



NAVIGATING COLLABORATIVE FUTURES

User guide for the report of the Expert Panel on
International Science, Technology, Innovation, and
Knowledge Partnerships

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ABOUT THE CCA

Canada faces complex challenges as it adapts to wide-ranging social, economic, technological, and environmental changes. The CCA convenes independent panels of leading experts to analyze and interpret the best available knowledge on issues of importance to Canadians, providing a trusted source of reliable information widely used by decision-makers across governments, industry, academia, and civil society.

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@cca_reports
info@cca-reports.ca
www.cca-reports.ca

Recognizing the opportunities and challenges created by the expanding global science, technology, innovation and knowledge (STIK) system, Global Affairs Canada and 10 supporting federal departments and agencies asked the CCA to convene an expert panel to provide an evidence-based and authoritative assessment on the following question:



In a post-COVID world, how can Canadian public, private, and academic organizations evaluate and prioritize science, technology, and innovation (STI) partnership opportunities with foreign countries to achieve key national objectives, using indicators supported by objective data where possible?

Navigating Collaborative Futures presents key elements of an evidence-based, data-enabled framework to evaluate new and existing international STIK partnership opportunities for Canada.

This user guide presents key findings and tools from the full report and provides quick-reference information to decision-makers navigating international partnership decisions.



[DOWNLOAD THE FULL REPORT](#)

The Expert Panel on International Science, Technology, Innovation, and Knowledge Partnerships

Monica Gattinger (Chair)
(Ottawa, ON)

Stewart Beck (Vancouver, BC)

Paul A. Berkman (Falmouth, MA)

Karen Croteau (Ottawa, ON)

Paul Dufour (Gatineau, QC)

Meredith Lilly (Ottawa, ON)

David Perry (Ottawa, ON)

Caroline S. Wagner (Columbus, OH)

Jennifer Welsh (Montréal, QC)

Opportunities for international partnerships are expanding alongside the rapid pace and increasing complexity of new scientific discoveries and emerging innovations. More nations than ever are participating in the global enterprise of science, technology, innovation, and knowledge production (STIK). Severe realities such as the COVID-19 pandemic, supply chain issues, geopolitical tensions, and climate change further highlight the urgency of international STIK cooperation and collaboration. At the same time, concerns of security and other national interests impact the movement toward open science and transdisciplinary approaches.

Global challenges demand global responses. International STIK partnerships offer opportunities for accelerating collective solutions, while at the same time meeting national priorities. They also create a mechanism for consensus building within a complex and changing geopolitical context. Strategic and deliberate partnerships, coordinated at a national scale through a decision-making framework that supports national priorities, can help Canada seize opportunities, manage accompanying risks, and build successful responses to today's global challenges. By engaging in international STIK partnerships, Canada can be a world leader in open and inclusive approaches to collaboration that unlock prosperity, resilience, and a wide range of other benefits for the country. But the need for a strategic approach is acute.

Elements of a Framework for Evaluating International STIK Partnerships

In *Navigating Collaborative Futures*, science (S) and technology (T) are inclusive of all activities concerned with the generation, advancement, dissemination, and application of knowledge in all science and technology fields. Innovations (I) are new or improved products and processes that are implemented within a system and create value. In recognition of knowledge systems that exist outside the standard STI frame – notably Indigenous knowledge – knowledge production (K) has been added to include both the practices of knowledge production and the body of knowledge beyond STI. STIK partnerships are formalized relationships among individual researchers, institutions, and governments with a focus on STIK activities and outcomes. International STIK partnerships are defined as relationships that establish or support cooperative STIK activities at a national or organizational level.

While the users of the framework elements are expected to be primarily from the federal government and associated entities, the panel anticipates that any public, private, or academic organization considering or participating in international STIK partnerships may find value in working through them.

Thus, framework elements are presented in a way that offers sufficient flexibility to serve partnership agreements at all levels of STIK development – from a bottom-up, researcher-driven partnership to a top-down, mission-driven partnership – and to be inclusive of both government-supported and independent operators.

Navigating Collaborative Futures describes three key steps of the partnership evaluation process: (i) articulating goals; (ii) identifying, evaluating, and weighting appropriate indicators; and (iii) making a decision whether to pursue or continue an international partnership. The first two steps are supported by the framework elements *National Priorities*, *Leveraging Value*, and *Benefits to Canada*. It is in the area of overlap among all three elements that the third step, decision-making, occurs. The successful implementation of framework elements will depend on the level of available supports, including those related to strategic foresight; data sources and analyses; governance; and the evaluation and adaptability of the framework itself to changing contexts and usages. These elements are foundational to framework success (Figure 1).

For international STIK partnership opportunities, evaluations are centred on meeting national priorities – though these will differ across contexts. Thus, an initial articulation of partnership goals is necessary to identify desired outcomes and their associated indicators and metrics. Partnership opportunities are also evaluated in the context of the existing and projected STIK landscapes, both domestic and international.

Foundational to the success of a framework are considerations of flexibility and responsiveness, as well as the risks of both action and inaction in seizing partnership opportunities. These elements can be combined to create a decision-making framework adaptable to different contexts and situations.

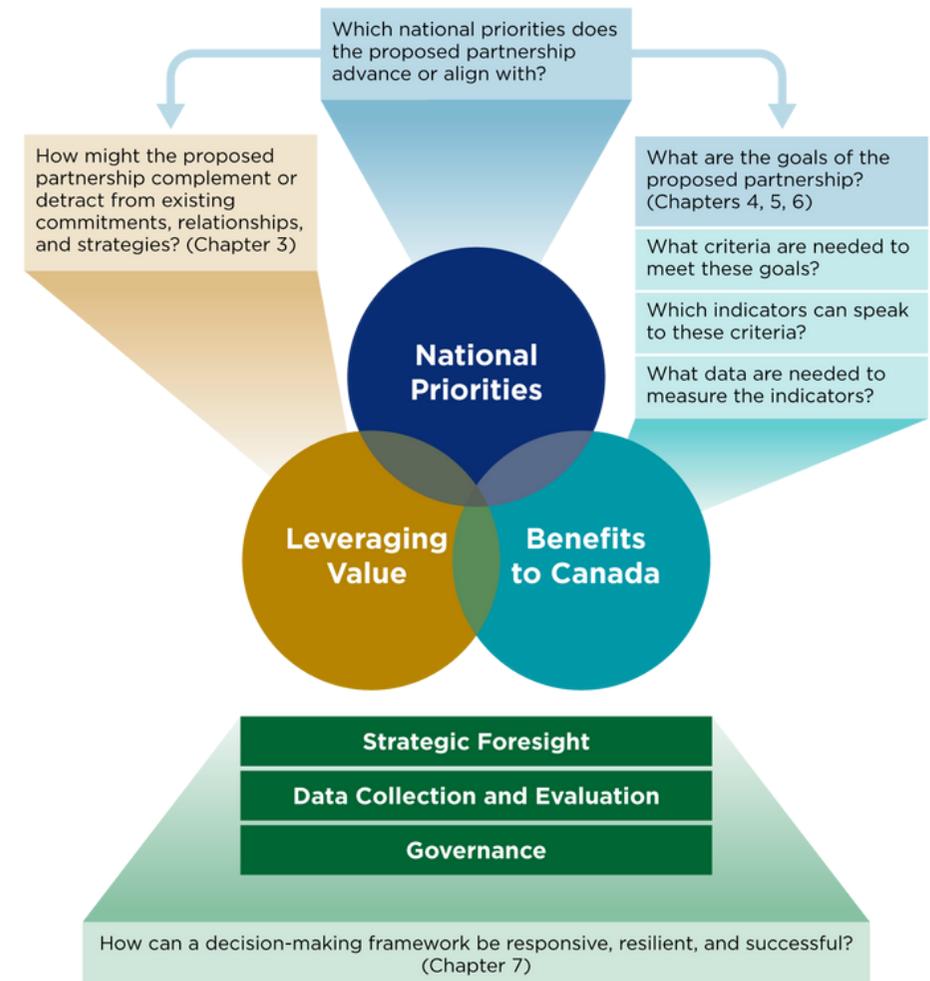


Figure 1: Elements of a framework for prioritizing international STIK partnership opportunities

Chapter references in parentheses indicate where additional information can be found in the full *Navigating Collaborative Futures* report.

National Priorities

Identifying the National Priorities that potential partnerships are meant to advance will help users articulate goals and desired outcomes (Figure 2). The goals and outcomes are used to identify indicators and data relevant to the other two main framework elements: Leveraging Value and Benefits to Canada.

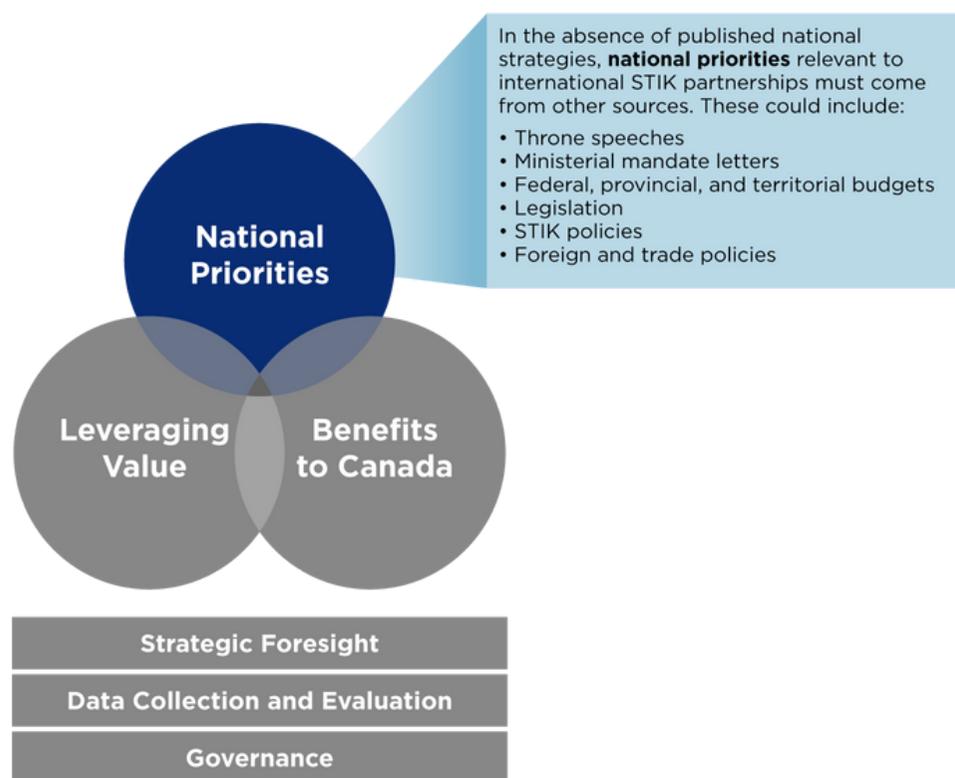


Figure 2: Identifying National Priorities to Articulate the Goals of a Partnership

Identifying national priorities helps users of a framework articulate international STIK partnership goals. Goals that reflect multiple interests, such as those that include specific provincial and territorial, global, or departmental or programmatic priorities, offer wider potential benefits than those that reflect only national-level considerations.

National priorities may be sourced from throne speeches, ministerial mandate letters, budgets, legislation, STIK policies, and foreign and trade policies. Areas where priorities overlap among ministries may be particularly relevant for international partnerships, as they can reflect a broader level of potential engagement across departments and agencies.

Subnational priorities may further articulate key criteria or provide a more detailed rationale for engaging in (or not) or continuing (or not) an international partnership. Provincial and territorial STIK policies, strategies, and funding announcements can speak to whether partnership opportunities align with subnational government priorities. Similarly, depending on the context, the particulars of departmental or programmatic priorities in other orders of government can provide further criteria for the evaluation or prioritization of international STIK partnership opportunities.

Leveraging Value

Maximizing outcomes from international STIK partnerships demands organization, strategy, and coordination among players in the STIK ecosystem – both domestic and international. Articulating goals makes clear which objectives a potential partnership will address; another important step in evaluating any proposed or ongoing relationship is to assess activities in relation to the ecosystem of domestic and international activities and agreements (Figure 3).

Benefits to Canada

To be successful, any international STIK partnership Canada enters into must create some benefit for the country. Broadly, a STIK partnership provides benefits by advancing Canadian interests and building capacity in Canada. This capacity may include introducing new ideas, insights, innovations, or unique knowledge. Benefits to Canada can also improve national resilience – for example, by addressing urgent issues of national security in the short term, or by contributing to sustainability over the long term. Users of any framework need to identify the benefits to Canada relevant to the goal(s) of the partnership under consideration, then choose the indicators or metrics that best predict, or directly measure, those benefits. If the partnership opportunities include those already established – that is, if the decision is on whether to continue a partnership rather than choosing among new opportunities – users may opt to directly measure past benefits. If the partnership seeks to build a new relationship, the indicators chosen will be those best suited to predict outcomes (Figure 4).

Indicators are tools that collect and synthesize quantitative and qualitative measures (metrics) of interest to facilitate meaningful evaluations and comparisons at different scales (e.g., among countries, disciplines, institutions). Selecting and evaluating indicators and metrics are complex tasks that require a substantial investment of time and human resources early in the decision-making process.

The **value** of a partnership is **leveraged** in the context of existing relationships and commitments. How does this opportunity fit into Canada's current STIK system, both internationally and domestically? Consider:

- Existing relationships and networks
- STIK funding
- Current STIK commitments
- Canadian STIK assets and strengths
- Strategies and agreements



Figure 3: Assessing and Leveraging the Value of Proposed Partnerships

Successful international STIK partnerships will not only create new relationships, but also help support existing relationships and activities in relevant areas both domestically and internationally. An assessment of the strategic value provides an opportunity to examine complementarity as well as uniqueness, both of which may inform further negotiations of partnership agreements.

However, this work transforms the framework elements into a useful tool for decision-making. Details about different types of indicators, their uses and limits, as well as potential applications to different scenarios, are examined in depth in the full

Navigating Collaborative Futures report in three main categories: those related to innovation, to science capacity building and knowledge production, and to national resilience.

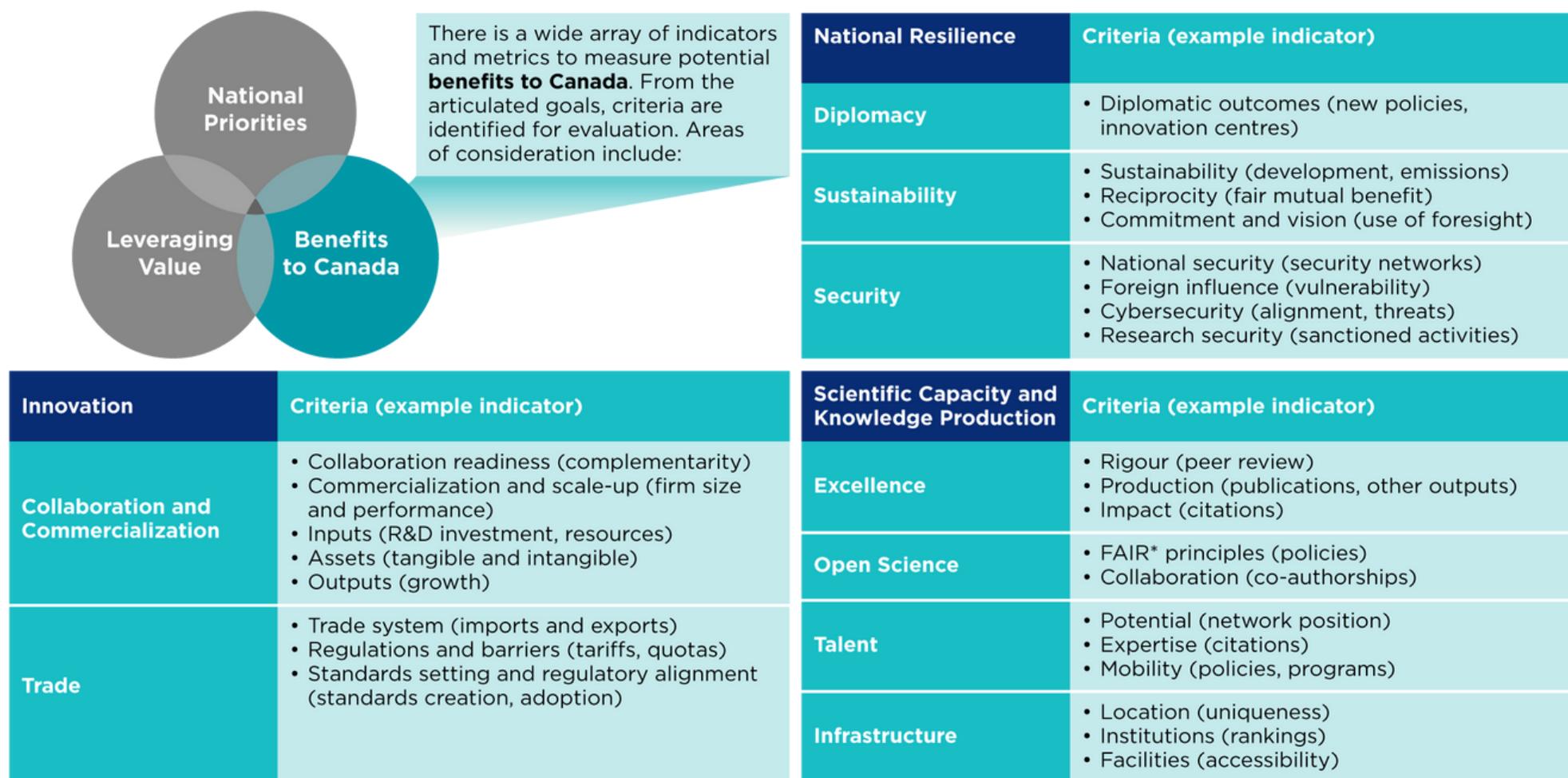


Figure 4: Increasing Innovation, Scientific Capacity and Knowledge Production, and National Resilience as Benefits to Canada

International STIK partnerships must bring some benefits to Canada to justify their pursuit. The identification of these benefits helps establish evaluation criteria. Useful indicators reflect the qualities a partner brings to the table that will result in those benefits to Canada, as evidenced by the potential partner's existing activities, outputs, and relationships.

*FAIR (findable, accessible, interoperable, reusable) principles of open data

Success Factors

While National Priorities, Leveraging Value, and Benefits to Canada are necessary for the decision-making process, they are incomplete. Additional considerations — strategic foresight, data collection and evaluation practices, and governance factors — are foundational to the responsiveness, longevity, and success of a framework (Figure 5).

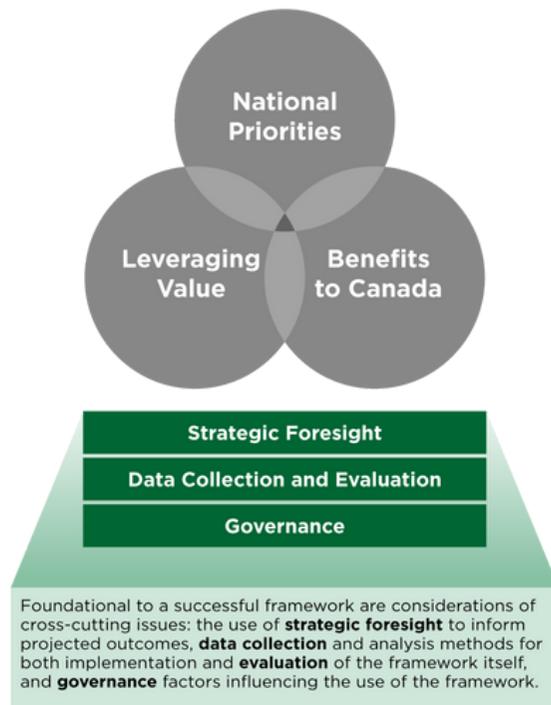


Figure 5: Foundational Elements for Success: Strategic Foresight, Governance, and Data Collection and Evaluation Practices

The main elements of a decision-making process — setting goals to address National Priorities, Leveraging Value, and measuring anticipated Benefits to Canada — are incomplete without an infrastructure to implement the process. A governance structure with coordination, resourcing, and accountability helps ensure effectiveness, longevity, and transparency; accessible, up-to-date data repositories and data sources help ensure responsiveness; ongoing evaluation of framework implementation provides a basis for adaptation; and the use of strategic foresight helps ensure decisions speak to the short and long terms.

While there is little evidence to suggest that any one approach to implementing a decision-making framework will best suit the Canadian context, the panel notes there are key success factors that can support the implementation of any such framework.

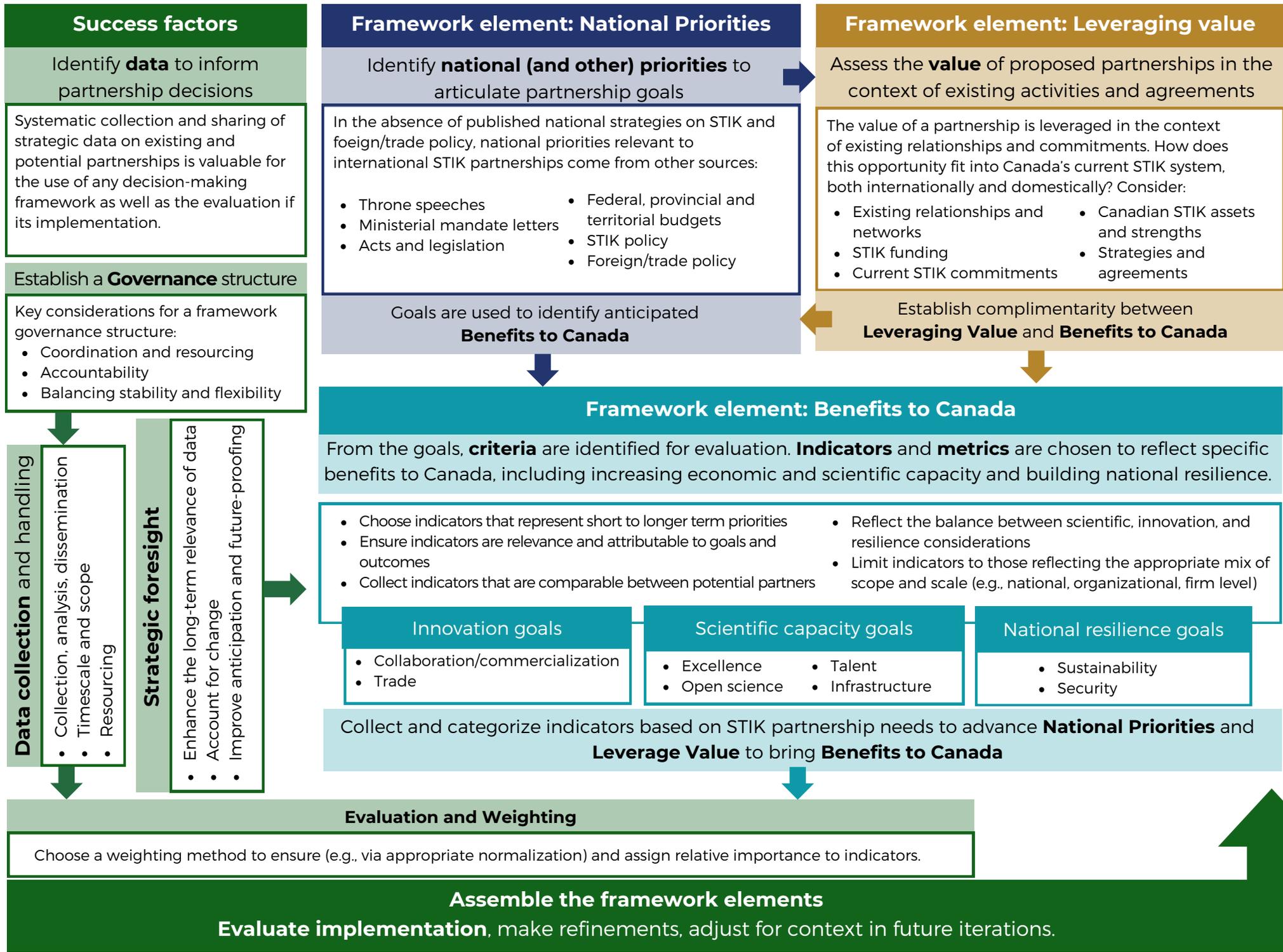
Putting It All Together

Once the framework elements have been chosen, the next step is assembling and ordering those elements in a logical format to inform the evaluation of potential STIK partnerships. For example, a user may apply the framework elements to choose among a set of potential opportunities. As a first step, users would identify the National Priorities relevant to that group of partners and their own interests in order to articulate goals and desired outcomes of the potential partnership.

Next, they would specify the expected Benefits to Canada that would flow from meeting those goals and outcomes and select or create appropriate indicators and metrics. In parallel, they would examine existing domestic and international landscapes to ensure that any potential partnership is Leveraging Value from what currently exists. They would then weight and evaluate the collected information and rank the partnership opportunity against other opportunities to make a decision. Implementation considerations are foundational to a decision-making framework.



ASSEMBLING FRAMEWORK ELEMENTS

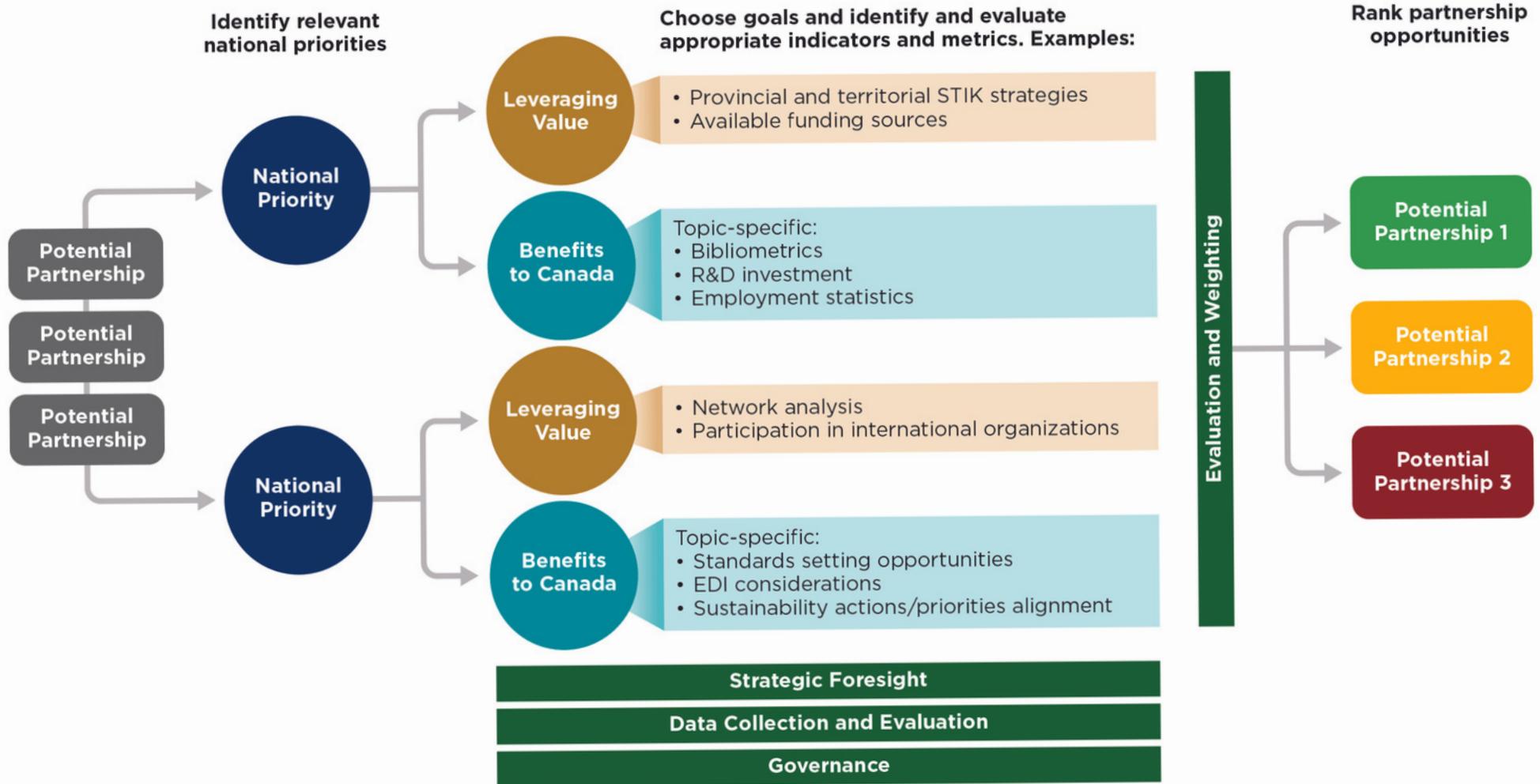


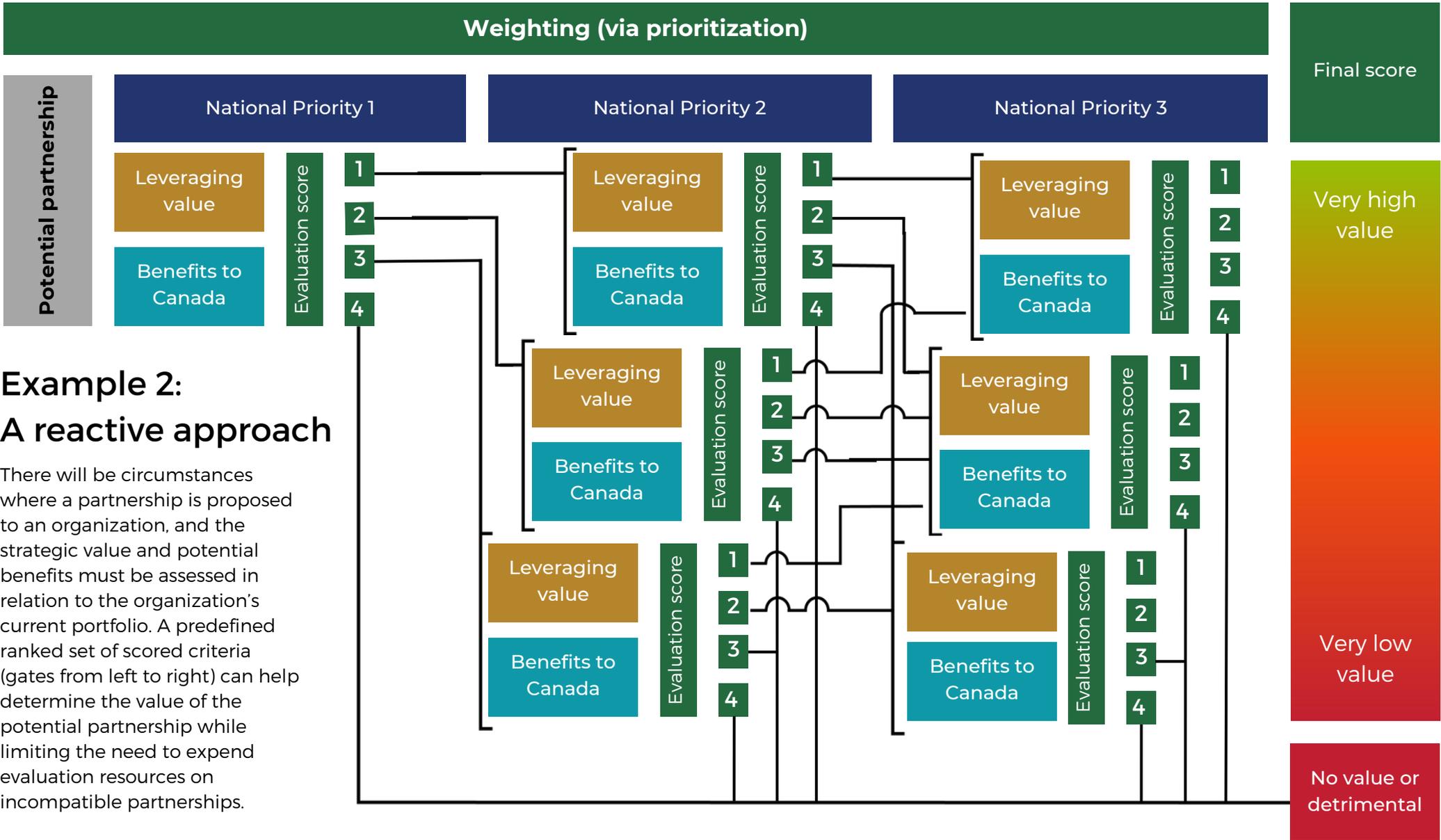


EXAMPLES OF FRAMEWORKS

Example 1: A proactive approach

A proactive framework is designed to compare multiple potential partners to create a prioritized list. One or more partners could be chosen based on their identified strengths from this list. The framework outputs can also inform the partnership, shaping expected outcomes, timelines, and contributions for both sides.





Example 2: A reactive approach

There will be circumstances where a partnership is proposed to an organization, and the strategic value and potential benefits must be assessed in relation to the organization's current portfolio. A predefined ranked set of scored criteria (gates from left to right) can help determine the value of the potential partnership while limiting the need to expend evaluation resources on incompatible partnerships.



INDICATORS AND METRICS

Innovation

	Criteria	Indicators	Examples of Metrics
Collaboration and Commercialization	Collaboration readiness	Previous collaboration practices, shared direction, complementarity	<ul style="list-style-type: none"> • Willingness to share assets vs. exploitative negotiating practices • Trust and transparency indices • Technological capacity complementarity • ROI for innovation investments • Development-stage-appropriate • Manufacturing efficiency and lead time • R&D spending/intensity (e.g., GERD, BERD, and as a % of GDP) • R&D personnel ratio • Innovation relevant assets • Level of training and education • Production of prototypes • New innovation products
	Commercialization and scale-up capacity	Firm size, performance, innovation strategy, development stage	
	Inputs	R&D investment, resources committed	
	Assets	Tangible and intangible assets	
	Outputs	Financial industry and market growth, enabling factors, market realities	
Trade	Trade system	Imports and exports; trade agreements	<ul style="list-style-type: none"> • Imports and exports as a % of GDP • Services trade measured as labour mobility • Time to import goods • Trade facilitation performance • Import/export control lists • Membership in regulatory organizations • More favourable agreements and regulations
	Regulations and barriers	Tariffs, quotas, and permitting	
	Standards setting and regulatory alignment	Standards creation and adoption	

Scientific Capacity & Knowledge Production

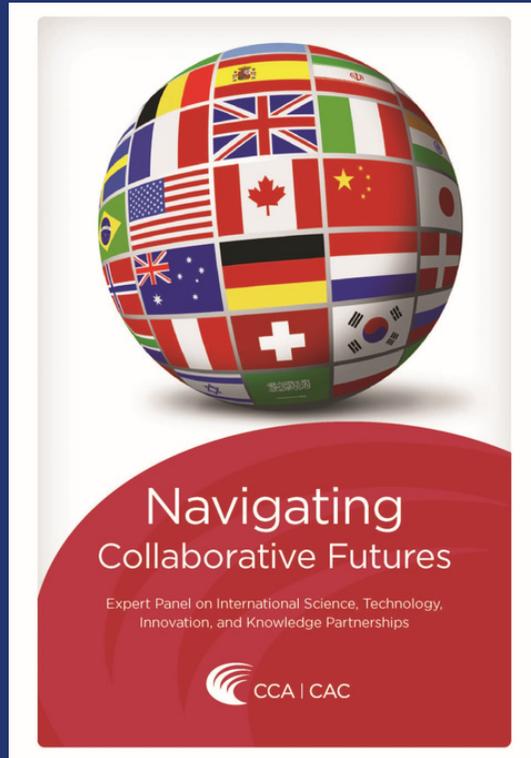
	Criteria	Indicators	Examples of Metrics
Excellence	Rigour	<ul style="list-style-type: none"> Scholarly output Citations Grey literature 	<ul style="list-style-type: none"> Number of indexed publications Number of citations (weighted by field) Peer review rankings and evaluations Number of books, chapters, technical reports, white papers Altmetrics Visual innovations, oral histories, ethnodramas, dialogues Geographically and culturally specific assessments of local and Indigenous knowledge
	Productivity	<ul style="list-style-type: none"> Peer review 	
	Impact	<ul style="list-style-type: none"> Social impacts Non-scholarly output 	
Open Science	FAIR Principles	<ul style="list-style-type: none"> Open access publication Data-sharing practices Code-sharing practices 	<ul style="list-style-type: none"> Number of findable, accessible papers Indexed data sets Findable, accessible code Open access policies, regulations, licensing information
	Collaboration	<ul style="list-style-type: none"> Co-publication Participation in international treaties and conventions Participation in international research organizations, conferences 	<ul style="list-style-type: none"> Number of co-authored indexed publications, citation metrics Number of co-authored books, chapters, non-scholarly outputs, and grey literature Attendance, hosting of international conferences Signatories on international treaties, conventions Peer review, community of practice assessments of collaboration
Talent	Network Potential	<ul style="list-style-type: none"> Network position Influence 	<ul style="list-style-type: none"> Social network or semantic analysis of publications Leadership at international organizations
	Expertise	<ul style="list-style-type: none"> Labour force Education and training opportunities Publication patterns 	<ul style="list-style-type: none"> Number of STEM, humanities, and social sciences graduates Higher education participation, completion, and graduation rates Number of new doctorates Total R&D personnel
Infrastructure	Mobility	<ul style="list-style-type: none"> International migration Bibliometrics Mobility supports 	<ul style="list-style-type: none"> Immigration and emigration data Co-publications Diplomatic apparatuses (funding, personnel, embassies)
	Locations, Institutions, Facilities	<ul style="list-style-type: none"> Uniqueness Complementarity Institutional rankings Bibliometrics 	<ul style="list-style-type: none"> Numbers and types of STIK facilities Research needs and accessibility of specific locations, facilities Peer review, community of practice assessments of institutions, facilities Publication rates, citation metrics applied at institutional levels

National Resilience

	Criteria	Indicators	Examples of metrics
Diplomacy	Diplomatic and policy outcomes	<ul style="list-style-type: none"> • Influence on international governance • Use of science in diplomacy 	<ul style="list-style-type: none"> • Meaningful new policies • Establishing science and innovation centres • Membership in international scientific working groups • Sustainability
Sustainability	Sustainability	<ul style="list-style-type: none"> • Sustainable development and progress • Sustainable competitiveness 	<ul style="list-style-type: none"> • Life expectancy • Emissions • Standard of living • Economic and social indicators • Matched contributions • Citation symmetry • Using foresight or backcasting • History of effective long-term planning
	Reciprocity	<ul style="list-style-type: none"> • Non-coercive negotiations • Fair and mutual benefit 	
	Longer-term commitment and vision	<ul style="list-style-type: none"> • Planning for the future • Track record of longer-term vision 	
Security	National security	<ul style="list-style-type: none"> • Membership in security networks • Military capacity • Social cohesion and government stability 	<ul style="list-style-type: none"> • Favourable military alliances • Military expenditures • Food and energy security • Economic, political, and security interactions • Dependence on a foreign power • Number of cybersecurity attacks • Technical capacity • Espionage convictions
	Foreign influence	<ul style="list-style-type: none"> • Foreign bilateral influence capacity (FBIC) • Vulnerability to foreign influence 	
	Cybersecurity	<ul style="list-style-type: none"> • Cybersecurity hostility • Cybersecurity alignment 	
	Research security	<ul style="list-style-type: none"> • Security agreements and relationships • Sanctioned and penalized activity 	

Message from the Expert Panel

In a changing geopolitical context, with dramatic technological and scientific advancements, Canada needs a more proactive and strategic approach to its international STIK partnerships. However, there is no one-size-fits-all framework to international STIK partnership decision-making. Success will depend on experimentation, evaluation, and flexibility in the use of framework elements to design and implement approaches best suited to the context today, and for future generations.



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