University of Strathclyde Business School

DEPARTMENT OF MANAGEMENT SCIENCE

Developing a Performance Management System for Measuring the Impact of NSAR Changes in SAR Operations

Approach to Evaluating and Enhancing Nunavut Search and Rescue (NSAR) Project Impact - **Client Report**

M.Sc. Dissertation

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Executive Summary

The **Nunavut Search and Rescue (NSAR)** system is vital in safeguarding lives in challenging environments. Recent operational changes, including the systematic integration of local Inuit knowledge and knowledge sharing practices, enhanced interagency collaboration, increased community engagement and adaptation to environmental risks due to changing ice conditions, require systematic evaluation to determine their effectiveness. Currently NSAR lacks a comprehensive framework to assess these interventions and align efforts with strategic goals and ultimate impact.

This report presents a structured approach to developing a Performance Management System (PMS) for NSAR to measure the effectiveness of NSAR changes and evaluate SAR operations across multiple dimensions. The methodology combines several key frameworks:

- **Logic Models:** Used to map how resources and activities lead to desired outcomes and impacts. This helps identify key areas for measurement and improvement.
- **Metric Causal Maps (MCMs):** Developed as a core deliverable to visualize causal relationships and dependencies among metrics. These metrics were categorized as Core, Inferred, Composite, and Impact Metrics, forming a causal hierarchy to holistically evaluate the system. MCMs are especially useful for non-technical stakeholders, making it easier to understand complex cause-and-effect relationships across operational pathways.
- **Metric Classification:** Metrics are organized as Core, Inferred, Composite, and Impact Metrics, creating a clear hierarchy for evaluating both immediate actions and long-term effects.
- **Pathway-Specific Analysis:** The PMS examines different operational pathways—such as incident response, community engagement, resource readiness, and training—to ensure a holistic evaluation of SAR performance.
- **Bayesian Networks (BNs) [Future Step]:** While MCMs provide qualitative visualization of relationships, BNs add a quantitative layer, offering data-driven insights into complex interdependencies. While not implemented in this report, BNs are recommended as a next step to add quantitative analysis and scenario simulation to the PMS.

By integrating these approaches, the PMS enables NSAR to track performance, understand what drives success, and make informed, data-driven decisions. The PMS enables NSAR to make data-driven decisions, link interventions to tangible improvements, and align activities with long-term goals. It offers a holistic evaluation framework by integrating Logic Models, MCMs, and potentially BNs, balancing immediate operational needs with strategic impacts.

Contents

Introduction

This document outlines the development of a **Performance Management System (PMS)** designed to evaluate the effectiveness of NSAR's interventions and align operations with strategic goals and outcomes. The PMS has in considerations the below key strategic goals for NSAR.

- Strengthening SAR systems through interagency collaboration and shared resources,
- Integrating Inuit traditional knowledge into SAR practices.
- Supporting volunteer well-being and retention.
- Promoting community safety and resilience via preventative programs.
- Building adaptive systems to address Arctic environmental challenges.
- Structured Collaborative approach to SAR respecting principles of IQ in the co-creation of knowledge.

The PMS aims to bring impact in:

- Supporting and enhancing data-driven decision-making and operational improvements using NSAR system models.
- Effective Integration of Inuit Knowledge and Community Values
- Improving SAR Readiness, Response times and mission success rates
- Enhancing Community trust and engagement
- Strengthening Inter-Agency Coordination and Communication
- Increased Capacity and Skill Levels of SAR Responders
- Sustainable Resource and Equipment Management
- Support Workload Management, Volunteer Well-Being and Retention

Section 1: Theoretical Framework and Methodology

The NSAR Performance Management System is built on Logic Models and Metric Causal Maps (MCMs) to systematically map and visualize key performance drivers. This approach ensures clarity, consistency, and alignment with NSAR's strategic goals, with Bayesian Networks planned for future quantitative analysis.

Logic Models (LMs): Structuring Relationships and Pathways

In the NSAR framework, Logic Models provide a foundational structure to analyse and map the relationships between various components of SAR operations. They illustrate how **inputs** like funding, personnel, and equipment translate into **activities**, such as training programs or community outreach, which then generate **outputs** like trained responders or engaged communities. These outputs lead to measurable **outcomes** like improved readiness and **impacts** such as lives saved or enhanced community resilience. This mapping enables NSAR to systematically understand how interventions—such as resource allocation or responder training—drive operational results.

In NSAR, Logic Models are built around key **pathways,** as below**,** that represent critical areas of SAR performance, contributes distinct objectives, interventions, and outcomes while addressing unique challenges while contributing to broader SAR goals. Each pathway integrates into NSAR's Performance Management System (PMS), ensuring interventions are tracked from input to impact. Feedback loops within these pathways allow NSAR to adjust strategies in real-time, while leverage points—like digital tools or enhanced training—help maximize impact. This approach ensures a comprehensive, adaptable framework to address NSAR's unique operational challenges.

Categorizing Metrics for Logic Model: Input, Output, Outcome, Impact

The Logic Model categorizes metrics into pathway steps—Input, Output, Outcome, and Impact—ensuring clarity and consistency in performance evaluation. Additionally, by linking MCM classifications to Logic Model components (e.g., Inputs → Constraints, Activities → Decisions, External Factors → Uncertainties), the system enhances the ability to link operational actions to strategic outcomes in a clear, measurable, and actionable way, ensuring that every aspect of performance—whether immediate or long-term—is systematically analyzed and effectively managed. This structured approach enables clear connections between actions and outcomes, driving evidence-based decision-making and continuous improvement.

Metrics Causal Maps (MCMs) and Causal Hierarchy

Metric Causal Maps (MCMs) are a structured hierarchy of metrics and their causal relationships within the NSAR's PMS, allowing for a deeper understanding of how the variables influence one another across pathways leading to broader outcome and impact metrics. Logic models and NSAR Causal Maps have been used to build the MCMs. MCMs incorporate diverse metrics including both objective and subjective metrics allowing for both quantitative and qualitative performance analysis.

Every input, activity, output, and outcome of every Logic Model Pathway is systematically converted to measurable metrics to derive the MCMs, allowing to visualise cross-pathway dependencies. For example, funding and personnel metrics (inputs) in the Resource Management Pathway may directly affect community trust (outcome) in the Community Engagement Pathway.

To visualise how interventions influence outcomes, Outcome and Impact have been used to derive the composite measures and impact metrics which collectively build the metric node hierarchy. For example, MCM maps causal relationships between inputs (e.g., funding, personnel), activities (e.g., training programs, resource mobilization), and resulting outputs, outcomes, and impacts (e.g., response times, community trust, lives saved).

MCM Models As foundation to Bayesian Network Model

In the context of NSAR PMS, MCMs serve as foundational models to Bayesian Networks. While MCM only provides the visualisation of the hierarchy of the metric nodes, its quantification can be achieved by using the BN models.

MCM Nodes and Influencing Factors

In Metric Causal Maps (MCMs), nodes represent the critical metrics or variables that form the foundation for evaluating relationships and performance within SAR operations. These nodes are connected by directional relationships, showing how one metric influences another within each pathway.

Influencing factors are the variables that directly or indirectly affect these nodes. These include external elements such as environmental conditions or funding levels, as well as internal operational factors like responder readiness or equipment availability. These factors are identified using NSAR Causal Maps, Logic Models (inputs, activities, outputs, and conditions), expert knowledge from SAR operations, and data-driven insights from historical records and incident patterns.

MCM Metric Categorization: Core, Inferred and Impact Metrics

MCMs categorize metrics into **core**, **inferred**, **composite**, and **impact metrics**, providing a structured framework for tracking and evaluating performance across operational and strategic goals. They also incorporate **uncertainties**, **decisions**, and **constraints**, which are critical for understanding operational dynamics and planning effective interventions.

Core Metrics

Core metrics are the foundational measures directly tied to the activities and decisions within SAR operations. They are derived from primary data sources or operational processes and provide baseline indicators of performance. It is developed from identified key activities, interventions and outputs

from the LM. For example: **Response Time**: Captures how quickly SAR teams can mobilize and respond to incidents. This is directly measurable from incident logs. These metrics are chosen because they are directly measurable, reflect critical operational processes, and influence higher-level outcomes.

Inferred Metrics

Inferred metrics are derived through causal relationships between core metrics and other operational variables and is informed primarily from the MCM model. They provide deeper insights into system performance by analyzing interdependencies creating connections between operational factors and broader outcomes. For example: **Average Resource Mobilization Time**: Inferred from equipment readiness and personnel availability. If equipment readiness is low, mobilization time increases. They are used in historical data and trend analysis identify patterns linking core metrics to inferred outcomes.

Composite Metrics

Composite metrics combine multiple individual metrics into a single, aggregated indicator to provide a broader evaluation of performance. They are particularly useful for summarizing complex systems and enabling comparisons across operations or time periods. These measures are primarily focused on operational or intermediate outcomes, simplifying analysis and enabling a clearer assessment of specific system components. For example: **Overall Resource Allocation Efficiency** may combine metrics like equipment readiness, personnel availability, and mobilization time.

Impact Metrics

Impact metrics go beyond immediate operational performance to assess the broader, long-term outcomes and impacts of SAR activities and interventions, reflecting their success at achieving strategic goals. They may aggregate multiple core and inferred metrics to evaluate systemic performance. Unlike composite measures, impact metrics focus on societal or organizational impacts, providing a holistic view of how the system contributes to its ultimate objectives. Impact metrics are tied to the outcomes and impacts defined in the Logic Model. For example: **Lives Saved**: Directly measures the success of SAR operations in protecting human life. **Community Trust Index**: Based on surveys assessing public confidence in SAR services, combining subjective perceptions with operational data. These metrics capture the ultimate objectives of SAR operations, such as saving lives and building public trust, and they provide a holistic view of the system's effectiveness.

Categorizing Metrics: uncertainties, decisions, outcomes, and constraints

MCMs can be further classified as uncertainties, decisions, outcomes, or constraints, which are critical for furthering the probabilistic structure and reasoning using BN models. This alignment ensures that each variable type in the classification fits into the broader framework of a Logic Model, facilitating clear mapping and analysis – Inputs as constraints, Activities as Decisions and External Factors as Uncertainties.

Integration with Logic Models

Inputs and activities from Logic Models inform core metrics, while causal relationships define inferred and composite metrics.

Bayesian Networks (BNs)

BN models are complementary to MCM as they enhance MCM by introducing probabilistic analysis, quantifying uncertainties, and integrating both objective and subjective data into a cohesive framework and predict outcomes under varying conditions. MCMs qualitative causal relationships can be integrated with BN to derive the likelihood of outcomes, simulate scenarios, and predict impacts under varying conditions. For example, MCM identifies that environmental severity affects equipment readiness, while BN quantifies this relationship, showing the probability of reduced readiness under specific weather conditions.

Holistic Evaluation of SAR Performance through Metrics Integration

The metrics integrated into the NSAR framework are diverse in scope and purpose, reflecting both operational and strategic dimensions. **Objective metrics** are derived from Logic Models, aligning with the flow of inputs, activities, outputs, outcomes, and impacts, offers hard evidence, serving as measurable benchmarks, while **Subjective metrics** add depth by capturing perceptions and human elements. These metrics can be further scoped as **Operational** metrics if they impact operational goals and **Strategic** metrics if they impact strategic goals.

MCMs play a pivotal role by structuring and integrating diverse metrics—whether operational, strategic, objective, or subjective—and their relationships within and across pathways and SAR operations. The combination of these metrics allows for comprehensive decision-making. For example: Training participation rates (objective and operational metric) are linked to responder readiness (inferred), which influences mission success rates (impact). Metrics Causal Maps effectively integrate both types of data/metrics enabling both quantitative and qualitative performance analysis.

Integrating with Bayesian Networks (BNs) is another integration requirement for quantifying MCM models and enabling predictive analysis. Integration with BN models is required for holistic evaluation.

Metrics Development Theory

The Metric Development Theory is a conceptual approach to a structured methodology for evolving metrics across Logic Models, MCMs, BNs and Balanced Score Card and operational models such as System Processes. It is an approach that has been developed or adapted for this project. It links core, inferred, and impact metrics to the language of each model, establishing contributions from each model in the development process, ensuring clarity and consistency in their development and application within a Performance Measurement System (PMS). This ensures metrics are integrated into the PMS, forming the foundation for evaluating both immediate and systemic SAR performance along required dimensions.

Metric Linkages with Logic Model:

- Core metrics are derived from inputs and activities.
- Inferred metrics explore interdependencies and influencing factors.
- Composite metrics aggregate performance across operations.
- Impact metrics evaluate long-term outcomes and strategic goals.

The accompanying table illustrates the conceptual understanding of the linkage and transition of metrics across these frameworks, forming the foundation development theory of metrics. By systematically identifying and developing these metrics, the SAR operations model ensures that both immediate performance and long-term outcomes are effectively evaluated.

	Framework Linkage					Data source	Example
	System Process	Logic Model (LM)	Metrics Causal Map (MCM) Model	Bayesian Network (BN) Model	Balanced Score Card		
Core Metrics	Input-level or operational-level measures essential for baseline system functionality.	Linked to inputs, activities, or outputs, representing measurable results within the operational flow.	Key causal nodes representing quantifiable variables that influence or result from relationships in the system. directly measurable variables	key probabilistic nodes, observable variables with defined probability distributions	Operational performance indicators aligned with process efficiency	primary data sources or operational processes, directly measurable, and provide baseline indicators of performance	Resource Availability
Inferred Metrics	Derived operational or intermediary metrics calculated from core metrics.	Linked to outcomes, capturing intermediate effects of activities and outputs.	Influencing factors. Intermediary causal nodes derived from relationships between core metrics and other variables.	Probabilistic intermediary nodes connecting core metrics to outcomes, accounting for uncertainties.	Leading indicators predicting future performance or operational success.	historical data and trend analysis identify patterns, probabilistic risk analysis	Resource Allocation Efficiency
Impact Metrics	Strategic-level metrics evaluating long-term outcomes and overall system impact.	Directly tied to impacts, measuring the long-term systemic effects of outputs and outcomes.	Aggregated causal outcomes from core and inferred metrics.	Outcome nodes predicting long-term impacts based on decisions, uncertainties, and interventions.	Outcome measures in the strategic perspective tracking progress toward organizational goals.	Core metric data combined with probabilistic risk analysis tools.	Lives Saved Community Trust Index Incident fatality reduction

Table 1: Framework Linkage of Metric Types: Core, Inferred, and Impact Metrics Across Performance Evaluation Models as the Foundation for the Metrics Development Transition (MDT) Framework

Section 2: Key Stakeholders

Key stakeholders who will use this system include:

- NSAR management and leadership (for strategic oversight and planning)
- SAR responders and coordinators (for operational improvement)
- Community representatives (to understand and build trust in SAR effectiveness)
- Partner agencies (for interagency collaboration and resource sharing)
- Data analysts (for monitoring, reporting, and future system development)

This integrated approach ensures all stakeholders can track performance, understand drivers of success, and support continuous improvement in SAR operations.

Section 3: Developing PMS - Approach to Methodology

The methodology for developing the performance management system for NSAR followed a structured and iterative approach to systematically analyze and evaluate the key aspects of the NSAR framework. This approach prioritized achieving clarity, measurability, and alignment with NSAR's specific impact goals. The following steps outline the methodology employed:

Step 1: Identifying Impact Areas and Pathways

Key areas of change were identified and categorized into specific pathways representing critical impact areas. By organizing the pathways, the methodology ensured that impact measurement would be easier to track, evaluate, and manage.

Key pathways identified were:

1. Collaboration, Coordination, Knowledge, and Trust
2. Community Engagement
3. Resource Management and Readiness
4. Recruitment, Retention, and Workload
5. SAR Personnel Education and Training
6. Incident, Environmental Conditions, and Outcomes

Step 2: Developing Logic Models

For each pathway, the **Logic Model** was constructed to define the sequence of inputs, activities, outputs, outcomes, and impacts:

- **Inputs**: Resources, personnel, funding, or technologies required to initiate SAR activities.
- **Activities**: Specific actions or processes undertaken to achieve pathway objectives, such as training, community outreach, or resource mobilization.
- **Outputs**: Immediate and measurable results of activities, such as the number of people trained or resources deployed.
- **Outcomes**: Intermediate effects of outputs, including improved responder readiness, increased public trust, or enhanced operational efficiency.
- **Impact**: Long-term effects aligned with strategic NSAR goals, such as lives saved, reduced response times, or resilient communities.

This structured breakdown clarified the goals for each pathway and highlighted how specific actions were linked to measurable impacts.

Step 3: Developing Metrics and Metric Causal Maps

Metrics were identified for each pathway. These metrics established measurable benchmarks essential for evaluating both intermediate and long-term performance. Building on the logic models, the next step involved constructing **Metric Causal Maps** (MCMs) to visualize the relationships and dependencies between metrics within each pathway. These maps highlighted critical causal linkages and informed decision-making. This process was informed by:

- **Logic Model Guidance**: The logic models provided the foundational structure, with inputs and activities informing core metrics and subsequent relationships.
- **NSAR Causal Maps**: These were used as reference points to identify key causal linkages, refine relationships, and ensure alignment with NSAR priorities and translated to measurable The Metrics Development Theory provided the methodology for categorizing metrics aligning with transitioning models – LM, MCM and BN classifications. It guided the development of causal linkages and ensured the MCMs captured the full spectrum of metrics across the performance measurement hierarchy.

The MCM development process for each pathway included identifying:

1. **Core Metrics**, **Inferred Metrics, Composite Metrics, Impact Metrics**
2. **Operational and Strategic Metrics** to track performance management along operational and strategic goals which can further inform Balanced Score Card approach. In most cases, the outcome and impact metrics will be aligned to Strategic Goals and Input and Output metrics to Operational Goals.
3. **Objective and Subjective Metrics** as foundational classification of metrics based on the type of data that is derived from.

Every metric has a set objective, its LM classification to track its performance from the perspective of the logic model elements, MCM Classification and BN Classification for easy integration with BN models and track performance across LM model pathways. This systematic mapping of metrics ensured a cohesive transition from foundational inputs to long-term impacts while highlighting causal relationships that could influence SAR performance.

Step 4: Identifying Key Data Sources and Data Collection Methodologies

Below is a list of data requirements, categorized into primary and secondary data sources for NSAR's PMS, along with the data collection methodology for each data source, indicating the specific SAR phase impact in the PMS.

Step 5: Feedback Loops and Iterative Refinement

During the development of the Metric Causal Maps (MCMs), an iterative refinement process was undertaken based on insights from the NSAR reports. These reports guided the validation of causal relationships, refinement of metric dependencies, and adjustments to pathways to ensure alignment with NSAR's goals and operational context. Feedback loops were also identified and incorporated.

Step 6: Integration

Potential MCM integration with BN is key. The clear delineation of metrics across categories ensured that data could be tracked, analyzed, and interpreted consistently across pathways, enabling a holistic understanding of SAR performance.

Section 4: Developing Logic Models

Logic Model Pathways, Pathway Diagrams and Snapshot of Key Metrics

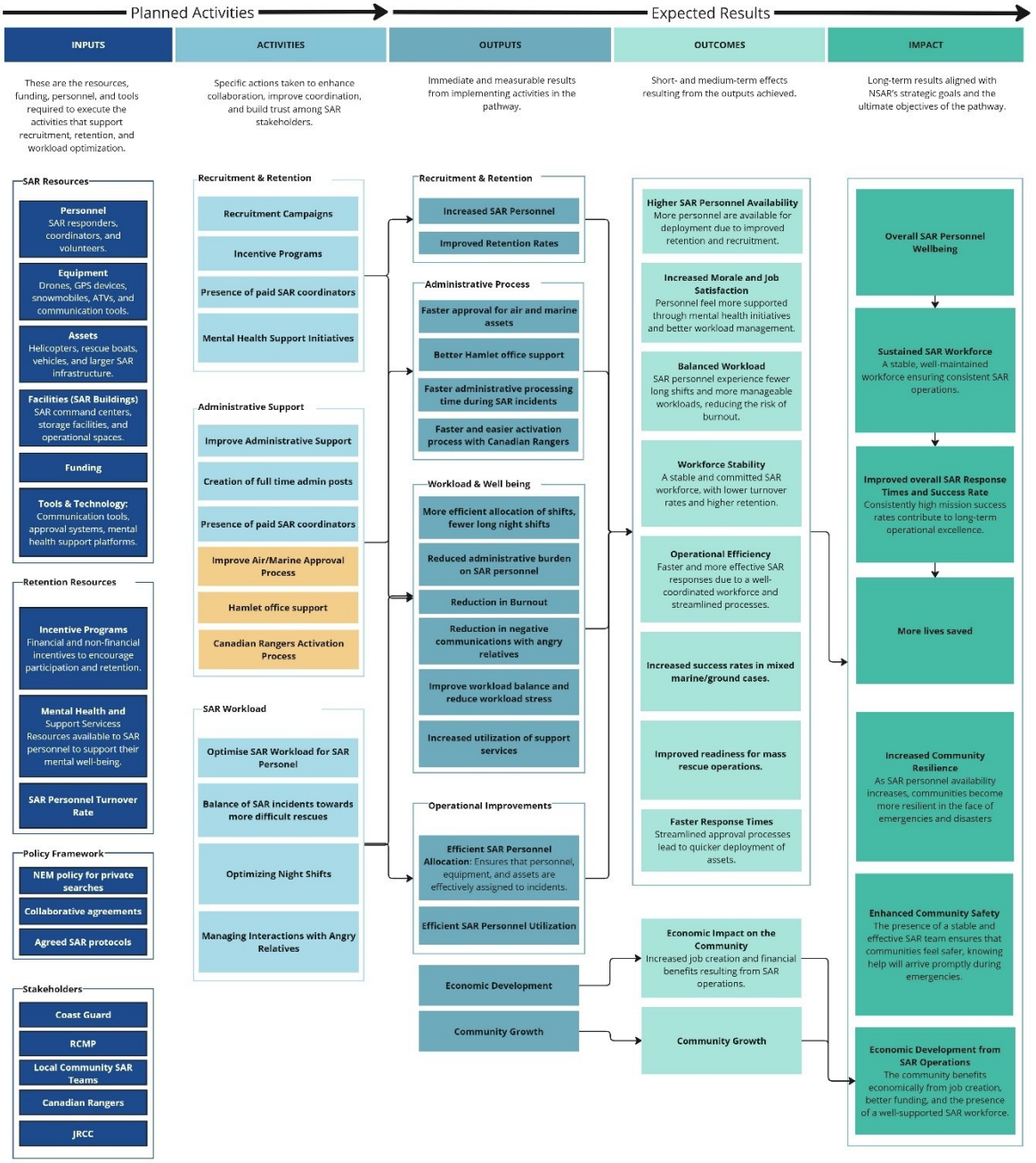
Below logic models have been developed for 6 identified pathways of NSAR operations. By delineating clear pathways, they help identify pathway specific measurable elements that can be further analyzed in BN models.

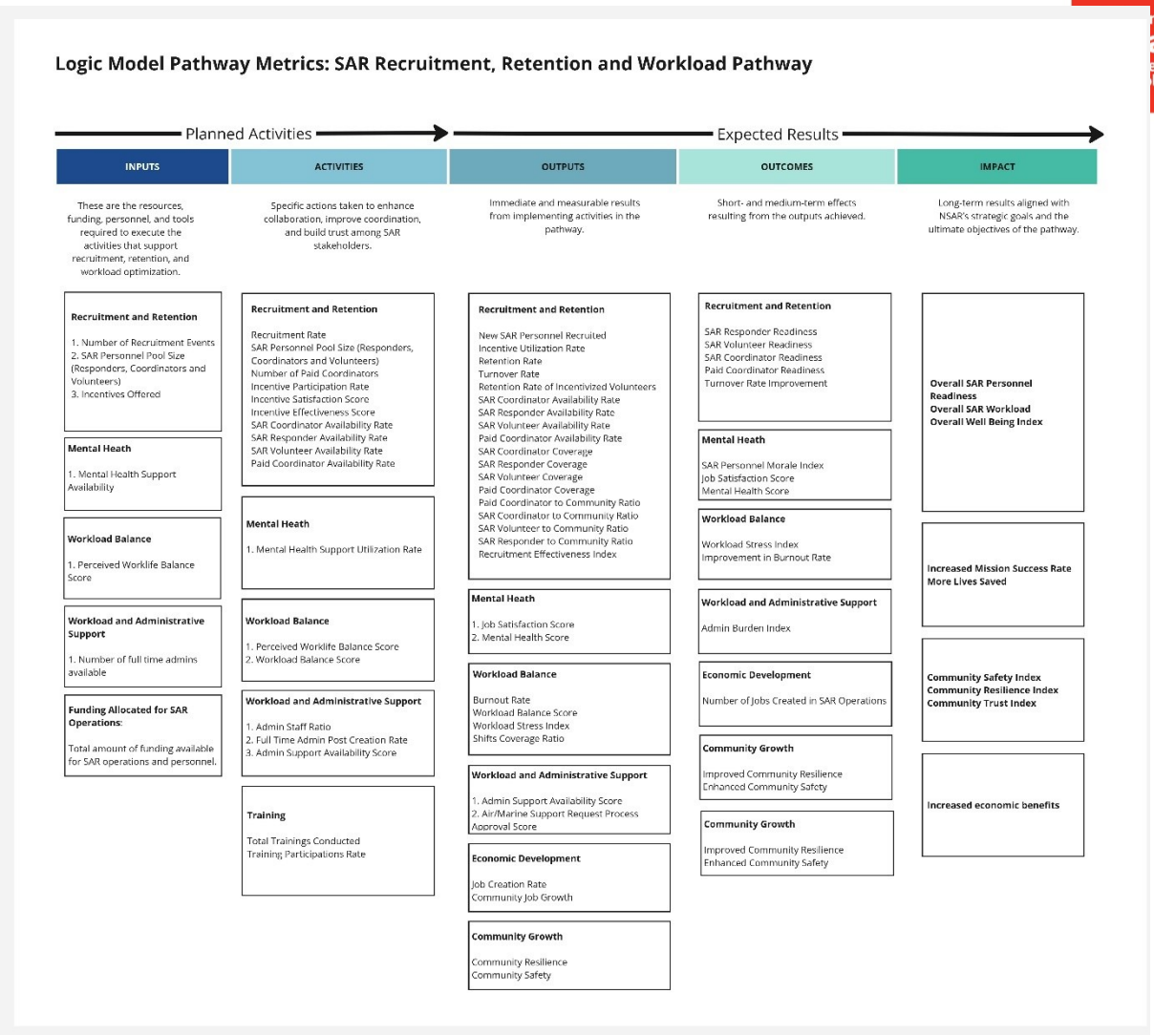
Refer to Picture D1-D7 in Appendix D for detailed Logic Models, Pathway Diagrams and snapshot of Key Metrics corresponding to each pathway.

SAR Recruitment, Retention, and Workload Pathway

The SAR Recruitment, Retention, and Workload Pathway logic model provides a framework for understanding and addressing challenges related to recruiting, retaining, and managing SAR personnel effectively. This pathway ensures a sustainable and motivated workforce by addressing high turnover and skill gaps through incentives, structured training, and recognition programs. By creating a stable volunteer base, this pathway supports SAR operations and enhances community resilience.

Logic Model: SAR Personnel Recruitment, Retention and Workload Pathway





Application in Practice

The pathway begins with **inputs** such as recruitment campaigns, training programs, and support resources for SAR personnel. **Activities** include targeted outreach for recruitment, implementing incentive programs to improve retention, and workload assessments to balance responsibilities effectively. **Outputs** from these activities include increased recruitment numbers, higher retention rates, and improved workload distribution. Over time, these outputs lead to **outcomes** such as reduced responder burnout, enhanced job satisfaction, and greater workforce stability. The pathway ultimately contributes to long-term **impacts**, such as a resilient SAR workforce and improved mission success rates.

Metrics and Data Collected

Refer Table A6 (Appendix A) for detailed list of metrics related to this pathway.

This pathway relies on a range of metrics to evaluate recruitment, retention, and workload management:

- **Recruitment Metrics**: Number of applications received and personnel successfully recruited, Demographics and skillsets of new recruits to evaluate diversity and fit for SAR roles.

- **Retention Metrics**: Annual retention rates of SAR personnel, Length of service for volunteers and paid staff.
- **Workload Metrics**: Average hours worked per responder during operations, Number of incidents handled per team or individual over a specified period.
- **Satisfaction and Well-Being Metrics**: Responder satisfaction scores from surveys, Utilization rates of mental health and support services.

Key Assumptions

- Data-driven decision support models can improve resource allocation and utilization.
- Mental health and support services utilization positively impacts responder well-being and retention.
- Implementing incentive programs will improve retention rates of SAR personnel.
- Structured training programs contribute to skill development and job satisfaction.

Informing Operational Changes: Interventions

The pathway provides actionable insights to address key challenges in workforce sustainability:

- **Improving Recruitment**: Recruitment metrics highlight areas for expanding outreach, such as targeting underrepresented demographics or tailoring campaigns to specific skill sets.
- **Enhancing Retention**: Retention metrics reveal patterns in turnover, guiding the development of incentives, such as career progression opportunities or enhanced training programs.
- **Balancing Workloads**: Workload metrics identify overburdened teams or individuals, informing adjustments to task distribution or the allocation of additional resources.

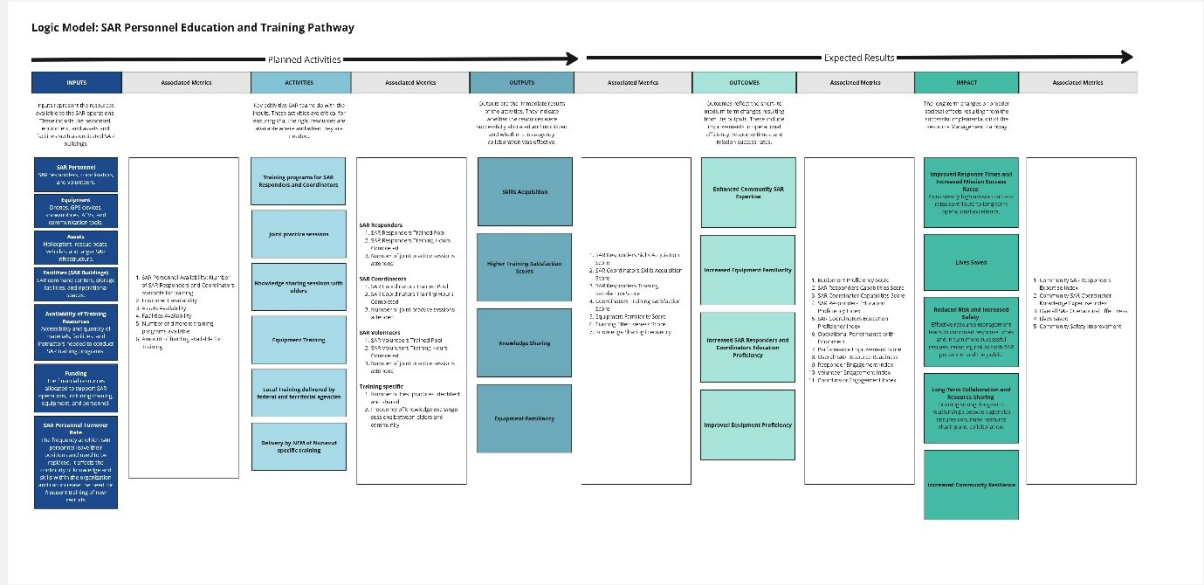
Guiding Strategic Decisions: Leverage Points

This pathway supports long-term workforce planning and well-being strategies:

- **Recruitment Strategies**: Data on recruitment trends informs targeted campaigns and skills development initiatives to build a versatile workforce.
- **Retention Policies**: Insights into satisfaction and turnover guide investments in responder support programs and mental health resources.
- **Sustainable Operations**: Workload analysis ensures responders are not overburdened, reducing burnout and improving operational efficiency.

SAR Personnel Education and Training Pathway

The Education and Training Pathway logic model is designed to enhance the skills, knowledge, and operational readiness of SAR personnel, volunteers, and community members. By structuring activities and interventions around capacity-building goals, this pathway ensures that SAR teams are equipped to respond effectively to diverse challenges.



Application in Practice

This pathway begins with **inputs** such as funding, personnel, training materials, and facilities for conducting educational sessions. **Activities** include training programs for SAR responders, workshops for community members, and simulations or drills to practice real-world scenarios. The **outputs** of these activities include the number of training sessions conducted, participation rates, and certifications achieved. These outputs lead to **outcomes** such as improved operational readiness, enhanced skills, and greater confidence among responders and volunteers. The long-term impacts include higher mission success rates, reduced response times, and increased community resilience. Feedback loops reinforce the value of training, with increased responder confidence and reduced response times leading to sustained mission success rates.

Metrics and Data Collected

Refer Table A7 (Appendix A) for detailed list of metrics related to SAR Resource Management and Readiness Pathway.

The pathway relies on several key metrics to evaluate the effectiveness of education and training programs:

- **Participation Metrics**: Number of participants attending training sessions and workshops, Demographics and skill levels of attendees to assess inclusivity and targeted outreach.
- **Training Quality Metrics**: Participant feedback on training sessions, Satisfaction scores and perceived relevance of training content.

- **Skill Development Metrics**: Assessment scores from training programs, Certification rates and practical skill demonstrations during drills.
- **Readiness Metrics**: Improved response times and operational performance post-training, Reduction in errors or inefficiencies during missions.
- **Impact Metrics**: Long-term improvements in mission success rates, Enhanced community engagement and preparedness due to training programs.

Informing Operational Changes: Interventions

The pathway informs operational adjustments by identifying areas for improvement in training delivery and content:

- **Targeting Gaps**: Participation and skill development metrics highlight gaps in training coverage, prompting targeted interventions for specific groups or skills.
- **Improving Content**: Feedback and satisfaction scores guide the refinement of training materials to ensure relevance and engagement.
- **Enhancing Readiness**: Metrics like response times and operational errors after training inform improvements in program structure and delivery methods.

Guiding Strategic Decisions: Leverage Points

The pathway also supports long-term strategic planning for capacity-building initiatives:

1. **Investment in Training Resources**: Data on participation rates and readiness improvements guide resource allocation for training facilities, materials, and personnel.
2. **Curriculum Development**: Insights from feedback and skill assessments shape the evolution of training programs to address emerging needs and challenges.
3. **Community Engagement Strategies**: Participation metrics from community workshops inform outreach strategies and enhance the inclusivity of SAR education efforts.

Community Engagement Pathway

The Community Engagement Pathway emphasizes building trust, awareness, and preparedness within communities to improve overall SAR effectiveness. Aims to raise public awareness of SAR roles, promotes safety protocols, and builds trust to enhance public understanding of SAR resources and roles, this pathway ensures that communities are better equipped to respond to emergencies and support SAR operations. Outreach campaigns, school-based education, and safety training enhance community preparedness. Feedback loops, such as increased public participation in SAR activities, lead to safer communities with fewer incidents. This pathway integrates metrics like community trust and safety awareness, which inform broader performance evaluations.

Application in Practice

This pathway begins with **inputs** such as public outreach programs, educational campaigns, and partnerships with local leaders and organizations. **Activities** include organizing community workshops, conducting safety drills, and developing digital platforms for information dissemination. The **outputs** of these activities include increased community participation in preparedness activities, higher attendance at training events, and greater access to safety resources. These lead to **outcomes** such as improved public trust in SAR services, enhanced community resilience, and reduced incidents due to better safety awareness. The long-term **impacts** include safer communities, increased collaboration with SAR teams, and improved response efficiency during emergencies. Feedback loops, such as increased public participation in SAR activities, lead to safer communities with fewer incidents.

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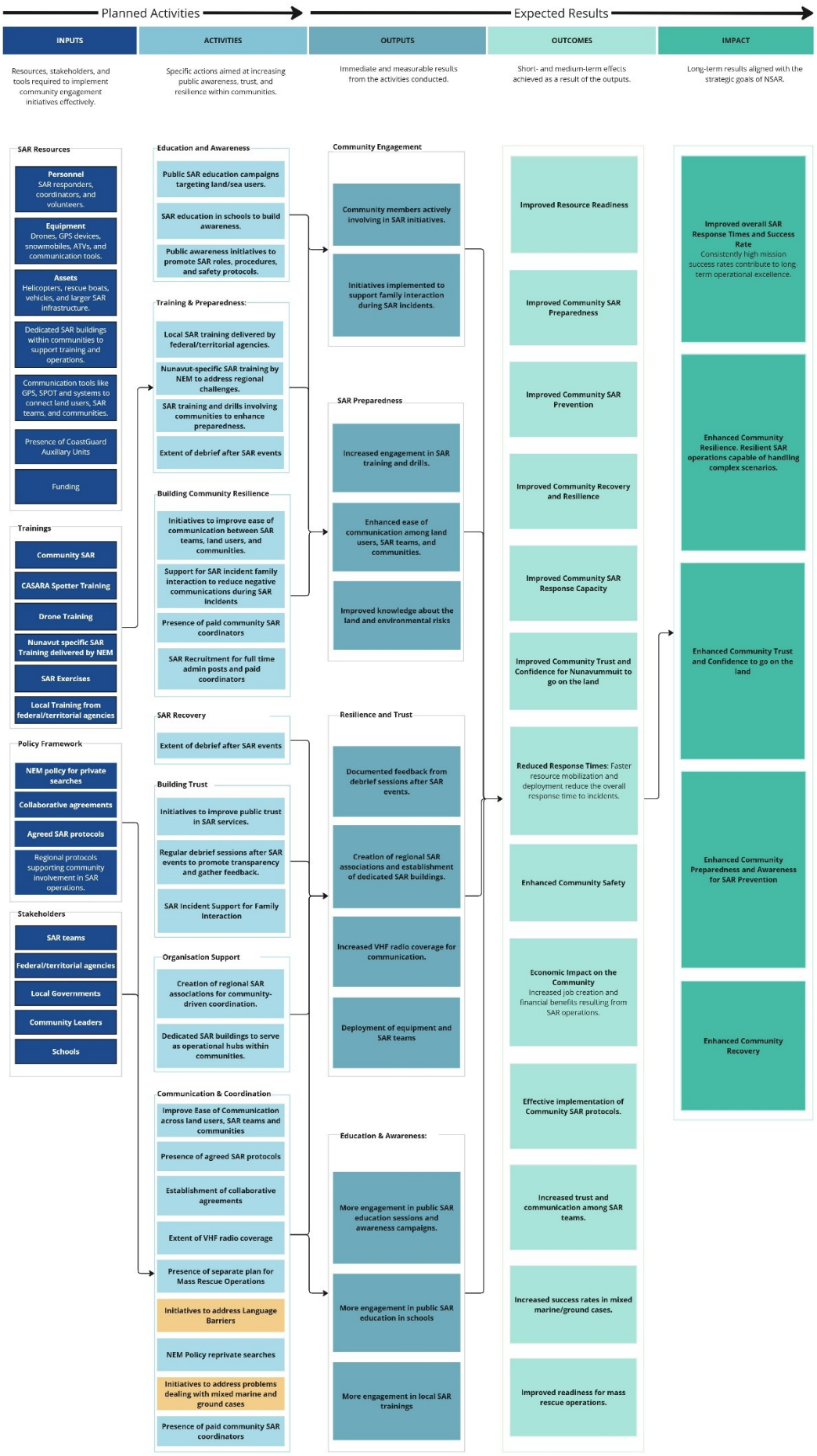
Logic Model: Community Engagement



Metrics and Data Collected

Refer Table A4 (Appendix A) for detailed list of metrics related to this pathway.

The pathway relies on several metrics to evaluate the effectiveness of community engagement initiatives:

- **Participation Metrics**: Number of attendees at community workshops and safety training sessions, Rates of participation in SAR-related drills and preparedness exercises.
- **Awareness Metrics**: Community knowledge scores from surveys assessing understanding of SAR roles and resources, Distribution and usage rates of safety materials and resources.
- **Trust Metrics**: Public confidence levels in SAR services, measured through surveys, Feedback from community leaders on SAR collaboration.
- **Impact Metrics**: Incident reduction rates in communities with active engagement programs, Response efficiency improvements due to community cooperation during SAR missions.

Informing Operational Changes: Interventions

This pathway provides actionable insights to improve SAR-community interactions:

- **Improving Awareness**: Awareness metrics identify gaps in public knowledge, guiding the development of targeted educational campaigns or digital resources.
- **Enhancing Collaboration**: Trust metrics reveal areas for strengthening partnerships with community leaders or addressing public concerns.
- **Increasing Participation**: Participation metrics inform the effectiveness of outreach strategies, helping to refine workshop content or engagement methods.

Guiding Strategic Decisions: Leverage Points

This pathway supports strategic planning for community engagement and readiness:

- **Public Education Strategies**: Data on knowledge gaps and safety resource usage shapes campaigns to enhance community preparedness.
- **Strengthening Trust**: Feedback from community surveys and leader assessments informs initiatives to build stronger relationships with SAR services.
- **Resource Allocation**: Metrics on participation and awareness help prioritize resource distribution to communities most in need of engagement and training.

SAR Interagency Collaboration, Trust, and Knowledge Pathway

The Interagency Collaboration, Trust, and Knowledge Pathway logic model emphasizes strengthening partnerships, enhancing communication, and fostering trust among various SAR stakeholders. By improving coordination and integrating knowledge-sharing practices, this pathway ensures more efficient and effective SAR operations.

Application in Practice

This pathway begins with **inputs** such as shared communication tools, formalized agreements (e.g., Memorandums of Understanding), joint training programs, and leadership engagement initiatives. **Activities** include conducting multi-agency drills, establishing centralized communication protocols, and creating knowledge-sharing platforms to exchange best practices and operational data. The **outputs** of these activities include streamlined communication, improved interoperability, and increased participation in joint exercises. These result in **outcomes** such as higher trust levels between agencies, enhanced response coordination, and reduced resource duplication. The long-term **impacts** include more effective SAR operations, improved resource utilization, and stronger partnerships that enhance overall readiness and response efficiency.

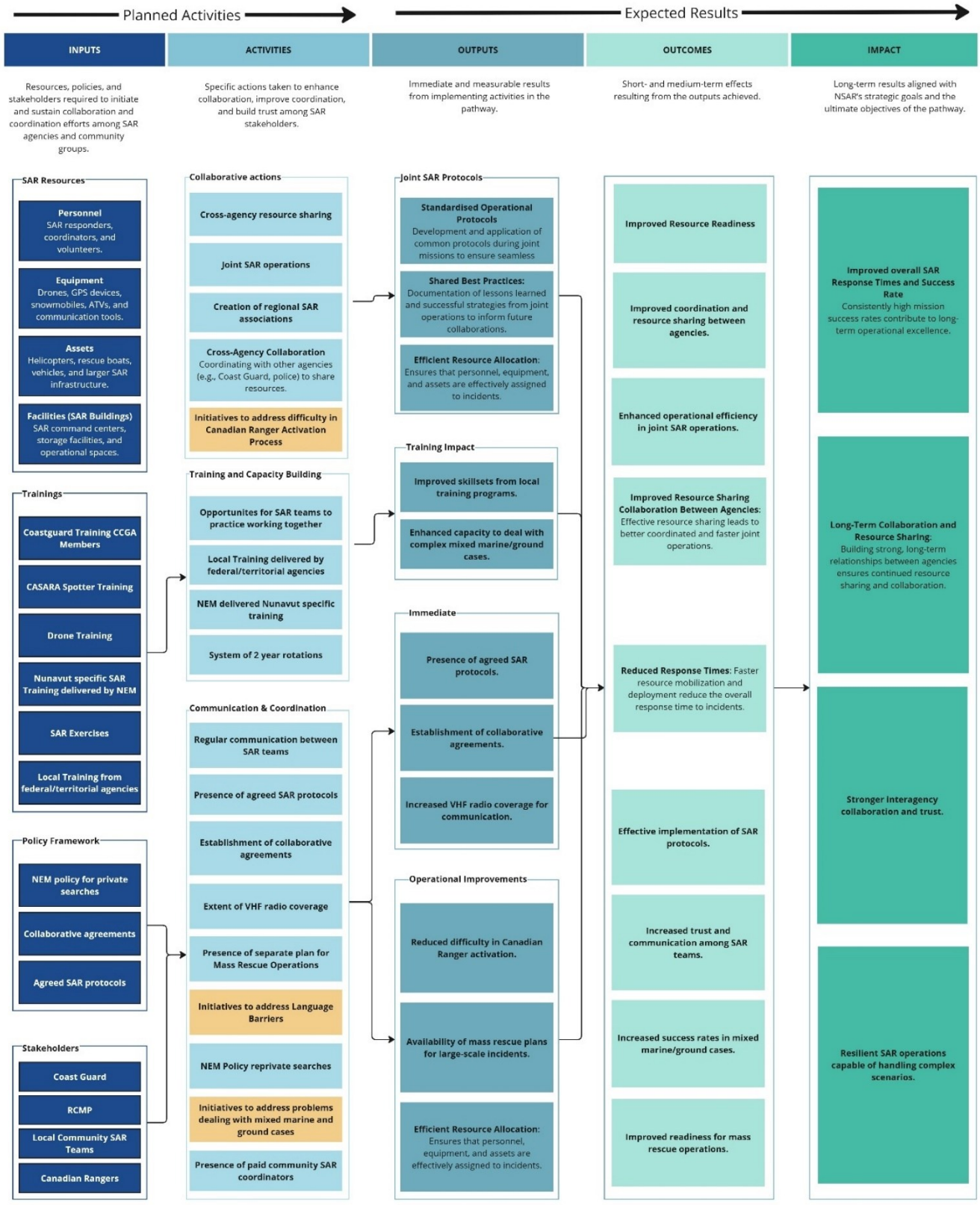
Metrics and Data Collected

Refer Table A4 (Appendix A) for detailed list of metrics related to this pathway.

The pathway relies on key metrics to evaluate the effectiveness of interagency collaboration:

- **Collaboration Metrics**: Frequency and quality of interagency meetings, training sessions, and joint operations, Number of agencies actively participating in shared protocols and initiatives.
- **Trust Metrics**: Interagency trust scores derived from surveys and collaborative feedback, Level of adherence to shared agreements and protocols.
- **Knowledge Metrics**: Frequency of knowledge-sharing sessions and platform usage rates., Number of best practices and lessons learned incorporated into operations.
- **Efficiency Metrics**: Time savings from streamlined communication and resource-sharing processes, Reduction in resource duplication and operational delays.

Logic Model: Inter Agency Collaboration, Trust and Knowledge Pathway



Informing Operational Changes: Interventions

This pathway provides actionable insights for optimizing interagency collaboration:

- **Improving Communication**: Metrics such as platform usage and meeting frequency identify gaps in communication, prompting enhancements to shared tools and protocols.
- **Building Trust**: Trust metrics reveal areas requiring targeted efforts to address interagency concerns or improve collaboration dynamics.
- **Enhancing Efficiency**: Efficiency metrics highlight bottlenecks in coordination, leading to adjustments in processes or resource-sharing agreements.

Guiding Strategic Decisions: Leverage Points

The pathway also informs long-term strategies for enhancing collaboration and knowledge integration:

- **Policy Development**: Insights from trust and collaboration metrics guide the formalization of agreements and protocols to standardize interagency operations.
- **Knowledge Management Strategies**: Data on platform usage and shared lessons informs the development of robust knowledge-sharing systems.
- **Resource Optimization**: Efficiency metrics support strategic decisions on resource allocation, ensuring better utilization across agencies.

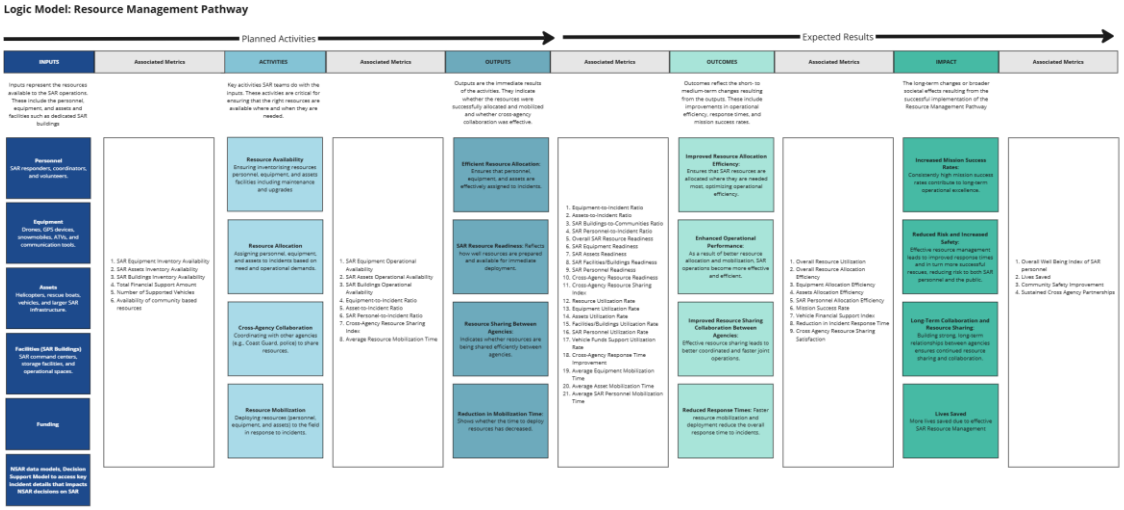
Feedback Loops

Below are some mechanisms to refine and improve the pathway over time based on operational data and stakeholder input.

- Regular evaluation of collaborative agreements and SAR protocols.
- Reviews of joint SAR operations to identify gaps and best practices.
- Stakeholder feedback on interagency communication and training programs.

SAR Resource Management and Readiness Pathway

The Resource Management and Readiness Pathway ensures the availability, allocation, and efficient utilization of Search and Rescue (SAR) resources. Regular resource assessments, improved mobilization protocols, and facility upgrades address resource shortages and delays. Metrics such as resource readiness and mobilization times contribute core and inferred metrics to the PMS, optimizing resource utilization and response efficiency.



Application in Practice

The pathway begins with **inputs** such as personnel, equipment (e.g., GPS devices, drones), assets (e.g., boats, helicopters), and funding that are essential for initiating activities like resource allocation, cross-agency coordination, and mobilization of SAR teams. The immediate results of these activities, or **outputs**, include updated resource inventories, improved readiness of equipment and personnel, and optimized mobilization times. Over time, these outputs lead to **outcomes** such as improved resource allocation efficiency and reduced response times, ultimately contributing to long-term **impacts** like increased mission success rates and community safety.

Metrics and Data Collected

Refer Table A3 (Appendix A) for detailed list of metrics related to this pathway.

The pathway relies on a set of metrics to evaluate operational performance and readiness:

- **Resource Availability Metrics**: Measures the inventory of personnel, equipment, and facilities ready for deployment.
- **Operational Readiness Metrics**: Includes ratios such as equipment-to-incident and personnel-to-incident, highlighting preparedness levels for emergencies.
- **Efficiency Metrics**: Metrics like average mobilization time and resource utilization rates evaluate the speed and effectiveness of resource deployment.
- **Impact Metrics**: Long-term measures, including mission success rates and community safety indices, assess the effectiveness and societal impact of SAR operations.

Informing Operational Changes: Interventions

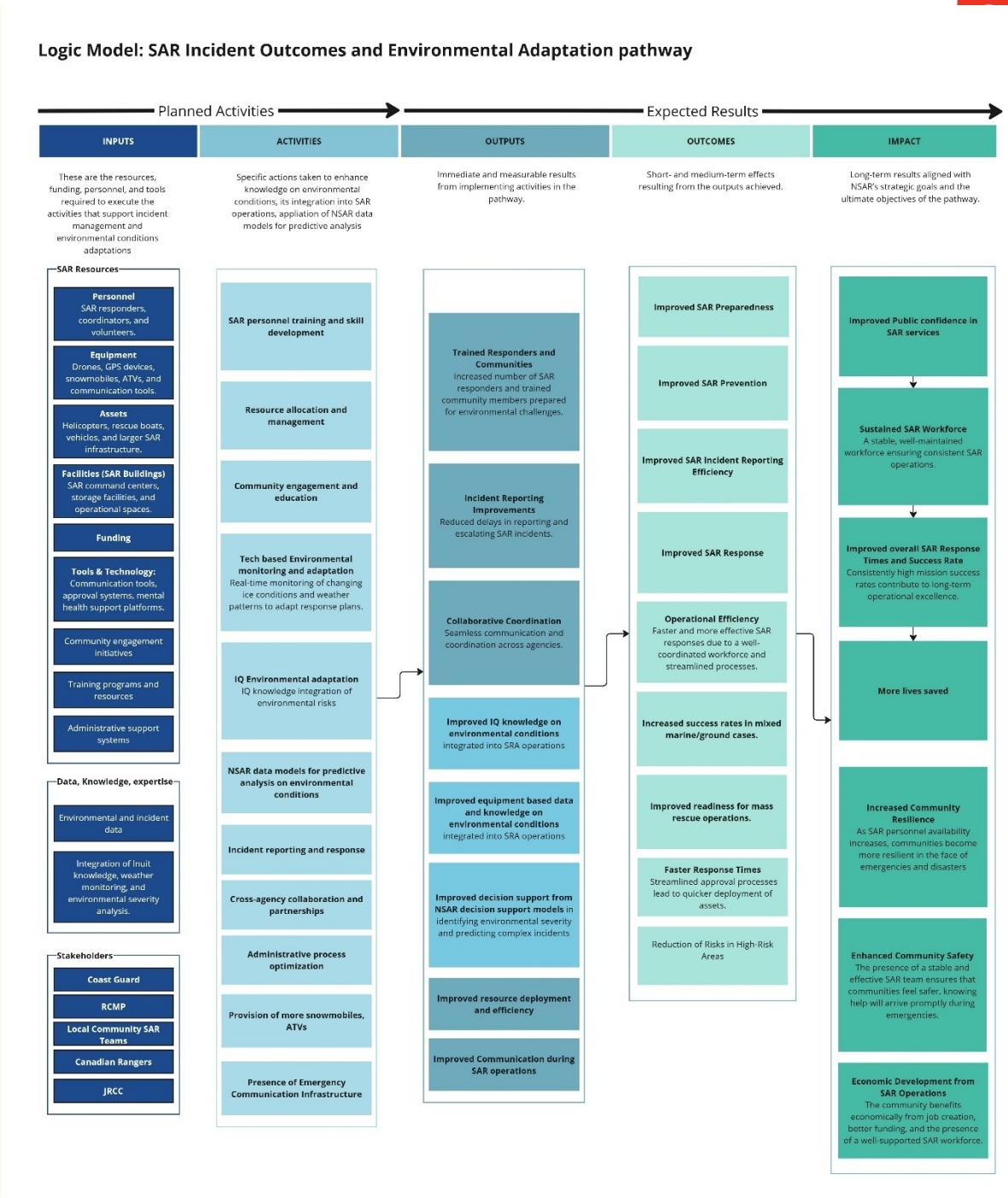
The pathway informs operational changes by identifying resource gaps and inefficiencies. For example, metrics such as mobilization time can reveal bottlenecks in deployment processes, prompting adjustments to improve response speed. Similarly, tracking cross-agency collaboration metrics can help identify opportunities for better coordination and resource sharing .

Guiding Strategic Decisions: Leverage Points

The pathway also supports long-term strategic planning by providing insights into resource needs and performance trends. Metrics on resource utilization and availability guide investment in personnel training, equipment maintenance, and facility upgrades. Additionally, analyzing outcomes like mission success rates helps refine policies to enhance SAR capabilities and community engagement.

SAR Incident Management and Environmental Adaptation Pathway

This pathway integrates key resources, traditional IQ knowledge, and technology to optimize incident response while adapting to changing environmental conditions. Specific planned activities include the integration of Inuit knowledge for environmental adaptation, predictive analysis using NSAR data, and optimized incident reporting processes. These outcomes directly contribute to long-term impacts such as increased community resilience, lives saved, and economic development through improved SAR operations.



Data Collected

The pathway relies on specific metrics to evaluate performance and outcomes effectively. These include: Preparedness, Response, Impact, Environmental Adaptation Metrics.

Refer Table A9 (Appendix A) for detailed list of metrics related to this pathway.

Informing Operational Changes

Better predictability of NSAR models on the environmental risks can benefit SAR preparedness for a community.

Guiding Strategic Decisions

The pathway provides critical insights for long-term planning and policy development. Key strategic actions informed by the pathway include:

- Investment in advanced environmental monitoring systems to adapt to changing ice conditions.
- Enhanced training for personnel on environmental risks and equipment usage.
- Improved funding allocation for infrastructure maintenance and resource readiness.

Section 5: Developing Metric Causal Maps (MCMs)

Development of Metric Causal Maps (MCMs)

The MCMs are systematically structured around. These maps enable data-driven decision-making by highlighting dependencies, uncertainties, and impacts across operational and strategic dimensions, aligning actions with NSAR's goals.

Refer to Picture B1-B6 in Appendix B for detailed Metric Causal Maps corresponding to each pathway.

Data Sourcing:

- **NSAR Reports**: Insights into historical performance, challenges, and resource trends.
- **Historical Incid ent Data**: Reveals influencing factors and dependencies.
- **Logic Models**: Inputs, activities, outputs, and impacts form the foundation for metrics.
- **NSAR Causal Maps**: Detail key decisions, uncertainties, and outcomes, guiding metric relationships.

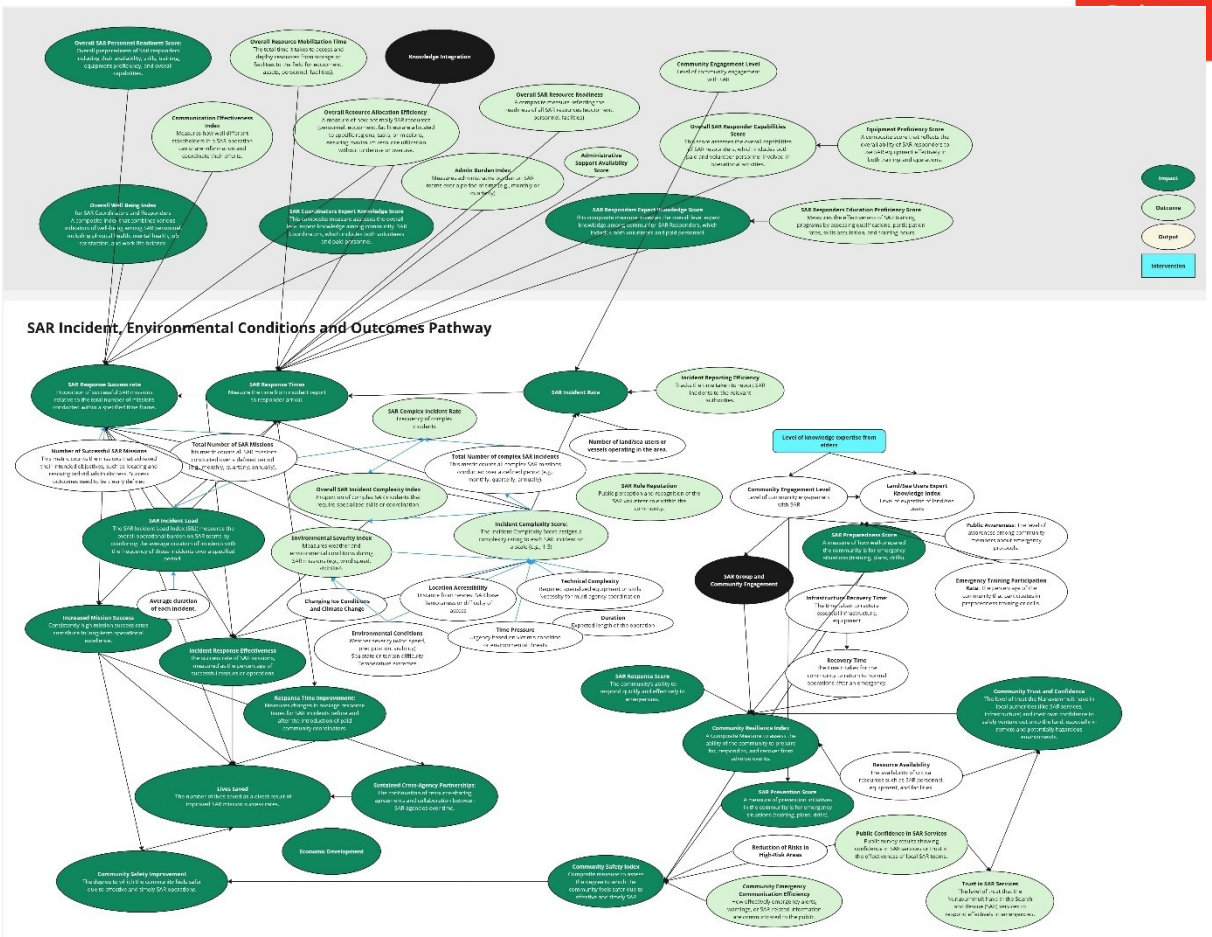
These maps provide a robust framework for evaluating SAR performance and supporting continuous improvement through actionable insights and leverage points.

Impact Assessment with MCM Models

While Metric Causal Maps (MCMs) help decision-makers understand metric dependencies and interactions across pathways, they also help identify leverage points. Its integration with BN model can allow for Tracking Input Changes, Evaluating Process Adjustments and Scenario Analysis. Impact assessment through MCMs ensures that decision-makers can trace the cause-and-effect pathways within SAR operations.

Impact assessment using Composite Measures Derived from MCM Analysis

Composite metrics, developed through MCM analysis, aggregate multiple individual metrics into comprehensive indicators, providing a holistic view of performance across SAR pathways. These measures combine core, inferred, and impact metrics to create multidimensional performance evaluations such as aggregating data across communities, regions, time dimensions. E.g. measuring Monthly Incident Rates or Yearly difference in response effectiveness.



These metrics are developed by standardizing individual data for comparability and aligning them with specific pathways. For example, the Community Engagement Index aggregates participation, awareness, and trust metrics to evaluate the success of community engagement initiatives, while the Overall Resource Allocation Efficiency Index combines data on equipment readiness, personnel availability, and mobilization time to measure operational efficiency.

Composite metrics simplify decision-making by condensing complex data into actionable insights, enabling quick performance evaluations. They also support performance tracking by providing a clear picture of progress toward strategic objectives, such as improving responder proficiency or enhancing community trust. Additionally, these measures enable benchmarking across regions, time periods, or operational units, helping identify best practices and areas for improvement.

Section 6: Metrics and Impact Measurement

This section outlines the identified metrics, categorized into three key areas: metrics for NSAR interventions and changes, pathway-specific metrics, and general impact metrics. Detailed tables referenced in the appendix provide a comprehensive view of these metrics.

Metrics for NSAR Identified Interventions and Changes

Metrics associated with specific NSAR identified interventions and changes are listed in Table A1 (Appendix A). These metrics capture the immediate and measurable outcomes of activities like training programs, resource mobilization, and interagency coordination. These metrics form the foundation for assessing the operational and strategic impacts of NSAR's efforts.

Pathway-Specific Metrics for NSAR

Each Logic Model pathway is supported by targeted metrics designed to evaluate its unique objectives and challenges. Detailed metrics for each pathway are provided in Tables A3 to A9 (Appendix A), covering the following pathways:

- Collaboration, Coordination, Knowledge, and Trust Pathway: Metrics include interagency communication scores and joint mission success rates.
- Community Engagement Pathway: Key metrics such as public trust indices and awareness campaign reach.
- Resource Management and Readiness Pathway: Includes metrics like equipment readiness scores and mobilization times.
- Recruitment, Retention, and Workload Pathway: Tracks volunteer retention rates and responder satisfaction levels.
- Education and Training Pathway: Metrics such as training effectiveness scores and responder proficiency indices.
- Incident, Environmental Conditions, and Outcomes Pathway: Includes metrics like environmental severity indices and response efficiency rates.

These metrics align with the causal relationships identified in the Metric Causal Maps (MCMs) and provide a granular evaluation of performance within each pathway.

General Impact Metrics for NSAR Changes

General impact metrics offer a broad view of NSAR's long-term outcomes, transcending specific pathways. When evaluating the effectiveness of various NSAR changes, it is essential to validate these initiatives against key impact metrics that reflect their overall influence on Search and Rescue (SAR) operations. The following metrics serve as general indicators of success and can be applied universally across different NSAR changes. These metrics are listed in Table A2 (Appendix A) and include:

- Mission Success Rates: The proportion of successful SAR operations relative to total missions.
- Lives Saved: A direct measure of SAR effectiveness in protecting human life.
- Community Safety Index: Reflects improvements in public awareness, preparedness, and resilience.
- Resource Allocation Efficiency: Aggregates metrics like equipment readiness and personnel availability to evaluate operational efficiency.

These metrics are critical for assessing NSAR's overall impact and ensuring strategic objectives are achieved.

Section 7: Data Collection Strategy

Below is a list of data requirements, key data sources, categorized into primary and secondary data sources for NSAR's PMS, along with the data collection methodology for each data source, indicating the specific SAR phase impact in the PMS. Primary sources are collected directly by NSAR or related SAR teams, providing firsthand data. Secondary data includes data from NEM, JRCC, RCMP, and other partner integrations if possible.

Data Category	Data Requirement	Primary or Secondary	Data Source	Collection Methodology	SAR Phase Impact
Community Satisfaction & Engagement	Community Satisfaction Survey Results	Primary	Community feedback surveys (annual)	Face-to-face/online surveys distributed via local leaders or digital tools	Recovery, Preparedness
	Community Preparedness Awareness	Primary	Community Emergency Response Plan (CERP) records	Attendance logs for training sessions; CERP records maintained by NEM	Preparedness
	Public Awareness of SAR Resources	Primary	Survey, event attendance records	Post-event feedback surveys; attendance tracking at community events	Preparedness, Prevention
	Incident Follow-Up Feedback	Primary	Direct feedback from community members post-incident	Follow-up interviews or surveys conducted in person or by phone	Recovery
Operational Efficiency	Response Timeliness	Secondary	SAR operation reports from JRCC, RCMP, NEM	Time stamps logged at each stage of incident response; collated in post-incident reports	Response
	Incident Success Rate	Secondary	SAR operation completion reports from JRCC, RCMP, NEM	Completion status and outcome summaries from SAR agencies	Response
	Equipment Availability and Readiness	Primary	Equipment maintenance and usage logs of all equipment used. Includes SmartICE, IMMP sensor data	Sensor data logs, Scheduled maintenance checks and readiness assessments; updated monthly by NEM and local teams	Preparedness, Response

	SPOT Devices Distributed	Primary	NEM distribution records	Inventory tracking logs maintained by NEM; annual distribution report	Preparedness
Learning and Growth	Training Completion Rate	Primary	Training attendance logs	Attendance tracking at each session; digital logs maintained by NSAR and MTO	Preparedness
	Volunteer Retention Rate	Primary	Volunteer records	Annual analysis of active vs. inactive volunteers; data maintained by NEM and community SAR coordinators	Preparedness, Recovery
	Skill Proficiency Improvement	Primary	Post-training assessments	Skill assessments administered at the end of each training session; tracked over time	Preparedness
Financial Metrics	Cost per Incident	Secondary	Financial reports from NEM	Analysis of incident-related expenses; data from NEM's finance department	Response, Recovery
	Funding Utilization Rate	Secondary	NEM budget and financial reports	Budget tracking against program-specific allocations; quarterly reviews	All phases
	Training Cost Efficiency	Secondary	Financial records and training attendance	Cost per training session calculated from financial logs and attendee counts	Preparedness
Resource Allocation & Readiness	Equipment Usage Frequency	Primary	Equipment usage logs	Recorded each time equipment is deployed; logs maintained by NEM and SAR agencies	Response, Preparedness
	Resource Allocation for High-Risk Areas	Secondary	NEM resource allocation data, annual reports	Resource distribution reports by region, updated annually	Preparedness, Response
Equitable Access	Vulnerable Community Coverage	Secondary	Community demographics, SAR records	GIS mapping and demographic analysis by NEM and SAR partners	Preparedness, Prevention

	Access to SPOT Devices and Go Bags by Region	Primary	NEM distribution data	Distribution logs updated after each distribution cycle; reviewed annually by NEM	Preparedness, Response
Incident and Environmental Factors	Incident Frequency by Type (land, marine, air)	Secondary	Incident reports from JRCC, RCMP, NEM	Categorized incident summaries collected and reported by SAR agencies	Response, Preparedness
	Seasonal Incident Patterns	Secondary	Historical incident data from NEM, JRCC	Historical data review for trends by season; analyzed annually	Response, Preparedness
	Environmental Condition Data (e.g., ice data)	Secondary	SmartICE, IMMP and other equipment data, sensor logs	Environmental monitoring data collected and shared by SmartICE, IMMP partners	Prevention

Section 8: Challenges and Solutions

The development of the NSAR PMS presented several key challenges, such as:

- **Aligning Metrics Across Diverse Operations**:
  Solution: Developed modular logic models tailored to each SAR pathway to ensure metric clarity and consistency.
- **Decentralized Performance Data**:
  Solution: Designed an integrated data collection strategy using both primary (community feedback) and secondary (SAR logs) sources.
- **Integrating Traditional and Modern Knowledge**:
  Solution: Embedded Inuit knowledge into metrics within environmental adaptation and training pathways.
- **Anticipating Climate-Driven Risks**:
  Solution: Recommended Bayesian Network integration for predictive modeling and scenario planning.

Section 9: Key Deliverables

1. Logic Models Pathway Diagrams

LogicModels.pdf file containing all pathway diagrams for below:

- Community Engagement
- SAR Personnel Recruitment, Retention and Workload
- SAR Collaboration, Coordination, Knowledge and Trust Pathway
- SAR Personnel Education and Training Pathway
- SAR Resource Management and Readiness Pathway

2. Detailed Metrics Tables

NSAR Metrics List Excel Worksheet/pdf

3. Metric Causal Maps for all SAR Logic Model Pathways

NSAR Metrics Causal Maps pdf files containing MCM models for all pathways

Conclusion

This dissertation has developed a structured Performance Management System (PMS) tailored to evaluate and enhance the operational impact of changes within the Nunavut Search and Rescue (NSAR) initiative. By integrating Logic Models and Metric Causal Maps (MCMs), the PMS offers a clear, visual, and analytical framework to trace the cause-and-effect relationships of metrics across critical SAR pathways—such as community engagement, resource readiness, training, and incident management.

The findings confirm that a robust metric framework is essential for tracking SAR performance, aligning interventions with strategic goals, and supporting data-driven decision-making. The pathway-specific logic models enabled a systematic approach to evaluating preparedness, response efficiency, and long-term outcomes such as community resilience and mission success. MCMs further enhanced this by identifying metric interdependencies and supporting strategic scenario planning.

To strengthen NSAR's impact, future recommendations include:

- Regular updating of metric models based on operational feedback and community input.
- Integration of Bayesian Network models to support probabilistic forecasting and decision support.
- Expansion of composite metrics to evaluate cross-pathway performance.

Ultimately, this PMS equips NSAR with the tools to assess, adapt, and improve SAR capabilities in a rapidly changing Arctic environment, while embedding Inuit knowledge and local engagement at its core.

Acronyms

Acronym	
LM	Logic Model
MCM	Metrics Causal Map
BN	Bayesian Network
NSAR	Nunavut Search and Rescue Project
SAR	Search and Rescue
PMS	Performance Measurement System
MDT	Metrics Development Transition

Appendix

Appendix A: Detailed Metrics Tables

Table A 1: Metrics for NSAR identified Inventions and Changes

Pathway	NSAR Intervention	Outcome Metrics	Impact Metrics	Data Collection Approach
Collaboration, Coordination and Trust	**System of 2-year rotations**	Retention Rate	Overall SAR Responder Capabilities Score	Personnel records
		Job Satisfaction Score	SAR Response Success Rate	Surveys
Collaboration, Coordination and Trust	**Local Training delivered by federal and territorial agencies**	SAR Responders Training Effectiveness Index	Incident Response Effectiveness	Training records
		Equipment Proficiency Score	Overall SAR Resource Readiness	Skills assessments
				Operational performance data
Collaboration, Coordination and Trust	**Creation of regional SAR associations**	Cross-Agency Resource Sharing Index	Sustained Cross-Agency Partnerships	Interagency agreements
		Cross-Agency Coordination Score	Overall Resource Allocation Efficiency	Joint operation reports
SAR Resource Management and Readiness	**Financial Support for Users' own vehicles**	Vehicle Funds Support Utilization Rate	SAR Response Times	Financial records
		Number of Supported Vehicles	Equipment-to-Incident Ratio	Vehicle usage logs
SAR Resource Management and Readiness	**Provision of snowmobiles, ATVs**	SAR Equipment Operational Availability	Response Time Improvement	Equipment inventory
		Equipment Utilization Rate	Increased Mission Success	Mission reports
SAR Resource Management and Readiness	**Presence of dedicated SAR buildings within communities**	SAR Building Availability Rate	Overall Resource Mobilization Time	Facility records
		Storage Capacity	SAR Building Readiness	Resource deployment logs
		Resource Accessibility Score		
	Provision of GPS, SPOT for land/sea users	Number of GPS/SPOT devices provided	Incident Response Effectiveness	Equipment inventory

SAR Resource Management and Readiness		Device Utilization Rate	SAR Response Times	Device usage logs
SAR Communication and Social Engagement	**Extent of VHF radio coverage**	VHF Radio Coverage Area	Communication Effectiveness Index	Coverage maps
		Communication Channel Reliability	SAR Response Success Rate	Signal strength tests
Collaboration, Coordination and Trust	**Presence of separate plan for Mass Rescue Operations**	Mass Rescue Plan Readiness Score	Incident Response Effectiveness for Complex Incidents	Plan documentation
		Number of Mass Rescue Drills Conducted	Overall SAR Resource Readiness	Drill reports
Collaboration, Coordination and Trust	**Presence of agreed SAR protocols**	Protocol Compliance Rate	Incident Response Effectiveness	Protocol documentation
		Cross-Agency Coordination Score	Sustained Cross-Agency Partnerships	Operational reports
Collaboration, Coordination and Trust	**Coastguard Training - CCGA Members**	Number of Coastguard Training sessions	SAR Responders Capabilities Score	Training records
		Training Effectiveness Index	Equipment Proficiency Score	Skills assessments
Collaboration, Coordination and Trust	**CASARA Spotter Training**	Number of CASARA Spotter Training sessions	SAR Responders Capabilities Score	Training records
		Training Effectiveness Index	Incident Response Effectiveness	Operational performance data
Collaboration, Coordination and Trust	**Drone Training**	Number of Drone Training sessions	Equipment Proficiency Score	Training records
		Equipment Familiarity Score	SAR Response Success Rate	Mission reports
Collaboration, Coordination and Trust	**Delivery by NEM of Nunavut specific SAR training**	Number of Nunavut-specific training sessions	SAR Responders Expert Knowledge Score	Training records
		Training Satisfaction Score	Knowledge Integration Score	Participant surveys
Collaboration, Coordination and Trust	**SAR Exercises**	Number of SAR Exercises	Overall SAR Resource Readiness	Exercise reports
		Exercise Participation Rate	Cross-Agency Coordination Score	Participant feedback
SAR Resource Management and Readiness	**Presence of Coastguard Auxiliary Units**	Number of Coastguard Auxiliary Units	SAR Response Times	Unit records
		SAR Assets Operational Availability	Incident Response Effectiveness	Operational data
Collaboration, Coordination and Trust	**Existence of regular communications between SAR teams and NEM**	Communication Effectiveness Index	Cross-Agency Coordination Score	Communication logs
		Information Sharing Speed	Knowledge Integration Score	Stakeholder surveys
Collaboration, Coordination and Trust	**Creation of regional SAR body associations**	Number of regional SAR associations	Sustained Cross-Agency Partnerships	Association records
		Cross-Agency Resource Sharing Index	Overall Resource Allocation Efficiency	Resource sharing agreements

Staff Recruitment, Retention and Workload	**Availability of mental health support**	Mental health support utilization rate	Overall Well-Being Index for SAR Coordinators and Responders	Support service usage data
		Perceived Work-life Balance	Reduced burnout and mental health issues	Well-being surveys
Staff Recruitment, Retention and Workload	**Incentives to participate in community SAR**	Community Participation Rate	SAR Role Reputation	Participation records
		Incentive utilization rate	Community Safety Improvement	Community surveys
Education and Training	**Level of knowledge exchange from elders**	Elder Knowledge Exchange Index	SAR Responders Expert Knowledge Score	Session records
		Number of knowledge sharing sessions	Knowledge Integration Score	Participant surveys
Community Engagement	**Degree of education from land/sea users**	Land/Sea User Education Participation Rate	Incident Rate	Training records
		User Knowledge Assessment Score	SAR Incident Complexity Index	Knowledge tests
Community Engagement	**SAR education in schools**	Number of SAR education sessions in schools	Community Safety Improvement	School program records
		Student SAR Knowledge Score	Public Awareness Score	Student assessments
Community Engagement	**Public SAR education other than schools**	Number of public SAR education events	Community Safety Improvement	Event records
		Public SAR Knowledge Score	SAR Role Reputation	Public surveys
Incident, Environmental Conditions and Incident outcome	**Balance of SAR incidents towards more difficult rescues**	Incident Complexity Score	Overall SAR Incident Complexity Index	Incident reports
		SAR Complex Incident Rate	SAR Response Success Rate	Operational data
Community Engagement	**Level of expertise of land/sea users**	Land/Sea User Expertise Assessment Score	Incident Rate	Skill assessments
		User Certification Rate	SAR Incident Complexity Index	Certification records
Community Engagement	**Level of community engagement with SAR**	Community Participation Rate	SAR Role Reputation	Event attendance records
		Number of community SAR events	Community Safety Improvement	Community surveys
Community Engagement	**Increased use of social media**	Social Media Mentions	Public Awareness Score	Social media analytics
		Engagement Rate	SAR Role Reputation	Online engagement data
Collaboration, Coordination and Trust	**Strength of relationships between SAR teams and rangers**	Collaboration Frequency	Cross-Agency Coordination Score	Joint operation reports
		Joint Operation Success Rate	Overall SAR Resource Readiness	Stakeholder surveys
		Inter-agency Communication Effectiveness	Incident Response Effectiveness	Communication logs

Collaboration, Coordination and Trust	**Strength of relationship between SAR teams and RCMP/nurses**	Joint Training Frequency	Cross-Agency Resource Sharing Index	Training records
Collaboration, Coordination and Trust	**Strength of relationship between SAR teams and NEM**	Information Sharing Speed	Knowledge Integration Score	Communication logs
		Coordination Effectiveness Score	Overall SAR Resource Readiness	Stakeholder surveys
Staff Recruitment, Retention and Workload	**Presence of paid community SAR Coordinators**	Number of Paid Coordinators	SAR Response Times	Personnel records
		Coordinator Retention Rate	Incident Response Effectiveness	Operational data
Education and Training	**Level of expert knowledge of local responders**	SAR Responders Expert Knowledge Score	SAR Responders Capabilities Score	Skills assessments
		Skills Acquisition Score	Incident Response Effectiveness	Operational performance data
Education and Training	**Level of expert knowledge of community SAR coordinators**	Coordinator Knowledge Assessment Score	SAR Coordinator Capabilities Score	Knowledge tests
		Decision-Making Effectiveness	Overall SAR Resource Readiness	Performance evaluations
Collaboration, Coordination and Trust	**Effectiveness of SAR coordination**	Coordination Efficiency Index	SAR Response Times	Operational data
		Resource Allocation Effectiveness	SAR Response Success Rate	Mission reports
Staff Recruitment, Retention and Workload	**Creation of full-time admin**	Full-Time Admin Post Creation Rate	Admin Burden Index	Personnel records
		Admin Staff Ratio	Paperwork Processing Time	Administrative task logs
Collaboration, Coordination and Trust	**Presence of agreed SAR protocols**	Protocol Compliance Rate	Incident Response Effectiveness	Protocol documentation
		Cross-Agency Coordination Score	Knowledge Integration Score	Operational reports
Collaboration, Coordination and Trust	**Roundtable Initiatives**	Number of Roundtable Sessions	Knowledge Integration Score	Session records
		Participant Diversity Index	Cross-Agency Coordination Score	Participant surveys
Collaboration, Coordination and Trust	**Best Practices Shared**	Number of Best Practices Documented	Knowledge Integration Score	Documentation records
		Best Practices Adoption Rate	SAR Response Success Rate	Operational reports
Collaboration, Coordination and Trust	**Community participation in roundtables**	Community Participation Rate	Community Safety Improvement	Attendance records
		Community Feedback Score	SAR Role Reputation	Participant surveys
Collaboration, Coordination and Trust	**Literature reviews**	Number of Literature Reviews Conducted	Knowledge Integration Score	Research documentation
		Research Integration Index	SAR Responders Expert Knowledge Score	Knowledge assessment tests

Table A 2: General Impact Metrics for overall NSAR Impact Assessment

Metric Category	Metric	Description	Data Collection Approach	Logical Model Classification
SAR Response	**Response Time Improvement**	Measures changes in average response times for SAR incidents before and after implementing changes.	Analyze historical response time data before and after changes.	Impact
SAR Response	**Increased Mission Success Rates**	Tracks the proportion of successful SAR missions relative to total missions conducted.	Track mission outcomes and success rates over time.	Impact
SAR Response	**Lives Saved**	The number of lives saved as a direct result of improved SAR mission success rates.	Compare incident reports and outcomes to determine lives saved.	Impact
SAR Prevention	**Community Safety Improvement**	Assesses the perceived safety of the community due to effective SAR operations.	Community surveys and feedback forms.	Impact
SAR Preparedness	**Overall SAR Resource Readiness**	A composite measure reflecting the readiness of all SAR resources (equipment, personnel, facilities).	Aggregate data from readiness assessments and resource availability logs.	Impact
SAR Response	**Incident Response Effectiveness**	The success rate of SAR missions, measured as the percentage of successful rescues or operations.	Track mission outcomes and success rates over time.	Impact
SAR Preparedness	**Overall SAR Incident Complexity Index**	Proportion of complex SAR incidents that require specialized skills or coordination.	Analyze incident reports to categorize complexity levels.	Impact
SAR Preparedness	**Community Resilience Index**	A composite measure to assess the ability of the community to prepare for, respond to, and recover from adverse events.	Community surveys and resilience assessments.	Impact
SAR Preparedness	**Community Trust and Confidence**	The level of trust the Nunavummuit have in local authorities (like SAR services) and their confidence to venture into hazardous environments.	Surveys measuring public trust and confidence levels.	Impact
SAR Prevention	**Prevention Score**	A measure of prevention initiatives in the community for emergency situations (training, plans, drills).	Assessment of community training programs and drills conducted.	Impact
SAR Preparedness	**Preparedness Score**	A measure of how well-prepared the community is for emergency situations (training, plans, drills).	Surveys assessing community preparedness activities.	Impact
SAR Response	**Response Capacity**	The community's ability to respond quickly and effectively to emergencies.	Evaluate response times and resource availability during incidents.	Impact

Table A 3: Pathway specific metrics SAR Resource Management and Readiness Logic Model

Metric Category	Specific Metrics	Description	Data Collection	Logic Model Classification
Equipment Readiness	Equipment Readiness	Percentage of essential SAR equipment ready for deployment	Equipment inventory checks and status reports	**Outcome**
	SAR Equipment Operational Availability	Number of specific SAR equipment (e.g., snowmobiles, ATVs, GPS devices) that are functional and ready for deployment.	Regular equipment checks and maintenance logs.	**Input**
	SAR Equipment Inventory Availability	Total number of SAR equipment available, operational and non-operational	Equipment inventory checks and status reports	**Input**
Asset Readiness	Asset Readiness	Percentage of essential SAR assets that are ready for deployment	Regular asset inspections and status reports Maintenance logs and readiness assessments Periodic audits of asset inventory and operational status	**Outcome**
	SAR Assets Operational Availability	Number of specific SAR assets (e.g., federal, air, marine) that are functional and ready for deployment.	Asset status reports and maintenance records.	**Output**
	SAR Assets Inventory Availability	Total number of SAR assets available, operational and non operational	Regular asset inspections and status reports Maintenance logs and readiness assessments Periodic audits of asset inventory and operational status	**Input**
Resource Sharing	Cross-Agency Resource Sharing Index	Extent to which SAR resources (personnel, equipment, facilities) are shared between agencies and regions.	Inter-agency agreements and joint operation reports.	**Outcome**
	Cross-Agency Coordination Score	Effectiveness of coordination between SAR teams, Coast Guard, RCMP, etc.	Post-operation surveys and joint mission reports.	**Outcome**
	Joint Resource Sharing Rate	The frequency of cross-agency collaborations and resource sharing	Joint operations reports	**Output**
Resource Allocation	Overall Resource Allocation Efficiency	Measure of how optimally SAR resources (personnel, equipment, facilities) are allocated to regions, tasks, or missions.	Resource allocation logs and mission reports.	**Output**

	Equipment Allocation Efficiency	A measure of how optimally SAR equipment are allocated to specific regions, tasks, or missions, ensuring maximum resource utilization without underuse or overuse.	Resource allocation logs and mission reports.	**Output**
	Asset Allocation Efficiency	A measure of how optimally SAR assets are allocated to specific regions, tasks, or missions, ensuring maximum resource utilization without underuse or overuse.	Resource allocation logs and mission reports.	**Output**
	Personnel Allocation Efficiency	A measure of how optimally SAR personnel are allocated to specific regions, tasks, or missions, ensuring maximum resource utilization without underuse or overuse.	Resource allocation logs and mission reports.	**Output**
Resource Utilization	Equipment Utilization Rate	Percentage of available equipment actively deployed during operations.	Equipment deployment logs and mission reports.	**Output**
	Asset Utilization Rate	Percentage of available assets actively deployed during operations.	Asset deployment logs and mission reports.	**Output**
	Personnel Utilization Rate	Percentage of available personnel actively deployed during operations.	Personnel deployment logs and mission reports.	**Output**
Resource-to-Incident Ratios	Equipment-to-Incident Ratio	The ratio of available equipment to the number of incidents requiring those equipment.	Equipment and asset inventory systems Personnel rosters and availability schedules Incident report databases	**Output**
	Asset-to-Incident Ratio	The ratio of available assets to the number of incidents requiring those assets.	Equipment and asset inventory systems Personnel rosters and availability schedules Incident report databases	**Output**
	SAR Personnel-to-Incident Ratio	The ratio of available personnal to the number of incidents requiring those personnel.	Equipment and asset inventory systems Personnel rosters and availability schedules Incident report databases	**Output**

	SAR Building Availability Rate	Percentage of communities with dedicated SAR buildings.	Facility inventory and community surveys.	**Output**
	Storage Capacity	Storage capacity of building or facility	Facility inventory and community surveys.	**Input**
Facility Readiness	Resource Accessibility Score	A composite measure reflecting how quickly and easily SAR resources (equipment, assets, personnel, facilities) can be accessed and mobilized for operations.	Regular assessments of resource storage locations Time logs for resource retrieval during drills and actual operations Surveys of SAR personnel regarding ease of access to resources	**Outcome**
	SAR Building Readiness	Composite score indicating how ready SAR buildings are to support operations. Reflects storage capacity, availability, and resource accessibility.	Facility inspections and readiness assessments.	**Outcome**
Mobilization Time	Average SAR Personnel Mobilization Time	Time taken to deploy SAR personnel to the field from storage or facilities.	Time logs from personnel deployment during operations.	**Output**
	Average Facilities Mobilization Time	Time taken to deploy SAR facilities to the field from storage or facilities.	Time logs from faciltilities deployment during operations.	**Output**
	Average Asset Mobilization Time	Time taken to deploy SAR assets to the field from storage or facilities.	Time logs from assets deployment during operations.	**Output**
	Average Equipment Mobilization Time	Time taken to deploy SAR equipment to the field from storage or facilities.	Time logs from equipment deployment during operations.	**Output**
	Overall Resource Mobilization Time	Total time to deploy all resources for SAR operations.	Time logs from resource deployment during operations.	**Outcome**
Overall Readiness	Overall SAR Resource Readiness	Composite measure reflecting the readiness of all SAR resources (equipment, personnel, facilities).	Time logs from resource deployment during operations.	**Impact**
	Cross-Agency Resource Readiness	The readiness of shared resources (personnel, equipment, facilities) to be deployed during joint SAR operations.	Joint readiness assessments with partner agencies Inventory checks of shared resources Tracking of response times during multi-agency exercises	**Outcome**
Financial Support for Vehicles	Vehicle Financial Support Index	Quantifies financial support for users' own vehicles (repairs, fuel).	Financial records and reimbursement logs.	**Impact**

	Total Financial Support Amount	Total financial support amount	Funding	**Input**
	Number of Supported Vehicles	Number of vehicles that has financial support	Vehicle inventory, Funding	**Output**
	Vehicle Funds Support Utilization Rate	Percentage of allocated financial support actually utilized by users for SAR operations	This metric helps assess the effectiveness of the financial support program for users' own vehicles in SAR operations	**Outcome**
Provision of Equipment and Facilities	Presence of Dedicated SAR Buildings	Percentage of communities with dedicated SAR buildings.	Community surveys Facility inventory records Regular updates from regional SAR coordinators	**Input**
	Provision of Snowmobiles and ATVs	Availability of agency-provided vehicles for SAR operations.	Equipment inventory and procurement records Maintenance logs Utilization reports from SAR operations	**Input**
	Provision of GPS, SPOT for land/sea users	Availability and distribution of GPS and SPOT devices to land and sea users for improved safety and location tracking.	Distribution records of GPS and SPOT devices User registration data Usage logs and activation reports during SAR incidents	**Input**

Table A 4: Pathway specific metrics for SAR Collaboration, Coordination and Trust Logic Model

Metric Category	Metric	Description	Data Collection Approach	Logical Model Classification
Resource Sharing	Cross-Agency Resource Sharing Index	The extent to which SAR resources are shared between different agencies and regions	Inter-agency agreements and joint operation reports	**Output**

	Overall SAR Resource Readiness	A composite measure reflecting the readiness of all SAR resources	Combination of all readiness metrics and assessments	**Impact**
	Joint Resource Sharing Rate	The frequency of cross-agency collaborations and resource sharing	Track and log instances of resource sharing between agencies	**Output**
Coordination	Number of regional SAR associations	Count of established regional SAR body associations	Direct count from organizational records	**Output**
	Collaboration Frequency	Number of collaborative operations between SAR teams and rangers	Joint operation logs and reports	**Output**
	Joint Operation Success Rate	Percentage of successful joint operations between SAR teams and rangers	Mission success reports from joint operations	**Output**
	Joint Training Frequency	Number of joint training sessions between SAR teams and RCMP/nurses	Training session records and attendance logs	**Output**
	Coordination Effectiveness Score	Assesses the quality and efficiency of coordination between SAR teams and NEM	Post-operation surveys and coordination performance assessments	**Output**
	Cross-Agency Coordination Score	The effectiveness of coordination between SAR teams, Coast Guard, RCMP, etc.	Post-operation surveys and joint mission reports	**Output**
Communication	Communication Effectiveness Index	Measures how well different stakeholders in a SAR operation can share information and coordinate their efforts	Stakeholder surveys and communication logs	**Output**
	Communication Channel Reliability	Assess the reliability of communication channels in the operational area	Technical performance reports and user feedback	**Output**
Partnerships	Sustained Cross-Agency Partnerships	The continuation of resource-sharing agreements and collaboration between SAR agencies over time	Long-term tracking of inter-agency agreements and collaborations	**Impact**
Knowledge Integration	Knowledge Integration Score	Reflects how well knowledge is integrated into SAR operations, including lessons learned from debriefings, training sessions, and collaborative efforts	Assessments of knowledge application in operations	**Output**
Debriefing	Debriefing Frequency	Measures how often debriefing sessions occur after SAR events	Records of debriefing sessions	**Output**

	Debriefing Participation Rate	Assesses the level of involvement from SAR coordinators and responders in debriefing sessions	Attendance logs of debriefing sessions	**Output**
	Debriefing Quality Score	Evaluates the effectiveness and thoroughness of the debriefing process	Participant surveys and actionable insights generated	**Output**

Table A 5: Pathway specific metrics for Community Engagement Logic Model

Metric Category	Metric	Description	Data Collection Approach	Logical Model Classification
SAR Prevention	**SAR Prevention Score**	Evaluates the effectiveness of SAR prevention initiatives within the community.	Analysis of incident reports and prevention program outcomes.	Impact
SAR Preparedness	**SAR Preparedness Score**	Assesses community readiness for potential SAR incidents.	Surveys on community training and preparedness activities.	Impact
SAR Response	**SAR Response Capacity**	Measures the community's ability to respond to SAR incidents effectively.	Inventory of local resources and response capabilities assessments.	Impact
SAR Recovery	**SAR Recovery Score**	Evaluates how well the community recovers from SAR incidents.	Post-incident evaluations and recovery assessments.	Impact
Public Perception	**SAR Role Reputation**	Public perception and recognition of the SAR volunteer role within the community	Community surveys and feedback	Impact
SAR Preparedness	**Community Trust and Confidence**	Measures public trust in SAR services and personnel.	Surveys gauging public trust levels in SAR operations.	Impact
SAR Preparedness	**Community Safety Improvement**	The degree to which the community feels safer due to effective and timely SAR operations	Community surveys and incident reports	Impact
	Community Safety Index	Assesses the perceived safety of the community due to SAR operations.	Community surveys and feedback forms.	Impact

Social Media Engagement	**Social Media Mentions**	Total number of mentions or posts related to SAR on various social media platforms over a specific period	Social media analytics tools	Output
	Engagement Rate	The level of engagement (likes, shares, comments) on SAR-related posts	Social media analytics tools	Output
	Community Engagement Index	Measures the level of community involvement in SAR activities and programs.	Participation records from community events and training sessions.	Outcome
	Hashtag Usage	Frequency of specific hashtags related to SAR incidents	Social media analytics tools	Output
Communication	**Communication Effectiveness Index**	Measures how well different stakeholders in a SAR operation can share information and coordinate their efforts	Stakeholder surveys and communication logs	Impact
	Information Sharing Speed	Measure the average time taken to disseminate critical information across all relevant parties	Time logs of information dissemination	Output
SAR Preparedness	**Number of land/sea users or vessels operating in the area**	Count of potential SAR service users in the community	Registration data and community surveys	Input
	Community Training Participation Rate	Percentage of community members participating in SAR training programs.	Attendance records from training sessions and workshops.	Output
Incident Reporting	**Incident Reporting Efficiency**	Tracks the time taken to report SAR incidents to the relevant authorities	Incident report timestamps	Output
SAR Preparedness	**Community Resilience Index**	Measures the community's ability to withstand and recover from SAR incidents.	Surveys assessing community preparedness and resilience factors.	Impact
SAR Preparedness	**Land/Sea Users Expert Knowledge Index**	Assesses the expertise of land/sea users regarding SAR procedures and safety measures.	Surveys or interviews with land/sea users about their knowledge of SAR operations.	Output
	Public SAR Education (Other than Schools)	Evaluates educational efforts related to SAR outside formal schooling.	Assessment of community workshops, seminars, or outreach programs.	Output
	SAR Education in Schools	Measures the incorporation of SAR education within school curricula.	Surveys or curriculum reviews from educational institutions.	Output

	Public SAR Knowledge Score	Assesses the level of SAR-related knowledge among community members	Public surveys and knowledge tests	Output

Table A 6: Pathway specific metrics for SAR Recruitment, Retention and Workload Logic Model

Metric Category	Metric	Description	Data Collection Approach	Logical Model Classification
Recruitment, Retention	**Number of Paid Coordinators**	Total count of paid SAR coordinators across regions or communities.	Administrative records and personnel databases.	**Output**
	Retention Rate	Percentage of SAR responders who remain active over a specified period.	Personnel records and turnover statistics.	**Impact**
	Retention Rate of Incentivized Volunteers	The percentage of volunteers who remain active after receiving incentives compared to those who did not, influenced by effective administrative support.	Monitor volunteer activity records over time, focusing on incentivized groups.	**Impact**
	Job Satisfaction Score	Measures the satisfaction levels of SAR personnel regarding their roles and responsibilities.	Surveys and feedback forms from SAR personnel.	**Impact**
	Paid SAR Coordinator Coverage	Percentage of communities or regions that have paid SAR coordinators.	Community records and administrative data collection.	**Output**
	Night Shift Staffing Demand	Measures the demand for SAR personnel during night shifts.	Shift scheduling records and incident logs.	**Output**
	Turnover Rate	The percentage of SAR personnel who leave their positions over a specified period.	Personnel records	**Impact**
	Recruitment Drives	The number of recruitment events or campaigns conducted to attract new SAR personnel.	Event logs and attendance records from recruitment activities.	**Output**
Paid Coordinator Presence	**Lives Saved**	The number of lives saved as a direct result of improved SAR mission success rates attributed to having paid coordinators.	Compare incident reports and outcomes to determine lives saved.	**Impact**
	Incident Response Effectiveness	Assesses the success rate of SAR missions, measured as the percentage of successful rescues or operations following the introduction of paid coordinators	Track mission outcomes and success rates over time.	**Impact**

	Response Time Improvement	Measures changes in average response times for SAR incidents before and after the introduction of paid community coordinators.	Analyze historical response time data before and after coordinator implementation.	**Impact**
SAR Personnel Capabilities	**Overall SAR Responder Capabilities Score**	Assesses the overall capabilities of SAR responders, including both paid and volunteer personnel involved in operational activities.	Performance evaluations and skills assessments.	**Outcome**
	SAR Responders Training Effectiveness Index	Measures both the proficiency and satisfaction levels of SAR responders with their training programs.	Training evaluations and participant surveys.	**Outcome**
	Equipment Training Participation Rate	The involvement of SAR personnel in training programs designed to build equipment proficiency.	Attendance records from training sessions focused on equipment use.	**Output**
	Equipment Proficiency Score	A composite score reflecting the overall ability of SAR responders to effectively use SAR equipment in operations.	Skills assessments and performance evaluations during training and missions.	**Output**
Workload Management	**Overall SAR Workload/Pressure**	Measures the number and difficulty of SAR missions over a specified period, assessing the operational burden on teams.	Incident logs and workload assessments.	**Impact**
Administrative Support	**Full-Time Admin Post Creation Rate**	Percentage of regional SAR associations that have established full-time administrative positions.	Tracking the creation of administrative posts through organizational reports.	**Output**
	Admin Burden Index	Measures administrative burden on SAR teams over a period (e.g., monthly or quarterly).	Administrative task logs and surveys on workload stress.	**Output**
	Administrative Support Availability Score	Measures the availability of administrative support for SAR operations including full time admins	Surveys or assessments of administrative staff presence and effectiveness.	**Output**
	Increased Mission Success Rate	Tracks improvements in mission success rates due to enhanced administrative support and coordination efforts.	Analyze mission success data pre- and post-administrative enhancements.	**Impact**

	Overall SAR Resource Readiness	A composite measure reflecting the readiness of all SAR resources (equipment, personnel, facilities) influenced by administrative support.	Aggregate data from readiness assessments and resource availability logs.	**Impact**
Work-Life Balance	**Perceived Work-Life Balance**	Survey results on perceived workload stress among SAR personnel (scale of 1-5).	Surveys assessing work-life balance perceptions among staff.	**Impact**
	Workload Balance Score	A measure of how well SAR personnel manage their work responsibilities alongside personal life commitments.	Surveys and workload assessments comparing actual hours worked to recommended hours.	**Output**
Overall SAR Personel Readiness	**Overall SAR Personnel Readiness Score**	Overall preparedness of SAR responders including their availability, skills, training, equipment proficiency, and overall capabilities.	Performance evaluations and readiness assessments.	**Output**
	Night Shift Staffing Demand	Measures the demand for SAR personnel during night shifts.	Shift scheduling records and incident logs.	**Output**
	Paid SAR Coordinator Presence	Percentage of communities or regions that have paid SAR coordinators.	Community records and administrative data collection.	**Output**
	SAR Coordinator Readiness Score	Overall preparedness of SAR coordinators including their availability, skills, training, equipment proficiency, and overall capabilities.	Performance evaluations and readiness assessments.	**Output**
	SAR Volunteer Readiness Score	Overall preparedness of SAR volunteers including their availability, skills, training, equipment proficiency, and overall capabilities.	Performance evaluations and readiness assessments.	**Output**
	SAR Responder Readiness Score	Overall preparedness of SAR responders including their availability, skills, training, equipment proficiency, and overall capabilities.	Performance evaluations and readiness assessments.	**Output**
Well Being	**Workload Stress Index**	Composite score reflecting SAR personnel stress levels due to workload, including burnout and emotional strain.	Surveys assessing stress levels and workload perceptions.	**Impact**

	Availability of Mental Health Support	Measures the accessibility of mental health resources for SAR personnel.	Surveys on mental health resource availability and usage statistics.	**Output**
	Mental Health Support Utilization Rate	The percentage of SAR coordinators and volunteers who utilize available mental health support services.	Surveys on mental health resource availability and usage statistics.	**Output**
	Overall Well-Being Index for SAR Coordinators and Responders	A composite index that combines various indicators of well-being among SAR personnel, including physical health, mental health, job satisfaction, and work-life balance.	Surveys assessing various well-being indicators among personnel.	**Impact**
	SAR Personnel Morale Index	Overall satisfaction and motivation of SAR volunteers and paid personnel.	Surveys measuring morale and job satisfaction levels.	**Impact**
Incentive Utilization	**Incentive Utilization Rate**	The percentage of community members who utilize the available incentives for participation in community SAR activities.	Surveys or registration data tracking incentive usage.	**Output**
	Incentive Effectiveness Score	Measures effectiveness of various incentives offered to encourage participation in community SAR activities.	Surveys assessing participant feedback on incentives received.	**Impact**
	Retention Rate of Incentivized Volunteers	The percentage of volunteers who remain active after receiving incentives compared to those who did not receive incentives.	Tracking volunteer activity records over time.	**Impact**

Table A 7: SAR Personnel Education and Training Logic Model

Metric Category	Metric	Description	Data Collection Approach	Logical Model Classification
Training	**SAR Responders Training Effectiveness Index**	Measures both the proficiency and satisfaction levels of SAR responders with their training programs.	Surveys and performance evaluations post-training.	**Output**
	SAR Coordinators Training Effectiveness Index	Measures both the proficiency and satisfaction levels of SAR coordinators with their training programs.	Surveys and performance evaluations post-training.	**Output**
	Equipment Training Participation Rate	The involvement of SAR personnel in training programs designed to build equipment proficiency.	Attendance records from training sessions.	**Output**
Knowledge	**SAR Responders Expert Knowledge Score**	Composite measure assessing the overall level of expert knowledge among community SAR responders.	Knowledge assessments and surveys of responders' expertise levels.	**Impact**
	SAR Cordinators Expert Knowledge Score	Composite measure assessing the overall level of expert knowledge among community SAR coordinators.	Knowledge assessments and surveys of responders' expertise levels.	**Impact**
Equipment Skills	**Equipment Familiarity Score**	Assesses the level of understanding of SAR personnel with SAR equipment.	Surveys or assessments evaluating knowledge of equipment.	**Output**
	Operational Performance with Equipment	Evaluates how well SAR personnel apply their equipment skills in actual operations.	Performance evaluations during SAR missions.	**Impact**
	Equipment Proficiency Score	A composite score reflecting the overall ability of SAR responders to effectively use SAR equipment.	Skills assessments during training and operational evaluations.	**Output**
Trainings	**Number of Coast Guard Training - CCGA Members**	Total count of Coast Guard Auxiliary members trained in SAR operations.	Training logs and membership records from Coast Guard Auxiliary.	**Output**
	Number of CASARA Spotter Training	Total number of training sessions conducted for CASARA spotters involved in SAR operations.	Attendance records from CASARA training sessions.	**Output**

	Number of Drone Training	Total number of drone training sessions conducted for SAR personnel.	Attendance records from drone training sessions.	**Output**
	Number of Training Delivered by Federal/Territorial Agencies	Total number of training sessions delivered by federal or territorial agencies related to SAR operations.	Event logs and attendance records from training events.	**Output**
	Delivery by NEM of Nunavut Specific SAR Training	Number of Nunavut-specific training sessions conducted for local SAR personnel.	Attendance records and training session logs specific to Nunavut.	**Output**
	Number of SAR Exercises	Total number of exercises conducted to simulate SAR operations for training purposes.	Event logs and participation records from SAR exercises.	**Output**
Overall Capabilities	**Overall SAR Responder Capabilities Score**	Assesses the overall capabilities of SAR responders, including both paid and volunteer personnel involved in operational activities.	Performance evaluations and capability assessments.	**Output/Outcome**
	Overall SAR Coordinator Capabilities Score	Assesses the overall capabilities of SAR coordinators, including both paid and volunteer personnel involved in operational activities.	Performance evaluations and capability assessments.	**Output/Outcome**

Table A 8: Pathway specific metrics for Social Media Engagement and Communication

Metric Category	Metric	Description	Data Collection Approach	Logical Model Classification
Social Media Engagement	Social Media Mentions	Total number of mentions or posts related to SAR on various social media platforms over a specific period	Social media analytics tools	Output
	Engagement Rate	The level of engagement (likes, shares, comments) on SAR-related posts	Social media analytics tools	Output/Outcome
	Total Engagements	Sum of likes, shares, and comments on SAR-related posts	Social media analytics tools	Output
	Total SAR Posts	Number of posts made by SAR organizations on social media platforms	Track posts on official SAR accounts	Output
	Hashtag Usage	Frequency of specific hashtags related to SAR incidents	Social media analytics tools	Output
Communication Effectiveness	Communication Effectiveness Index	Measures how well different stakeholders in a SAR operation can share information and coordinate their efforts	Surveys, post-operation evaluations	Output/Outcome
	Information Sharing Speed	Average time taken to disseminate critical information across all relevant parties	Time-stamped communication logs	Output
	Communication Channel Reliability	Reliability of communication channels in the operational area	Technical performance logs, user feedback	Output
	Cross-agency Coordination Score	Effectiveness of coordination between different agencies involved in SAR operations	Post-operation surveys, evaluations	Output/Outcome
	Timely Response Rate	Average number of stakeholder responses within target or threshold time	Communication logs	Output/Outcome
Communication Infrastructure	Extent of VHF Radio Coverage	Impact of extent of VHF coverage on all the general impact indicators. Impacts communication effectiveness index		Impact
Negative Communications	Abusive Messaging Rate	Rate of abusive messages per incident	Social media monitoring tools	Output
	Impact on Team Morale	Average rating of team morale based on surveys conducted after receiving abusive messages	Surveys using a scale of 1-5	Impact
	Total Negative Communications	Count of total negative communications received via social media	Social media monitoring tools	Output

Table A 9: Metrics for SAR Incident Management and Environmental Adaptation Pathway

SAR Category	Specific Metrics	Description	Data Collection	Logic Model Classification	BN Classification	MCM Metric Type
SAR Preparedness	**SAR Incident Load**	Operational burden of SAR teams, combining the frequency and duration of SAR incidents.	Historical incident data	Outcome	Uncertainty	Inferred
SAR Preparedness	**Incident Complexity Score**	Measures complexity of SAR incidents based on environmental and situational factors.	Complexity assessment during incidents	Outcome	Uncertainty	Inferred
SAR Preparedness	**Overall SAR Incident Complexity Index**	Aggregated complexity score for SAR incidents over time, considering factors such as location and weather.	Aggregated incident records	Outcome	Outcome	Composite
SAR Preparedness	**Incident Complexity Score**	Complexity rating assigned to SAR incidents based on situational factors like environment and access.	Incident complexity assessments	Outcome	Uncertainty	Inferred
SAR Preparedness	**SAR Role Reputation**	Public perception and recognition of SAR volunteers within the community.	Public surveys, community feedback	Outcome	Outcome	Inferred
SAR Preparedness	**Environmental Severity Index**	Measures environmental conditions during SAR missions (e.g., wind speed, visibility).	Weather data and incident logs	Input	Uncertainty	Core
SAR Preparedness	**Resource Availability**	Availability of critical SAR resources such as personnel, equipment, and facilities.	Resource tracking systems	Input	Constraint	Core

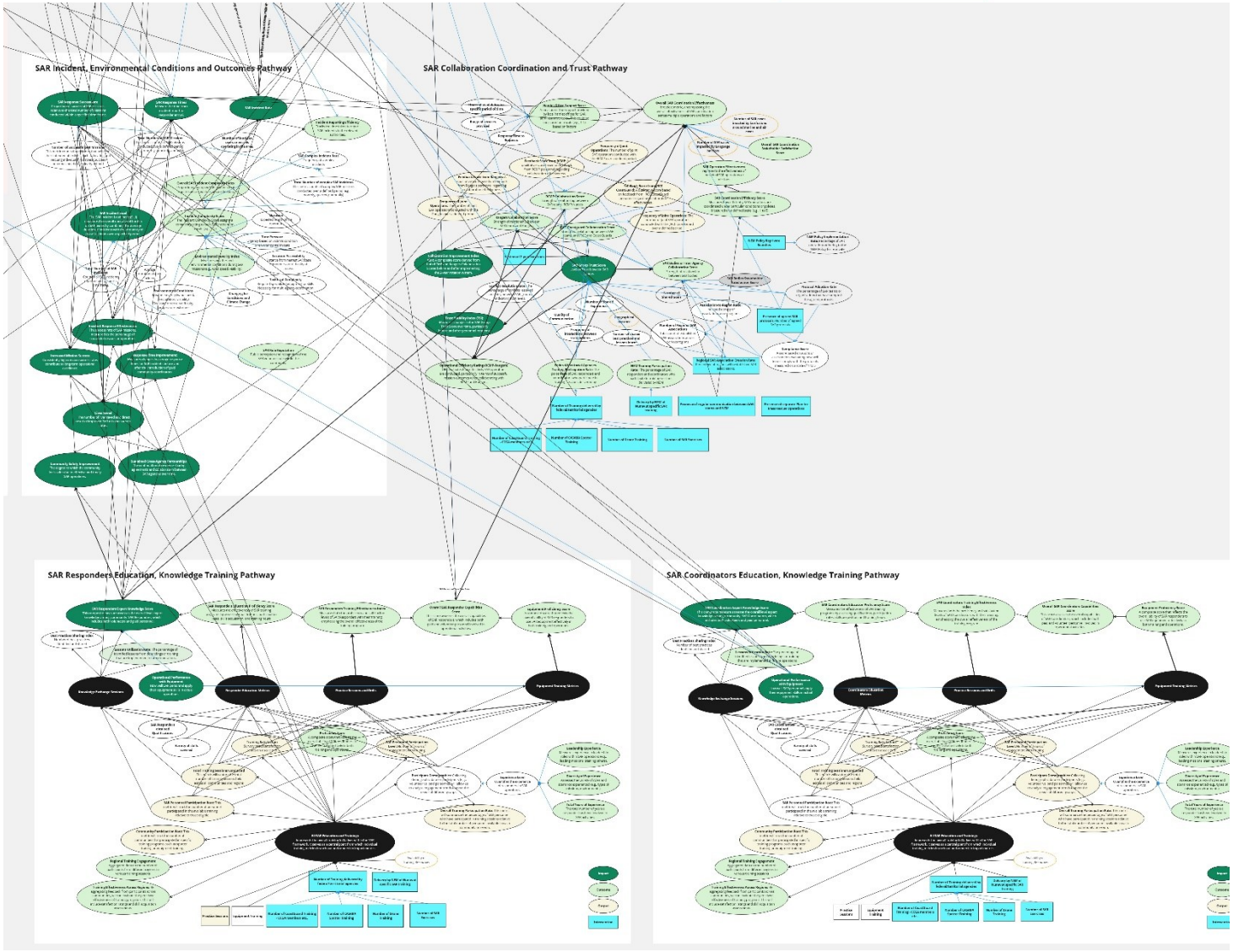
SAR Preparedness	**SAR Preparedness Score**	Evaluates how well-prepared the community is for emergency situations.	Training participation logs, drills	Output	Outcome	Core
SAR Preparedness	**Emergency Training Participation Rate**	Percentage of community members participating in training programs or drills.	Training attendance records	Output	Outcome	Core
SAR Preparedness	**Infrastructure Recovery Time**	Time taken to restore essential infrastructure and equipment after an emergency.	Operational recovery reports	Output	Outcome	Inferred
SAR Preparedness	**Changing Ice Conditions**	Assesses the impact of changing ice conditions and climate on SAR operations.	Environmental monitoring data	Outcome	Uncertainty	Inferred
SAR Prevention	**SAR Prevention Score**	Evaluates how well-prepared the community is for preventative emergency situations.	Training participation logs, drills	Output	Outcome	Core
SAR Prevention	**Community Resilience Index**	Assesses the ability of the community to prepare for, respond to, and recover from adverse events.	Community feedback and preparedness reports	Impact	Outcome	Composite
SAR Prevention	**Community Safety Index**	Measures the degree to which the community feels safer due to effective SAR operations.	Surveys, incident logs	Impact	Outcome	Composite
SAR Prevention	**Public Confidence in SAR Services**	Reflects public trust in SAR services' ability to respond effectively to emergencies.	Public surveys, interviews	Outcome	Outcome	Inferred
SAR Prevention	**Community Trust and Confidence**	Level of trust and confidence among residents in SAR services and their safety protocols.	Community surveys	Outcome	Outcome	Inferred

SAR Response	**SAR Response Success Rate**	Proportion of SAR missions successfully completed within a specific time frame.	SAR mission reports and post-operation logs	Output	Outcome	Core
SAR Response	**SAR Response Times**	Average time taken to respond to SAR incidents, from report to deployment.	Incident logs and timing records	Output	Outcome	Core
SAR Response	**Increased Mission Success**	Consistently high success rates across missions contribute to long-term operational excellence.	Mission success reports	Impact	Outcome	Impact
SAR Response	**Lives Saved**	Number of individuals rescued successfully, indicating SAR operational effectiveness.	Incident outcome logs	Impact	Outcome	Impact
SAR Response	**Incident Reporting Efficiency**	Tracks the time taken to report SAR incidents to relevant authorities.	Incident logs and communication records	Input	Constraint	Core
SAR Response	**SAR Incident Rate**	Total number of SAR incidents occurring within a specified time frame.	Incident reports	Input	Constraint	Core
SAR Response	**SAR Complex Incident Rate**	Frequency of complex SAR incidents requiring specialized skills or coordination.	Incident logs and assessment reports	Output	Outcome	Core
SAR Response	**Total Number of SAR Missions**	Total number of SAR missions conducted within a defined period.	Operational reports	Input	Outcome	Core
SAR Response	**Number of Successful SAR Missions**	Count of missions achieving intended objectives such as locating and rescuing individuals in distress.	Operational reports	Output	Outcome	Core

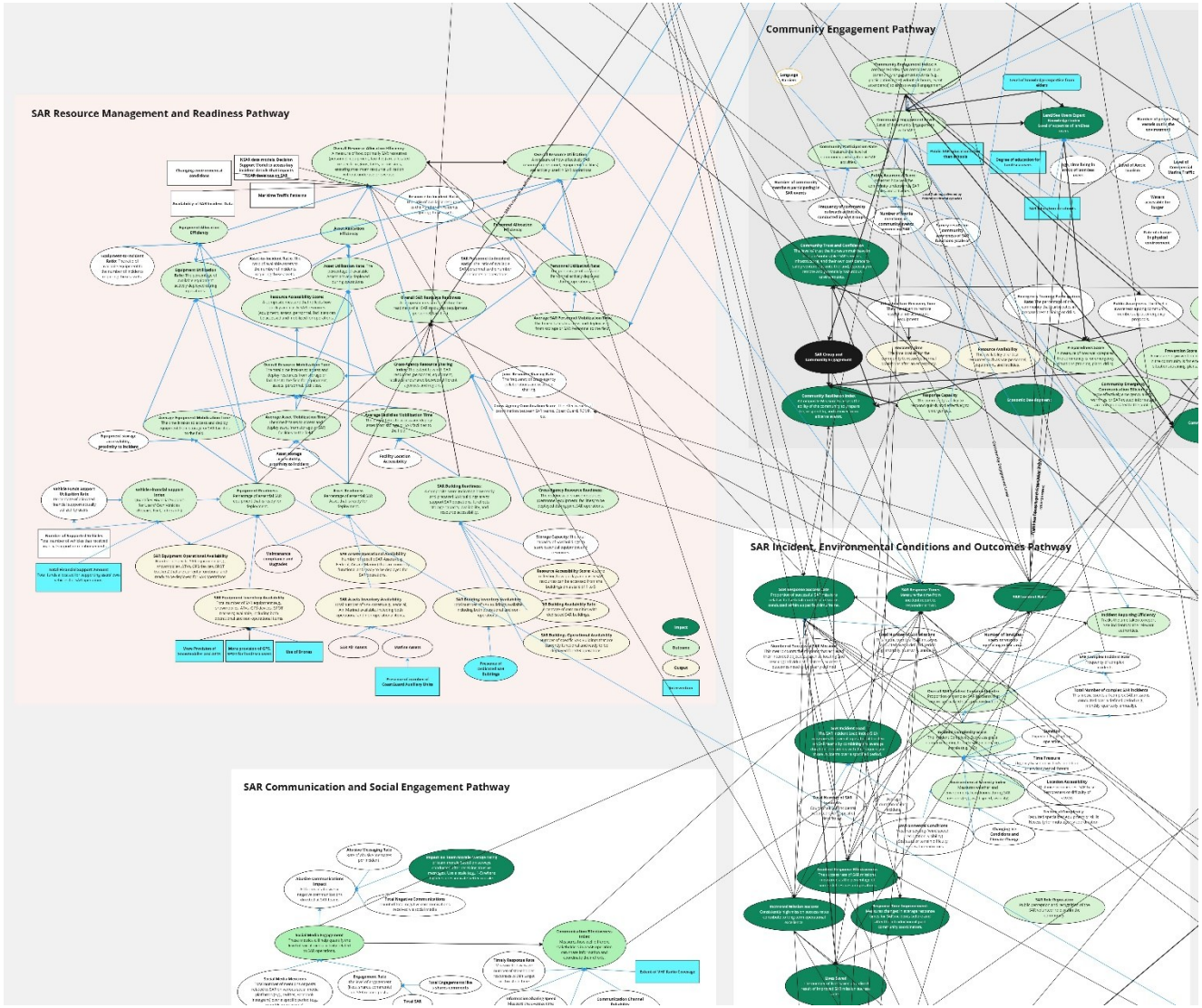
SAR Response	**Response Time Improvement**	Measures changes in response times after specific interventions.	Pre/post-intervention timing comparisons	Outcome	Outcome	Composite
SAR Response	**Incident Response Effectiveness**	Measures SAR mission success rates as a percentage of successful operations.	Incident reports	Impact	Outcome	Impact

Appendix B: Metric Causal Maps (MCMs)

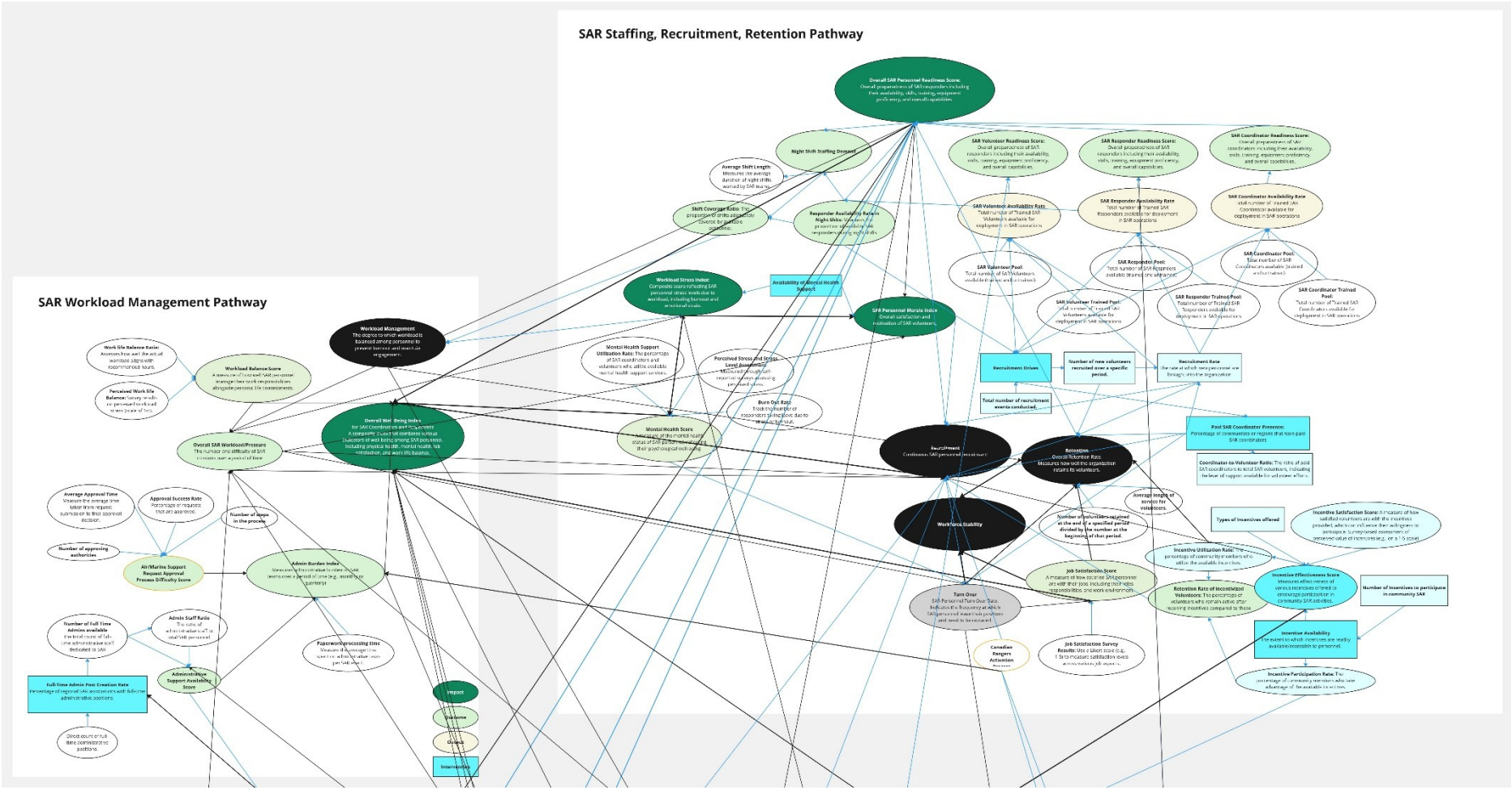
Picture B 1: Metric Causal Map for SAR Personnel Education and Training Logic Model Pathway



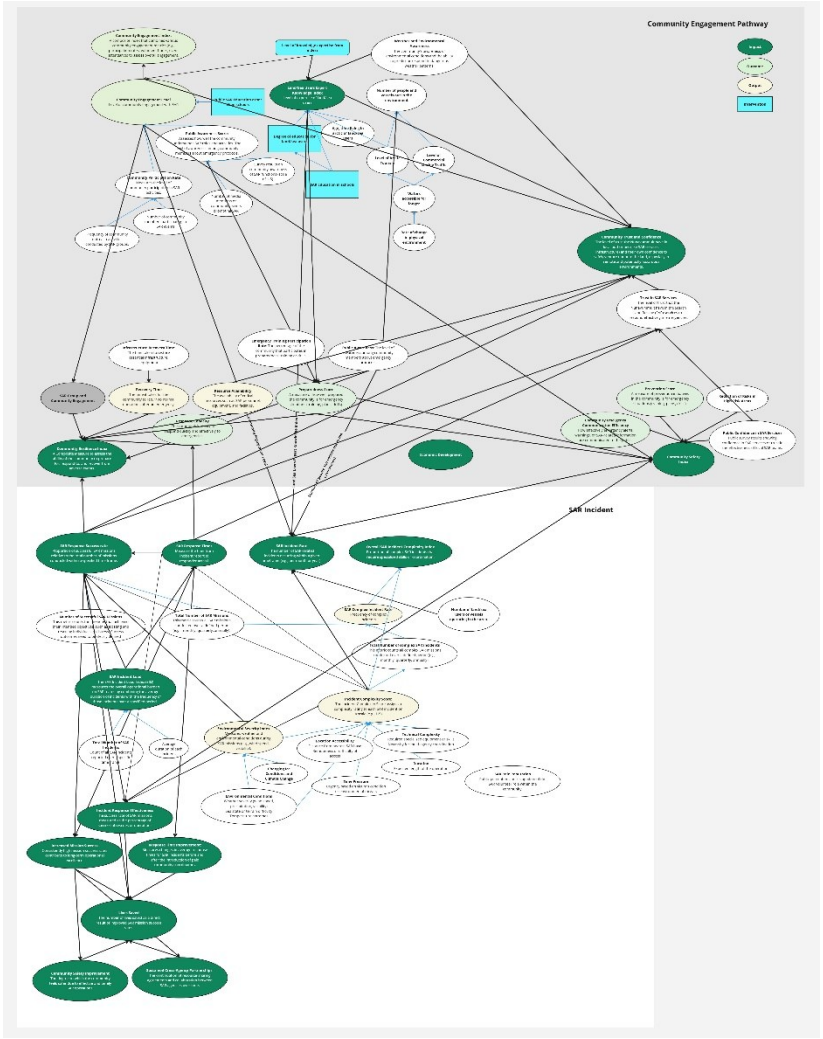
Picture B 2: Metric Causal Map for SAR Resource Management and Readiness Logic Model Pathway



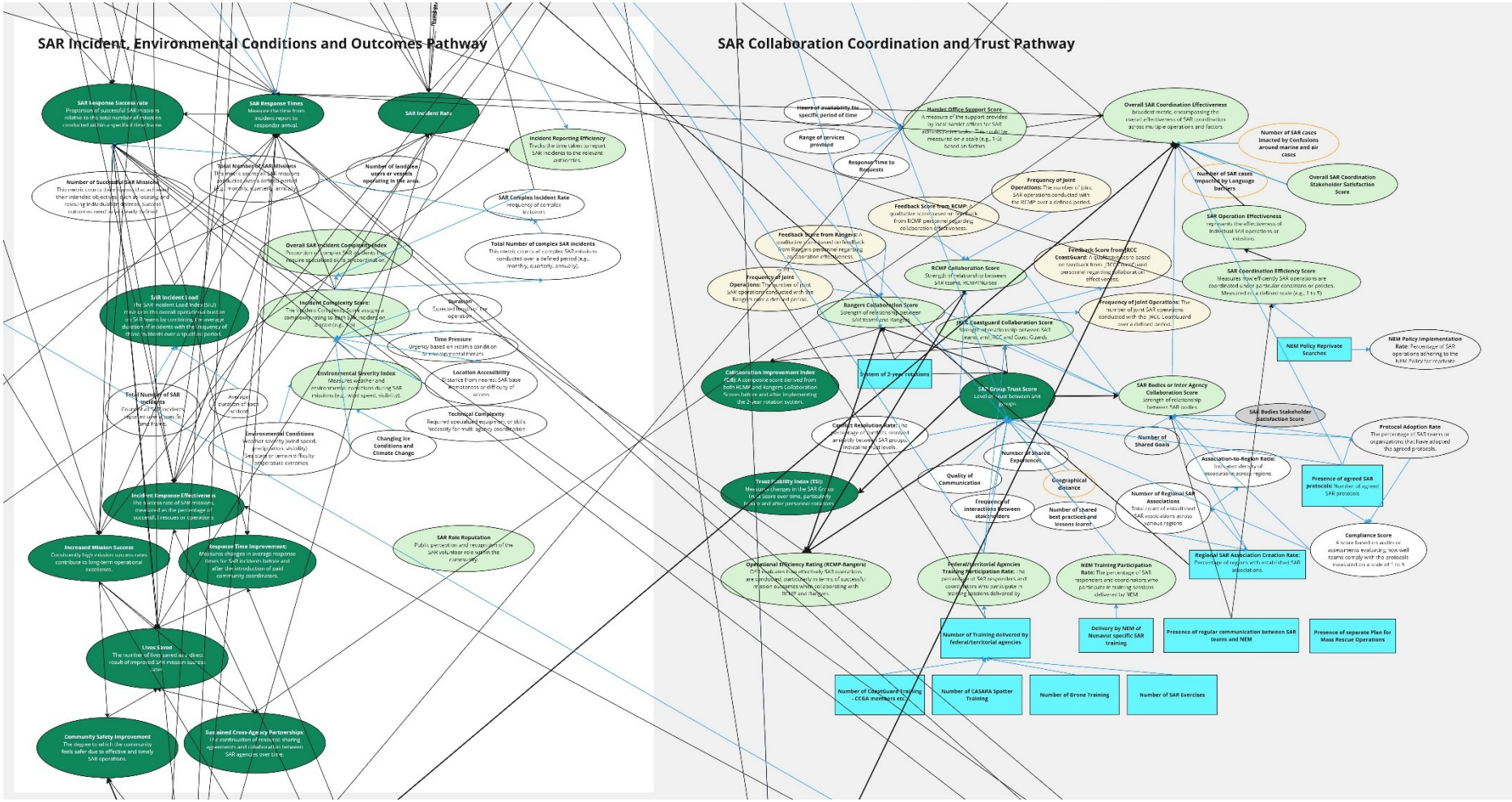
Picture B 3: Metric Causal Map for SAR Recruitment, Retention and Workload Logic Model Pathway



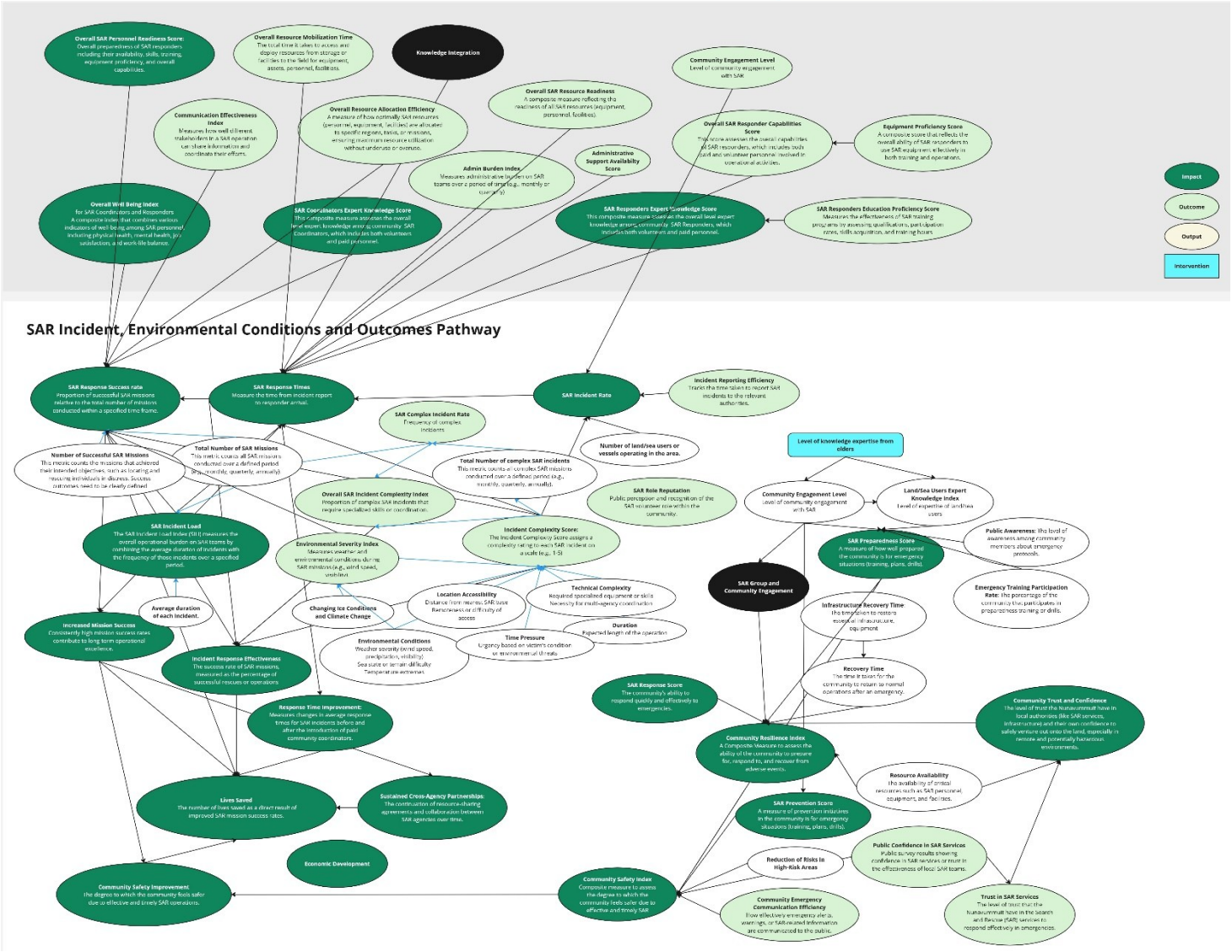
Picture B 4: Metric Causal Map for Community Engagement Logic Model



Picture B 5: Metric Causal Map for SAR Inter Agency Collaboration Coordination Knowledge and Trust Logic Model Pathway



Picture B 6: Metric Causal Map for SAR Incident, Environmental Conditions and Incident Outcome Logic Model Pathway



Appendix C: Identified changes and interventions

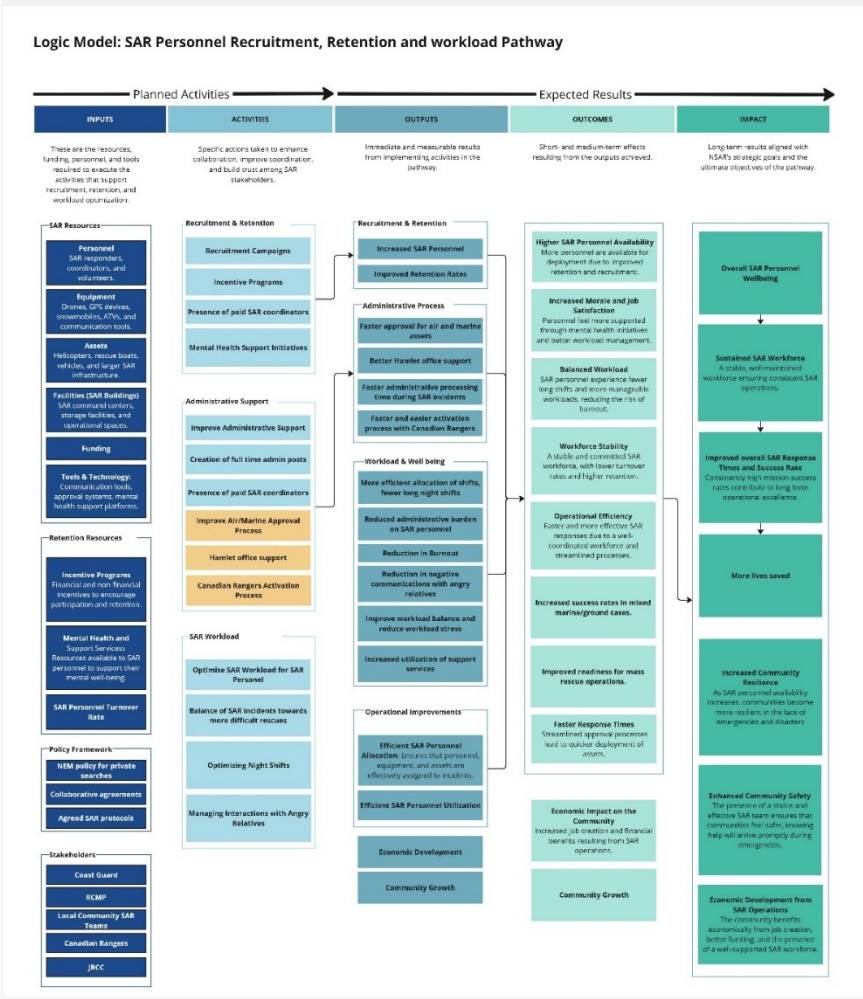
Table C 1: Key identified SAR decisions, changes and interventions

Pathway	#	Decision/Change/Intervention
Collaboration, Coordination and Trust	1	System of 2-year rotations
Collaboration, Coordination and Trust	2	Local Training delivered by federal and territorial agencies
Collaboration, Coordination and Trust	3	Creation of regional SAR associations
SAR Resource Management and Readiness	4	Financial Support for Users' own vehicles
SAR Resource Management and Readiness	5	Provision of snowmobiles, ATVs
SAR Resource Management and Readiness	6	Presence of dedicated SAR buildings within communities
SAR Resource Management and Readiness	7	Provision of GPS, SPOT for land/sea users
SAR Communication and Social Engagement	8	Extent of VHF radio coverage
Collaboration, Coordination and Trust	9	Presence of separate plan for Mass Rescue Operations
Collaboration, Coordination and Trust	10	Presence of agreed SAR protocols
Collaboration, Coordination and Trust	11	Coastguard Training - CCGA Members
Collaboration, Coordination and Trust	12	CASARA Spotter Training
Collaboration, Coordination and Trust	13	Drone Training
Collaboration, Coordination and Trust	14	Delivery by NEM of Nunavut specific SAR training
Collaboration, Coordination and Trust	15	SAR Exercises
SAR Resource Management and Readiness	16	Presence of Coastguard Auxiliary Units
Collaboration, Coordination and Trust	17	Existence of regular communications between SAR teams and NEM
Collaboration, Coordination and Trust	18	Creation of regional SAR body associations
Staff Recruitment, Retention and Workload	19	Availability of mental health support

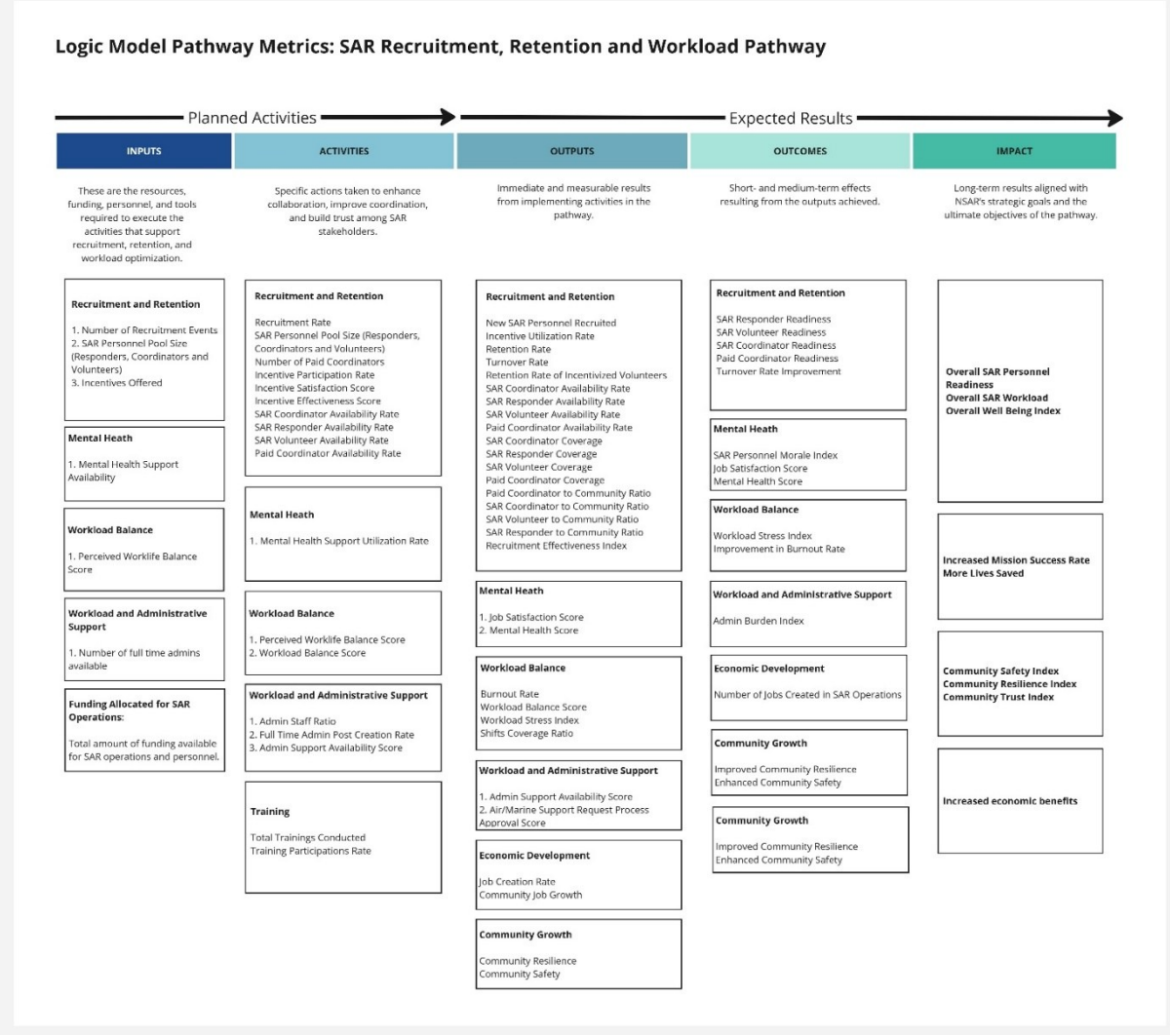
Staff Recruitment, Retention and Workload	20	Incentives to participate in community SAR
Education and Training	21	Level of knowledge exchange from elders
Community Engagement	22	Degree of education from land/sea users
Community Engagement	23	SAR education in schools
Community Engagement	24	Public SAR education other than schools
Incident, Environmental Conditions and Incident outcome	25	Balance of SAR incidents towards more difficult rescues
Community Engagement	26	Level of expertise of land/sea users
Community Engagement	27	Level of community engagement with SAR
Community Engagement	28	Increased use of social media
Collaboration, Coordination and Trust	29	Strength of relationships between SAR teams and rangers
Collaboration, Coordination and Trust	30	Strength of relationship between SAR teams and RCMP/nurses
Collaboration, Coordination and Trust	31	Strength of relationship between SAR teams and NEM
Staff Recruitment, Retention and Workload	32	Incentives to participate in community SAR
Staff Recruitment, Retention and Workload	33	Presence of paid community SAR Coordinators
Education and Training	34	Level of expert knowledge of local responders
Education and Training	35	Level of expert knowledge of community SAR coordinators
Collaboration, Coordination and Trust	36	Effectiveness of SAR coordination
Staff Recruitment, Retention and Workload	37	Creation of full-time admin
Collaboration, Coordination and Trust	38	Presence of agreed SAR protocols
Collaboration, Coordination and Trust	39	Roundtable Initiatives
Collaboration, Coordination and Trust	40	Best Practices Shared
Collaboration, Coordination and Trust	41	Community participation in roundtables
Collaboration, Coordination and Trust	42	Literature reviews

Appendix D: Logic Models Pathway Diagrams

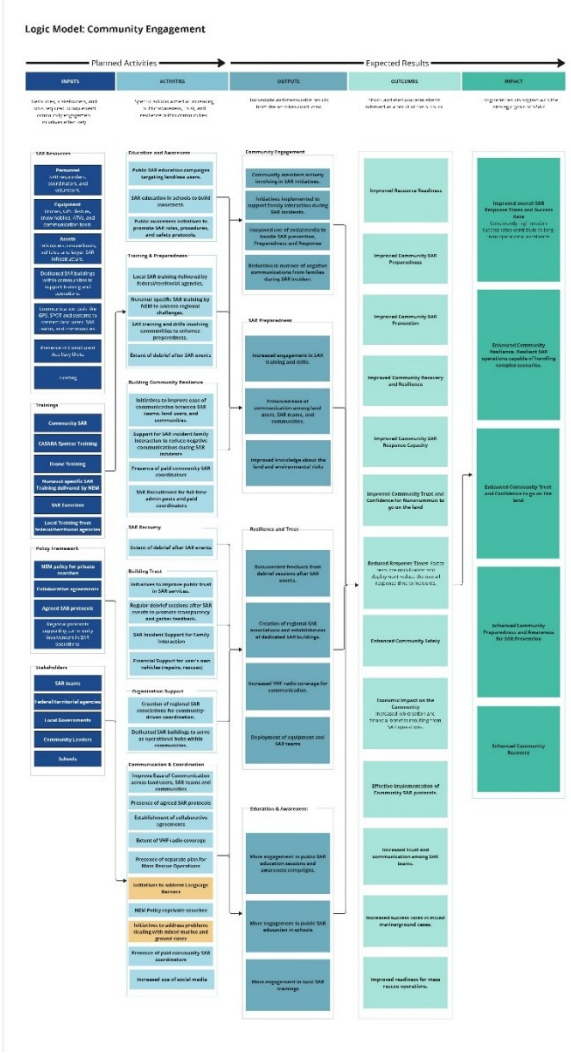
Picture D 1: Logic Model for SAR Personnel Recruitment, Retention and Workload Pathway



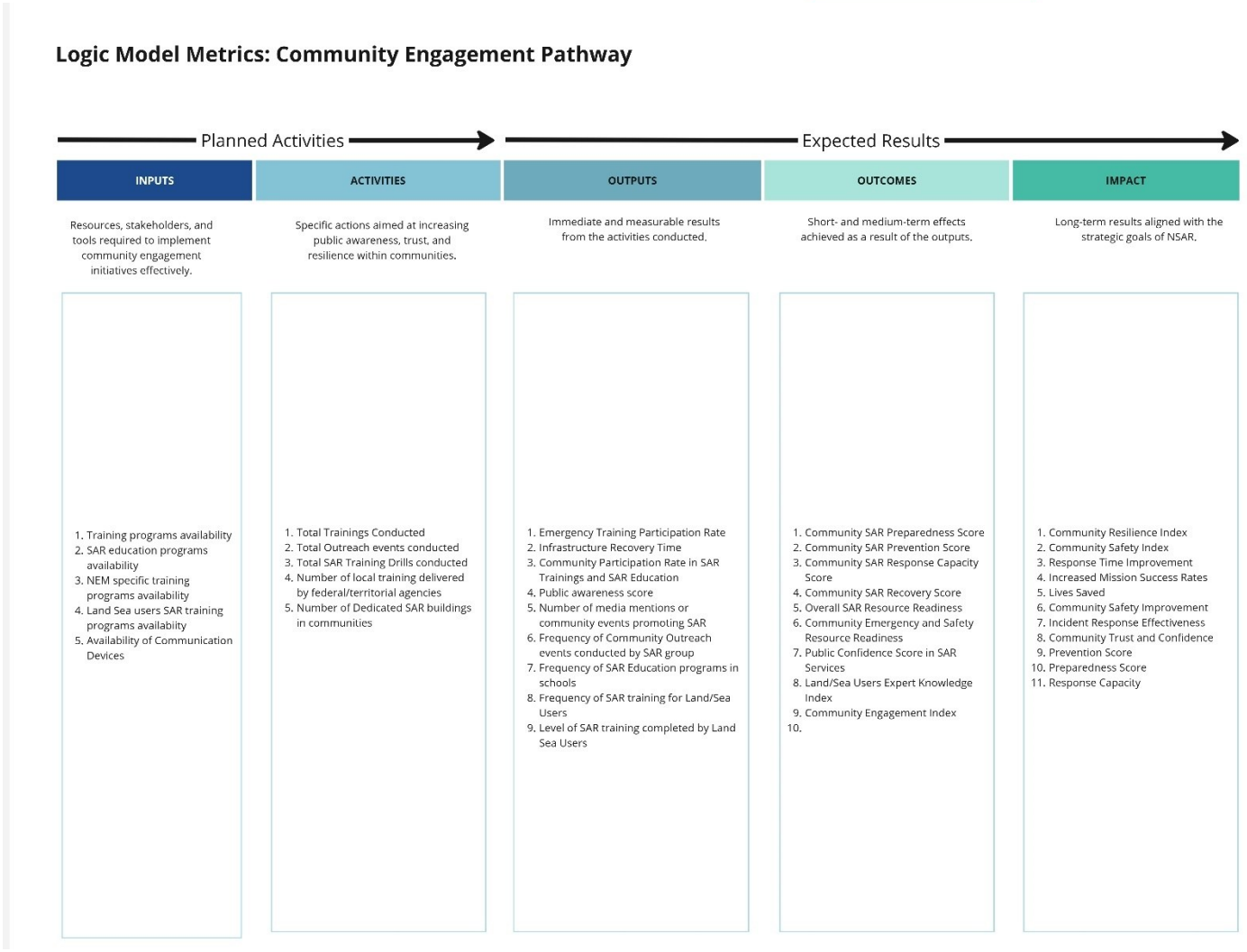
Picture D 2: Snapshot of Key Metrics for SAR Personnel Recruitment, Retention and Workload Pathway



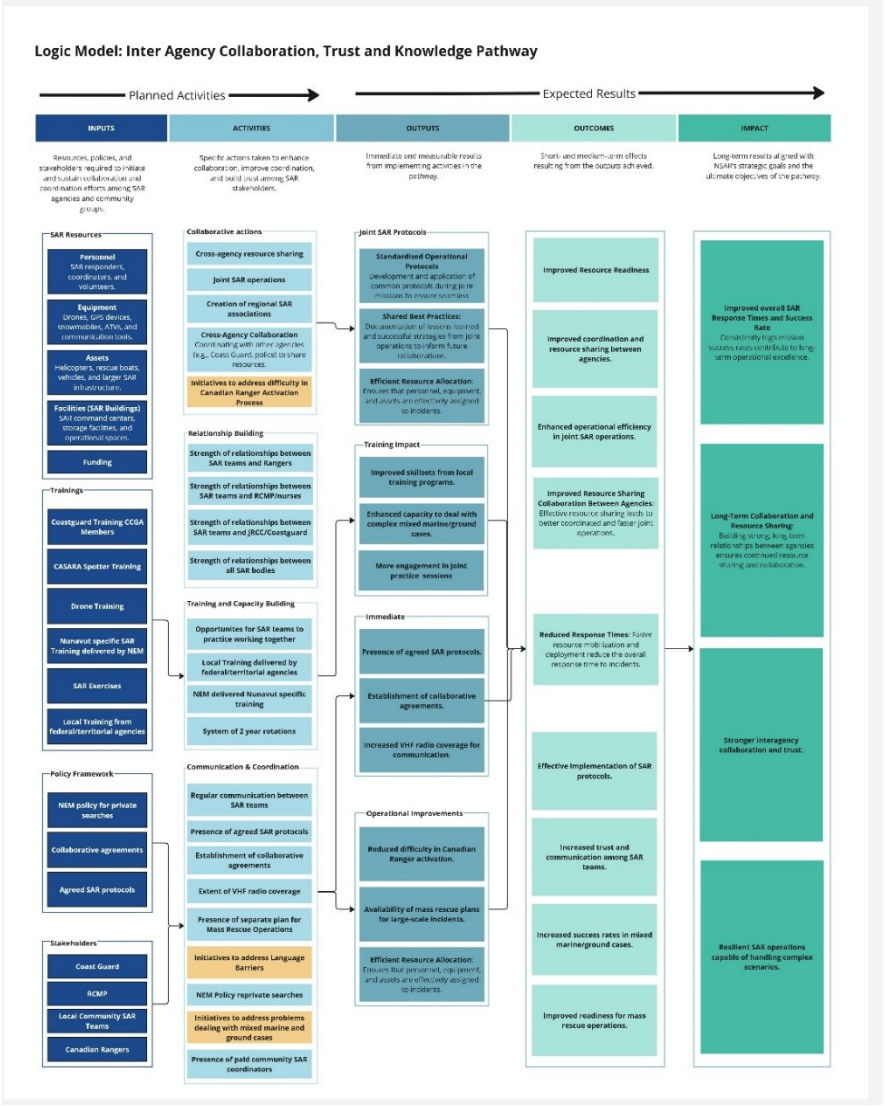
Picture D 3: Logic Model for Community Engagement Pathway



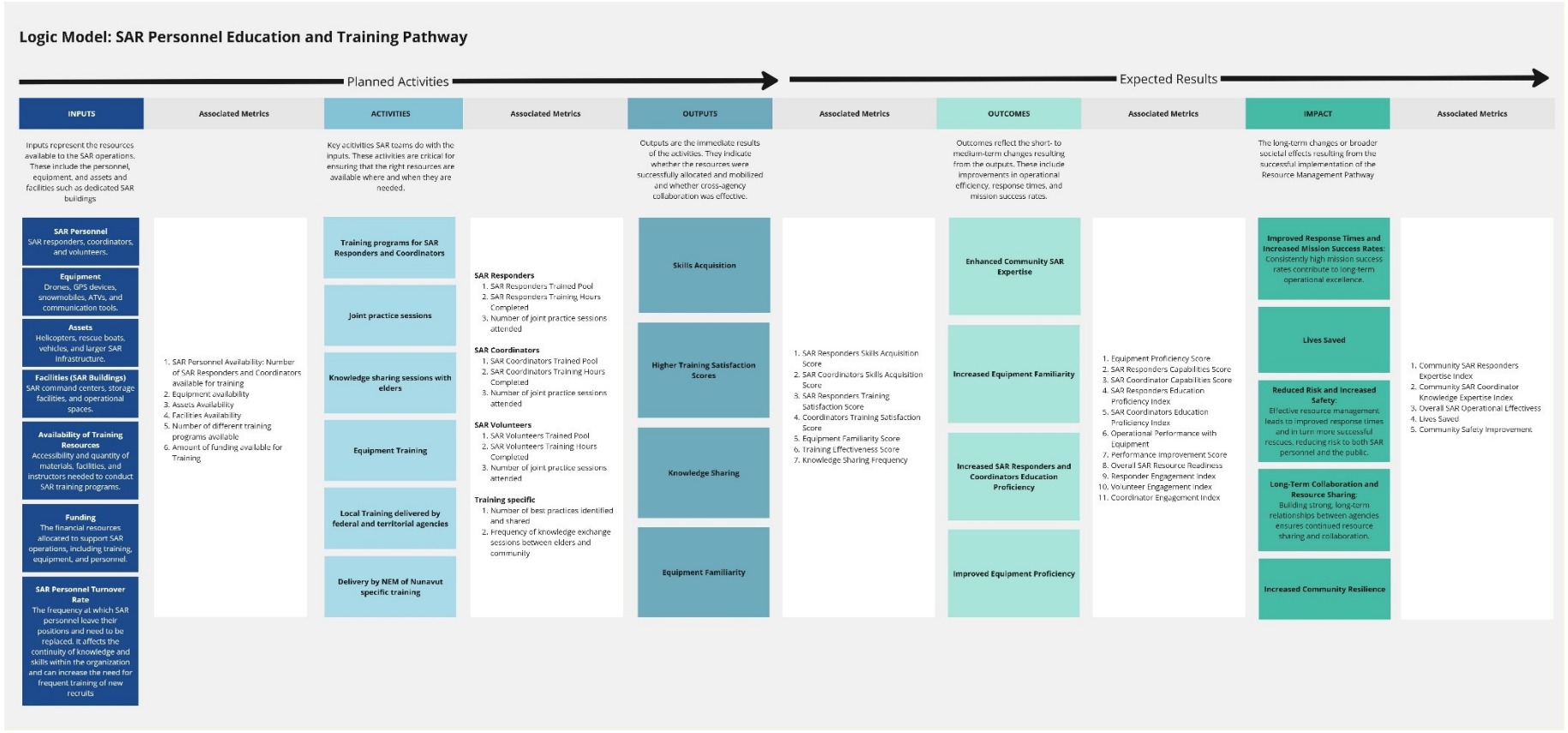
Picture D 4: Snapshot of Key Metrics for Community Engagement Pathway



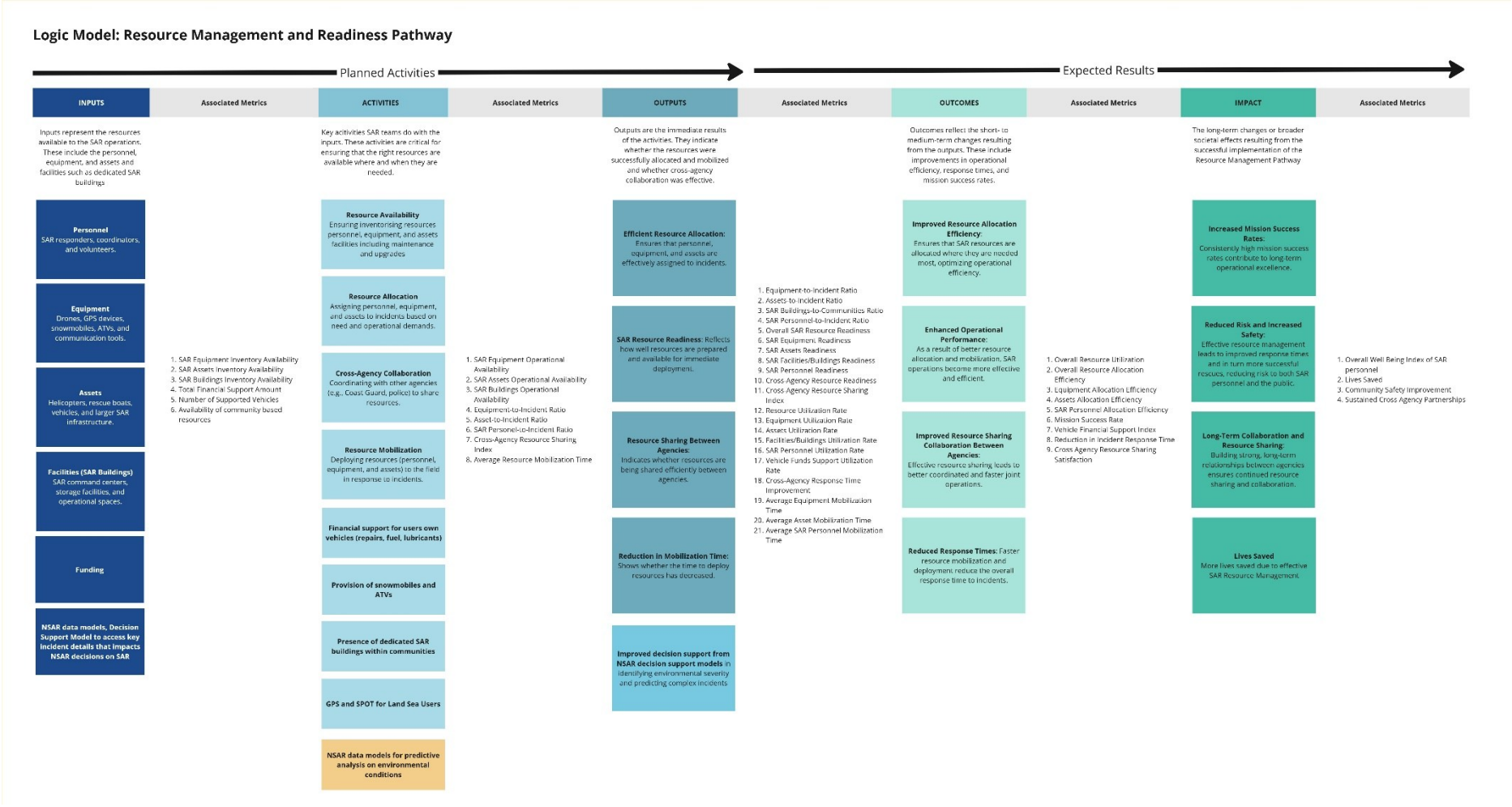
Picture D 5: Logic Model for Inter-agency Collaboration, Coordination, Trust and Knowledge Pathway



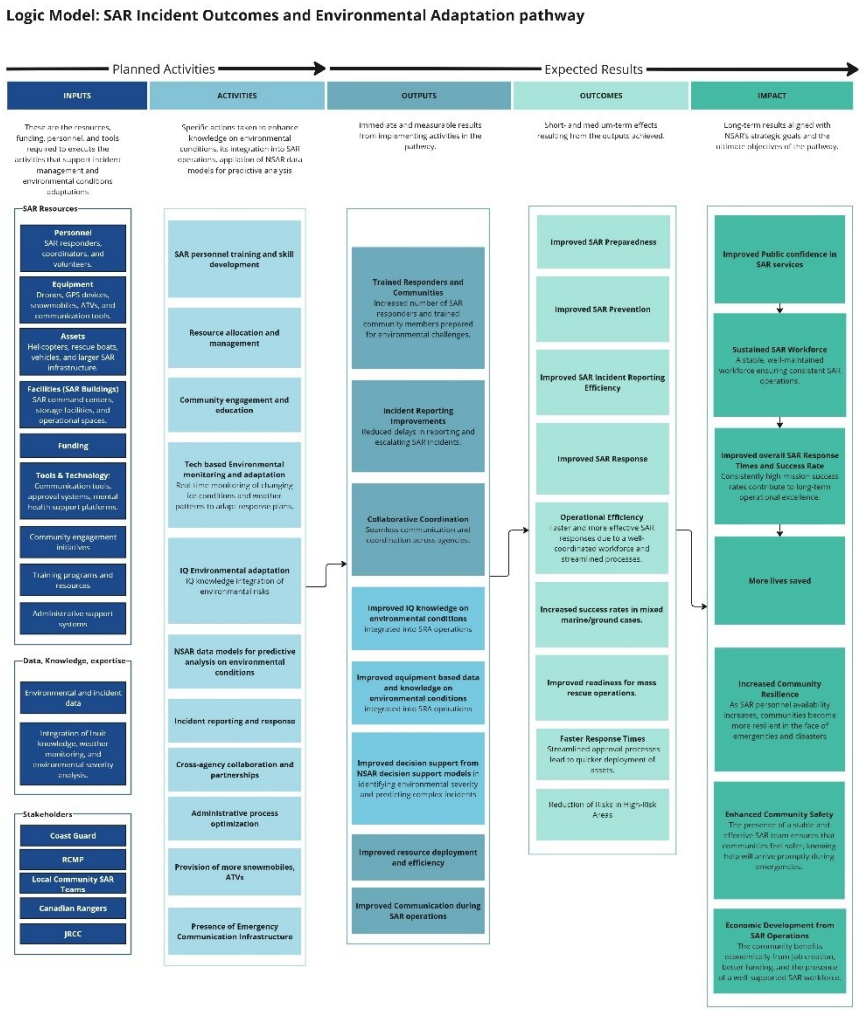
Picture D 6: Logic Model and Snapshot of Key Metrics for SAR Personnel Education and Training Pathway



Picture D 7: Logic Model and Snapshot of Key Metrics for Resource Management and Readiness Pathway



Picture D 8: Logic Model for SAR Incident Management and Environmental Adaptation Pathway



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