Ring of Fire Regional Assessment

Preliminary Scenario Framework – Draft for Discussion

Prepared by Firelight for the Regional Assessment Working Group

January 20, 2026

Overview

This document presents the preliminary scenario framework for the Ring of Fire (ROF) Regional Assessment (RA) and describes the methods and process used to develop it. Firelight is completing this work at the direction of the Regional Assessment Working Group (RAWG). At the time of preparing this document, the scenario mapping methodology, draft maps, and summary of limitations, challenges, and opportunities are preliminary. Firelight and the RAWG continue to collaborate on next steps for this work.

The framework integrates information from base mapping, literature review, and scenario-planning discussions held RAWG in March, June, October, and November 2025. Using a participatory scenario-matrix approach, the project team identified **Indigenous Governance and Development Pressure** as the two most influential and uncertain dimensions shaping plausible regional futures. These dimensions form the axes of a 2×2 matrix that generates four contrasting draft scenarios:

- **Scenario 1: Indigenous-Led Planning** – With moderate development pressures and strong Indigenous governance, Nations guide land-use decisions, stewardship approaches, and community-defined economic activities based on their governance systems and priorities.

- **Scenario 2: Co-Governed Growth** – Strong market demand aligns with strong Indigenous governance, resulting in managed development that proceeds under shared governance, negotiated conditions, and strengthened stewardship frameworks.

- **Scenario 3: Gradual Change** – Economic activity grows slowly and unevenly, with few major projects and limited capacity for Indigenous Nations to influence land use decisions, leaving communities facing service, infrastructure, and governance gaps.

- **Scenario 4: Accelerated Development** – A rapid surge of mining and infrastructure expansion unfolds across the region, driven by external market forces, with limited opportunities for Indigenous Nations to shape development decisions or safeguard stewardship priorities.

These scenarios represent internally consistent combinations of future conditions and will serve as the foundation for spatial scenario mapping. Each scenario will be operationalized by defining levels of change in mappable features, linking them to spatial datasets, and generating mapped representations of plausible future regional conditions. These maps will support subsequent phases of the RA, including additional data collection, cumulative effects analysis, and the development of findings and recommendations.

The remainder of this document explains the approach to scenario analysis used, outlines the steps taken to develop the scenarios, and presents each draft scenario in more detail. It concludes with a description of how the scenarios will be operationalized into spatial maps and how they will support the next stages of the Regional Assessment.

Approach to Scenario Analysis

Scenario analysis is a structured process used to explore how a system might change under different plausible futures. In environmental assessment and planning, scenario analysis supports regional and cumulative effects assessment, long-term planning, and decision-making by examining how different combinations of driving forces may influence future regional conditions (Duinker & Greig, 2007; Qortado, 2023).

There are several established approaches to scenario analysis, including exploratory narrative methods, quantitative modelling, and structured frameworks such as scenario matrices that organize scenarios around key drivers of change (Amer et al., 2013). Participatory scenario approaches have increasingly been used to integrate local and Indigenous knowledge in environmental planning and sustainability assessments (Natcher et al., 2021; Cordova-Pozo et al., 2023).

For the ROF RA, a participatory scenario-matrix approach was used to explore how the region could plausibly evolve under different futures, including the nature and intensity of potential development. This approach is grounded in the understanding that **scenarios**, **parameters** (**types of change)**, **outside forces**, and **community priorities** represent interlinked concepts that together describe how complex systems can unfold over time.

- **Scenarios** are descriptions of different possible futures used to explore how regional conditions may change over time (Duinker and Greig 2007). They are not predictions, but an exploration of what might happen given certain trends, uncertainties and choices.

- **Parameters (types of change)** are the types of things that change over time. They provide the tangible building blocks of each scenario, such as infrastructure development, community growth, or land and water stewardship. Each parameter is represented by mappable features.

- **External drivers (outside forces)** are the factors that shape how change occurs. External drivers are outside of our control, and include broad influences such as policy directions, market dynamics (e.g. mineral prices), demographic shifts, technological change, and governance approaches. While parameters describe what changes, drivers explain why and how change occurs.

- **Community priorities** represent the values, goals, and desired outcomes that communities seek to realize in the future (e.g. enhanced community services). They provide a values-based complement to the external drivers of change, expressing what communities consider to be desirable.

A 2×2 scenario-matrix approach was used to develop scenarios for the ROF RA (see Figure 1). Scenario-matrix methods are widely used in environmental planning and foresight to examine how interactions between two critical and uncertain dimensions can shape future conditions (Rhydderch 2017; Duinker and Greig 2007). Crossing the two drivers in a matrix produces four contrasting yet internally consistent scenarios, each representing a distinct combination of parameter states.

Scenario Development Process

This section describes the process undertaken to develop the draft scenarios. The scenario development followed six main steps:

1. Defining Spatial and Temporal Boundaries
2. Identifying Key Parameters (Types of Change)
3. Identifying External Drivers of Change
4. Identifying Community Priorities
5. Selecting two Key Dimensions for the Scenario Matrix
6. Scenario Confirmation and Operationalization

This process built directly on the earlier scenario planning discussions led by the RAWG in March and June 2025. The March and June workshops explored possible development intensities, timeframes, and community priorities for the region. A subsequent workshop in October 2025 expanded on this work to identify tangible parameters of regional change, external drivers and community aspirations to support development of the scenario framework.

Each step is described in detail below.

Step 1. Defining Spatial and Temporal Boundaries

The scenario development process began with defining the spatial and temporal boundaries for the analysis, grounded in the Regional Assessment Terms of Reference (TOR) and guided by the input received from the RAWG during the March, June, and October 2025 workshops.

Spatial Boundary

The spatial boundary for scenario mapping is the Regional Assessment Area (RAA) as defined in the TOR. RAWG members emphasized that scenarios should reflect conditions across the full RAA, viewed through the lens of homelands, land use, and stewardship responsibilities. The scenario maps will therefore illustrate future conditions across the entire assessment area rather than focusing on localized project footprints.

Temporal Boundaries

The TOR requires that the RA identify potential development scenarios "with attention to different development intensities and timeframes." RAWG workshop discussions further reinforced the importance of considering multiple temporal horizons, noting that regional futures vary from near-term project activity to long-term intergenerational change.

Based on the TOR and RAWG guidance, four temporal boundaries were selected:

- Near-Term: 5–10 Years
- Medium-Term: ~30 Years
- Long-Term: ~60 Years
- Intergenerational: ~150+ Years ("Seven Generations")

Step 2. Identifying Parameters (Types of Change)

Parameters (types of change) were identified through a facilitated RAWG workshop held on October 21, 2025, and were informed by review of available spatial data and materials from previous RAWG meetings. During the workshop, participants reflected on the human activities, infrastructure, and stewardship actions they expect to see in the region over the coming decades. Working in small groups, participants discussed these potential future developments and then reported back in plenary.

RAWG input was recorded on a Miro digital whiteboard using virtual sticky notes, which captured a wide range of ideas related to infrastructure, industrial activity, community services, and environmental management. During the workshop, these notes were synthesized and organized into four thematic clusters[1] representing broad types of change of regional change, including:

- **Access and Infrastructure** – transportation, energy, and communication systems such as roads, rail, ports, pipelines, and airstrips.
- **Cumulative Industrial Development** – sectors including mining, forestry, hydroelectricity, nuclear (SMRs), and emerging technologies such as AI and automation.
- **Community Growth** – services, housing, and facilities that support population change and community well-being, including health care, housing, work camps, and cultural infrastructure.
- **Conservation and Indigenous Economy** – land and water stewardship initiatives, protected areas, renewable energy projects, wild rice harvesting, fish farms, and ecotourism.

An image of the Miro board summarizing the grouped parameters (types of change) is provided in Appendix A.

[1] A fifth cluster was identified (appearing in grey in the Miro board displayed in Appendix A) that relates more to external drivers than to parameters.

Step 3. Identifying External Drivers of Change

The next step of the process focused on identifying the outside forces and uncertainties most likely to influence how regional conditions evolve. The discussion drew on the PEESTL framework (Political, Economic, Environmental, Social, Technological, and Legal) suggested by a RAWG delegate to help thinking about external change.

Working in plenary, participants reflected on factors that could shape development pathways in the region, such as market demand and international trade, energy prices, population growth, immigration, labour and union dynamics, regulatory and legislative change, Indigenous governance and self-determination, and environmental commitments. These ideas were recorded on a Miro board using virtual sticky notes (Appendix A) and later grouped into thematic categories of influence (Table 1)[2].

This step provided a set of drivers of change that represent the external context against which community decisions and regional development will unfold. These drivers were subsequently considered alongside community-defined priorities to establish the key dimensions for the scenario matrix.

Table 1: Thematic Grouping of Key External Drivers

TERMS IDENTIFIED IN OCT 2025 RAWG WORKSHOP	THEMATIC GROUPING OF KEY EXTERNAL DRIVERS
Population growth; Immigration	**Demographic Change**
Labour, employment, economy; Unions	**Labour Dynamics**
Self-determination / Indigenous governance; Assertion of rights	**Indigenous Governance and Rights**
Legislation (Bills 5 and C-5); Regulations / legislation; Governance	**Crown Policy and Legislation**
Environmentalism; Canada's environmental commitments; Water scarcity	**Climate and Environmental Change**
Defense spending; Geopolitics / international markets; International trade; U.S. tariffs; Mineral value; Metal prices; Energy demands; Shipping ports / routes	**Geopolitics, Trade, and Global Commodity Markets**

Step 4. Identifying Community Priorities

Building from the discussion of external drivers, the RAWG turned its attention to community priorities, referring to the outcomes, values, and future conditions that communities wish to achieve. This conversation also took place in plenary, with feedback captured on the Miro board (Appendix A). Community aspirations were later grouped into thematic areas (Table 2).

[2] While key drivers are interdependent (e.g. demographic change may result from development driven by global commodity markets), they are grouped independently for the purpose of the scenario framework.

Participants identified a broad set of aspirations related to health and well-being, clean water and reliable heating, community infrastructure and housing, cultural continuity and language preservation, youth engagement, and economic participation and self-reliance. These reflections express community priorities for future change in the region.

Table 2: Thematic Grouping of Key Community Aspirations

TERMS IDENTIFIED IN OCT 2025 RAWG WORKSHOP	THEMATIC GROUPING OF KEY COMMUNITY ASPIRATIONS
Access to quality health care; Well-being; Healing and healthy communities; Equality with all Canadians (health, education, etc.); Community cohesion and family skills training	**Health, Well-Being, and Quality of Life**
Community infrastructure; Elders facilities; Recreational facilities; Heating; Clean water	**Community Infrastructure and Services**
Cultural resiliency; Language preservation; Land-based seasonal activities (particularly for youth)	**Cultural Continuity and Resilience**
Participation in economic development; Own-source revenue	**Economic Participation and Self-Reliance**
More land and additions to reserve lands; Capacity; Ability to participate	**Land, Governance, and Self-Determination**

Step 5. Selecting Key Dimensions for the Scenario Matrix

Following the workshop, the project team reviewed and synthesized the feedback gathered through the Miro board discussions on external drivers and community aspirations.

The RAWG identified a wide range of forces potentially shaping the region's future. When examined together, these inputs clustered into two overarching dimensions that consistently emerged as likely to be the most influential in shaping divergent regional futures:

- **Indigenous Governance** – representing the degree to which Indigenous Nations exercise decision-making power, jurisdiction, and stewardship responsibility over land use, development, and community futures. Indigenous governance was chosen for this dimension as it is a key structural condition that enables communities to achieve the stated aspirations.
- **Development Pressure** – representing the external forces (particularly global market demand, investment patterns, and political dynamics) that influence the scale and pace of industrial development and infrastructure expansion in the region.

Climate change also emerged as a key dimension but will be incorporated into scenario development as a cross-cutting overlay rather than as a scenario-defining axis. Unlike other external drivers identified in the workshop, climate change does not align neatly with the two meta-categories. Instead, it represents a pervasive external condition that will influence all futures regardless of the level of development pressure or the degree of Indigenous governance.

Step 6. Scenario Confirmation and Operationalization

The draft 2 X 2 scenario matrix (*Indigenous Governance X Development Pressure*) was presented to the RAWG for review and confirmation on November 26, 2025. RAWG feedback was used to refine the narrative framing of each of the four scenarios, ensuring that the descriptions accurately reflect community priorities, concerns, and expectations about how regional conditions could evolve under different futures.

The project team will operationalize each scenario by translating the qualitative narratives into spatially and temporally explicit representations of future regional conditions.

Draft Scenarios

The scenario matrix below presents four plausible futures for the Ring of Fire region based on the two key dimensions identified through the workshop process and subsequent synthesis: Indigenous Governance and Development Pressure. These draft scenarios will serve as the foundation for spatial scenario mapping. Climate change will be incorporated as a cross-cutting overlay during scenario elaboration to illustrate how climate-related stressors interact with each scenario.

1. Indigenous Governance

This dimension reflects the degree to which Indigenous Nations exercise jurisdiction, governance, stewardship responsibility, and decision-making power over land, water, and development activities.

- **Limited Indigenous Governance**: Limited recognition of and limited active protection of rights, procedural participation in Crown-led processes, and constrained Indigenous capacity to influence development pathways or stewardship regimes.

- **Strong Indigenous Governance**: Strong recognition and protection of Indigenous rights, substantive co-governance, community-led planning, and expanded Indigenous governance over land and water stewardship.

2. Development Pressure

This dimension reflects the level of external pressure for regional development arising from factors such as global commodity markets, political and geopolitical dynamics, investor activity, and national mineral strategies.

- **Low Development Pressure**: Weak or fluctuating commodity demand and prices, limited investment, slower or stalled infrastructure expansion, high cost per unit of production vs. international sources, and fewer project proposals.

- **High Development Pressure**: Strong global demand for critical minerals and high prices, active investment, accelerated infrastructure development, lower cost per unit of production vs. international sources, and multiple overlapping project proposals.

Figure 1 presents the scenario matrix, followed by descriptions of each draft scenario.

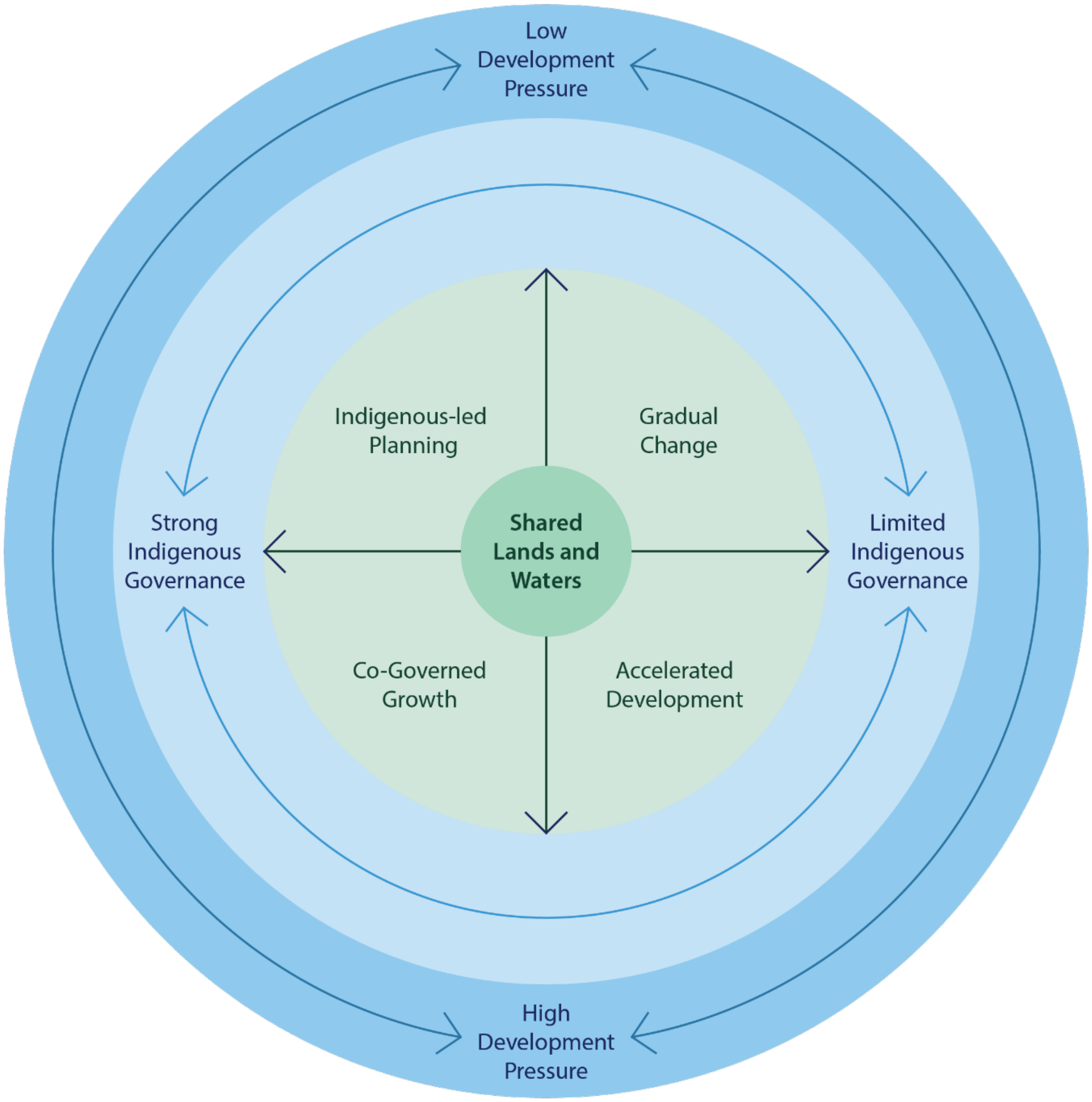

Figure 1: Scenario Matrix for the Ring of Fire Regional Assessment

Scenario 1: Indigenous-Led Planning

Low development pressure coincides with strong Indigenous governance, enabling Nations to advance land stewardship, cultural revitalization, and community-defined economic development. Land use planning, conservation initiatives, and Indigenous economy activities (e.g., renewable energy, cultural tourism, wild rice, fisheries) expand. Infrastructure development is strategic and community-led (or at least community-endorsed). The regional future is shaped primarily by Indigenous values, governance structures, and long-term stewardship goals.

Scenario 2: Co-Governed Growth

Strong Indigenous governance coincides with high development pressure. Nations play a central role in decisions about land use, project approvals, conditions, monitoring, and stewardship, supported by appropriate capacity. Development proceeds, but under co-governed frameworks that ensure cultural values, rights, land use priorities, and community benefits shape development outcomes. Infrastructure expansion is negotiated to support a mixture of national/provincial economic and community goals. Stewardship regimes are strengthened, and cumulative effects are actively managed.

Scenario 3: Gradual Change

With low development pressure and limited Indigenous governance, the region experiences slow economic activity, limited new infrastructure, and few major project proposals. Decision-making remains primarily Crown-driven, and opportunities for expanding Indigenous governance or stewardship capacity are constrained. Indigenous communities may face ongoing challenges in accessing infrastructure, services, and economic opportunities.

Scenario 4: Accelerated Development

High external demand drives rapid project proposals, infrastructure expansion, and exploration activity across the region. With limited Indigenous governance, development proceeds under existing Crown regulatory structures with procedural consultation but limited shared decision-making, and on an expedited timeline. Industrial footprints expand quickly and access corridors are developed primarily to facilitate mineral extraction. Community benefits are uneven (in part due to the difficulty of developing Indigenous “ability to take advantage” within tight timeframes) with high benefit leakage away from local and Indigenous communities, and Indigenous stewardship priorities struggle to keep pace with development pressures.

Scenario Mapping Methodology

Using a combination of different types of present/baseline and plausible map features (e.g., industrial development), various geospatial data model operations and processes are available to produce four scenarios over four different time periods (as described above). These operations and processes have been organized into a model (referred to as the Scenario Model) that can be used for varying the input map features and seeing different output scenarios. The use of model follows similar approaches used in the past to explore different land use outcomes in northern Ontario (Carlson & Chetkiewicz, 2013).

The Scenario Model uses a grid-based approach (hexagon) for summarizing different selected (and optionally buffered) map features within the Regional Assessment Area using a geographic information system (GIS). These map features could represent cumulative (baseline) disturbances, as well as plausible disturbances that could come if proposed projects are implemented. Currently, the Scenario Model assumes each hexagon represents an area of 10 square kilometres. A complete GIS model diagram of the methodology is provided in Appendix B, with input dependencies in Appendix C through F. At this stage, only a Baseline Map is available from use of the Scenario Model (see Figure 7). The remainder of this section provides a general overview of the workflow available to display different scenarios.

1. Baseline Map

First, a summarized Baseline Map was established (see Figure 7) by counting past and present access, linear, and industrial features within the grid, as seen in the diagram below (Figure 2). The features included are based on those that are openly available (see Appendix D). Buffers were applied to features to reflect cumulative/areal disturbances (also see Appendix D).

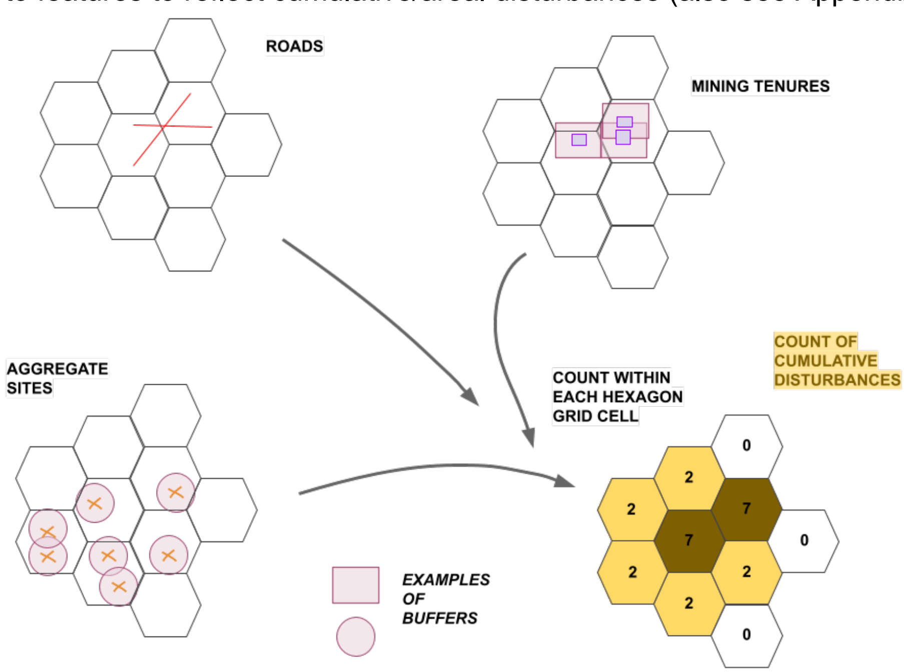

Figure 2: Example of the baseline footprint workflow.

2. Scenario Maps

Second, Firelight prepared map features to spatially represent different proposed plans and future development goals, pulled from publicly available reports (referred to as plausible map features, Appendix E and F). For example, Firelight digitized image maps of proposed roads, transmission lines, communication lines, and work camp locations. Firelight also coded notes from alienated land areas documented by the Government of Ontario. These different map features were also buffered similarly to the baseline map.

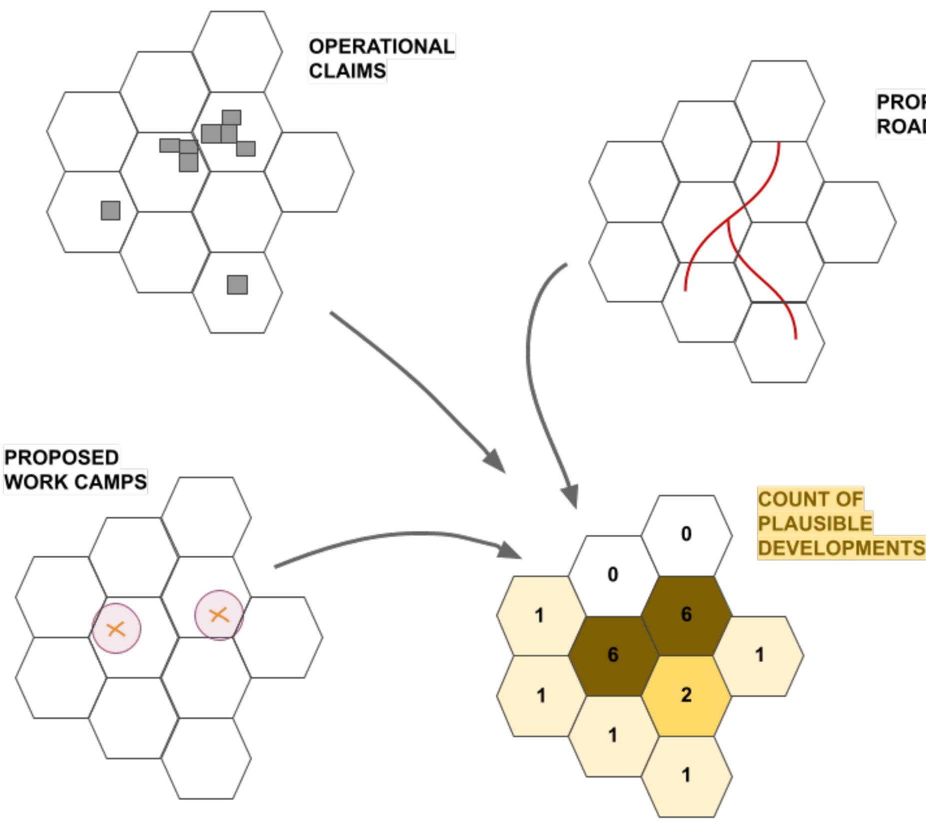

Figure 3: Example of the scenario mapping workflow.

After counting each plausible map feature per hexagon, different multipliers (or coefficients) were applied to assume future intensity of development. Multipliers were applied greater than 1 to assume growth. For proof of concept, +0.25 increments could be applied per each scenario and time.

For example, multipliers for each scenario could be as follows:

- Scenario 1 (Indigenous-led Planning): 1.25
- Scenario 2 (Co-governed Growth): 1.50
- Scenario 3 (Gradual Change): 1.75

- Scenario 4 (Accelerated Development): 2.00

Then, in this case, multipliers for each time period could:

- Near-Term (5–10 Years): 1.25
- Medium-Term (~30 Years): 1.50
- Long-Term (~60 Years): 1.75
- Intergenerational Term (~150+ Years): 2.00

Then, the overall coefficient for each hexagon would be: scenario coefficient × time period coefficient. For example, S1T1 = 1.25 × 1.25; S1T2 = 1.25 × 1.5.

Varying the different inputs and multipliers (i.e., parameters) in the Scenario Model will yield alternative scenarios.

These multiplied values can then be classified into “Low”, “Medium” or “High” groups (Figure 4). The breaks can be determined based on the distribution of the data, or can be informed by Indigenous perspectives and ecological thresholds.

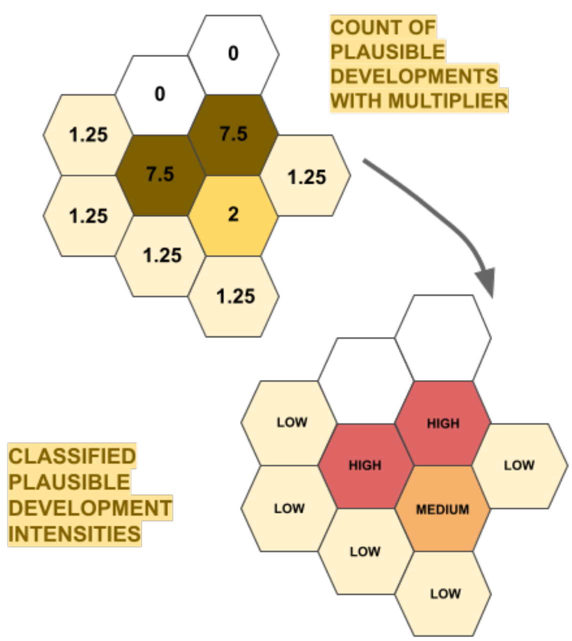

Figure 4: Classification of plausible development features.

Additionally, Firelight digitized maps of proposed, planned, and prospective protected areas. These can be inputted into the Scenario Model differently, with a multiplier of -1 (Figure 5). These areas are valued differently as they are assumed future areas of no development for some scenarios. They can be styled and presented differently on maps, and applied as a mask over baseline or plausible map features (Figure 6).

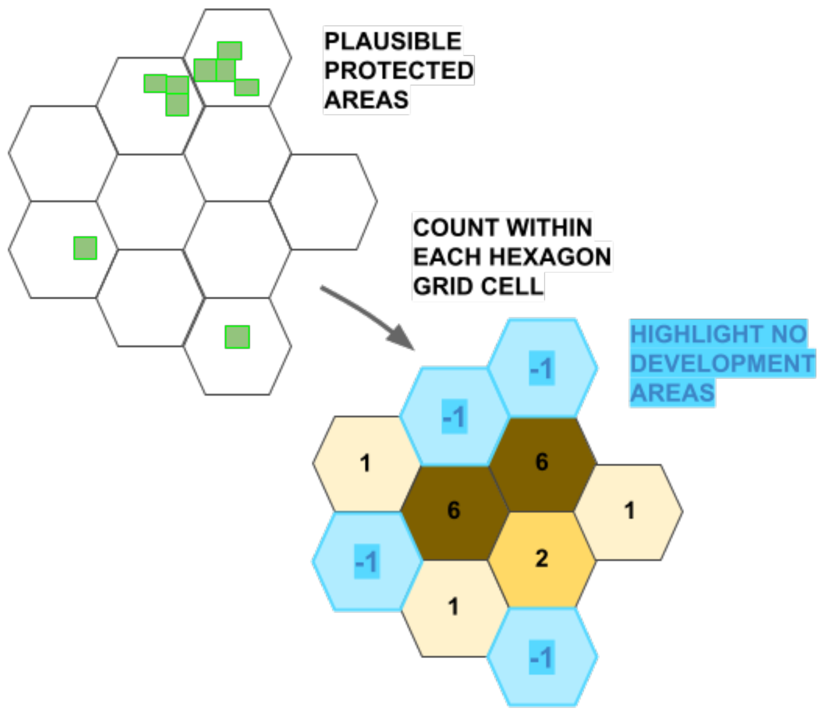

Figure 5: Application of -1 multipliers for plausible protected areas.

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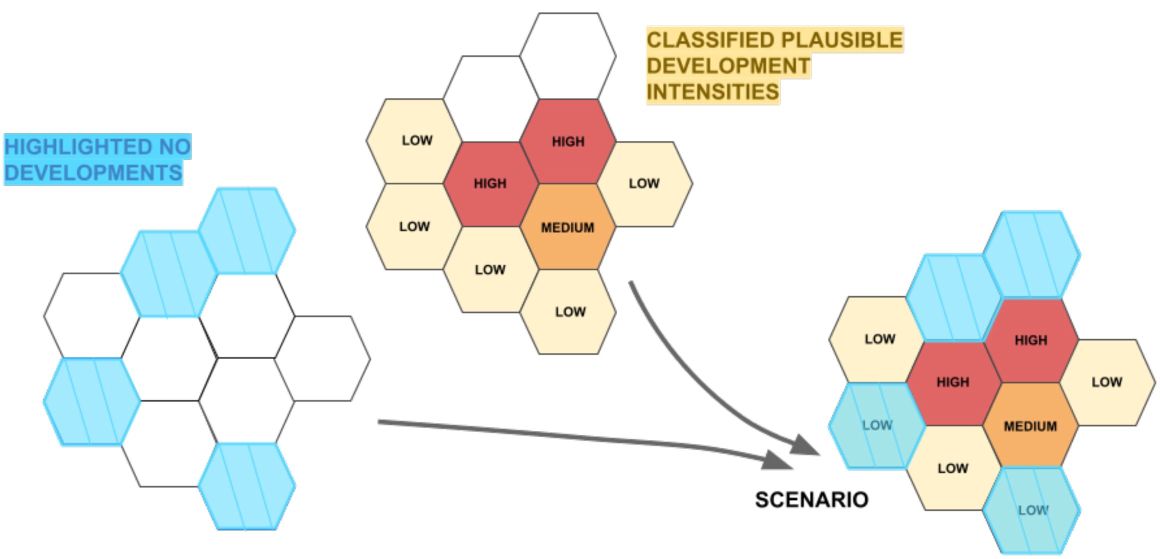

Figure 6: Application of the plausible protected areas mask.

In summary, the combination of these different map features with buffering, multiplying, classifying, and masking display different scenarios outputted from the Scenario Model. Given different inputs, or different map features and different parameters (i.e., multipliers, classification breaks), new outputs will be presented.

Preliminary Maps

Baseline Map

Referring to the Figure 7, there are areas of “High”, “Medium”, and “Low” baseline development intensity.

This is an assessment of the current cumulative disturbance per 10 square kilometre hexagon within and around the Regional Assessment Area, based on available data.

The breaks between these categories are derived from the natural breaks found in the data. The goal of this map is to establish a baseline footprint of development disturbances in the region. The breakdown of these categories is provided in Table 3 below.

Table 3: Breaks used to categorize “Low” to “High” baseline development intensity.

BASELINE DEVELOPMENT INTENSITY	FEATURES COUNTED (PER HEXAGON)
High	Greater than 304
Medium	Greater than 58 but less than 304 (inclusive)
Low	Greater than 0 but less than 58 (inclusive)
No Data	0

The Baseline Map can be used to compare against forthcoming scenario maps.

No data does not mean no data exists, only that there is no data at this time captured in the Baseline Map.

The data and parameters used in the creation of this map are summarized in Appendix E.

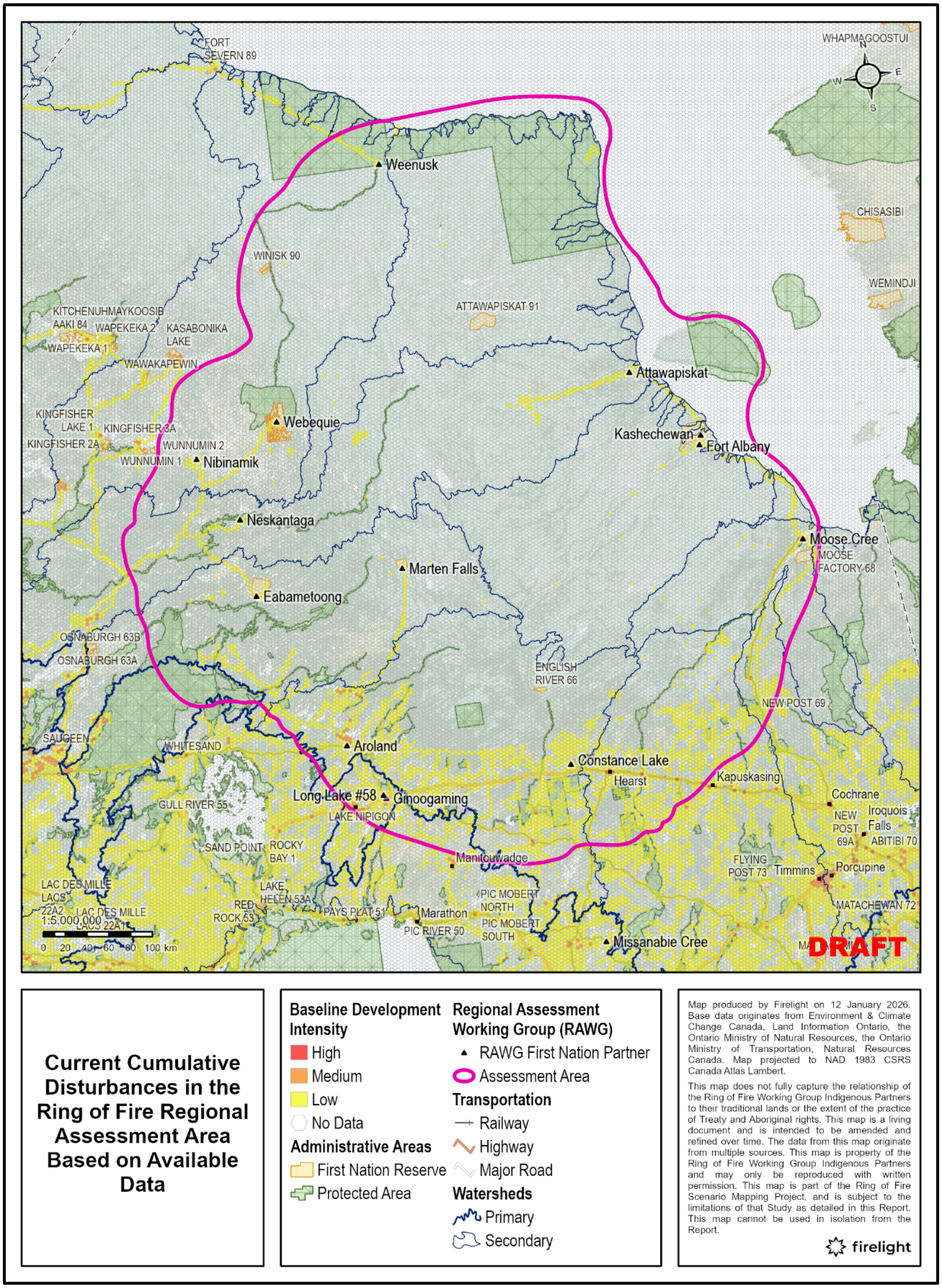

Figure 7: Preliminary baseline development footprint and intensity map.

Limitations, Challenges and Opportunities

The following are data gaps and assumptions. As the Scenario Model can be re-run by modifying the datasets and parameters (see Appendix C-F), there are opportunities to make adjustments and see different scenarios to support various decision-making needs and interests. These opportunities are raised throughout the listed gaps and assumptions:

- Data is aggregated to a hexagon grid. This is better for forthcoming connectivity studies, but data is grouped to an area of 10-km^2. Alternative resolutions could be applied to explore alternative outputs.

- All buffers are the same for each scenario. In future, buffers could be nuanced based on other values present within a hexagon. This would require additional data sources and continued participatory inputs from RAWG members.

- No Indigenous uses and activities are currently captured in the Scenario Model. However, the Scenario Model is available for local use and can be updated based on additional inputs. Indigenous use and activity layers could be developed in the future and then be used to update the Scenario Model to reflect the differences in Indigenous governance and development pressure in the scenarios where Indigenous use and activities overlap with plausible development footprints.

- No forestry map features are presented in the baseline map or available to be inputted into the Scenario Model. If data is available, it can be inputted into the Scenario Model.

- No biophysical and climate change features have been inputted into the Scenario Model yet. Moreover, no ecological values (e.g., sensitive wildlife habitat, rare ecosystems) are currently captured in the Scenario Model. Ecological value layers could be developed in the future and then be used to update the Scenario Model to reflect the differences in Indigenous governance and development pressure in the scenarios where ecological values overlap with plausible development footprints. Furthermore, existing climate change map features can be incorporated into the Scenario Maps.

- The plausible map features were derived from various data sources. Firelight digitized from proposed projects sourced online and qualitatively coded notes from spatial data sources available from the Government of Ontario. There are opportunities to enrich this data through feedback from each member of the RAWG, as well as incorporate input from proponents and government agencies.

- The Scenario Model currently assumes all plausible map features are incorporated for all time periods. However, some proposed projects could possibly end in the +150 years time period. This can be adjusted as input to the Scenario Model.

- The following datasets are excluded but could yield useful information to include as inputs into the Scenario Model:
    - Indigenous Mining Agreements (https://atlas.gc.ca/imaema/en/index.html).
    - Areas of Scientific and Natural Interest, specifically qualitatively coding the “General Comments” attribute for inferring cultural activities / heritage sites.
- The multipliers are applied consistently across all current and plausible disturbance activities in the Scenario Model. This means that disturbance activities are treated the same in terms of magnitude of effect and does not account for the likelihood of one future plausible development to move forward relative to another (e.g. mineral claim vs. planned access road). Alternative scenario coefficients could be applied to incorporate the likelihood of future plausible developments to move forward or possibly other characteristics of the developments (e.g. impact level of disturbance).
- The intensity classifications of “Low”, “Medium” and “High” is currently created based on the data distribution, but in the future could be informed by Indigenous perspectives and/or ecological thresholds.

Map Uses and Other Applications

The output baseline and plausible map layers (i.e., scenarios) can be integrated with other types of spatialized information. For example, these layers can be overlaid with community hunting areas or with ecological values (e.g. moose wintering areas, moose aquatic feeding areas).

As part of overlaying these layers, the resulting maps from the Scenario Model could reflect the differing priorities between Indigenous governance and development pressure, such as where Indigenous-led Planning may prioritize the protection of ecological values where they overlap with development activities, while Accelerated Development may prioritize the development activities where they overlap with ecological values.

The following Table 3 describes some applications for how the datasets, methods and outputs may be applied.

Table 3: Examples of Use Cases with Scenario Maps.

USE	DESCRIPTION	EXAMPLE
Create Indigenous Use and Activities Layers	Indigenous use and activities layers could be developed and applied within the Scenario Model. This could help in showing differences in the levels of Indigenous governance and development pressures in the different scenarios where Indigenous use and activities could be weighted to have more or less priority over development footprints.	As part of the Indigenous use and activities layers a layer specific to Indigenous hunting areas could be created. Within the model a rule could be established for each scenario where development footprints will or will not be included depending on the level of overlap with Indigenous hunting areas. This rule could vary depending on the different scenarios, with scenarios with higher levels of Indigenous governance prioritizing protection of Indigenous hunting areas, while scenarios with high levels of development pressure prioritizing development footprints.
Create Ecological Value Layers	Ecological value layers could be developed and applied within the Scenario Model. This could help in showing differences in the levels of Indigenous governance and development pressures in the different scenarios where ecological values could be weighted to have more or	As part of the ecological value layers a layer specific to moose habitat could be created. Within the model a rule could be established for each scenario where development footprints will or will not be included depending on the level of overlap with moose habitat. This rule could vary depending on

	less priority over development footprints.	the different scenarios, with scenarios with higher levels of Indigenous governance prioritizing protection of moose habitat, while scenarios with high levels of development pressure prioritizing development footprints.

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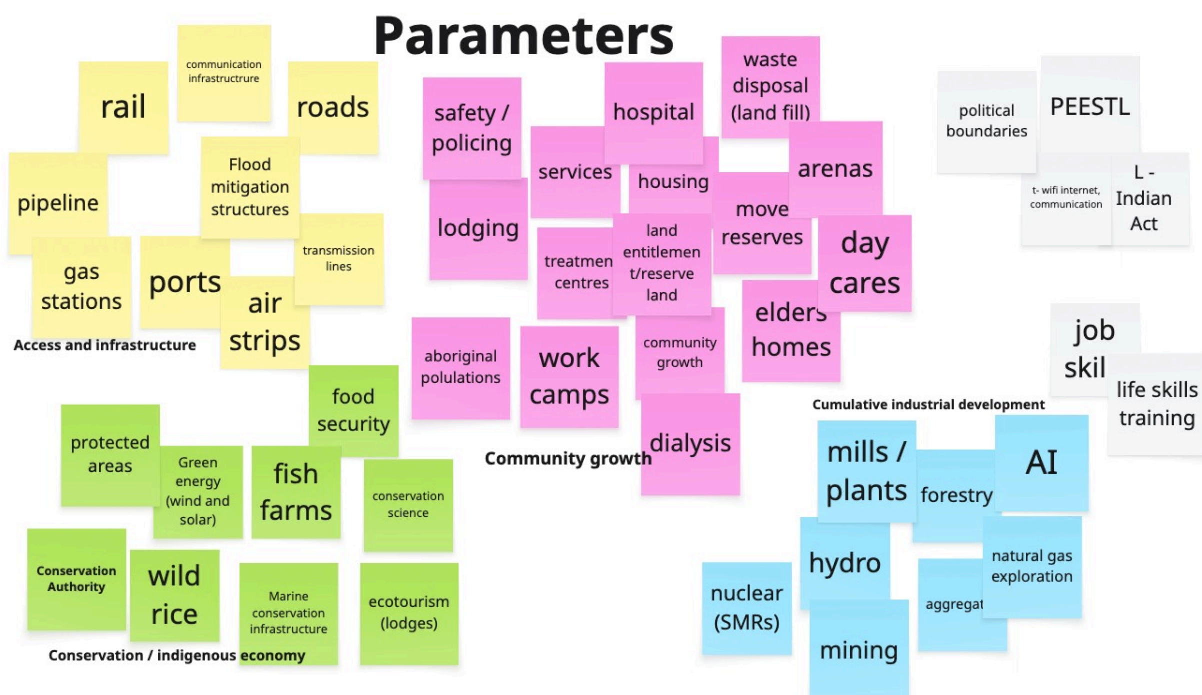
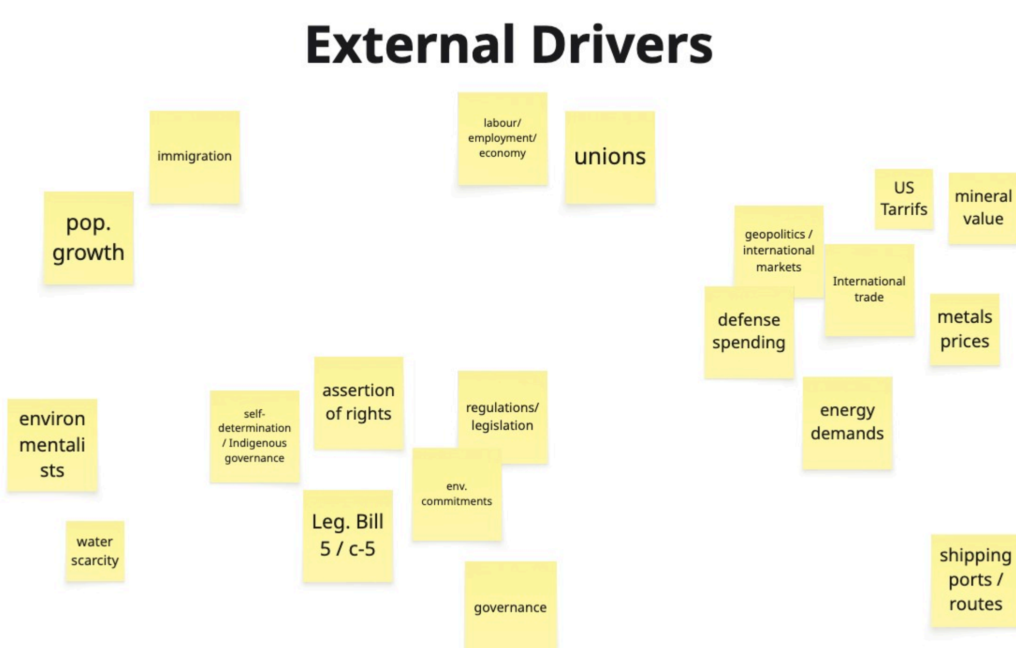
Appendices

Appendix A: October 21 RAWG Workshop Materials

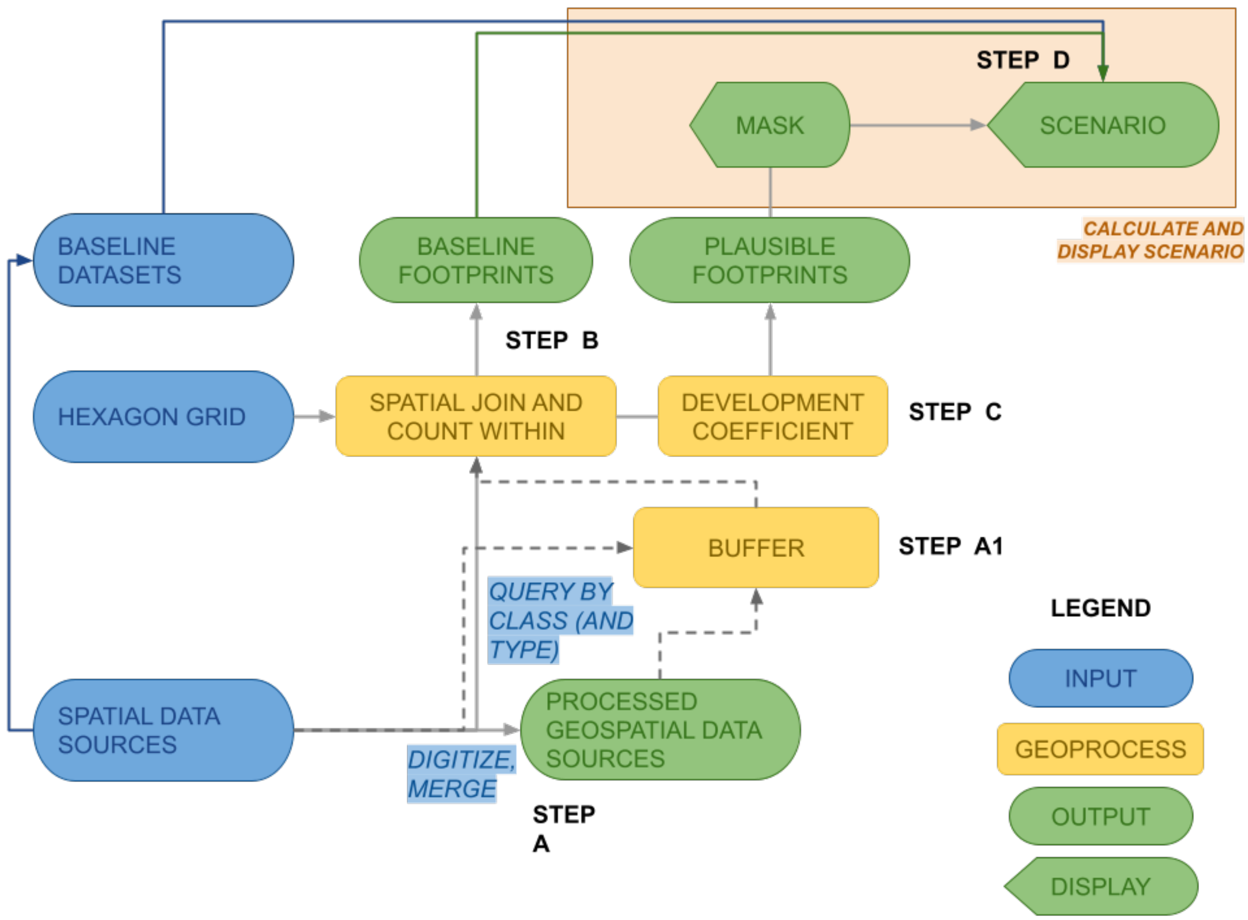





Community Aspirations
community cohesion / family skills training
health care
recreational facilities
elders facilities
wellbeing
healing / healthy communities
community infrastructure
clean water
heating
equality with all Canadians (health, education, etc.)
more land / additions to reserves
land based seasonal activities (youth)
cultural resiliency
language preservation
participation in economic development
own source revenue
capacity
ability to participate

Appendix B: Scenario Model

The following summarizes a workflow developed using Python (version 3).



Step A: From compiled open geospatial data files (e.g., shapefiles) and other types of documents with spatial information (e.g., PDF reports), Firelight created two configuration files (i.e., spreadsheets) that document data sources for “Baseline Map Features” (Appendix E) and “Plausible Map Features” (Appendix F).

Step A1: If a buffer is specified, then apply a buffer to the point, line or polygon feature.

Step B: Apply a spatial join (intersect), where a created Hexagon Grid is an input and the selected and queried geospatial data sources (from Step A) are overlayed and counted within each grid cell.

Step C: For the Plausible Map Features that are inputted and counted into a Hexagon Grid, a coefficient can be applied for representing induced development.

Step D: Last, overlay and visually display on a map the selected baselines (and other base map layers) and plausible activities (i.e., scenario) within a desktop GIS software.

Appendix C: Scenario Map Input Datasets

Table C1 summaries available inputs that the Scenario Model depends on.

Table C1: Input datasets available for the Scenario Model.

FILE	INPUTS	PARAMETERS	DESCRIPTION
Baselined Map Features	Refer to Appendix D		Each row represents a geospatial data file that is an input to the Scenario Model for producing Baseline Footprint(s).
Plausible Map Features	Refer to Appendix E		Each row represents a geospatial data file that is an input to the Scenario Model for producing the Plausible Footprint(s).
Hexagon Grid	Regional Assessment Area	Resolution: 10-km^2 Extent: Ontario Cell: Hexagon Projection: EPSG 3347 (Statistics Canada Lambert) Operations: ArcGIS Pro 3.6.0	Hexagon Grid for the Scenario Model.

Appendix D: Baseline Map Features

The following are the baseline map features that led to the development of the Baseline Map Figure 7.

Table D1: Features included in the Baseline Map.

FEATURE TYPE	NAME	BUFFER (METRES)	SOURCE
All Roads	Ontario Road Network	500	Ontario Ministry of Natural Resources
Winter Roads	Ontario Road Network	250	
Railways	Ontario Railway Network	500	
Airports	Official airports CanVec Runways	1000	
Nautical Facilities	CanVec Nautical Facility	1000	Natural Resources Canada
Transmission Lines	Utility Line	100	Ontario Ministry of Natural Resources
Pipelines	Utility Line	100	
Communication Lines	Utility Line	100	
Mineral Exploration Areas	Exploration Activity Atlas of Canada 900A	100	Ontario Ministry of Energy and Mines
Mining Tenures	Atlas of Canada 900A	250	
Active Aggregate Sites	Aggregate Sites	250	
Inactive Aggregate Sites	Aggregate Sites	0	
Partial Surrender Aggregate Sites	Aggregate Sites	0	
Unrehabilitated Aggregate Sites	Aggregate Sites	0	
Aggregate Extraction Area	Aggregate Sites	250	
Aggregate Sites	Aggregate Sites	250	Ontario Ministry of Transportation
Forest Processing Facilities	Forest Processing Facility	500	Ontario Ministry of Natural Resources
Dams	Ontario Dam Inventory	500	
Petroleum Wells	Petroleum Well	250	
Renewable Energy Sites	Renewable Energy Projects	500	Ontario Ministry of Environment, Conservation and Parks
Protected and Conserved Areas	Canadian Protected and Conserved Areas Database	1000	Environment and Climate Change Canada
Wild Rice Stands	Wild Rice Stands (1997)	0	Ontario Ministry of Natural Resources

Table D2: Baseline features input configuration (.csv) column description.

COLUMN NAME	DATA TYPE	DESCRIPTION
UID	Integer	The unique identifier for each mappable feature.
CLASS	String	The type of classification the mappable feature falls within, can be anything but recommend consistent list used (e.g., “Industrial” or “Cultural”).
FEATURE_TYPE	String	Generic classification of the mappable feature.
NAME	String	Name of the dataset used as the input.
SOURCE	String	Source of the relevant geospatial data and/or referenced materials.
FILE_PATH	String	The file path to the spatial data source that will be an input for the Scenario Model.
SELECT_LYR	String	The specific layer to select if a geodatabase is read into the Scenario Model.
FILTER_COL	String	The specific name of the field/attribute to query (e.g., “road_type”) by the Scenario Model.
FILTER_VAL	String	The specific value of the specified field/attribute to query (e.g., “winter”) by the Scenario Model.
BUFFER	Float	To create a larger area based on specified ***metre*** distance from a point (e.g., port), line (e.g., road, pipeline), or polygon (e.g., land use plan zone) feature. This would be more to indicate an anticipated growth in area across time. For example, wanting to show more coverage.
S1_T1, S1_T2, …, S4_T3, S4_T4	Float	A number over 1 for assuming a greater magnitude/weight of use/activity. A number over 0 and under 1 for assuming a lesser magnitude of use/activity. Specify -1 for assuming no use/activity. These columns are not currently being used for the baseline map, but may be applied.

Appendix E: Plausible Map Features

The following summarizes the datasets compiled to assume plausible map features. These plausible map features can be used as inputs into the Scenario Model.

Table E1: Features included in the plausible development footprints.

FEATURE TYPE	PROJECT	BUFFER (METRES)	DATA SOURCE
Road	Webequie Supply Road	500	Impact Assessment Agency of Canada
Road	Northern Road Link	500	Impact Assessment Agency of Canada / AECOM Canada ULC
Road	Marten Falls Community Access Road	500	Impact Assessment Agency of Canada
Road	Noront East-West Road Link	500	Northern Policy Institute
Road	KWG East-West Road Link	500	Northern Policy Institute
Road	TGR Railway-Road	500	Northern Policy Institute
Road	Anaconda and Painter Lake Road	500	AtkinsRéalis
Communication	Rapid Lynx Broadband Project	500	AtkinsRéalis
Shipping/ Boating	James Bay Seaport	1000	Northern Policy Institute
Transmission	Wataynikaneyap Transmission Project	100	Watay Power
Transmission	East West Tie Transmission Line Project	100	AECOM Canada ULC
Transmission	Waasigan TL Project	100	AECOM Canada ULC
Communication	See Appendix G	500	Ontario Ministry of Energy and Mines
Operational Mineral Claims	See Appendix G	250	
Mining Plans/Permits	See Appendix G	250	
Aggregates Operations	See Appendix G	250	
Hydroelectric Development	See Appendix G	500	
Renewable Energy Projects	See Appendix G	1000	
Work Camps	Potential Camp Site (Northern Road Link)	500	AECOM Canada ULC

Protected and Conserved Areas	Western James Bay and Southwestern Hudson Bay National Marine Conservation Area	0	Mushkegowuk Council
Protected and Conserved Areas	See Appendix G	0	Ontario Ministry of Energy and Mines

Table E2: Plausible features input configuration .csv column description.

COLUMN NAME	DATA TYPE	DESCRIPTION
UID	Integer	The unique identifier for each mappable feature.
CLASS	String	The type of classification the mappable feature falls within, can be anything but recommend consistent list used (e.g., “Industrial” or “Cultural”).
PROJ_NAME	String	Name of the mappable project or project component.
DIGITIZED	Boolean	“Yes” or “No” if the input data source was digitized by Firelight. This is only in the Plausible Map Features dataset.
SOURCE	String	Source of the relevant geospatial data or referenced materials.
FILE_PATH	String	The file path to the spatial data source that will be an input for the Scenario Model.
SELECT_LYR	String	The specific layer to select if a geodatabase is read into the Scenario Model.
FILTER_COL	String	The specific name of the field/attribute to query (e.g., “road_type”) by the Scenario Model.
FILTER_VAL	String	The specific value of the specified field/attribute to query (e.g., “winter”) by the Scenario Model.
BUFFER	Float	To create a larger area based on specified ***metre*** distance from a point (e.g., port), line (e.g., road, pipeline), or polygon (e.g., land use plan zone) feature. This would be more to indicate an anticipated growth in area across time. For example, wanting to show more coverage.
S1_T1, S1_T2, …, S4_T3, S4_T4	Float	A number over 1 for assuming a greater magnitude of use/activity. A number over 0 and under 1 for assuming a lesser magnitude/weight of use/activity. Specify -1 for assuming no use/activity.

Appendix F: Coded Alienation Map Features

As part of the plausible map features (described in Appendix E), this section describes how the Alienation dataset from the Ontario Ministry of Energy and Mines and Forestry was qualitatively coded to assume areas of plausible development or no development.

Table F1: Summary of the classification of alienation features used for analysis.

FEATURE TYPE	CODE	DESCRIPTION
Renewable Energy	RE	Any reference to wind, solar, etc. (not hydroelectrical)
Indigenous Land Claim	IC	Any reference to aboriginal land, boundary, territory land/title claims with First Nations
Aggregate Permit	AG	Any reference to aggregate
Hydro Electrical	HE	Any reference to hydroelectrical/hydropower development
Shipping/Boating	SB	Any reference to anchorage, boating or shipping activity
Telecommunication	TC	Any reference to communication, telecommunication etc development
Conservation Area	CA	Any reference to land for conservation or protection from development
Research	RS	Any reference to areas alienated for research and monitoring. For example, weather station, forestry studies
Transportation	TR	Anything related to transportation
Forestry	FR	Any reference to forestry activity
Plan	*	Add * at the end if the feature is related to a plan, proposal, future development assessment, etc.
Surface and Mining Rights	SMR	Any reference to alienation of an area as there are surface and/or mining rights held by an entity
Land Status Under Review	LSR	Any reference to alienation of an area as it is under evaluation by a ministry or governing body.
Withdrawal of Land from Prospecting and Mining	WL	Any reference to alienation through the withdrawing of land from prospecting and mining (i.e., those done under S. 29 and S. 36 of the Mining Act)
Property Development	PD	Any reference to areas set aside for municipal development, including development of residential property and / or recreational areas.
Rehabilitation	REHAB	Any reference to areas being alienation for the purposes of rehabilitation of a site AFTER development
Crown Reserves / Lands	CR	Any reference alienation for the purpose of developing Crown Reserves / Lands that do NOT provide additional detail about the activity taking place there
Public Use	PU	Areas that are set aside for public use

Waste Disposal	WD	Areas alienated for the purposes of waste management (i..e, landfill development) and waste disposal
Agricultural Lands	AL	Any references to agricultural lands
Defense	CD	Any references to areas being set aside for defense and/or policing purposes