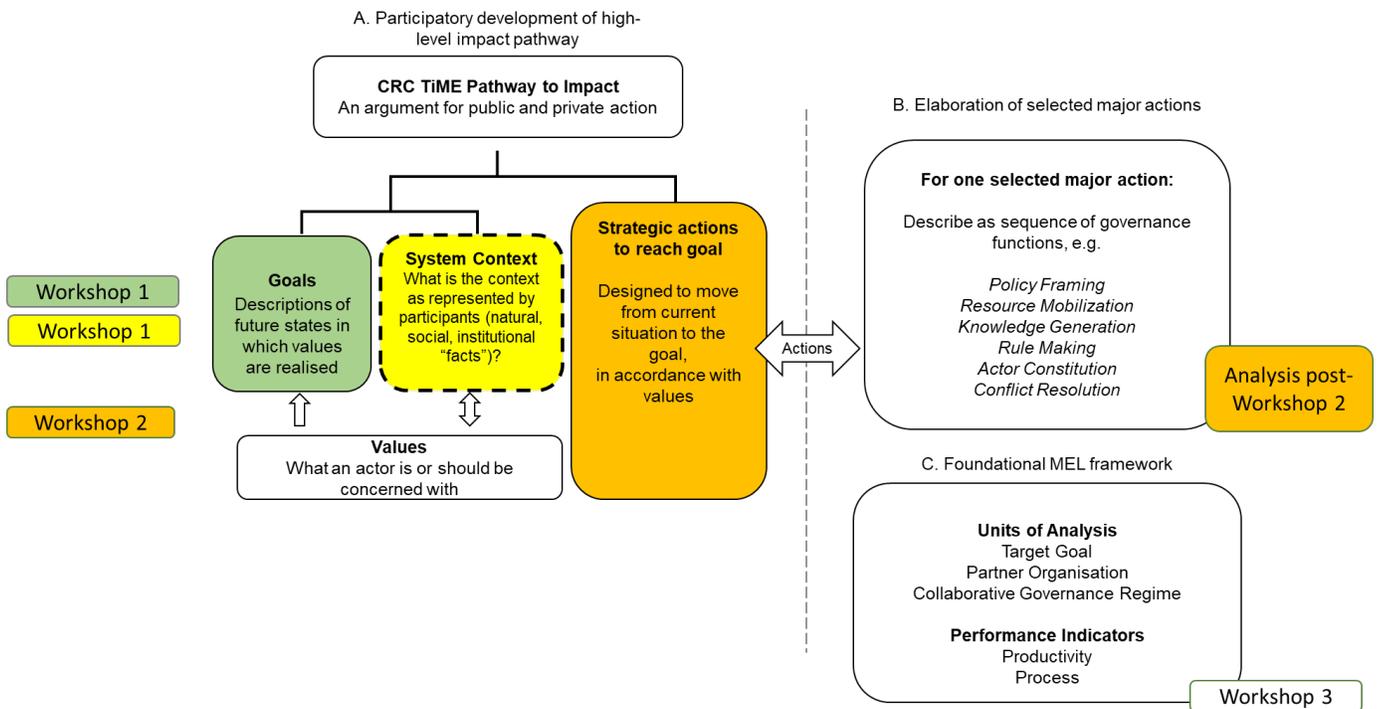


Figure 2 Summary of project conceptual framework

Source: Authors, based on Fairclough & Fairclough (2012).

Governance functions

Strategic means-to-goal actions can be analysed as sequences of ‘governance functions.’ Governance functions are functionally distinct types of actions needed to govern. Each function includes positions, to which actors are assigned (Ostrom, 2009; Pahl-Wostl, 2015). Types of governance functions are listed in Table 2.⁴

A governance function is thus a structured social interaction, at one or more levels of governance. It is designed to produce a particular effect considered necessary to realize a strategic action. A governance function can be described as a particular desired effect or objective; the set of positions (roles) and actors assigned to those roles; and a lead responsible actor. Based on additional information about required roles, and capability and legitimacy of actors to serve in those roles, descriptions of governance function can be refined (Ostrom, 2009).

Table 2 Governance functions

GOVERNANCE FUNCTION	ABBREVIATION	DESCRIPTION
Policy framing	PF	Representing an issue as a particular type of policy problem. May include proposing a particular set of policy instruments as an appropriate response.
Resource or organizational mobilisation	RM	Securing political support and/or financial and human resources
Knowledge generation	KG	Producing relevant knowledge
Actor constitution	AC	Forming a new actor, especially one accepted by existing actors
Institution or rule making	IM	Establishing formal commitments on how to govern an issue
Conflict resolution	CR	Managing or resolving conflicts between actors
Monitoring and evaluation	ME	Includes setting specific targets or indicators against which outcomes of action can be evaluated; evaluation of outcomes; defining actions if targets not met

Source: Authors, adapted from Pahl-Wostl (2015).

Knowledge generation: rational choice and coproduction

We can conceive of knowledge generation for sustainable development as the production of scientifically credible, legitimate, and relevant findings ('CRELE'; Cash et al., 2003), or alternatively stated, research which is applicable, comprehensive, well timed, and accessible to policy actors ('ACTA'; Dunn & Laing, 2017).

An iterative relation exists between knowledge generation, and the actions taken by policy actors. The processing of findings is a cognitive and social process which results in ‘determinations’ (i.e. policy framing), for example, a particular interpretation of the issue to be decided, a set of options for further inquiry.

Determinations subsequently get processed by decision-takers, who make authoritative decisions (sometimes establishing new rules).

⁴ The functions are used in Table 7 to communicate a proposed impact pathway for the CRC’s regional economic development program (Program 1) .

To have impact, knowledge generation requires embedding in other governance functions (CSIRO & WECS, 2021; Pahl-Wostl, 2015). Knowledge generation is therefore more effective if informed by an understanding of the other governance functions which precede it and follow on from it. The governance functions introduced above can be used:

- to track the relationship between knowledge generation and policy action over time
- to explore different models of decision-making.

It is helpful to distinguish two approaches to decision making: a rational choice model, and a co-productive model. (Table 3). The former assigns significant responsibility and authority to state actors and credentialed experts. A key feature of the co-productive model is that citizens can serve in more roles, including the co-design of studies and participation in making determinations (Foran et al., 2019).

Not surprisingly, a degree of compatibility is required between knowledge generation and the prevailing model of decision making. Perhaps less obviously, modes of knowledge generation have implications for prevailing modes of governance. Over time, experience with co-productive knowledge generation may lead to expectations that the governance context adapts to enable such approaches (Jasanoff, 2004).

Table 3 Models of decision making

	RATIONAL CHOICE	CO-PRODUCTIVE
Role of public	Express political preferences government authorities Supply local knowledge to experts	Co-design studies Analyse & deliberate (make determinations) Co-produce findings
Role of experts	Produce findings (e.g. consequences of taking different options)	Co-produce findings Analyse & deliberate (e.g. preferred option)
Role of government	Take decisions (processing the expert determinations & political preferences)	Take decisions (processing the co-produced knowledge & political preferences)
Associated mode of governance	Hierarchical	Collaborative (or 'network')

Source: Foran et al. (2019)

3.2 Participatory workshops

The project's three workshops link to components of the project shown in Figure 2 above.

3.2.1 Workshop 1 (system context & outcomes)

A total of 26 people participated in the first workshop on 20 March 2021, with representatives from six categories of CRC TiME stakeholders (community, government, Indigenous, METS, mining, and research organisations). Prior to Workshop 1, the project team provided participants with its interpretation of the CRC TiME's existing high-level pathway to impact, based on internal documents and associated literature (Annex A). The project team also provided a summary of the conceptual framework (Figure 2) and discussion topics. We invited participants to consider:

- factors in the system context inhibiting the integration of mine closure planning with post-mining regional development
- intermediate and long-term outcomes which they considered important for CRC TiME to contribute towards

The participants also initiated a discussion about the processes by which CRC could contribute to realizing desired outcomes.

3.2.2 Workshop 2 (major strategic actions)

The project's second workshop (10 May 2021) explored major strategic actions in greater detail. Twenty two participants (from the six stakeholder categories) were invited to consider the regional planning decision 'tool', one of three major research outputs proposed by Program 1.⁵

The workshop's three discussion topics were inter-related:

- what should the regional planning 'tool' and its usage look like?
- what changes to prevailing mine closure planning and regional planning processes would be required to accommodate such usage?
- what contributions should CRC make to reforming such processes?

To catalyse the discussion, three participants with relevant professional or academic experience were invited to make seven-minute presentations covering topics (1) and (2) above.⁶ In addition, the study team provided a short introduction on how knowledge generation links to decision taking under classic rational choice, and co-productive models of decision making (Section 3.1).

3.2.3 Workshop 3 (MEL framework)

The project's third workshop (24 June 2021) was designed for members of the CRC's Research Committee, its Impact Committee, Program leaders, and selected members of the TiME staff. The workshop presented an overview of the MEL framework (Section 7.1) to 11 participants, and invited them to comment on the scope, relevance, and practicality of elements in the proposed framework for the purpose of use by CRC TiME. To facilitate this discussion, the study team provided examples of evaluation indicators. The team also outlined the elements of an operational MEL system, which remains to be developed by CRC TiME (Section 7.2).

3.3 Data analysis

The project team conducted a manual content analysis of workshop discussions, supported by NVivo software. Topics for classification of the discussion were drawn from the project conceptual framework. Key themes were

⁵ The two other major outputs proposed by Program 1 are a 'policy reform roadmap' and a set of stakeholder 'engagement tools and decision systems' (Annex A).

⁶ Key points made during these presentations are reported in Section 4, together with perspectives contributed by other participants.

identified by comparing points raised in discussion against themes previously identified in a literature review (Annex A, 'Challenges').

4 System context and desired outcomes

4.1 System context

Participants recognized multiple inhibitors in the system context. Political economy elements of the system context – for example, high value minerals such as gold or critical minerals – do not favour the long-term predictable closure of mines (P07).⁷ A related political economy element is that mining companies have differing cost structures, allowing some to continue or prolong operations viably at a given site (P06).

Categories in the system context which participants referred to most frequently were institutional arrangements, on the one hand; and values, norms, and issue framing on the other hand.

With respect to private sector institutional arrangements, one participant noted that with the exception of large, well-resourced firms, mining company business models are not focussed on post-mining development (P03).

Participants noted that the divergence in public values is reflected in public institutional arrangements.

You'll often find say in Queensland you have one regulatory agency whose position is to maximize that resource and you have another department which is to ensure that you carry out rehabilitation and closure in a timely manner. So those two can actually be conflicting. . . [the first agency] doesn't want to be seen as limiting that resource for a future operator. (P06)

[I]nter-departmental divergence of values, interests, and desires within government, within the state government, is also a very strong issue that I think . . . controls a lot of what we do – finding a way to get strong inter-governmental buy-in to a future mine rehabilitation plan that does not have conflicts within the state departments involved is actually a complicated and complex process and something that CRC TiME can actually help with - I think quite a lot. (P20)

At times, public institutional arrangements were perceived as predominately favouring mining. One participant referred to a regional futures collaborative planning initiative. The initiative has multi-stakeholder participation but is not well supported by the prevailing practice of five-year mining plans under the WA Mining Act (P02):

[W]hilst [proposals for 5-year mining plans] are put out for our public comment and community consultation, the actual group that decides those sorts of proposals, doesn't have any community representation on them. So they're heavily stuck with government agency representatives and it's very hard to break down those sort of silos and barriers in getting across what the community and the visitors to the particular region would like to see happen

⁷ Alpha-numeric codes beginning with "P" refer to individual participants, whose identity is confidential, in line with the Project's human research ethics obligations.

in a longer term sense. So we're just trying to talk to government at the moment and regulators about how the community's values can be fed into that process and hopefully, the [future planning initiative's] outcomes, can be considered higher up the chain. (P02)

Other participants noted that framing the policy issue as one of mining development leads to institutional arrangements that are not conducive to more integrative regional development outcomes:

We tend to take a mining-centric view on this issue and I guess the language of focusing on "mine planning" and "post-mine" development is a little bit indicative of that, rather than actually stepping back and saying, "well, what's the regional development framework that we have in Australia?" And "how do we get various entities to work collaboratively, given that they have different powers, resources, approaches, priorities, time scales?" and actually get a more coordinated view on how our landscape can be utilized and add value over time - and that's environmental, social and economic value. In the absence of that kind of [system] context what we end up with is [a] really patchy approach to public policy, inconsistent objectives and a regulatory framework that continues to drive a mining-centric view on what the next use options are as well. (P17)

[M]aybe this is specific to WA, but it's really the intersection between how the mining regulation works with the broader planning legislation and regulations, and how regional planning ties in, in Western Australia. I certainly say that that's quite a significant problem in that essentially the Mining Act is quite powerful and it can be difficult to get long-term planning outcomes in line with the mining outcomes that people are looking for, or mine closure outcomes. (P07)

Examples of innovative closure practices exist. One participant referred to a mining operator at Collie, WA taking on additional (unspecified) risks to support post-mining development. Although it is not uncommon for mining operators to conduct progressive rehabilitation, there are very few examples of successful relinquishment. Participants referred instead to the risk-averse nature of governments or other rights holders to assume liability for risks that emerge after relinquishment (P24, P07).

In summary, participants during the first workshop reflected on multiple challenges in the system context, including prevailing policy framings and institutional arrangements. That context would need to adapt, and indeed transform, to realize participants' desired outcomes.

4.2 Desired outcomes

4.2.1 Long-term outcomes

Participants began their discussion of desired outcomes by viewing the long-term outcomes proposed by the CRC as part of its Stage 2 proposal for Commonwealth funding (Figure 3). These long-term outcomes imply economic, social, and environmental gains to multiple interests and actors. As such, they could be regarded as ostensibly attractive and non-controversial.

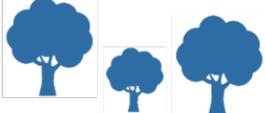
 <p>\$646M New mining projects</p>	 <p>\$975M Commercial IP and services</p>	 <p>\$262M 'New use' projects</p>
 <p>\$231M Progressive Rehabilitation</p>	 <p>\$291M Agricultural development</p>	 <p>Environmental outcomes</p>
 <p>\$6.8M Government Administration</p>	 <p>\$17M Regional closure service jobs</p>	 <p>Indigenous social benefits</p>

Figure 3 Summary of CRC TiME's proposed long-term outcomes

Source: Synergies Economic Consulting (n.d.). Note: Measures of economic impact are tentative.

The CRC's proposed outcomes are multi-sectoral and cross-sectoral, with broad scope. Accordingly, some participants expressed an interest in *explicitly* broadening the scope of post-mining development, along several dimensions of meaning.

One dimension was to broaden the scope from mined land to reinvestment in people affected by mining. One participant described a key long-term outcome in redistributive terms, that is, reinvestment of mining revenue collected by the state, in regional people:

. . . building the capacity of all of the relevant rights holders and stakeholders to engage in regional level landscape planning, in which mining is seen as a temporary land use. (P17)

A second dimension of meaning regarding post-mining development was to explicitly include non-land assets (e.g. airports and other infrastructure) as factors enabling regional development (P14).

Participants considered that realizing these dimensions of regional development would require more effective institutional arrangements, a wider distribution of planning capability, and alternative issue framings, as detailed below.

Coherent and effective institutional arrangements

Participants used the concept of 'certainty' repeatedly during the session on outcomes. We interpret it as referring to institutional arrangements which deliver outcomes effectively to multiple interests, using coherent processes.

The discussion touched on several issues and examples of desired coherence and effectiveness. One involves coherence in pathways to relinquishment of tenure (e.g. clarity about performance standards for land rehabilitation). As one participant put it, institutional reforms are needed to deliver 'certainty of environment for decision-making.' By this the participant meant regulatory reforms which:

delivers very strongly on delivering certainty - that's not only certainty for the mine operators, but certainty for the community and certainty for the government. . . . If we don't get certainty into the regulatory environment everything else falls apart. (P20)

More effective institutional arrangements may require an altered balance of responsibilities and capabilities. For example, effective arrangements may be those which oblige mining companies to deliver more clearly to what communities aspire to. An institutional change requiring operators to actively consider the next use of a final landform, and to design and rehabilitate the landform to effectively support that use, was recommended:

[If you were turning returning something to say grazing land, rather than returning it to the previous environmental condition, the obligation is to return it to improved pasture which would increase the likelihood of grazing and therefore [has implications for] the quality of seed stock. So there is a piece that's about the decisions that you make that actually determine what the landform and land use underlying parameters look like are the responsibility of the tenement holder during the operating asset . . . (P17)

One participant referred to requirements in Peru as a positive example in this regard:

The Peruvian Mining Laws around closure⁸ provide that the company must take technical and legal actions to rehabilitate the used or disturbed area to achieve an ecosystem that is healthy and sustainable for the development of life and the preservation of the landscape. 'Suitable for the development of life' has been interpreted as a human centric requirement. It is common across closure plans in Peru to see that the designs for next land use planning commonly include commitments to deliver improved and more sustainable grazing pastures than prior to mining. The 'preservation of the landscape' has also been interpreted as a term more focused on the human use of the environment, including access to waters and visual amenity.

(P17, pers. commun. 11 August 2021)

4.2.2 Intermediate and near-term outcomes

Collaborative processes

At the beginning of Workshop 1, the study team suggested that the impact pathway for CRC TiME could take the form of an argument for public and private action – that is, for collaboration across organisational boundaries. This suggestion was based on an interpretation that the creation of CRC TiME as an entity was evidence that initiating leadership – one driver of collaboration – had been activated (Section 3.1).

During the final segment of the 'outcomes' session, participants identified collaborative processes as a domain that the CRC could contribute to, as an important intermediate outcome. They identified several dimensions of such processes:

⁸ Law 28090 (Ley que regula el Cierre de Minas) and Supreme Decree 033-2005-EM.

- research projects designed in part to attract young people into the domains of the CRC (i.e. where relevance to young people is a co-benefit of the research project) (P13)
- networks which allow participants to learn about specific promising or successful regional planning initiatives (P18)
- collaboration as the process by which CRC could create new and valued social venues – i.e. safe spaces, with honest brokerage – for multiple actors to debate policy issues, as well as to create transformative leadership (P09)

Participants recognized that joint actions – that is interim, successful contributions towards the above outcomes – would enhance the external legitimacy of the CRC (P03).

Alternative issue framing

The prevalence of mining-centric policy framing was recognized as an inhibitor of integrated long-term regional development.

Some states already require mine closure plans to be prepared, as a condition of approval for mining development. However, participants from regional development organisations emphasized that a key change they would like to see is one where planning for post-mining ‘transformation’ (i.e. transformation of the regional economy) is already evident at the approval stage (P18, P14). Were it to occur, this would shift regional development planning in mining regions from a mining-centric policy framing (see Section 3.1), to a more holistic set of practices.

Why isn't there a process in a region that is from the start of the approvals through to the relinquishment and post mining? There isn't one sort of regional process that occurs. It's a government-based process that industry participates in, and they have to have some social impact assessments and other impact assessments as part of that approvals process. But . . . in my view seems to be disjointed. So, that might be an opportunity longer term as to looking at the whole cycle, not just the [post-mining] transformation. I think the transformation starts at the approval process and goes on from there onwards to be honest. (P18)

Capability

A second dimension of effectiveness pertains to reducing uncertainty for all stakeholders around ‘the optionality that exists for post mining landforms’ (P17). This dimension implies improved knowledge and technical capability among multiple stakeholders. It is a specific manifestation of the long-term goal one participant expressed, which is to have multi-stakeholder engagement in regional landscape planning (Section 3.2.1).

Regional planners and community development organisations need knowledge of what next land uses are technically feasible, to plan effectively:

We . . . need to be able to actually make the narrative . . . correct in terms of actually drawing the planners into . . . beginning to think about how to pull what are in many cases very large areas of land into the wider conversation around what the visions are for the future. . . . There are a lot of planners out there . . . they have cross-cutting visions, and very important visions, and they entice certain parts of the community to be really excited by what's going on. But

getting them to be coherent in terms of actually recognizing how the mine land can actually ultimately add to their value, it becomes quite important. (P20)

5 Innovations in planning processes

5.1 Planning ‘tool’ and its usage

CRC TiME has proposed to develop by Year 7, decision tools which improve on current regional land-use planning techniques (see Annex A). The proposed planning tools will allow the alternative options for post-mining land use to be assessed (including the dynamic and cumulative impacts of such options). The regional planning ‘tool’ is intended for use by a diverse set of actors, including governments, mining companies, NGOs, and local communities.

The study team invited participants to reflect on the planning ‘tool’ and its usage. Table 4 summarizes the perspectives expressed during the workshop, which raise issues of:

- functionality and user capability
- information accessibility
- existing practice.

The concept of a planning ‘tool’ encompasses the everyday usage of ‘tool’ to refer to a technique (as in ‘software tool’). However, participants noted that regional planning involves a *combination* of techniques and processes (Table 4). A planning *process* is a type of policy instrument (Hurlbert & Gupta, 2018). It is perhaps less ambiguous to use the word ‘methodology,’ referring to a conceptual framework and associated methods and techniques. In either case, the development of anything beyond a narrowly defined analytic device raises questions of fit to prevailing mine closure and regional planning processes (Section 4.2).

Table 4 Perspectives on proposed regional planning tool and its usage

ISSUE	PERSPECTIVES
Meaning of ‘tool’ Functionality (analytic process & content)	Proposed planning ‘tool’ should be considered a toolset - there is no single analytic pathway (P22) A combination of tools & processes undertaken by different parties could feed into a final decision (P31) It is possible to describe a coherent planning methodology (Pershke & Elliott, 2019) A desired function is ability to identify or visualize sector-specific post-mining economic opportunities, mobilizing resources from interested parties (P13)
Accessibility of information	A useful planning tool would make comprehensive information (e.g. about groundwater) accessible at mine-site scale. Such information currently is not readily available to parties other than licensees (P27)
Learning from existing practice	Review existing tools & usage, including international examples (P03; P12) Examples exist of mine closure toolkits, challenge is identifying techniques & processes agreed across multiple stakeholders (P01) Spatial planning tools used by non-mining state agencies are relevant (e.g. land use capability, water assets, road networks) (P12) Land use change analysis which incorporates water-using sectors is relevant (P20)

Source: Authors.

With respect to functionality, the argument that no one analytic pathway exists (Table 4) makes sense from a pluralist perspective: different groups will engage in analysis, drawing on tools they have capability to use. By contrast, it is possible to outline the elements of a coherent planning methodology in terms of the following steps:

- compile information on the regional or system context (e.g. existing economic development strategies, environmental objectives)
- generate and visualize options for post-mining land use (based on understanding of land capability and other ecosystem constraints such as water availability and water quality)
- evaluate options (i.e. assess economic, environmental, socio-cultural impacts)
- articulate preferred options as a strategic plan
- mobilize resources to implement preferred options.

(Pershke and Elliott, 2019)

Whether the planning objective is to formulate a broadly agreed, multi-step regional strategic plan, or to support a more limited, near-term set of post-mining development decisions, a legitimized planning process is required. This planning process would ideally refer to a methodology for knowledge generation which is credible, legitimate, and relevant.

The current difficulty accessing mine-site information raises questions of how to balance interests in intellectual property against public interests. The need of multiple stakeholders in a mining region for legitimized analysis of transition options and pathways suggests that:

- Access to the findings of necessary specialized analysis (e.g. to assess uncertain future effects, or effects across scales) should be provided to stakeholders of a mining region, in the public interest.
- Access to proprietary information should be provided for the purpose of such analysis.

In summary, workshop discussion on analytic processes and content to enable regional planning raises questions about knowledge generation as a social process involving groups with different interests, capabilities and resources.

Finally, participants' interest in reviewing existing practice in spatial and land use planning, or international mine closure practice, underscores that it is necessary to consider analytic techniques as embedded in prevailing planning processes. Planning tools require effective institutional processes. Strengths and weaknesses of prevailing processes may limit lessons to be learnt from a review of planning tools.

5.2 Changes to mine closure planning and regional planning processes

Participants considered a key purpose of the multi-stakeholder regional planning methodology is to enable the articulation of a preferred strategy to integrate mining and post-mining land use, thereby contributing to desired regional development (Section 4.1). A preferred and broadly agreed strategy is an intermediate outcome which in turn is expected to catalyse specific business development activities, leading to increased regional investment.

Participants recognized that new understandings, or new planning conversations made possible by such a tool, are insufficient for a diverse group of actors to reach an agreed regional strategy. They recognized that the **system context** in which such planning conversations occur is important (Section 3.1.1). That context includes: the values (i.e. core aspirations, matters of concern) which stakeholders bring to regional development; relations between stakeholder groups; as well as the structural context of mining regulation and formal regional

planning processes. Table 5 summarizes participant perspectives and study team reflections on the challenges of multi-stakeholder participation in planning. Participants recognized that stakeholders hold multiple values. Some are absolute: the loss or failure to realize an absolute value cannot simply be mitigated or substituted for by providing another good (Measham et al., 2021).⁹

Table 5 Perspectives and reflections on prevailing planning processes and system context

ISSUE	PARTICIPANT PERSPECTIVES	STUDY TEAM REFLECTIONS
Forms of knowledge provided by stakeholders; categories of value; time	<p>Stakeholders hold information & have aspirations (values); information & values comprise stakeholder knowledge (P28)</p> <p>People – and state agencies – hold a diversity of values. Categories of value have equal weight to each other. Financial/economic value is a different category than social/cultural value (P28).</p> <p>One recurring value conflict is between groups which are concerned with creating opportunity & those which are concerned with controlling risks of alternative post-mining land use (P01)</p> <p>Groups in society have varying timeframes for realization of values (P28)</p>	<p>The idea that categories of people, and categories of societal value have equal weight is an ethical proposition or principle.</p> <p>If CRC TiME subscribes to this principle, then consequences follow for achieving proposed objectives such as ‘building knowledge bases across stakeholders’ (P28); and providing ‘a safe space for stakeholders to come together and discuss complex issues’ (P28).</p> <p>Consequences: the ‘spaces’ CRC TiME builds, and the ‘tools’ it commissions, need to give unbiased consideration of categories of people & categories of value.</p>
Inclusiveness of participation	<p>It is desirable to take an inclusive approach to civic and stakeholder participation but the question of who should participate is contested in society (P28)</p>	
Barriers to participation	<p>Some stakeholders view other segments of society as inappropriate or disinterested</p> <p>Stakeholders want meaningful participation</p> <p>Stakeholders do not necessarily live locally</p> <p>Some do not want to have a ‘public voice’ (P28)</p> <p>Stakeholders need informed participation: intermediaries are needed to share and translate specialized forms of knowledge (e.g. about biophysical constraints on future land use).</p>	<p>Barriers to participation are cognitive, relational (i.e. between stakeholders) & structural (i.e. power asymmetries or dominant framings may contribute to exclusion of certain categories of stakeholder).</p> <p>Planning methodology which makes information and knowledge more accessible (see Table 4) has potential to reduce barriers to participation.</p>
Timeframes for planning	<p>Prevailing local government or regional planning has short timeframe – typically not activated until closure is imminent (P05)</p> <p>Could such planning be better informed by the long-term knowledge contributed from mine closure planning (e.g. Latrobe Valley regional closure planning)? (P20)</p> <p>Long timeframes require planning processes to adapt to changes in regional context, to community & stakeholder values (P23)</p>	
Financial responsibility for mine closure and initial post-mining land use	<p>Responsibility for implementing a post-mining land use needs to be negotiated between mine operator and post-mining land developer (P20)</p> <p>Distinction between landform and land use. Licensees are responsible for providing landforms which are safe, stable,</p>	<p>Ideally the costs of different rehabilitation options would be identified and be one input to a decision on the preferred mine closure plan (MCP). The cost of implementing the MCP sit with the licensee. As the cost of an option increases beyond a threshold, then the licensee could seek to shift some of it to other</p>

⁹ Foundation-stage project 2.1 will explore through workshops and interviews the values CRC TiME participants hold with respect to land and people undergoing transitions to post-mining.

ISSUE	PARTICIPANT PERSPECTIVES	STUDY TEAM REFLECTIONS
	non-polluting (& in VIC, 'sustainable'); and potentially for providing an 'initial simplified land use' (P20) Planning stakeholders need to reach understanding about who has responsibility for what (P20)	parties, perhaps claiming a limited interpretation of safe, stable, and sustainable.
Potential for conflict between state agencies	Lack of clarity or agreement in mine closure plan contributes to lack of coordination between government agencies (P20) A source of potential conflict is between agencies which are concerned with risks, and those which are concerned with opportunities (P01)	

Source: Authors.

The perspective and reflections in Table 5 convey the multiple challenges facing any proposal to develop multi-stakeholder, multi-objective planning:

- the diversity and dynamic nature of values
- multiple barriers constraining multi-stakeholder participation
- challenges posed by private and societal resource constraints
- institutional complexity.

It is not surprising that existing governance arrangements – which assign responsibility to separate agencies to realize different values and goals – were perceived as ineffective at realizing goals in a harmonious manner. In most Australian jurisdictions mine closure planning is governed separately from regional planning. Issue framing and rules governing mine closure planning assume a (relatively narrow) set of objectives.

Typical objectives set by mining regulators are to return mined land to pre-existing condition (Pershke & Elliott, 2019). No obligation exists to set objectives which are consistent with preferences for alternative post-mining land use as expressed during stakeholder consultation. The process is one of regulation to ensure compliance with those objectives:

[Mine] closure planning is actually being regulated, rather than being part of a planning process. You've already jumped to the end point, assuming that there is a plan that's in play, and then someone's trying to regulate that you're actually managing against the plan. When really the planning process at the moment is – planning – it needs to be reviewed revised and have all these different stakeholders . . . (P32; emphasis added)

[Under prevailing processes] while a mine is still operating, [a mine regulator is] trying to regulate, they're trying to check boxes on a list, as opposed to facilitate the conversations to make sure that everybody is coming to the party from government agencies and all others. That's how I kind of see us having that hurdle to get over: when it comes to the planning processes that we've sort of embedded mine closure in the regulatory space. (P32; emphasis added)

A planning and regulatory process which integrated mine closure and strategic regional planning would entail significant institutional reform, which would require high-level political support (P30). Victoria is an example of relatively integrated governance regimes (e.g. requirement for operators to consult with communities about preferred post-mining land use [P20]).

5.3 CRC TiME contributions to development of integrative regional planning

The final session of Workshop 3 built on the above reflections on the systemic context constraining a more integrative approach to mine closure and regional planning. Table 6 summarizes further perspectives and reflections on developing an integrated methodology for mine closure and regional planning.

TABLE 6 PERSPECTIVES AND REFLECTIONS ON DEVELOPMENT OF PLANNING METHODOLOGY

ISSUE	PARTICIPANT PERSPECTIVES	STUDY TEAM REFLECTIONS
Leadership Diffusion of innovation	Identify actors who are regarded as leaders in a domain (whether miners, regulators, or regional development organisations) to develop & apply the methodology	Pragmatic action, considering that different users will have different specific planning needs
Brokerage & Coordination	<p>CRC TiME has the potential to serve as an honest broker, mediating between different viewpoints. Requires CRC establish itself as a 'trusted agent' of knowledge generation & synthesis across different viewpoints (P30)</p> <p>TiME needs to develop its planning 'tool' in coordination with, & learning from, similar initiatives to strengthen regional planning for biodiversity conservation under NESP (P22)</p> <p>Opportunity exists for TiME to 'enhance' a variety of existing initiatives (e.g. integrate initiatives focussed on understanding regional social & cultural effects of mine closure, with those focussed on environmental effects) (P01, P05)</p>	<p>Different actors will have different viewpoints about how knowledge should be generated, (i.e. disciplinary, interdisciplinary, transdisciplinary) approaches, with implications for models of decision making</p> <p>Possibility that institutional reforms to EPBC Act, which aim to support assessment of cumulative environmental effects, offer governance models which are also useful to embed TiME's regional planning tool (P12)</p>
Agenda setting by non-state actors	Government agencies involved in environmental regulation & mine closure in WA were incentivized to address contested issues, once an economically viable option had been identified, broadly supported by local community (P28)	Prevailing institutional arrangements provide a mixed set of incentives to state actors
Local community co-design	Regional planning 'tool' will not be used by local community planners unless a proactive effort is made to involve them in process of co-design (P22)	This point was made with respect to indigenous communities, as well as biodiversity regulators who support co-design

Source: Authors.

6 An impact pathway to realize regional economic development outcomes

This section presents a proposed high-level path to impact for the CRC TiME's regional economic development program (Program 1). The impact pathway was developed by the study team:

- reviewing the system context and desired outcomes, as expressed during stakeholder Workshop 1
- synthesizing desired functions of a regional planning decision methodology, based on discussion during Workshop 2 (Section 5)
- proposing a set of 'design principles' to guide the impact pathway, based on analysis of Workshop discussion
- describing the impact pathway, influenced by recognition during Workshop 2 of the need to address key elements of the system context inhibiting its usage and adoption.

The design principles and impact pathway describe how the CRC's proposed research outputs can work in synergy, to create innovations in planning practice with potential to catalyse innovations in governance.

6.1 Desired outcomes

The project's first workshop invited participants to consider the CRC's existing long-term goals, and to formulate additional long-term and intermediate-term outcomes. Key points from deliberation on desired outcomes can be summarized as follows. With respect to long-term outcomes, participants suggested broadening the framing of regional development in mining regions, to make it less mining-centric and more integrative and holistic. Were such reframing to occur, it would imply regional development planning processes and institutions would take precedence over their mining development counterparts. With respect to intermediate outcomes, some participants considered it important for the CRC to contribute to regulatory frameworks for closure and relinquishment, in which operators were *mobilized and obligated to support next land uses*.

An intermediate outcome readily identified by participants was the ability for CRC TiME to *convene multi-stakeholder collaborative processes*. The initiating leadership (i.e. the management) and organisational structure of the CRC (e.g. key committees, and the regional hubs) demonstrate that the CRC acknowledges the importance of collaboration. However, the importance attached to collaboration, and the varied facets of collaboration (Section 4.2.2), suggest that explicit and dedicated investment in collaborative structures and collaborative research methodologies will be required.

Thus, participants attached value to collaborative processes, and attached importance to CRC TiME reframing development in mining regions, with *institutional reforms directing operators to clearly support post-mining development* (long-term outcome). One way to interpret these outcome statements is to regard them as elements of a coherent pathway:

- the CRC needs actions which contribute to multi-stakeholder collaborative processes (an intermediate outcome)
- in turn, such processes will contribute to the desired reframing of regional development in mining regions (a long-term outcome)

Each strategic action proposed by the CRC has the potential (to a greater or lesser extent) to help realize the foregoing connections between outcomes. By virtue of its intended stakeholder use and its topical focus, the CRC's proposed regional planning 'tool' is an output with potential to contribute to the above outcomes.

6.2 Regional planning methodology: functional capability & challenges

During Workshop 1, participants considered it important to equip planners and community development interests with greater knowledge of feasible options for regional development (taking a holistic approach to land, physical, and human assets). Delivering this proposed outcome – the capability for holistic regional planning – would require the CRC to scrutinize the definition and scope of major research outputs it has identified thus far in its three core research programs. Accordingly, Workshop 2 explored productive or desirable functions of a regional planning methodology; identified key challenges in the 'system' context inhibiting productive usage; and canvassed specific contributions CRC TiME could make to the development of a planning methodology.

6.2.1 Functional capability

The desired capability for holistic regional planning has implications for how the planning methodology should function.

Two interlinked points emerge from Workshop 2. First, a methodology that allows for comprehensive post-mining options assessment (identification, compilation, screening, ranking) is useful, provided that its techniques support multi-stakeholder planning conversations in a manner that is accessible to diverse stakeholders (Section 5.1). Second, workshop discussion touched on how to support deliberation and negotiation about the relation between risk, cost, and value of post-mining land use. Participants recognized 'value' as multi-dimensional (i.e. social, cultural, economic) (Table 5).

A synthesis of these points suggests that the functional capability required is one which:

- supports comprehensive post-mining options assessment
- supports deliberation about risk, cost, and value of different post-mining land use options
- is accessible to diverse stakeholders

This set of capabilities raises methodological tensions and challenges which remain to be resolved.

For example, a structured discussion of costs, risks, and values, might be structured as a multi-criteria analysis. It is possible to imagine a multi-criteria analysis which includes the following steps:

- generate a base-case future land use, and a range of alternative future land uses, all of which are safe, stable, non-polluting, and technically feasible
- nominate a set of costs, risks, and values as evaluation criteria
- generate a first evaluation of the costs, risks, and values associated with each land use option (without specifying how costs, risks, values would be allocated to concerned parties)
- support concerned parties to explore alternative evaluations of costs, risks, and values (anticipating that parties will perceive costs, risks, and values differently)
- iterate the analysis, this time considering alternative allocations of costs, risks, and values to concerned parties

Further inquiry is required as to whether the type of analysis outlined above can support a range of stakeholders to identify preferred alternatives and to allocate costs, risks, and values in an agreed manner.

6.2.2 Challenges in the system context

Participants identified cognitive, relational, and structural challenges in the system context which inhibit the application of innovative regional planning methodologies (Table 5). A notable challenge is that capability to participate in complex techniques (such as the analysis outlined above) is unevenly distributed. This implies that knowledge intermediation will be required, which further implies relations of trust to enable knowledge ‘brokers’ to work with resource-constrained regions and communities. Requirements for knowledge intermediation raise questions about the degree of commitment to making analytically specialized planning processes accessible to communities..

6.3 Proposed impact pathway for regional economic development (Program 1)

6.3.1 Outputs proposed during inception phase

Outputs proposed by the CRC’s leadership during its inception phase (prior to this project) can be summarized as follows. Program 1 aims to:

- develop policy frameworks which clarify expectations around mine closure and relinquishment
- integrate mine closure planning more strongly into regional planning processes
- make regional planning more representative of community values and aspirations

Specifically, the first major output (Output 1.1; see Figure 9 in Annex A) will identify “gaps, ambiguities, and counter-productive outcomes” in policy and regulation governing mine closure planning and regional planning (by Year 2). It will also assess the socio-economic impact of alternative policy settings (by Year 4) and produce a policy reform roadmap (by Year 5). The roadmap will be targeted at environmental regulators and regional development agencies.

The second major output (Output 1.2; Figure 10) will develop, by Year 7, software tools which improve on current regional land-use planning tools. The improved planning tools will allow alternative options for post-mining land use to be assessed. This regional planning decision tool (the focus of the project’s May 2021 workshop) is intended for use by governments, mining companies, NGOs, and local communities. Output 1.3 will develop approaches which improve the quality of community input into criteria for mine closure, and the identification of preferred post-mining land use.

6.3.2 Design propositions based on participatory workshops

A content analysis of the project’s two participatory workshops yields insights for how the above research outputs (i.e. strategic actions) should be designed. On the one hand, Output 1.2 aspires to deliver a new integrative approach to regional planning, in a system context rife with multiple barriers to its adoption. On the other hand, Output 1.1 explicitly aspires to offer policy reform recommendations, and workshop discussion can be interpreted as supportive of that aspiration, while cognizant of the depth of structural reform and level of political support required (Section 5.2).

Potential to realize transformative synergy

A central insight which emerges from participant discussion is that a transformative synergy exists among the outputs of Program 1. The ability to activate or realize such synergy is a matter of design. For example, the CRC can develop innovative planning methodology, and in parallel convene dialogues around how to integrate the

policy regimes of mine closure and regional development, in a manner such that both outputs are mutually informed. Should the formulation of future regional development strategies be guided by regional planning decision methodology, actors who on balance support such planning methodology may increase their support for changes to the system context which enable and recognize it (i.e. changes which integrate hitherto distinct policy regimes).

The above reflections draw on the theoretical proposition that modes of knowledge generation have implications for prevailing modes of governance (Section 2.1), and lead to the following proposition:

Proposition 1: The relationship between planning innovation, and adaptation in the system context is one of mutual influence.

The design propositions below build on this core proposition.

Inter- and transdisciplinary planning

Mining regions will experience ramifying cross-sectoral impacts from mine closure. These include direct socio-economic impacts, as well as systemic impacts which will flow on from the specific consequences of using regional resources to rehabilitate mines. The kind of decisions that need to be taken do not fall neatly within existing statutory planning processes.

For instance, in the Latrobe Valley, decisions as to what post-mining land uses are preferred require determinations about what landforms are feasible for the three large coal mine voids. Feasibility in turn hinges on multiple dimensions, each of which require determinations:

- standard setting: definitions of landform rehabilitation standards (e.g. safe, stable, sustainable);
- allocations of rights to water (and other valued resources) for landform rehabilitation;
- reasonable allocations of financial responsibilities between operators, the state, and future developers.

(Government of Victoria, 2020) and (P20)

Discussions during Workshops 1 and 2 suggest that stakeholders and policy actors will hold diverse reasoned positions regarding the above substantive issues.

Methodology to support the above determinations and decisions will be most useful if it is not only multi-stakeholder and participatory, but holistic and cross-sectoral (cf. Innes & Booher, 2018). In substantive terms, the required methodology is interdisciplinary (plural in perspective, recognizing the need to assess effects across sectors in a region) and transdisciplinary (socially inclusive, recognizing the contribution that diverse stakeholders have to knowledge production). Process-wise, the methodology is deliberative (structured communication seeking reasoned pragmatic solutions). The above considerations lead to the following proposition:

Proposition 2: Inter- and transdisciplinary methodology informs effective regional transition planning.

Integrative program design & delivery

The scope of Output 1.1 is expected to include policy reforms which recognize new forms of planning (Proposition 1). The act of proposing a policy reform roadmap creates opportunity to specify what effective knowledge systems look like (i.e. links between knowledge generation, making determinations [interim decisions], and taking decisions). The policy reform roadmap thus provides an opportunity to explicitly describe how knowledge generation can inform decision taking. For coherence, if new forms of planning are to be recognized, then desired processes and outcomes need to be described in sufficient detail in formal rules. This opportunity requires integrated design and delivery of Outputs 1.1 and 1.2.

Integration of outputs is also required to increase coherence between Output 1.3 (which is concerned with improving the depth of community engagement) and Output 1.2 (which proposes the development of software tools accessible to multiple stakeholders, including those representing communities).

The following proposition emphasizes the need for integrated program design and delivery:

Proposition 3: Integrated design and delivery of Program 1 research outputs results in more effective delivery of proposed long-term outcomes.¹⁰

6.3.3 High-level impact pathway for CRC TiME Program 1

Figure 4 summarizes a high-level path to impact for the CRC's regional economic development program (Program 1). Table 7 elaborates on the path, showing that it involves iterative cycles of knowledge generation, policy framing, and resource mobilization. Each of these strategic actions are functional interactions (i.e. 'governance functions'; Section 2.1.3). These cycles are intended to generate inter- and transdisciplinary knowledge concerning viable regional planning methodologies by Year 7¹¹, together with an understanding of the types of institutional reform required. The long-term target goals are:

- mobilization of investment informed by and aligned with a regional development plan, which has been formulated using the methodology (Figure 4; Outputs 1. 2 and 1. 3)
- institutional reforms which channel actors to use the methodology when planning (Figure 4; Output 1.1).

¹⁰ Refers to outcomes proposed by CRC during its inception stage and outcomes proposed by workshop participants (Section 3.2).

¹¹ Timeframes in this section are based on CRC TiME inception phase documents (see Annex A).

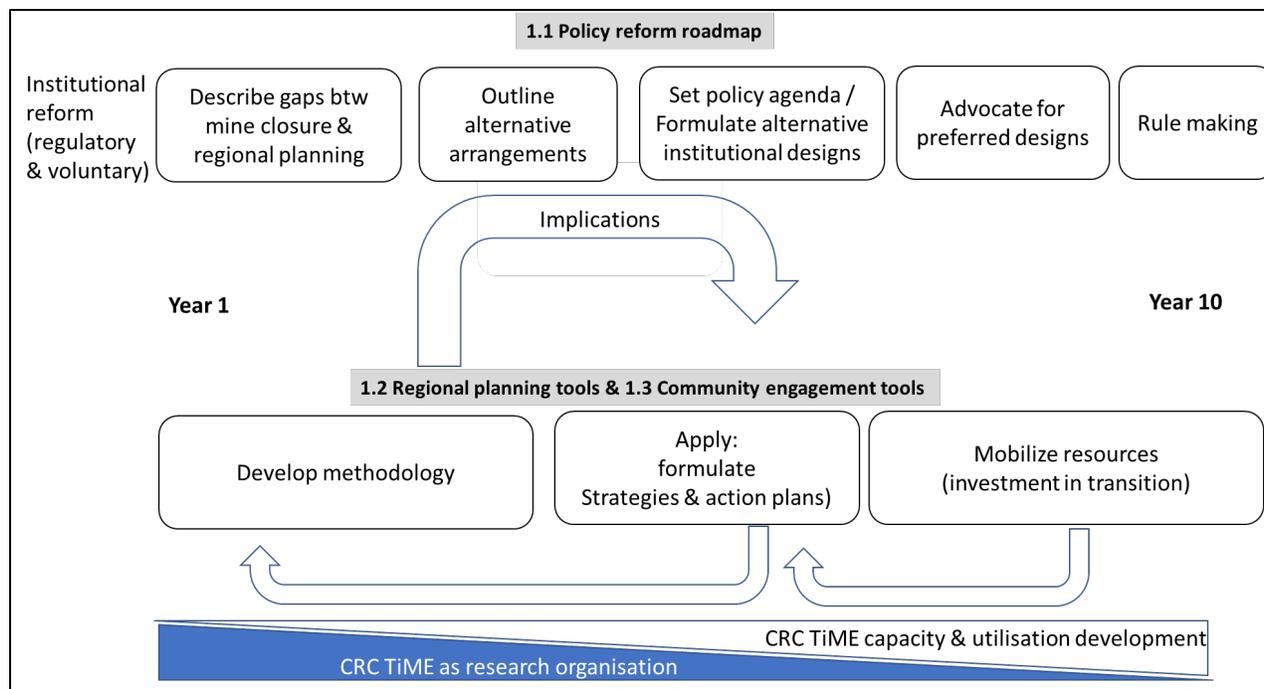


Figure 4 Summary of proposed pathway to impact for Program 1

During Years 6 to 10, the impact pathway involves a multi-stakeholder assessment of alternative institutional designs. Preferred institutional designs (i.e. rules and policy instruments) are subsequently negotiated and ratified in public and private rule making.

Table 7 High-level impact pathway for Program 1

YEAR	ABBREVIATION	DESCRIPTION OF FUNCTIONAL INTERACTION	RESPONSIBLE ACTORS (INDICATIVE)
1	KG	Foundation-stage projects describe gaps in institutional arrangements within and between mine closure planning & regional planning	Selected CRC TiME foundation-stage research projects (e.g. Projects 1.1, 1.3, 2.1, 2.2, 2.4)
1	PF	Adoption of design propositions (Section 5.3.2): potential to realize transformative synergy; inter- & transdisciplinary planning; integrative program design & delivery	This project CRC Impact Advisory Committee
1–2	KG PF	Outline essential functionality of regional planning methodology	Forthcoming research projects: building on findings of selected Year 1 projects (e.g. Projects 1.1, 1.3, 2.1, 2.2, 2.4)
1–2	RM	CRC TiME allocates research funding	CRC TiME corporation
2–7	KG RM	Iterative development & application of methodology to formulate regional plans (action research in regional hubs) Implications for policy and institutional reform (of integration of mine closure and regional planning as policy regimes)	Forthcoming research projects CRC TiME participant organisations in regional hubs
6–7	KG PF	Set policy agenda: outline & advocate for institutional reforms required to channel public and private attention to applying regional planning methodology	Forthcoming research projects (KG) CRC TiME participant organisations (PF)

YEAR	ABBREVIATION	DESCRIPTION OF FUNCTIONAL INTERACTION	RESPONSIBLE ACTORS (INDICATIVE)
7–10	KG	Formulate alternative institutional designs & policy instruments Conduct deliberative multi-stakeholder assessment of alternatives	State & federal governmental agencies in collaboration with non-state stakeholders (convened by CRC TiME) (Forthcoming research projects)
8–10	RM	Participants advocate for preferred institutional designs (individual & joint action)	CRC TiME participant organisations
8–10	IM	Public rule making (i.e. legislation, statutory rules) Private rule making (e.g. industry guidelines & codes of conduct)	State and federal governments Non-state organisations

Notes: Timeframes are indicative. Codes refer to ‘governance function’ (Section 3.1). KG = Knowledge generation; PF = Policy framing; RM = Resource or organizational mobilisation; IM = Institution or rule making. CRC research projects are detailed at <https://crctime.com.au/research/projects/>

6.3.4 Revising a high-level pathway to impact

The high-level pathway to impact for the regional economic development program (Program 1) presented above is a representation of changes needed in institutions, planning practices, and investment practices. As with all representations, it simplifies what in reality are practices and procedures which resist planned interventions. In this section we discuss how greater rigor can be introduced to the initial ‘theory of change’.

The pathway to impact for Program 1 can be refined or revised in several ways. To begin with, its persuasiveness can be explored by reflecting on key assumptions, and implications arising from assumptions. Next, the initial identification of responsible actors (Table 7) can be refined, by elaborating on additional positions and actors required for each action. Later, the impact pathway can be revised based on learning during the course of program implementation.

Reflection on underlying assumptions. One proposition and one presupposition inform the discussion of regional planning methodology explored in Section 4:

(Proposition) To inform post-mining investment in a region, it is necessary to develop a regional planning methodology. A core purpose of such methodology is to allow stakeholders to identify post-mining land use and asset use scenarios, and to facilitate them to converge on preferred post-mining development strategy.

(Presupposition) The application of such methodology is expected to catalyse post-mining investment in a region.

The proposition appears reasonable on first inspection. Regional strategic planning is a well-established domain of practice, the limitations and potential of which are documented (Gordon & Champion, 2021; Harrison, Galland, & Tewdwr-Jones, 2021; Thompson & Maginn, 2012).

Proposed innovations in planning methodology raise questions about the receptiveness of existing planning processes to those innovations. The presupposition raises questions about how regional planning intersects with the interests and abilities of stakeholders, as well as alternative means-to-goal actions:

- What planning outputs and outcomes do post-mining investors seek (e.g. evidence of emerging business opportunities, indications that business propositions have support of stakeholders)?
- What planning outputs and outcomes are sought by local-level stakeholders in a region (local governments, community organisations, Indigenous organisations) (e.g. broad agreement among key stakeholders)?

- What innovations in planning methodology are likely to meet the above range of stakeholder expectations?
- Do alternative means to catalyse investment exist which are effective, and do not require development of sophisticated regional planning methodologies?

The above questions are *ex ante* questions about effectiveness: how well is a set of proposed actions likely to deliver the desired outcome of mobilizing investment in a region's post-mining economic development? Although discussion during Workshop 2 touched on innovations in methodology (Section 5), a sustained conversation about methodology is necessary to improve confidence in the assumptions above.

Elaboration of actions. Once the core assumptions underlying the impact pathway are considered rationally persuasive, the high-level impact pathway can be refined by describing the set of specific functions required to realize each action in the pathway presented in Figure 4.

As noted in Section 3.1.3, a governance function can be described as a particular objective, the set of positions (roles) and actors assigned to those roles, and a lead responsible actor (Ostrom, 2009). Elaboration requires additional information about required roles, and capability and legitimacy of actors to serve in those roles.

Table 8 provides examples of relevant functional positions in the context of the Program 1 impact pathway, based on which specific organisations and individuals can be identified.

Table 8 Functional 'leadership' positions

POSITIONS	ACTOR / DETAIL
Participants (Representatives)	Individuals that engage in program activities on behalf of CRC TiME participant organisations: represent their organisation's interests; mediate between their organisation & emerging outputs of collaborative process (e.g. collective understandings & shared commitments)
Implementors	Organisations that pilot or experiment with aspects of planning methodology
Convenors	Individuals with ability to draw diverse actors into exploration of collaboration; perceived as fair, capable, trusted
Scientific & technical experts	Individuals with capability to translate or interpret specialized methods & findings Individuals with capability to develop inter- and transdisciplinary methodology
Facilitator	Impartial, efficient, effective managers of collaborative processes, able to resolve disagreement or conflict

Source: based on (Emerson & Nabatchi, 2015a).

Learning. Learning about the effectiveness of implemented actions is one of several forms of learning which can feed back to revising a path to impact (Section 7.2). The following section presents a monitoring and evaluation framework to support learning and adaptive programming, based on collaborative governance.

7 A framework and system for monitoring, evaluation and learning

7.1 Conceptual framework

We propose a conceptual framework for monitoring, evaluation & learning (MEL) for CRC TiME, based on Emerson and Nabatchi (2015a). Conceptually, this framework combines two of six approaches described in a review of program evaluation literature (Dart, 2020).¹² The first approach is oriented to the evaluation of how actions perform against planned goals and outcomes ('productivity performance'). The second approach recognizes the complexity of acting to change a complex, uncertain, and adapting system: it emphasizes evaluating collaborative processes, and its evaluation indicators are derived from Emerson et al.'s integrative collaborative governance framework ('process performance'). Although process and productivity performance are causally related, it is helpful to distinguish them.

7.1.1 Productivity performance

Productivity performance is defined as 'The actions (or outputs) of a collaborative governance regime, and the resulting outcomes and adaptations in the system context generated' (Emerson & Nabatchi, 2015a). Table 9 outlines a framework for evaluation of productivity performance. It can be summarized as a 3 x 3 matrix consisting of:

- three units of analysis: participant organisations; target goals; CRC as a collaborative governance regime
- three performance levels: actions or outputs; outcomes; system responses to outcomes.

(Emerson & Nabatchi, 2015b)

Evaluation involves assessing how the actions of CRC TiME, ensuing outcomes, and responses to outcomes contribute to changes relevant at the different units of analysis. Elements in Table 9 represent indicators – that is, concepts which are meaningful at a particular unit of analysis. The concepts begin (at top left of matrix) with a focus on near-term effects at a discrete unit of analysis (the participant organisation), then proceed to longer-term effects and more complex units of analysis (e.g. sustainability at bottom right).

¹² The productivity performance component of the Emerson and Nabatchi (2015b) MEL framework can be classified as an "objectives-based" approach, while the process performance component can be classified as a type of "pluralist" approach (cf. Dart, 2020).

Table 9 Productivity performance – indicators & evaluation questions

		PERFORMANCE LEVEL:		
		COLLABORATIVE ACTIONS/ OUTPUTS	OUTCOMES OF COLLABORATIVE ACTION (INTERMEDIATE OR END)	RESPONSES TO OUTCOMES (SYSTEM ADAPTATIONS)
UNIT OF ANALYSIS:	Participant organisation in CRC TiME	<i>Efficiency.</i> Do actions/outputs result in efficiency gains to participant organisations, by sharing or delegating collective actions?	<i>Effectiveness.</i> Do outcomes result in benefits or desired changes to participant organisations? Have outcomes enhanced our organisation’s capacity to achieve its mission & goals?	<i>Resilience (balance between stability & change for a participant organisation).</i> Do adaptations to the system context allow for organisational resilience? I.e. for participant organisations to assert continuity in mission while responding to a changed context?
	CRC TiME (as collaborative governance regime)	<i>Efficacy.</i> Do actions/outputs align with the CRC’s mission & shared pathway to impact? Are we taking actions, and generating outputs which are consistent with what we set out to achieve, and how we planned to achieve it?	<i>External legitimacy.</i> Do outcomes contribute to improved perceptions & status of CRC among key external stakeholders?	<i>Viability.</i> Is the CRC capable of generating outputs, outcomes, and other work in a changed system context? Do system adaptations increase the organisational & financial capacity of the CRC in ways that support continued collective action?
	Target goals (public problem/s that are the focus of collaboration)	<i>Equity.</i> Is the distribution of cost, benefit, and risk of actions/outputs taken equitable, considering the multiple interests and needs of beneficiaries?	<i>Effectiveness.</i> Do outcomes meet the CRC’s goals?	<i>Sustainability (longevity of outcomes).</i> Are the CRC’s outcomes robust, resilient, and lasting over time?

Source: adapted from Emerson and Nabatchi (2015a).

Each of the indicators presented in Table 9 requires metrics and evidence. Table 10 provides examples of relevant metrics and data sources.

Table 10 Productivity performance – metrics & potential data sources

PERFORMANCE LEVEL: UNIT OF ANALYSIS:	COLLABORATIVE ACTIONS/ OUTPUTS	OUTCOMES OF COLLABORATIVE ACTION (INTERMEDIATE OR END)	RESPONSES TO OUTCOMES (SYSTEM ADAPTATIONS)
Participant organisation in CRC TiME	Measures of net efficiency gains. S, I, OR	Benefits attributable to CRC TiME outputs. Reported benefits S, I, OR	Evidence of resilience attributed to CRC TiME S, I, OR
CRC TiME (as collaborative governance regime)	Consistency of actions with shared pathway to impact. Workplans, meeting minutes, external interviews	Statements by key external leaders & media acknowledging CRC outcomes. OR, Funding, Media coverage	Maintenance / growth in number of CRC TiME participants Maintenance / growth of CRC TiME capacity OR, strategic plans, financial reports
Target goals	Satisfaction with distribution of net benefits (across beneficiaries and/or participants)	Evidence of desired change in targeted conditions. Criteria set for target goals; measures of attainment (objective and perceived)	Sustainability of target goal attainment in a system context which has adapted Criteria set for sustainability of target goal attainment

Source: adapted from Emerson and Nabatchi (2015a). Note: “S” = Surveys; “I” = interviews; “OR” = organisational records.

7.1.2 Performance of collaborative processes

As noted above, the theory of collaborative governance emphasizes the importance of participants’ ability to articulate a shared pathway to achieve desired outcomes (whether intermediate outcomes or target goals). The ability to reason in a collaborative manner among parties with diverse interests is a prerequisite for developing a shared impact pathway. As shown in Table 10, the consistency of actions with a shared pathway to impact constitutes the metric proposed for evaluation of actions at the level of CRC TiME.

This section introduces process-related indicators of collaboration, again based on Emerson and Nabatchi’s theory of collaborative governance. Process performance is defined as:

The level of functioning of collaboration dynamics where such dynamics are theorized as emerging from the interactions of principled engagement, shared motivation, and capacity for joint action.

(Emerson and Nabatchi 2015a; Figure 1)

The indicators in this section allow the level of functioning of three sub-processes to be evaluated: principled engagement, shared motivation, and capacity for joint action. When performance is high across one or more of these components, a potential exists to catalyse the other component/s, that is, for interactions to be synergistic, in turn motivating and mobilizing joint action (Figure 1).

Evaluating the performance of collaborative performance is relevant during the operational cycle of a collaborative governance regime: this is ‘formative evaluation’. The three sub-processes of collaborative dynamics provide insight into how research programs could design operational pathways to impact, where joint action among CRC TiME participants is required to realizing outcomes or target goal.

Table 11 to Table 13 provide examples of evaluation indicators and data sources relevant to collaborative dynamics. For these indicators, potential data sources consist of archival data (e.g. meeting minutes, reports, case documentation); surveys or interviews; and direct observation.

Table 11 Process performance - ‘principled engagement’ component of collaborative dynamics

ELEMENT	DEFINITION	SAMPLE INDICATORS
Discovery	Identification and analysis of relevant information	Extent to which participants reveal interests, concerns, and values; recognize shared goals; recognize how their own interests are served by participation in group; identify, share, and analyze relevant information
Definition	Effort to build shared meaning around issues relevant to CRC TiME	Extent to which participants articulate common purpose and target goals; define concepts and terminology; clarify tasks and expectations; develop evaluation criteria
Deliberation	Use of candid and reasoned discussion to address issues	Extent of engagement in fair and civil discourse; open and inclusive communication; candid and reasoned discussion; offering of individual opinions; listening; examination of diverse perspectives; management of disagreement; willingness to change perspective
Determinations	Decisions reached by CRC TiME and its working groups	Explicit agreement on purpose ¹ , target goals, shared pathway to impact

Source: adapted from Emerson and Nabatchi (2015a). Note: ¹ “Purpose” in Tables 11 to 13 refers to collective purpose.

Table 12 Process performance - ‘shared motivation’ component of collaborative dynamics

ELEMENT	DEFINITION	SAMPLE INDICATORS
Trust	Confidence in reliability, truthfulness, & abilities of others	Extent to which participants believe each other to be reasonable, predictable, and dependable
Mutual understanding	Understanding & tolerance of differences	Extent to which participants identify and respect differences among each other; are comfortable revealing information to others; appreciate and feel appreciated by others
Internal legitimacy	Beliefs about worthiness & credibility of CRC TiME & its participants	Extent to which participants deem CRC TiME and its parties to be useful, worthy, and credible
Commitment	Dedication & responsibility to CRC TiME purpose, target goals, shared pathway to impact	Extent to which participants are committed to the CGR, its collective purpose, target goals, and shared impact pathway; are motivated to achieve outcomes together; feel responsible and accountable for outcomes

Source: adapted from Emerson and Nabatchi (2015a).

Table 13 Process performance - ‘capacity for joint action’ component of collaborative dynamics

ELEMENT	DEFINITION	SAMPLE INDICATORS
Procedural or institutional arrangements	Protocols for managing organisation/s ¹ over time	Extent to which arrangements enable effective administration and management of CRC TiME (e.g. supports synergistic interactions between projects in a program and between programs) Relevant protocols of individual participants in CRC TiME
Leadership	Functional positions served by participants	Types of leadership roles filled/unfilled (e.g. champion, convenor, facilitator, expert)
Knowledge	Knowledge required to position organisation to take joint action, including processes for sharing w/participants & accessing expertise	Degree to which high-quality information made accessible to participants (e.g. credible research agenda-setting for CRC TiME) Extent to which explicit models of knowledge generation inform program or project design (e.g. coproduction)
Resources	Acquisition of resources needed to achieve organisation’s purpose	Extent to which funding, administrative support, expertise, tools, and other resources were acquired Extent to which parties contributed to and leveraged various resources Extent to which parties accommodated differences in resources and capacities of others

Source: adapted from Emerson and Nabatchi (2015a). Note: ¹ ‘Organisation’ refers to relevant reporting unit (e.g. CRC TiME, research program).

7.2 Operational MEL system

This section proposes core functions and elements of an operational MEL system, informed by comments received from participants of Workshop 3. ‘Operational’ refers to the set of procedures and resources which CRC TiME draws on for performance monitoring, evaluation, and learning.

The proposed MEL system supports two objectives, the first of which is ongoing learning and adaptive programming (‘formative evaluation’). As discussed in Section 5, CRC’s long-term outcomes require programs with multi-year operational cycles. The transformative aspirations of the CRC, combined with complexity and uncertainty in its system context, suggests that a key purpose of the MEL system is to support rapid learning and flexible adaptive program design

During its long operational cycles, monitoring and evaluation of program implementation experience allows:

- learning about efficacy – how well actual, implemented actions align with actions planned in an impact pathway (so-called ‘single-loop’ learning)¹³
- learning about effectiveness – how well a set of implemented actions delivers outcomes planned in an impact pathway (‘single-loop’ learning)
- learning about the feasibility or desirability of intermediate or long-term outcomes (‘adaptive’ or ‘double-loop’ learning)
- learning about ‘deeper’ elements of the system context that need to be addressed in order to realize long-term outcomes (e.g. changes to mental models and organisational values; ‘triple loop’ learning).

A second objective of the MEL system is to support an evaluation of progress towards nine impacts described in the CRC’s Stage 2 bid documents submitted to the Commonwealth government (Figure 3). This evaluation is expected to be conducted in the final years of the CRC by an economic consultant, informed by MEL reports submitted by responsible organisational units.

The MEL system is informed by comments received from CRC TiME’s executive, staff, and board, during the project’s final workshop, which presented the conceptual framework described above (Annex B). While participants appreciated conceptual sophistication, they requested the operational system provide practical guidance on how to prioritize performance evaluation by units of analysis and by stage of program development.

This section outlines the following elements of a proposed operational system:

- Guidelines for preparation of impact pathways¹⁴
- Guidelines for prioritization of monitoring and evaluation activities
- Standardized instruments for data collection
- Organisational structure & information management systems.

The elements contain recommendations to benchmark and prioritize recurring types of activity. The fourth element refers to establishing effective positions and workflow for the conduct of MEL, and functional infrastructure to record, access, and share MEL information.

7.2.1 Preparation of impact pathways

As of mid-2021, the CRC is in the process of developing impact pathways for each of its four programs and associated priorities, along with other strategic plans (notably, a research prioritization plan and an organisational Strategic Plan). The importance of strategic planning suggests that CRC establish standards for

¹³ See Pahl-Wostl (2015) for discussion of single-loop, double-loop, and triple-loop learning.

¹⁴ Contributing to the development of a CRC TiME ‘Impact Framework’ methodology document (CRC TiME, n.d.-a).

adequate impact pathways at all organisational units that are vehicles of significant action – for example, at the program unit of analysis and at the project unit of analysis.

A project's impact pathway is a contribution to a program impact pathway. It should describe specific elements of the system context the project is designed to address; what outputs a project will contribute; how the project will produce its outputs (i.e. the project's methodology); how those outputs contribute to a program impact pathway (e.g. how they will be used by subsequent projects or end-users).

The formulation of an impact pathway – as demonstrated in this report for Program 1 – is an iterative process (Section 6).

Given the multiple, ambitious, and cross-sectoral nature of the CRC's target goals, it is reasonable to expect that organisational units responsible for preparing impact pathways provide the following types of evidence:

- (a) Describe 'baseline' conditions or assumptions about the system context; state achievable goals or outcomes; propose feasible means-to-goal actions
- (b) Describe how intended users of research innovations can engage in co-design and coproduction of knowledge (see 'Knowledge generation' in Section 3.1)
- (c) Describe collaborative action, informed by theory and practice of collaborative governance (Section 3)
- (d) Methodology (within or across programs) considers relevance of interdisciplinary / transdisciplinary (ITD) problem framing and methods¹⁵
- (e) Consider relevant science or organisational innovations in other domains
- (f) Are periodically peer-reviewed, and periodically revised based on MEL.

In the process of designing an impact pathway we recommend that responsible organisational units (e.g. programs and projects) nominate the indicators, metrics, and data sources against which they propose their process and productivity performance be evaluated.

The framework presented in Section 7.1 provides a representative set of indicators, metrics, and data sources, from which programs and projects can draw on for MEL.

Evaluating the system context

An impact pathway is credible when it demonstrates understanding of dynamics in the system context which can feasibly be influenced by a particular set of actors and course of action.

The system context includes social and biophysical elements which interact to produce outcomes of interest in regions (see Section 3.1.1). Table 15 provides sample indicators.

¹⁵ Examples of ITD methods include the exchange of mental models among researchers, and systems thinking (e.g. Hovmand, 2013; Pennington, 2016; Pennington et al., 2016).

Table 14 Sample indicators to evaluate system context

ELEMENT	SAMPLE INDICATORS	POTENTIAL DATA SOURCES
Regional environmental and natural resource conditions	Number of mines by position in life-of-mine cycle Extent of progressive rehabilitation	Archival data (e.g. meeting minutes, reports, case documentation); survey data; interviews
Socio-economic conditions	Income education and health levels Source of employment by industrial sector Global and national socio-economic driving forces	
Public and private institutional arrangements	Sectoral public policies & legal arrangements Priority between sectoral policies & arrangements Private sector codes of conduct Driving forces for reform	
Socio-political dynamics	Actor's positions, interests in post-mining regional development (e.g. stated positions, mental conceptions, actions) Actor's sources of power and influence (e.g. support from public decision makers) Actor's position in regional social network/s Prior disputes Actor's experience with multi-stakeholder collaboration	

Source: Authors, based on Emerson and Nabatchi (2015a).

To understand its contribution over time to changing the system context, CRC TiME needs to monitor elements of that context. The complexity of the system means that no individual actor in the CRC network has the capability to monitor or authoritatively represent the system context. As a practical response, many aspects of the system context can be assessed by system indicators which relate in a coherent manner to indicators which programs and CRC leaders consider relevant for the purpose of impact pathway evaluation.¹⁶

For example, for Program 1, relevant indicators would include: stakeholder perceptions of the effectiveness of regional strategic planning processes, and perceptions of the performance of implemented planning methods (cf. Section 5). Other aspects of the system context – such as perceptions of need for policy or institutional reform among state agencies – could be assessed by specific projects (including management projects) which leverage the specific knowledge that CRC participant organisations possess.

We propose that reporting on system context be led by Programs and by CRC Management, with data collection assigned to relevant research and management projects (see Table 15 and Section 6.3). The CRC could publish periodic reports on the system context (e.g. 'Post-mining regional transformation: state of the system').

¹⁶ We make an analytic distinction between a system indicator and CRC TiME program indicators. The CRC will develop indicators to track outcome performance against target goals (CRC TiME, n.d.-a). Some of these can serve as system indicators. Other elements of the system context are influenced by forces beyond CRC TiME programs.

7.2.2 Prioritisation of evaluation

As the CRC evolves, the program and network can be viewed as transitioning through several stages. These stages reflect the interaction of the CRC with its system context, developing greater capability to influence that context over time:

- Formation (developing processes and resources to support joint action)
- Ability to realize actions & outputs (with limited influence on system context)
- Ability to realize outcomes (with increased influence on system context)
- Ability to adapt to changes in system context.

We recommend that the above stages of development guide the prioritization of MEL efforts, as illustrated in Figure 5.

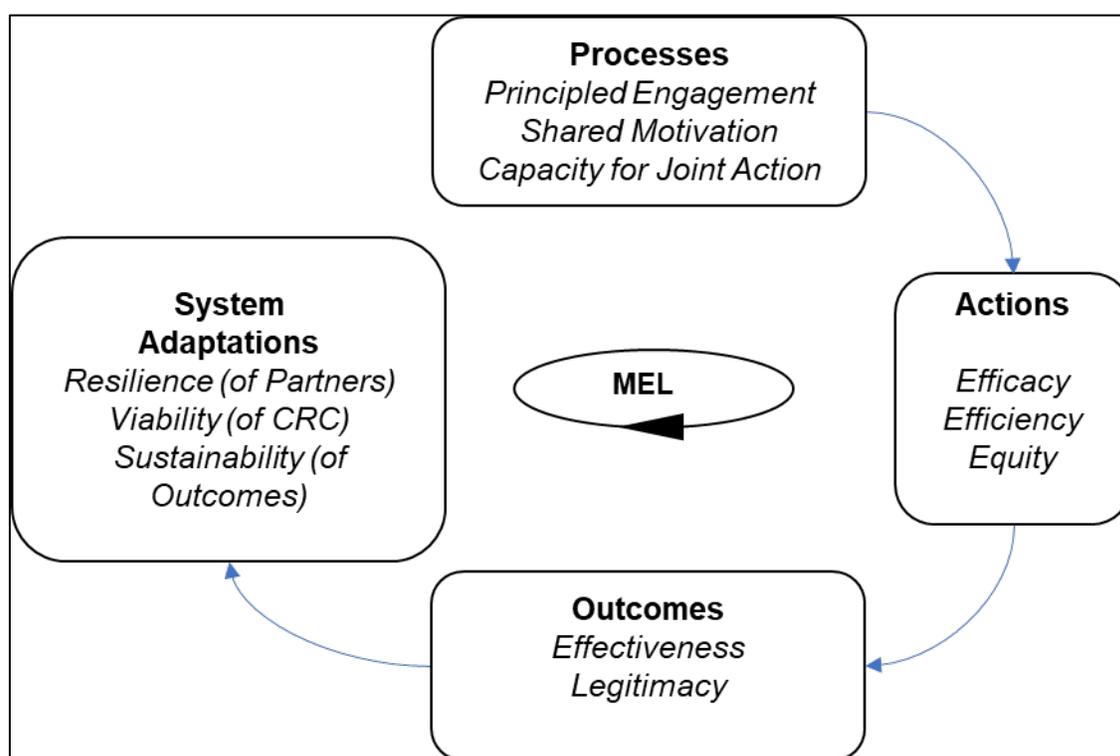


Figure 5 Indicative prioritisation for MEL over program life cycle.

Note: Italicized terms refer to components of MEL framework presented in Table 9 to Table 13.

The CRC is currently in a “formation” stage of collaboration – the stage of exploring and defining common purpose, agreeing on pathways to impact, establishing trust, acceptance, and other interpersonal relations needed to underpin action (Emerson & Nabatchi, 2015a). We propose that during the formation stage of CRC TiME programs, assessment be prioritized in the following order:

- capacity for joint action (Table 13)
- its determinants: principled engagement (Table 11) and shared motivation (Table 12).

By this we mean that if evaluation of capacity for joint action reveals challenges and limitations, additional inquiry should be directed to its process determinants (Section 7.1.2).

As *actions* emerge, it is possible to assess: efficacy, efficiency, and equity (Table 9), while continuing to monitor capacity for joint action.

As *outcomes* emerge, it is possible to evaluate: effectiveness for target goal attainment, effectiveness for participant organisations, and the external legitimacy of CRC (Table 9).

Towards the end of the CRC's 10-year program cycle it may be possible to assess system adaptations (Table 9). However, new projects initiated later in the program still need to evaluate process performance.

7.2.3 Organisational structure & information management systems

This section proposes responsibilities and workflow for the conduct of MEL, and functional infrastructure to record, access and use MEL information.

Proposed workflow

Responsibility for data collection and MEL reporting should be delegated to the organisational unit best situated to generate such data. The current structure of the CRC is one that treats projects as the main unit for realizing action, and the program (a portfolio of projects) as the main unit for realizing outcomes. Given this structure, both research projects and management projects are a significant source of MEL data collection, and the initial locus of MEL data analysis and reporting.

Examples of relevant 'management' projects include convening and facilitation of periodic conferences and dialogues for participant organisations, convening and facilitation of research in regional hubs, and capacity-building activities.

In mid-2021 CRC TiME elaborated its organisational structure and considered adding organisational categories to its existing Program and Project units (CRC TiME, n.d.-a, n.d.-c). Table 15 outlines existing organisational units that appear best situated to report on components of the MEL framework.

We propose that Project leaders report to Program leaders, gathering data and reporting against indicators to be agreed with the latter. These indicators should relate coherently to the impact pathway of a Program.

Table 15 Proposed responsibility for MEL reporting by organisational unit of CRC TiME

COMPONENT & INDICATORS	REPORTING ORGANISATIONAL UNIT	DATA COLLECTION PERIODS
Processes Capacity for joint action Principled engagement Shared motivation	Program Project	Inception Periodic program reporting Completion Inception & Completion
Actions Efficacy against impact pathway Efficiency gains for participants	Program & Project	Inception & Completion
Outcomes Effectiveness (benefits for participants) Effectiveness at level of target goal External legitimacy of CRC	Program CRC Management	Inception Periodic program reporting Completion
System Context	Program CRC Management	Inception Periodic program reporting Completion
System Adaptations	Program CRC Management	Periodic program reporting Completion

Source: Authors.

To the extent they include diverse CRC participants, project advisory committees and regional hubs where projects are implemented, are sources of MEL data for projects.

Analysis and reporting will be conducted by Project leaders and Program leaders, supported by the Impact Translation Lead (ITL) and Research Director (RD). The ITL is best situated to build capacity to apply the MEL framework.

We propose that Project and Program leaders deliver key findings and recommendations to the ITL and RD, who report to relevant Committees (e.g. proposed changes to project or program design in response to challenges or opportunities in system context). The need for adaptive program design in turn highlights the importance of enhancing the capacity, among the CRC's management, advisory committees, and board, to deliberate on MEL findings.

A similar process of reporting by programs could be used to inform periodic external reviews of CRC.

With respect to summative evaluation, the CRC TiME is likely to conduct a cost-benefit assessment of direct and indirect, tangible economic impacts of its outputs and outcomes towards the end of its program cycle (e.g. Year 8). The inputs to such assessment consist of qualitative and quantitative descriptions of actions and outcomes resulting from the CRC's investments. The storage, classification and retrieval of such information require fit-for-purpose information systems.

Information management systems

This section outlines desired functions of information management systems. To support the workflow outlined above, MEL data and draft MEL reports should be accessible to project leaders, program leaders, and the ITL, in conformance with privacy and human research ethics requirements.

As of mid-2021, the reporting of MEL-relevant data was not systematized and took place on several software platforms. The CRC’s project management platform, the web-based system ‘Turnkey’, supports basic reporting against project milestones. Project leaders can upload data on project performance on a quarterly basis, but at present Turnkey is not informed by any MEL framework.

In future, Turnkey should record the relevant Commonwealth impact areas of each project, and details of project steering committee membership. Further discussion is required as to whether extending Turnkey’s functionality could enhance MEL reporting, for example, by the addition of reporting on MEL indicators.

Alternatively, the use of dedicated content analysis software (e.g. NVivo) allows data from diverse sources (e.g. interviews, meeting records, documents) to be manually analysed and classified according to various elements of the MEL framework, for the purpose of informing MEL report preparation. Given its capacity to store and support analysis of diverse sources of data, we recommend that the CRC explore the use of a content analysis software platform to support MEL reporting by all reporting units (Figure 6).

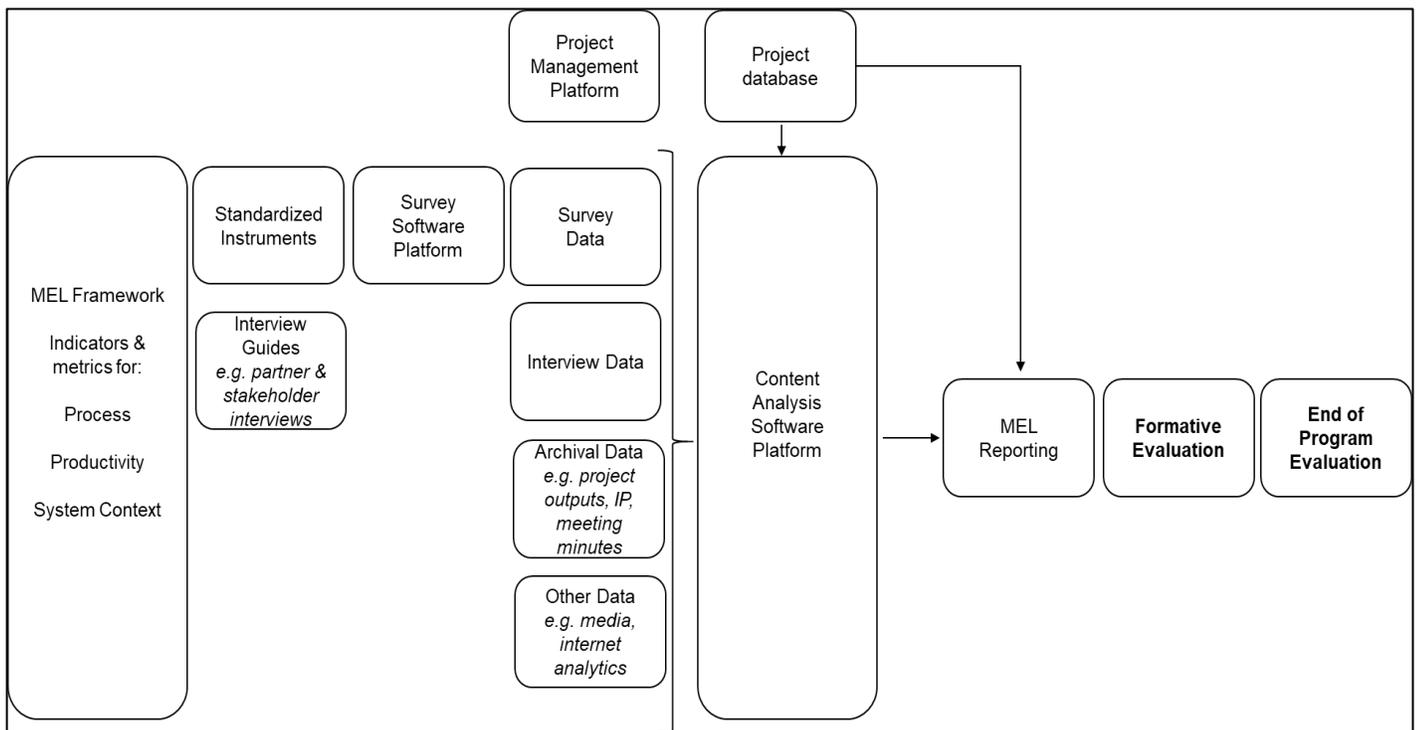


Figure 6 Proposed information management systems for MEL

Source: Authors. Note: ‘Project’ refers to research project or management project; ‘IP’ = intellectual property.

Design and administration of surveys is typically conducted on dedicated software platforms. As the CRC moves to develop and implement standardized instruments, it will need platforms which deliver a consistent survey respondent interface and support longitudinal analysis. .

Similarly, dedicated software applications exist to support group discussion. Such discussion is relevant where a topic under evaluation would benefit from multiple perspectives (e.g. eliciting perspectives from different managers in a participant organisation on efficiency gains realized from collaboration in CRC TiME projects) – or more generally, to support participatory planning. Although CRC leaders may elect to use such applications routinely in projects, for the purpose of MEL an enterprise-level commitment to these applications is unnecessary.

In summary, we recommend use of content analysis software as the main platform to analyse MEL data, and capability development for all reporting units to use such software.

7.2.4 Standardised instruments

Development of standardized instruments for data collection and analysis will increase efficiency across CRC TiME research projects and the CRC TiME network. Data collection for the following types of indicators can be standardized in the form of survey instruments and structured interview guides:

- Process performance
 - Communicative behaviour ('principled engagement') (Table 11)
 - Relations between participants ('shared motivation') (Table 12)
 - Functional assets ('capacity for joint action') (Table 13)
- Productivity performance
 - Participant perceptions of CRC outputs & outcomes (efficiency gains to participants, benefits for participants, external legitimacy) (Table 9).

Taking capacity for joint action (CJA) as an example, it consists of four elements, each of which is considered necessary to enable action: procedural or institutional arrangements; leadership; knowledge; resources (Table 13). Items for a survey instrument can be derived from the sample indicators provided for each element.

To rate the performance of CJA, an evaluator could assign value based on the following evidence, in order of increasing value:

- the presence of an indicator (e.g. leadership positions identified by the organisational unit have been filled [Table 8])
- the *value* or quality of indicators present (e.g. research agenda makes use of credible and relevant knowledge; institutional arrangements perceived as effective and efficient; unique contribution of in-kind resources)
- evidence that two or more elements of CJA are *interacting in a productive or synergistic manner* (e.g. synergy between leadership positions; institutional arrangements and resources support implementation of research agenda).

For 'procedural or institutional arrangements,' relevant evaluation metrics depend on the reporting unit (project, program, or CRC TiME as a whole). Such a survey could be administered by the ITL to participants, committees, and project or program leaders.

If scoring is of interest the conceptual approach which informs the Hydropower Sustainability Assessment Protocol (HSAP) could be followed. An assessment guide describes ‘basic good practice’ and ‘proven best practice’ for each topic assessed by this protocol. Scores on a scale of 1 to 5 are assigned by a trained assessor (International Hydropower Association, 2010). Implementing this approach in CRC TiME’s MEL system would require ‘good practice’ and ‘best practice’ to be defined. This is most readily done for process performance. By contrast, establishing normative standards for mine closure and post-mining development practices would require a basis of prior knowledge, experience, and multi-stakeholder agreement which do not yet exist.

Standardized instruments are not appropriate for every type of evaluation. The MEL framework anticipates that specific criteria need to be defined to evaluate goal attainment (Table 10). When evaluating outcomes, metrics should be defined which are meaningful (salient) to CRC participants and achievable in the timeframe of CRC TiME. For example, while an increase in the rate of mine relinquishment is a meaningful target goal, such outcomes are contingent on many factors beyond the control of the CRC’s activities and are unlikely to be achieved during the program’s 10-year timeframe. One participant suggested that metrics such as coherence and transparency in closure and relinquishment processes, and stakeholder support for such processes, are more useful to evaluate productivity performance (P28). The National Resources Statement is an important but not exhaustive source of target goals, from which the CRC can define specific criteria and metrics of goal attainment.¹⁷

8 Conclusion

This project is the first to explicitly apply theories of collaborative governance to catalyse multi-stakeholder engagement in the design of Australian cooperative research to address post-mining development. The project demonstrated how a combination of collaborative governance theory and stakeholder participation can be harnessed to formulate a high-level action to impact pathway (‘theory of change’) focussing on regional economic development.

The project engaged multiple stakeholders of CRC TiME in evaluating elements in the system context which inhibit the wholistic treatment of mine planning and regional development. We invited participants to express intermediate and long-term outcomes they desired – that is, goals which reflect their values and understanding of the system context (Figure 7). We further explored how major actions proposed by the CRC for its regional economic development program should be conceptualized, focussing on regional planning methodology. The project’s methodology included iterative exchange of knowledge between the stakeholder participants and the study team, in the form of workshop deliberation and post-workshop analysis, over three rounds of workshops.

The process of formulating an impact pathway for the regional economic development program yielded design propositions which included: the importance of pursuing inter- and transdisciplinary (ITD) approaches; and the

¹⁷ The statement refers to ‘benefit sharing’ for communities, but does not refer to ‘closure’, ‘relinquishment’, or post-mining development.

potential for projects in the program to realize compelling synergies with transformative outcomes. These propositions may be relevant to other programs of CRC TiME.

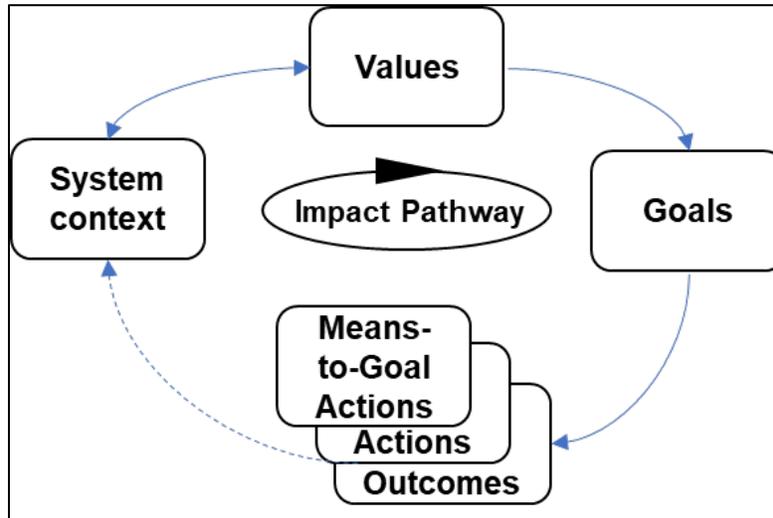


Figure 7 Impact pathway formulation as iterative process

The aspirations of CRC TiME to integrate the domains of life-of-mine planning and post-mining development in mining regions, require flexible adaptive program planning. To support such programming, the project proposed core elements of an operational MEL system for CRC TiME, drawing on an evaluation framework explicitly based on collaborative governance. The proposed MEL system is directly linked to elements of the impact pathway (Figure 7), allowing periodic refinement and amendment of the planned course as implementation proceeds.

In conclusion, the formulation of impact pathways and the selection of performance evaluation indicators and metrics for CRC TiME necessarily become an iterative process. This foundation-stage research project has contributed to the first iteration, as program planning and development of an operational MEL system proceed in the CRC's second year. From the perspective of collaborative governance, the imperative for iteration is an opportunity to engage stakeholders of mining regions in the co-crafting of research and capacity-building programs, in turn catalysing joint action.

Acknowledgements

We thank the more than 30 people who participated in project workshops, including representatives of CRC TiME partners, board members, and management. We thank Guy Boggs, Fiona Haslam McKenzie, Rae Mackay, and Donna Pershke for contributing workshop presentations; and Guy Boggs, David Brereton, Fiona Haslam McKenzie, Jason Kirby, and Jane Stacey for reviewing interim outputs or drafts of this publication.

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Annex A: Overview of CRC TiME's inception phase path to impact

Purpose

This section introduces key objectives and activities of the CRC TiME, as formulated by the management and leadership of the CRC, during its inception phase (2019–20). This section offers an interpretation of CRC TiME leadership's understanding (as of early 2021), of the program's overarching pathway to impact.¹⁸ It introduces the CRC's major research programs and their rationale. The three research programs of the CRC, together with a cross-cutting support program, indicate what types of strategic action (i.e. major research outputs) the CRC has committed to investing in, along with an indicative timeframe.

Challenges

Mine closure and relinquishment is a complex undertaking which involves a series of planning and implementation processes. These processes involve multiple actors (regulators, mining company managers, local community, interest groups). Mine planning interactions involve negotiations among groups with different interests, power, resources, and capabilities. A series of such interactions and negotiations is required during the life of a mine; hence, the planning timeframe can be very long.

Ideally, the planning and implementation of closure and relinquishment is structured and orderly. It commences during the design phase of the mine, and is informed at each successive phase by relevant knowledge and values – for example, regarding the status of the mine, the local and regional context, and post-mining development visions and plans (DIIS, 2016).

In principle, closure and relinquishment could be orderly, rational, knowledge-based, and stakeholder-influenced, contributing to sustainable post-mining development.

Figure 8 shows an 'integrated' model of mine planning and regional development. In this model, policy reforms give greater importance to defining post-mining land use, empowerment post-mining local and regional development actors. Mining companies are motivated to reframe their models of mine closure and relinquishment. The Figure also shows how the currently planned research outputs of the CRC may contribute to such a model.

The model of leading practice shown in Figure 8 is an ideal. It would improve a mining project's social license to operate, while reducing the life-of-mine costs of planning, operation, and closure. More efficient regulatory approval in turn would enable increased investment in productive post-mining land use.

¹⁸ The document draws on various unpublished documents of CRC TiME, including its Stage 1 funding application; a draft 'Research Path to Impact'; a summary of the Foundation stage research project portfolio; and a strategic planning workshop in February 2021.

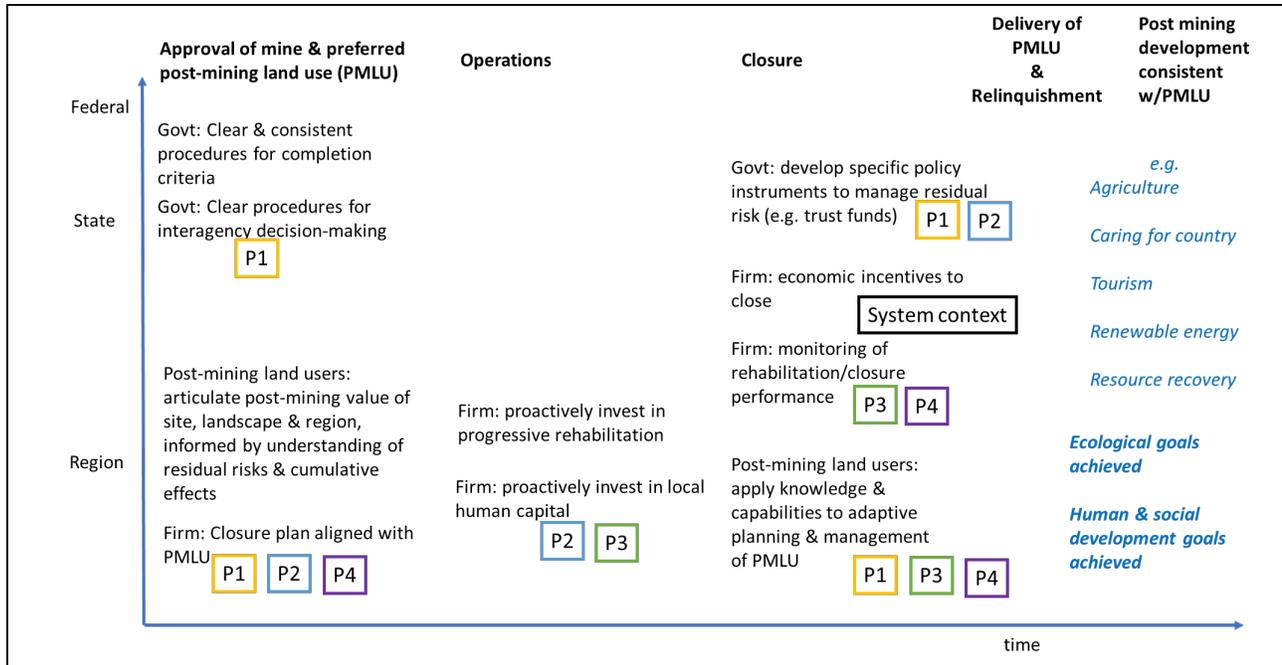


Figure 8 Components of an integrated model of mine planning and regional development

Source: Authors. Notes: “P” refers to CRC TiME Program. PMLU = post-mining land use. Elements of system context include: ecosystems; socio-economic structures; power relations; policy & legal frameworks; and history of outcomes (Section 3.1.1).

In practice, many factors or forces can disrupt the leading practice model. Those factors include variations in minerals prices, which could shorten or prolong mining at a site, as well as policy and regulation governing mining relinquishment (Tiemann, McDonald, Middle, & Dixon, 2019). With respect to the latter, mining companies are permitted to enter into ‘care and maintenance’ that is, suspend operation for an indefinite period, while maintaining their mining lease (Unger, Everingham, & Bond, 2020). Relinquishment requires a company’s obligations for environmental rehabilitation to be met and demonstrated. Rehabilitation faces challenges with respect to ecological restoration, as well as geotechnical challenges. Should uncertainty arise as to whether rehabilitation standards (‘closure criteria’) have been met, or should a company lack resources to meet those standards, the land could remain under mining leasehold for an indefinite period.

CRC TiME’s proposed approach

CRC TiME has organized its approach to addressing the above challenges according to three research themes or programs. The first program focuses on the relationship between mining and post-mining regional development. The second program focuses on strategic planning and decision making at the mine site level. The third program focuses on operational solutions at the mine site level. The three programs are supported by a fourth thematic program, which consists of activities to develop cross-cutting knowledge management and information systems.

Each program has three major research outputs (i.e. work packages). Each output will require the design and delivery of a set of relevant research projects and activities. Although most outputs are planned for completion by Year 7 of the CRC, the testing of operational solutions (developed by Program 3) is planned to conclude at Year 10, the final year of the CRC. In addition to the major research outputs, each program includes investment in human capability development. This will occur through PhD scholarships and the development of training programs.

Regional Economic Development (Program 1)

This program aims to harmonize the governance of mine closure and relinquishment with the governance of regional development – that is, to bridge gaps between policy, regulation, and planning practices which apply in the policy domain of closure and relinquishment, and those which apply in the domain of regional socio-economic development.

The program’s three outputs aim to develop policy frameworks which: clarify expectations around mine closure and relinquishment; integrate mine closure planning more strongly into regional planning processes; and make regional planning more representative of community values and aspirations.

Specifically, the first major output (Output 1.1) will identify “gaps, ambiguities, and counter-productive outcomes” in policy and regulation governing the above two policy domains, which impede successful relinquishment (by Year 2). This output will assess the socio-economic impact of alternative policy settings (by Year 4) and (by Year 5), then produce a policy reform roadmap. The roadmap will be targeted at environmental regulators and regional development agencies. The CRC believes that greater clarity and certainty in policy will make investors more willing to finance mining projects at a lower cost of capital.

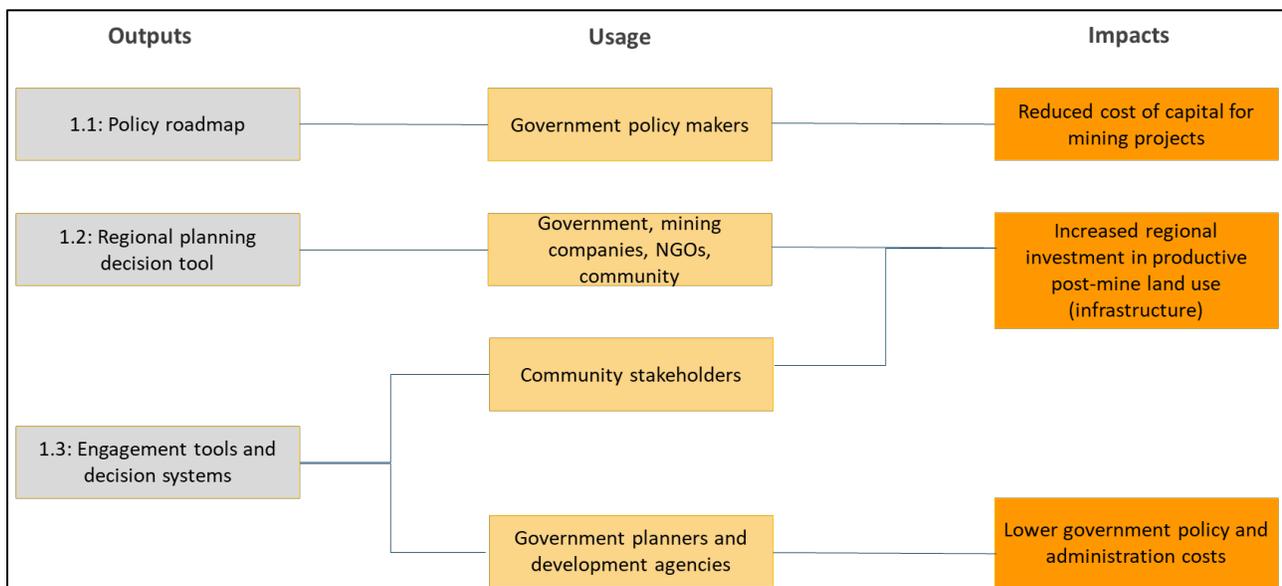


Figure 9 Outputs and impacts proposed for Program 1

Source: Synergies Economic Consulting (n.d.)

The second major output (Output 1.2) will develop, by Year 7, software tools which improve on current regional land-use planning tools. The improved planning tools will allow the alternative options for post-mining land use to be assessed (including the dynamic and cumulative impacts of such options). This decision tool for regional planning is intended for use by a diverse set of actors, including governments, mining companies, NGOs, and local communities.

The third major output (Output 1.3) will develop and test community engagement approaches which improve the quality of community input into criteria for mine closure, and the identification of preferred post-mining land use.

The CRC believes that the second output can increase investment in post-mining regional development – notably agricultural development. The third output is expected to make community-level deliberation about values and aspirations more effective and efficient. This could reduce regulatory and administrative costs, and it could shorten mine closure planning processes.

It is likely that new organisational structures will be needed to support the above vision: the CRC plans to explore “innovative governance models” as well as networks, and business models centred around regional hubs.

The capability development output for this program involves 20 PhD students gaining skills to become leaders in community engagement and regional development, as well as training modules to help communities “design their own economic and social futures” using tools developed by the CRC.

Risk, Evaluation and Decision Making (Program 2)

“This program is aimed at improving the way decisions are made over the life of a mine, in order to optimise cost effective and successful relinquishment. The research will focus tools and methodologies that will assist mining companies make improved management decisions that balance short term operational objectives with long term objectives around mine closure and rehabilitation.” (CRC TiME, n.d.-b)

A basic proposition that informs this program is that mine planning can be improved, first, by reframing mining as a (temporary) land use which generates a stream of benefits, costs, and impacts. A full understanding of those benefits, costs, and impacts requires going beyond conventional mine planning, to take a long-term, societal perspective. This proposition informs the first major output of the program (Output 2.1): the output aims to develop an evaluation framework which will identify and quantify the ‘actual’ or ‘unique’ value proposition of a mining project, informed by alternative framing of costs and benefits (by Year 3) (Figure 10).

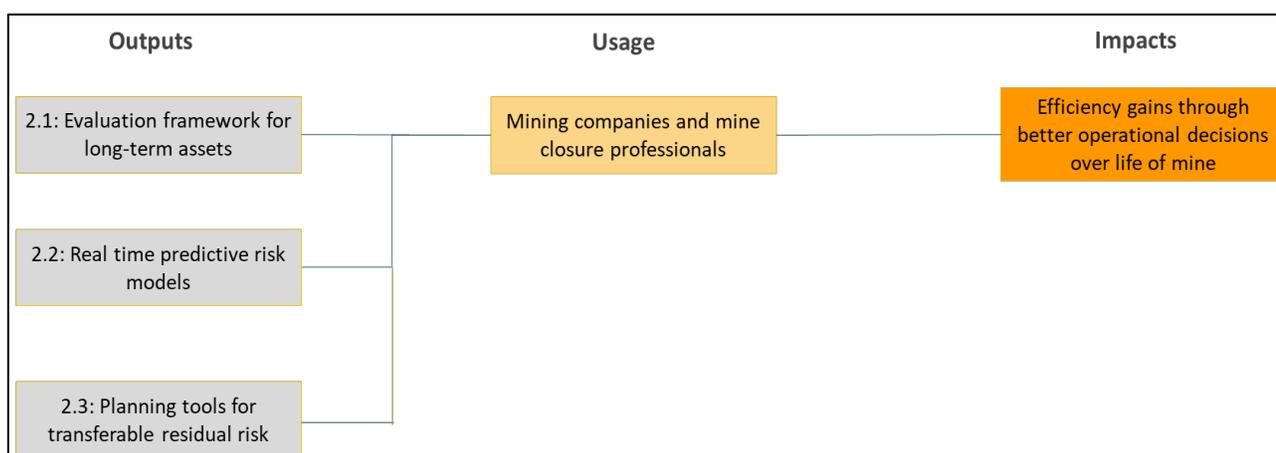


Figure 10 Outputs and impacts proposed for Program 2

Source: Synergies Economic Consulting (n.d.)

A second proposition is that mine closure planning can be improved through processes that consider a broader range of options (e.g. for waste design and for rehabilitation), some of which may be superior in terms of residual risk and liability at closure (CRC TiME, 2020). This proposition provides the basis for the program's second major output (Output 2.2), which will assess the risk reduction potential of different design options and rehabilitation activities (by Year 6). Components of this output thus include development of methods and tools which 'evaluate different mine closure options and the closure risk associated with different design options. The tools and methods developed will 'provid[e] greater transparency around the real risks and costs of closure', including the impact of different rehabilitation activities on residual risk for a site. These tools and methods include models to estimate the 'the total liability and residual risk for a site (both mitigatable and unmitigatable).' (CRC TiME, n.d.-b)

One important use of the above tools and method is to support stakeholders to analyze risk-reward trade-offs – that is, the relation between net benefits associated with alternative design options (or alternative post-mining land uses), and the risks associated with those alternatives. This will allow stakeholders to identify acceptable levels of risk and liability that would be transferred to land users upon relinquishment. The program's third major output (Output 2.3) is focussed on developing analytic and participatory techniques that deliver on the above planning objectives (by Year 5). This work package also includes identifying the optimal mix of 'progressive' activities to achieve relinquishment (by Year 9).

The capability development output for this program involves 10 PhD students gaining skills to become leaders in mining finance, as well as training modules for project planners, investment analysts, and regional planners – these financial and planning professionals are the intended adopters of Program 2's outputs.

Operational Solutions (Program 3)

This program is focussed on providing mining practitioners and the METS sector with the operational tools – that is, technologies which are effective and with commercial potential – for improving the quality of environmental outcomes from mine rehabilitation.

Domains for which viable tools are needed are water, ecosystem resilience, and acid mining drainage (AMD). Each domain is 'crowded and contested' (CRC TiME, 2020) – that is, has attracted significant attention while containing unresolved challenges. The CRC in its first year will seek to define how it can contribute to moving beyond 'business-as-usual' technology development for each domain.

The first major output of this program (Figure 11 below) consists of information systems to support decision making (e.g. a 'database of rock mass chemical potential for long term risks such as AMD, liquefaction, erosion'). The information systems to be developed include 'collaborative data governance protocols' in order to access mining company information systems.

The second output consists of development of commercially optimal technical solutions to specific high-risk issues encountered during mining operations. The third major output aims to improve the supply chains required by post-mining land uses, by addressing specific organisational or technological gaps or needs in such supply chains.

The primary users of this program's output are the METS (mining equipment, technology, and service) sector, mining companies, and environmental regulators.

The capability development output for this program involves 20 PhD students gaining skills to become leaders in mining operations, technology development, and supply chain development, as well as delivery of training modules for these topics.

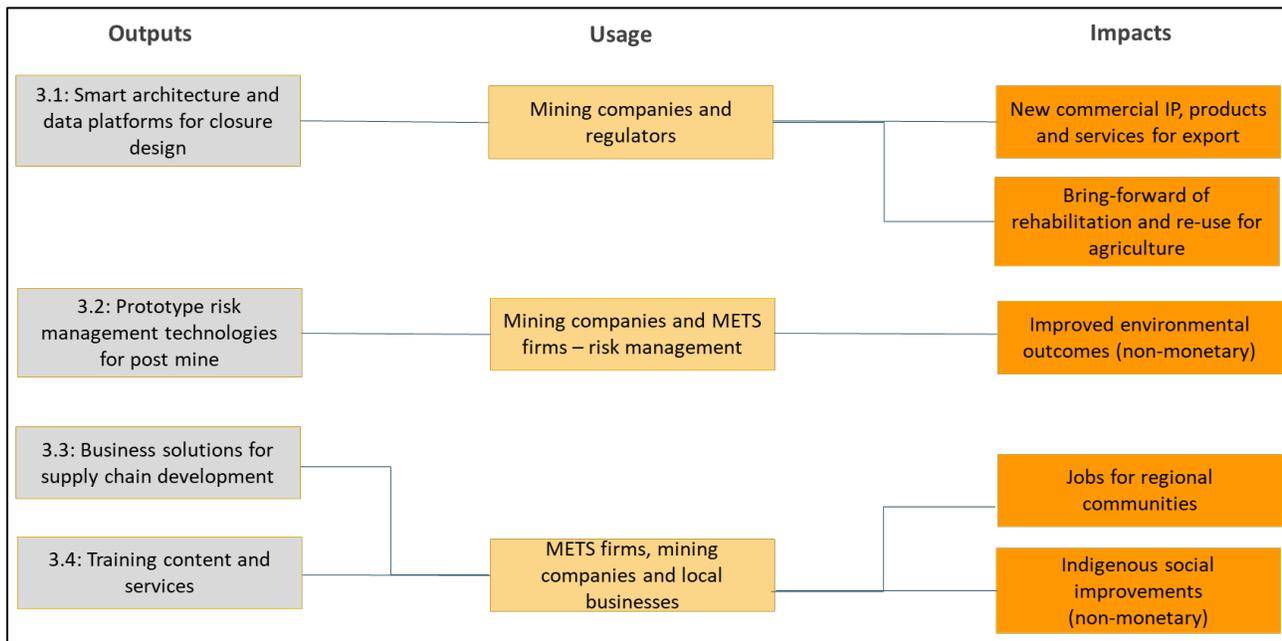


Figure 11 Outputs and impacts proposed for Program 3

Source: Synergies Economic Consulting (n.d.)

Data integration, forecasting, and scale (Program 4)

The CRC will invest in cross-cutting activities to develop information and knowledge management systems which support the three thematic programs. A key aim of this thematic integration program is to make various information sets – ranging from mine closure R & D repositories, to databases of abandoned mines – accessible to the CRC’s stakeholder community. The program will also establish protocols for use of physical infrastructure for shared trials.

Annex B: Participant perspectives on MEL framework

The Project’s final workshop (June 2021) invited members of CRC TiME’s executive, staff, and board to reflect on the scope, relevance, and practicality of the MEL framework introduced in Section 7. Table 16 summarizes participant perspectives, and implications for CRC TiME’s practice of MEL, based on those perspectives.

Table 16 Perspectives on proposed MEL framework

ISSUE	PERSPECTIVES	IMPLICATIONS
System context	CRC is seeking to contribute to changes in a complex system context where other forces operate independently, such as urbanization, reform of Native Title, and reforms to regional planning (e.g. in Perth-Peel region) (P26)	<p>Programs and projects need to demonstrate adequate understanding of system context (see Section 2.1) during design phase</p> <p>CRC TiME should periodically evaluate system context (e.g. Table 15) to understand its contribution to change</p>
Relevance (salience)	<p>Outcomes at the target goal unit of analysis are more important than outcomes at CRC unit of analysis (P05)</p> <p>CRC needs a system for accountability. Slow- and fast-moving metrics that provide meaning to the CRC are important. An evaluation question about how CRC TiME is perceived by external stakeholders is important (P12)</p>	<p>Salience of indicators will vary as a function of participant’s position in CRC as a network</p> <p>CRC TiME’s system should guide & support MEL of the most salient indicators by participant & over time</p> <p>CRC TiME participants should nominate metrics for the following indicators of productivity performance at the <u>participant organisation</u> level: <i>efficiency</i> (of actions) and <i>effectiveness</i> (of outcomes) (Table 10)</p> <p>Indicators & metrics at <u>target goal</u> level can be co-designed with CRC participants (e.g. at the level of stakeholder colleges, regional hubs & project areas¹) (Table 9)</p>
Complexity, coherence, prioritization	<p>Acknowledge the need for sophisticated indicators; however simplicity is also important</p> <p>‘Know what you’re going for and set metrics’ (e.g. a project that seeks to work with indigenous organisations to co-design development outcomes upfront requires more detailed metrics) (P09)</p> <p>Metrics should be prioritized (P04; P09; P12)</p> <p>Stages of organisational development (life cycle of program) matter (analogy to product design v. delivery) (P09)</p> <p>The CRC is elaborating its program structure: which unit of analysis should be evaluated? (P12, P20)</p>	<p>Sections 7.2 proposes a prioritization by developmental stage of CRC TiME & workflow for existing organisational units</p>

ISSUE	PERSPECTIVES	IMPLICATIONS
<p>Innovation & transformative change</p>	<p>It is immensely valuable for CRC to observe and learn from innovations outside its own program space (P20)</p> <p>Lack of trust and cross-cultural hybridity inhibit transformative change (P26)</p>	<p>Organisational innovations of relevance include mission-directed models (Mazzucato, 2018)</p> <p>Potential sources of domain innovations include: METS technology & demonstration sites developed independently of TiME; NESP (for regional planning); data sharing innovations.</p> <p>Use knowledge of innovations to guide design of impact pathways</p> <p>Describe benefits of innovations developed by CRC TiME in terms of: <i>capacity for joint action</i>, <i>efficiency</i> (of actions) & <i>effectiveness</i> (of outcomes) (Table 10, Table 13)</p>
<p>Resources</p>	<p>Understanding is required of the scale of resources (financial, people) available to run an MEL framework (P20)</p>	<p>CRC TiME executive should provide guidance on resource requirements for responsible parties (e.g. project leaders, program leaders, CRC TiME staff, and participant organisations)</p>