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# Targeting Policies to Place: A Jurisdictional Analysis Of Composite Indicators for Rural Development

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## Abstract

How can government policy and decision-makers obtain a more nuanced understanding of rural and small-town community conditions and capacities in order to support decision-making and deliver targeted programs and services? How can community differences be captured in the day-to-day work of governments at all levels? This is an inherent challenge facing government decision makers. The range of definitions of rurality can be imperfect for policy purposes and small area data can face numerous challenges, reducing its robustness and utility. In response to these issues, many jurisdictions have adopted composite indicators for rural development, to provide a snapshot of community conditions and changes over time. This study presents a comparative analysis of composite indicators (CI) for rural development, local economic development, community resilience, and community well-being in five countries: Canada, New Zealand, Poland, Slovakia, and Spain. It explores leading practices and offers recommendations for robust rural CI development.

**Keywords:** Rural development indicators, composite indicators, rural development, local economic development, community resilience, community well-being

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# Ciblage des politiques à placer : une analyse juridictionnelle des indicateurs composites du développement rural

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## Resumée

Comment les politiques et les décideurs du gouvernement obtiennent-ils une compréhension plus nuancée des conditions et des capacités des communautés rurales et des petites villes afin de soutenir la prise de décision et de fournir des programmes et des services ciblés? Comment les différences communautaires peuvent-elles être prises en compte dans le travail quotidien des gouvernements à tous les niveaux? Il s'agit d'un défi inhérent auquel sont confrontés les décideurs gouvernementaux. L'éventail des définitions de la ruralité peut être imparfait selon les fins politiques et les données régionales peuvent faire face à de nombreux défis, ce qui réduit leur solidité et leur utilité. En réponse à ces problèmes, de nombreuses juridictions ont adopté des indicateurs composites pour le développement rural, afin de fournir un instantané des conditions et des changements communautaires au fil du temps. Cette étude présente une analyse comparative des indicateurs composites (IC) du développement rural, du développement économique local, de la résilience communautaire et du bien-être communautaire dans cinq pays : le Canada, la Nouvelle-Zélande, la Pologne, la Slovaquie et l'Espagne. Il explore les pratiques exemplaires et propose des recommandations pour un développement rural robuste de l'IC.

**Mots clés** : Indicateurs de développement rural, indicateurs composites, développement rural, développement économique local, résilience communautaire, bien-être communautaire

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## 1.0 Introduction

Rural places have contextual characteristics and considerations that are fundamentally different from urban ones. Characteristics like small population sizes, low density, and remoteness influence the needs, challenges, and opportunities of rural communities, as do place-specific factors that differ across communities. Due to these differences, it is important to understand local conditions when developing rural development policies and programs. The multidimensional nature of rural development processes ensures that no one indicator is capable of accurately describing local realities. Multiple indicators are required, and yet the capacity to compile and interpret a larger set of indicators is challenging and entails a myriad of choices about what to include, what to prioritize, and how to compare. These are complex questions that are made more difficult by data gaps and restrictions since not all factors that influence the development process are collected or directly measurable at the community level. Challenges related to data suppression, as well as time lags in local data availability are also common. Composite indicators (CI) have arisen as a useful tool for rural development. CIs can provide a snapshot of community conditions to help inform decision making, as well as to inform policy and program design and service provision by upper-level governments. They can also help deliver targeted policy supports to communities in need, prioritize resource allocation, and track changes over time.

This comparative multi-jurisdictional analysis of composite indicators for rural development examines how community-level data has been used to measure local conditions in a rural setting. This study presents a comparative analysis of CIs that have been created to measure local conditions in rural communities across five countries: Canada, New Zealand, Poland, Slovakia, and Spain. It uses a leading practices methodology to investigate ways in which data and indicators have been operationalized and applies these findings to offer recommendations for robust CI development.

This study proceeds in four parts: (a) elaboration of research methods; (b) overview of key considerations in composite indicator construction; (c) description and analysis of eight composite indicators for rural development, local economic development, community resilience, and community well-being across eight countries; (d) conclusions and recommendations.

## 2.0 Methods

This study employs a literature review of key concepts for rural CI construction alongside an analysis of leading practices for CI construction.[1] It has entailed a jurisdictional scan of how community-level data has been compiled to create a better understanding of local conditions in rural areas. The set of initiatives presented in this article are not exhaustive and were selected to illustrate the different ways in which local conditions can be measured and communicated. Rural CI initiatives were identified through online searches using the University of Victoria's online library and Google Scholar.[2] The selection process focused initially on Canadian experiences due to the highly contextual nature of rural development processes. This

[1] The OECD's *Handbook on Constructing Composite Indicators: Methodology and User Guide* (Nardo et al., 2008) was a key reference in the CI literature.

[2] The following search terms were used: rural, rural economic, community development, community economic development, local economic development, rural sustainability, community sustainability, rural resilience, community resilience, local resilience, rural well-being, and others combined with the terms, indicators, index, and composite indicators.

selection was then expanded to other comparable countries to include a wider range of approaches to CI construction. The criteria for inclusion were: (a) that the CI aggregates indicators in a way that facilitates community comparability and ranking, (b) that the CI has an explicit rural component, and (c) that the CI's construction methodology was publicly available. Within these criteria, we selected a sample of CIs that illustrate different approaches to measuring local conditions.[3] An acknowledged limitation of this study is that there may be selection bias due to use of search terms and language (English, Portugese, Spanish). The search methodology is targeted and not exhaustive.

No specific definition of rural was used to identify CI initiatives. How rural is defined depends on the user, application, and location. Definitions often focus on common characteristics like distance (e.g., access to employment, services), and population density. Where definitions are based on calculations or numeric variables, they differ by region, as well as by nation (Miller, 2013). Rural is also a social construct, formed by factors related to place, history, economy, and lifestyle (Reimer & Bollman, 2010). What is considered rural in one place can differ dramatically from another. Different cultures, particularly where there are Indigenous communities, also influence how rural is defined and understood. As such, 'rural' was left flexible to allow the inclusion of a range of rural CI examples.

The study scope was limited to reviewing leading practices in CI construction, investigating successful experiences in other jurisdictions, and using that information to provide recommendations on data use to support place-based rural development policy. Data on CI construction from the five countries was organized and interpreted through a thematic analysis approach (Vaismoradi et al., 2013). This method is highly flexible, providing ample theoretical freedom and allowing the research to examine different perspectives and highlight similarities and differences in the data (Nowell et al., 2017). This approach was used throughout the report to capture and organize leading practices in CI construction, organize and compare different approaches to understanding rural community conditions. The CIs were organized based on the phenomenon they aimed to measure (e.g. rural development, rural resilience).

## 3.0 Key Considerations in Composite Indicator Construction

Composite indicators combine individual indicators into a single measure to facilitate comparisons and ranking. As a tool for aggregating and simplifying measurements, CIs are useful in situations where no single indicator is capable of appropriately measuring a phenomenon. They have been extensively applied to measure a variety of multidimensional phenomena, from comparing human development across countries to ranking universities. Although CIs are often criticized for their shortfalls, they consistently garner significant public attention and influence decisions and policies (Saltelli, 2007). Thus, an important question is *when* and *how* can CIs be used appropriately and effectively?

[3] Initiatives that were reviewed but not covered in this paper include: Rural Deprivation Index—Norfolk, England (Burke & Jones, 2019); Rural Development Index—India (Banakar & Patil, 2018); the Sustainable Community Design—Scotland (Winther, 2017); Community Indicators Victoria—Australia (Cox et al., 2010), Heritages and Patrimonies of the Peasantry—Mexico (Ariza et al., 2017), Rurality Index—China (Li et al., 2015), Canadian Index of Well-being (Smale & Holliday, 2020), State of the Basin Report—British Columbia (Rethoret & MacDonald, 2017), and Subjective Well-being Report—British Columbia (Columbia Basin Rural Development Institute, n.d.).

A key advantage of CIs lies in their ability to easily communicate and draw attention to multidimensional phenomena, while facilitating comparisons. Although a dashboard of disaggregated indicators provides more information than a CI, it makes comparing or ranking communities based on their overall conditions difficult because one would have to compare various separate indicators and implicitly make choices regarding their relative weights. In a rural context, CIs can be particularly useful to identify how rural communities differ among themselves and in comparison to their urban counterparts (e.g. economic structure, training and education, access to infrastructure and services). For example, they can be used to identify communities that are facing barriers to development; help upper-level governments to understand what these barriers are; and help to inform targeted funds and initiatives to support communities both in overcoming barriers, but also in capitalizing on unique rural opportunities.

If carefully constructed, with a clear understanding of the rural context in question, CIs can help decision-makers to recognize and understand the range of unique factors influencing rural communities. However, if poorly constructed, CIs may send misleading policy messages or result in simplistic policy conclusions (Nardo et al., 2008; Saltelli, 2007). Thus, they should be constructed carefully and used in conjunction with disaggregated indicators and local knowledge to assess conditions in rural communities.

The literature on CIs highlights several steps in the construction process. The following key steps are briefly reviewed here: (a) developing a sound theoretical framework, (b) selecting variables, (c) normalizing indicators, (d) weighing indicators, (e) aggregating indicators, and (d) validating the composite indicator. For a more comprehensive discussion see Nardo et al. (2008).

### *3.1 Developing a Theoretical Framework*

The first step in creating a CI is to develop a sound theoretical framework (Booysen, 2002; Nardo et al., 2008). The theoretical framework is the foundation of the CI, as it defines the phenomenon that will be measured, identifies its dimensions, and determines the type of variables to be included (Burchi & De Muro, 2016). In effect, CI construction should be grounded in the fundamental purpose of the tool and the conceptual framework it is embedded in.

### *3.2 Selecting Variables*

The variable selection process is also crucial, as the success of a measurement tool largely depends on the quality of its underlying variables (Nardo et al., 2008). Variable selection is based on a combination of theory, empirical analysis, availability, and intuitive appeal—as well as political and policy considerations—since these tools are generally designed to inform the debate on a specific issue of interest (Booysen, 2002). Consideration should be given to both the positive and negative aspects of selected variables and how this impacts approach to measurement. Migration, for example, can be both a pull towards and a push away from a place. The information included in a CI should be easily communicated and of interest to a range of stakeholders using a manageable number of consistent and unambiguous indicators, while avoiding omitting relevant variables and oversimplifying the model (Blanke & Walzer, 2013; Kovacevic, 2011).

### *3.3 Normalizing Indicators*

Normalization is required when the selected variables are measured in different units (e.g. dollars, percentage). Simply put, it is the process of transforming indicators from their measurement units into a standard scale. There are many ways to normalize indicators and this choice can significantly impact CI results. Choosing an appropriate method is a complex task that needs to consider the structure of the data and the objectives of the particular CI (Nardo et al., 2008). The normalization process should balance the width of the range and the spread of the CI score, such that scores are not so close that communities cannot be distinguished from each other or so widely spread that comparable communities do not receive similar scores (Booysen, 2002).

### *3.4 Weighing Indicators*

There is little consensus on how to choose a weighting scheme, making it one of the hardest steps in CI construction (Greco et al., 2019). They are contentious because weights are value judgements that can directly impact the results of a CI (Booysen, 2002; Nardo et al., 2008). The subjectivity involved in this decision may put into question the credibility of a CI. There are three categories of approaches for weighting variables: (a) equal weighting,(b) participatory approaches, and (c) statistical approaches. Equal weighting is the most commonly used approach in CI development and entails distributing weights uniformly across indicators or distributing weights uniformly across dimensions (Greco et al., 2019; Nardo et al., 2008). In contrast, participatory approaches rely on consultations with stakeholders to determine the weighting scheme (Booysen, 2002; Nardo et al., 2008). Statistical approaches attempt to increase objectivity by using the data itself to derive indicator weights (Booysen, 2002).

### *3.5 Aggregating Indicators*

Following the weighting process, indicators need to be aggregated into a single composite score. A useful way to categorize aggregation methods is by separating compensatory and non-compensatory approaches (Greco et al., 2019). The key difference between the two is that compensatory approaches allow poor performance in one indicator to be offset by good performance in another. Linear and geometric aggregation methods are examples of compensatory approaches, while the non-compensatory multi-criteria approach (MCA) is an example of a non-compensatory approach (for a detailed discussion of non-compensatory aggregation see Munda & Nardo, 2009).

### *3.6 Validating the CI*

The last step in CI construction is to test, adjust, and validate the index. The processes of indicator selection, normalization, weighting, and aggregation bear direct influence on CI results, and poor or incompatible choices may lead to meaningless results (Greco et al., 2019). Often, despite weighting and aggregation processes being made explicit, their implications are not fully understood or assessed by developers (Paruolo et al., 2013). Validation helps developers understand the implication of their choices on final results and reduces the chances of producing meaningless results (Booysen, 2002; Greco et al., 2019). Methods such as sensitivity analysis should be applied to ensure the robustness of the CI.

## 4.0 Jurisdictional Analysis of Rural Composite Indicators

Six composite indicators were reviewed across five countries with diverse rural realities in terms of geography, social and economic structures (see Table 1). The choice of indicators varies significantly due to the contextual nature of these measurement efforts, their goals and the availability of data in each country or region. The overview of each initiative focuses on their structure and methodological choices and not on their findings, as these tend to be location-specific. Some CI initiatives are continuous efforts, with publicly accessible interfaces; others are one-off efforts designed to answer a specific question.

This section provides an overview of each CI initiative, discussing its purpose, structure, key methodological issues (e.g. normalization, weighting and aggregation), and limitations. It proceeds by describing the indicators according to their main CI frameworks: rural development (4.1), community resilience (4.2), and community well-being (4.3). These frameworks differ in their theoretical underpinnings, purposes and applications, thus leading to the consideration of different dimensions. Nevertheless, they share the trait of being complex, multidimensional concepts that cannot be adequately measured by a single indicator, hence CIs have been extensively used in their measurement.

### *4.1 Measuring Rural Development*

Rural development can be defined as "the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated areas" (Moseley as cited in Jean-Vasile et al., 2013, p. 61).

*Poland and Slovakia's Rural Development Index (RDI)* was created to measure the level of rural development and quality of life in Poland and Slovakia through a multidimensional lens (Michalek & Zarnekow, 2012). Michalek and Zarkenow (2012) argue that the RDI can be used to analyze the main determinants of rural development and measure the impact of rural development programs at different regional levels. The RDI assumes that the level of development and the quality of life in a rural community are equivalent and that quality of life is correlated with migration levels. It is thus built on the premise that areas with a better quality of life—or a higher level of development—will experience net in-migration, while less well-performing areas will experience net out-migration (Michalek & Zarnekow, 2012). Unlike the other CIs presented in this section, the RDI does not pre-select the 'most important' variables based on a theoretical framework or expert knowledge. Instead, it considers all partial indicators available to measure different aspects of rural development in districts (Michalek & Zarnekow, 2012). As a result, it includes 991 variables for Poland and 340 variables for Slovakia in the following domains: (a) economic, (b) social, (c) environment, (d) demographics, (e) administration, and (f) infrastructure. Given the number of variables, the RDI uses multivariate analysis methods to create a smaller set of components that retain most of the information in the original variables. Weights for each component are estimated using a panel regression model with gross migration flows between rural areas as a dependent variable (Michalek & Zarnekow, 2012).

Table 1. *Initiatives Measuring Local Conditions*

| Index/Study | Location | Purpose | Unit of Analysis | Dimensions |
|---|---|---|---|---|
| **Rural Development Frameworks** | | | | |
| **Rural Development Index** | Poland / Slovakia | Measure the level of rural development and quality of life through a multidimensional lens. | Community | Economic, Social, Environmental, Demographics, Administration, Infrastructure |
| **Rural Economic Capacity Index** | Newfoundland & Labrador, Canada | Provide communities with information on socioeconomic conditions to support policy decisions and regional collaboration | Community/Region | Demography, Economic Structure, Income, Service Level, Spatial Location, Governance |
| **Community Resilience Frameworks** | | | | |
| **Indicators of Resilience for Rural Communities** | New Zealand | Understand resilience in a rural context and develop a measure that could be incorporated into the policymaking process | Community | Economic, Environmental, Social, Institutional, Cultural |
| **Territorial Resilience Index** | Spain | Identify characteristics associated with resilience in rural areas to help guide the design of policies that support adaptation efforts. | Region | Index: Economic, Demographics Descriptive Indicators: Economic, Social, Human, Natural |
| **Community Well-Being Frameworks** | | | | |
| **Community Well-Being Index** | Canada | Measure of well-being for Indigenous and non-Indigenous communities across Canada | Community | Income, Labour Force, Education, Housing |
| **Community Accounts Composite Well-Being Score** | Newfoundland & Labrador, Canada | Measure of well-being in communities to allow users to understand the factors that affect progress in communities. | Community | Not structured around dimensions. Includes indicators on population, migration, income, employment, poverty, education, subjective well-being. |

Source: Authors' own elaboration.

Michalek and Zarnekow (2012) explain that the model postulates that migration flow between regions depends on the differences in observable conditions in different regions and the transaction costs of moving between them. Thus, weights become a measure of importance assigned by society—migrants and non-migrants—to a set of characteristics that represent the quality of life in origin and destination regions (Michalek & Zarnekow, 2012). Finally, components are aggregated through a weighted average process using the endogenously estimated weights.

The construction of the RDI is complex, making it harder to replicate and communicate. The RDI comprises a large amount of data that encompasses the key domains of the rural development process. The RDI construction reduces the subjectivity involved in the variable selection and weighting process by including all available variables in the selected domains and allowing endogenous processes to determine their weighting. Due to the large number of variables included in the model, it uses multivariate analysis methods to reduce dimensionality—number of variables—with the drawback of creating components that are difficult to interpret. Regarding its theoretical underpinnings, the RDI is built on the assumption that migration flows are the best measure of rural development or rural quality of life. Although this assumption appears plausible, it does not consider that migration to less desirable communities may occur as individuals are pushed towards more affordable areas. The use of hedonic pricing or other preliminary analysis could have helped determine if net migration is, in fact, a good measure of rural development.

*Newfoundland and Labrador's Rural Economic Capacity Index (RECI)* is an initiative of the Memorial University[4]. RECI was developed to address two issues faced by rural communities in that province: (a) the lack of information about local socioeconomic conditions to help communities assess their best options for development and (b) the difficulty of collaborating regionally to avoid the pressures for aggregation due to demographic decline (Simms et al., 2014). As such, RECI was built to provide communities with a set of socioeconomic and demographic information aggregated in a way that is easy for local leaders to understand and apply to policy decisions. Additionally, it allows users to view metrics at different levels of aggregation to demonstrate how conditions may change if regions work collaboratively (Simms et al., 2014). The RECI was built around eight components considered relevant to community economic capacity: (a) demography, (b) economic structure, (c) income, (d) service level, (e) spatial locations, (f) governance, (g) labour supply, and (h) labour demand (Simms et al., 2014). In the RECI, variables are weighted equally, but individual and composite scores are based on the concept of comparative advantage, thus if a region scores a plus on a majority of the inputs, it will have a comparative advantage over its neighbours with lower scores (Simms et al., 2014). To create a single composite score for a community, RECI uses a fuzzy function to standardize results into a -1/+1 scale, then aggregates results using a linear aggregation method, which with equal weights is simply the average score of all variables.

The RECI has a relatively straightforward construction, thus making results easy to interpret and communicate. Given that the purpose of RECI is to providing information to communities, this simplicity is helpful to ensure results can be used by communities for development planning purposes. However, the RECI's

[4] The information from RECI is publicly available at http://reci.ucs.mun.ca/index.php.

documentation presents no discussion of statistical analysis to understand the data structure and support the choice of variables. It also does not explain how authors dealt with missing data. As a design choice, RECI has a narrow focus on variables that impact economic well-being. Although not a problem in itself, this choice may leave out variables that are significant to rural development processes.

### *4.2 Measuring Community Resilience*

Community resilience is concerned with the capacity of a territory (e.g. community, district, region) to (a) prepare, (b) resist (short-term), and (c) adapt (long-term) to changes or shocks (Breen, 2016; Sánchez-Zamora et al., 2014). The concept of community resilience is rooted in a social-ecological systems approach (Salvia & Quaranta, 2017) that recognizes the connection between socio-economic and environmental systems, leading to stronger consideration of environmental factors in the development process (Breen, 2016).

*New Zealand's indicators of resilience for rural communities* develop a measure of community resilience to inform the policymaking process (Kaye-Blake et al., 2019, p. 162). The study analyzed indicator data from a set of variables correlated to resilience and compared the results from these indicators with resilience ratings collected through workshops with rural community residents (Kaye-Blake et al., 2019). Workshop participants in four rural communities provided qualitative information about factors that affect their community's resilience, as well as ratings on their community's level of resilience (Kaye-Blake et al., 2019). This dual approach allowed researchers to compare and understand the relationship between residents' perceptions of resilience and a measure of resilience based on statistical data. The resilience framework used in this CI includes (a) social, (b) institutional, (c) economic, (d) environmental, and (e) cultural dimensions, as well as the external factors that affect community resilience (Kaye-Blake et al., 2019). To create a single index value, partial indicators are normalized through a categorical process where communities are given a score between 1 and 5 based on certain predetermined performance ranges (Kaye-Blake et al., 2019). Once all indicators are in a 1–5 range, scores are linearly aggregated using equal weights for each dimension. In parallel, the resilience perception ratings provided by workshop participants are scored out of 10 points considering community resilience holistically (Kaye-Blake et al., 2019).

The qualitative component—assessed through community workshops—is likely to have significantly increased time and cost commitments, which could be prohibitive for initiatives with large geographical coverage. Nevertheless, the use of both 'objective' measures of resilience based on statistical data and individuals' perception of resilience is innovative and allows researchers to understand how well residents' perceptions align with information derived from their resilience framework. Regarding its methodological choices, the applied categorical normalization results in large information loss as the magnitude of differences are not captured because communities within a category receive the same score, regardless of being close to the lower or the higher bound of the category.

*Spain's Territorial Resilience Index (TRI)* was developed to identify characteristics associated with resilience in different rural areas of Andalusia, Spain. It aims to provide information to guide the design of policies that support adaptation efforts in rural areas, with a focus on territorial recovery capacity following the 2008 economic crisis (Sánchez-Zamora & Gallardo-Cobos, 2019). The CI is calculated for 52 rural Andalusian counties, accounting for 80% of the territory and 698

municipalities (Sánchez-Zamora & Gallardo-Cobos, 2019). The study uses employment, income, and population as the variables to measure resilient behaviour. The percentage increase in the employment rate, the percentage increase in net income per capita, and the percentage increase in the population during the period between 2012/2013–2016 are used as indicators to assess resilient behaviour (Sánchez-Zamora & Gallardo-Cobos, 2019). Sánchez-Zamora and Gallardo-Cobos (2019) argue that a county can be considered resilient if it has been able to perform well in these three indicators during the analyzed period. Thus, these indicators are combined to create the TRI. Once the TRI is calculated for each territory, the authors used a set of 30 indicators to identify characteristics that were relevant to determine territorial performance following the crisis (Sánchez-Zamora and Gallardo-Cobos, 2019). The indicators were selected based on the literature, collected from available statistical data published by official bodies and categorized under four territorial capitals: economic, social, human, and natural (Sánchez-Zamora & Gallardo-Cobos, 2019). The study uses these indicators to first create four clusters of rural territories and then compare territorial characteristics with the TRI to identify how they impact territorial resilience.

The TRI uses Data Envelopment Analysis (DEA)—a statistical method that determines weights endogenously to maximize the efficiency of each territory (Sánchez-Zamora and Gallardo-Cobos, 2019). This method has the advantage of avoiding selecting weights arbitrarily or relying on expert opinion, but it has the disadvantage of creating specific weights for each territory, which may decrease the index comparability. Since the three indicators included in the TRI used the same units—variables standardized to percentages—no additional normalization procedures were required. A key drawback of the TRI is equating resilient behaviour in rural counties to growth in only three variables: employment, income, and population. Aside from not considering other important aspects of local performance, these indicators may be affected by factors unrelated to local resilience, possibly leading to misleading results.

### *4.3 Measuring Well-Being*

Community well-being is another multidimensional concept built on the understanding that economic development should be viewed as part of a broader development goal that includes social and environmental conditions (OECD, 2016). Well-being focuses on people and not on the economy, as there might be important differences between the economic performance of a community and the well-being experiences of its inhabitants (Durand, 2015). However, this people-centric approach does not mean places are left out of the analysis, instead, they are evaluated based on the quality of life they provide to residents (Stiglitz et al., 2009).

*Canada's Community Well-Being Index (CWB)* is a measure of well-being for Indigenous and non-Indigenous communities across Canada developed by Indigenous Services Canada (ISC) using data from the Statistics Canada Census of Population (Penney et al., 2012). The CWB was based on the Human Development Index (HDI), which defines well-being in terms of educational attainment, income and life expectancy. Given that community-level life expectancy estimates would be unreliable due to the small population size, the CWB removed that indicator and included indicators related to housing and labour force—key areas of concern in Indigenous communities (Penney et al., 2012). The CWB thus includes the following dimensions: (a) income, (b) education, (c) housing, and (d) labour force

activity (Indigenous Services Canada, 2019). These components are not intended to represent all dimensions of well-being but focus on areas where information is readily available at the community level through the census, as to allow the comparison of Indigenous and non-Indigenous communities across Canada over many decades (Indigenous Services Canada, 2019). Given that all indicators are expressed as proportions in a 0–100 range, the CWB does not require any additional normalization procedures. Each component in the CWB is given equal weights (O'Sullivan & McHardy, 2004) and although the aggregation process is not described in the documents, it is assumed that it uses a linear aggregation process, the most common method in CIs.

The CWB is only available for Canadian communities of at least 65 residents that are not an incompletely enumerated reserve and whose global non-response rate did not exceed 25% in the Census of Population (Penney et al., 2012). As such, many Indigenous communities are excluded from the index. Further, due to data availability, the CWB uses a very narrow concept of well-being. The Office of the Auditor General in an audit recommended that the CWB be included in a broader dashboard along with other indicators, such as health and language, to provide a more holistic assessment of community well-being (Indigenous Services Canada, 2019). While using census data increases the coverage of the CWB, it only allows the index to be updated every 5 years. This is not ideal to inform policy decisions. However, there are positive elements as well: the CWB's construction is simple and easy to communicate.

*Community Accounts* is an initiative of the Government of Newfoundland and Labrador and the Labrador Statistics Agency to provide publicly available data at the community, regional, and provincial levels. The well-being composite score is derived from a set of 16 indicators such as (a) population change, (b) income, (c) employment, (d) education and health, and (e) life satisfaction. The set includes both quantitative and qualitative indicators from various sources, including Statistics Canada, Canada Customs and Revenue Agency, and provincial ministries. The indicator has a simple construction; the score for each community is calculated by taking the number of indicators that score in the bottom 25% of all communities and subtracting it from the number of indicators that score in the top 25% of all communities. The resulting number is turned into a percentage of the range. Thus, the index uses a categorical scale to normalize results and an equal weighting scheme.[5]

The use of categorical scaling results in a significant loss of information because all indicators within a category are given identical results. Additionally, the thresholds at the top and bottom 25% may be perceived as arbitrary and may have an impact on the rankings. The use of equal weights without clear justification may also be considered arbitrary. However, the simple construction of the index makes it easy to interpret and communicate.

Table 2 provides an overview of all CIs examined, noting the number of indicators that the instrument covers alongside its geographical coverage, scaling, weighting, aggregation technique and the pros and cons of each approach.

[5] When data for an indicator is missing for a community, the index uses offsets to create a complete indicator collection. An offset is larger geography that contains the community of interest. For instance, when data is missing for a community, the index will use the data from the regional district in which that community is located (Government of Newfoundland and Labrador, n.d.-b), Understanding the Use of Offsets in Well-Being section) .

Table 2. *Summary of Initiatives*

| Initiative | Number Of Indicators | Coverage | Scaling | Weighting | Aggregation | Pros | Cons |
|---|---|---|---|---|---|---|---|
| **Rural Development Index – Poland/Slovakia** | Poland – 991<br>Slovakia - 340 | 314 communities | Indicators are converted into factors using PCA and FA and then z-normalized | Weights are determined endogenously using a panel regression model on migration | Linear Aggregation | • Use of statistical methods reduce subjectivity.<br>• Includes a large amount of data.<br>• Use of regression allows for identification of key variables for development. | • Complex construction, making it hard to replicate and communicate.<br>• Built on the assumption that migration flows is the best measure of rural development. |
| **Rural Economic Capacity Index** | 25 | 365 communities, or 20 economic zones, or nine rural secretariats | Fuzzy function that normalizes results in a +1,-1 range. | Equal weights | Linear aggregation (weighted average) | • Simple construction makes index easy to replicate and communicate.<br>• Results can be calculated for different geographic levels (i.e. community, region). | • Narrow focus on economic well-being. |
| **Indicators of Resilience for Rural Communities** | 22 | 4 communities | Categorical scaling | Equal weights | Linear aggregation | • Simple construction makes index easy to replicate and communicate.<br>• Uses both quantitative and qualitative data to compare perceptions of resilience with index results. | • Construction choices are not well justified.<br>• Use of categorical scaling leads to information loss.<br>• Use of qualitative information increases costs, and would not be scalable to large geographical coverage. |

| Initiative | Number Of Indicators | Coverage | Scaling | Weighting | Aggregation | Pros | Cons |
|---|---|---|---|---|---|---|---|
| **Territorial Resilience Index (TRI)** | 3 | 52 counties | Not required (all indicators are in the same unit) | Determined endogenously through Data Envelopment Analysis (DEA) | DEA | • The TRI is regressed against a set of 30 indicators to find the determinants of resilience. This process is replicable and may be of interest to other jurisdictions.<br>• DEA removes some subjectivity from the construction process. | • Index equate rural resilience to growth in employment, income and population<br>• DEA produces weights that are unique to each unit (county), thus reducing comparability. |
| **Community Well-Being Index** | 7 | 4454 communities | Not required (all indicators are in the same unit) | Equal weights to each component. | Linear Aggregation | • Simple construction makes index easy to replicate and communicate.<br>• Use of census data allows for broad coverage. | • Uses a narrow concept of well-being due to data availability issues.<br>• Only updated every 5 years due to reliance on census data. |
| **Community Accounts Composite Well-Being Score** | 16 | 365 communities | Categorical scaling | Equal weights | Linear aggregation | • Simple construction makes index easy to replicate and communicate.<br>• Includes indicators on the perception of well-being (e.g. self-reported sense of belonging). | • Construction choices are not well justified.<br>• Use of categorical scaling leads to information loss. |

### *4.4 Discussion*

This review of CI indicators demonstrates the diversity of initiatives to understand local conditions through different lenses. Even initiatives that rely on similar frameworks are varied in their indicator selection and methodological structure. While some indices use only a handful of indicators, others include over 900 indicators. And while some are built using simple methodological structures to normalize, weight, and aggregate indicators, others rely on complex statistical methods. Finally, while some present a narrower economic focus, others include environmental, cultural, and qualitative factors—which provide rich data, but are typically more challenging, time-consuming, and expensive to replicate over time.

All initiatives attempt to capture multi-dimensional phenomena that are hard to define and even harder to measure. Since these phenomena cannot be measured directly, initiatives resort to identifying measurable proxies to represent their manifestation. As proxies rely on assumptions about the relationship between the measurable indicator and the variable of interest, if the assumed relationship is incorrect, the measurement will be inaccurate (Schipper & Langston, 2015). Additionally, due to data limitations, which are especially prevalent in rural, remote, and Indigenous communities, indicators often need to be selected based on data availability, resulting in important aspects of rural conditions being excluded from consideration. As such, the reviewed initiatives encompass a range of variables to capture a complex reality that is context-dependent, while being constrained by data availability issues and hard methodological choices. A perfect set of variables or an ideal methodology does not exist. A successful CI needs to fit with the unique rural context of the jurisdiction in question and the goals of its users. Initiatives presented here demonstrate the amplitude of community measuring initiatives, which may help guide choices in developing tools to measure and communicate rural community conditions.

A limitation of the CIs presented in this paper is that the variable selection process tends to be uniform and top-down. That is, all communities are measured by a predetermined set of variables deemed important by the CI creator. This top-down approach may not encompass the different realities, cultural backgrounds and goals of communities. This can be a particular challenge for Indigenous communities when values are determined from a colonial perspective. Since the need for externally consistent measures still exists, it is important to be conscious that any undifferentiated ranking system imposes a common set of goals on communities that may be radically different. Thus, externally determined measures that rank communities against an undifferentiated set of criteria must be applied carefully and with the understanding that communities may have diverse goals. This is especially important when considering Indigenous communities.

From a technical standpoint, this brief exploration provides some key takeaways. For most initiatives, data availability is as important as the theoretical framework in determining variable selection. In an ideal world, a CI constructor would design a theoretical framework and use it to guide and justify all further decisions, from variable selection to determining a weighting scheme. In reality, this review found that theoretical frameworks are only briefly described and seldom used to justify design choices, which may be a result of data and technical constraints. In terms of variable selection, the choice is constrained by the availability of data, particularly at the community scale. This constraint is even more relevant when considering rural, small, and Indigenous communities. Therefore, the theoretical framework may

work as an initial filter to determine what variables should be considered, but the final choice is dependent on data availability. However, this review is based only on publicly available documents. Further primary data collection may shed more light on the extent that theoretical frameworks were used to guide design choices.

Another key finding relates to the diversity of the CIs reviewed in terms of complexity. Adding complexity tends to improve accuracy but reduces interpretability. This trade-off influences various aspects of the construction process, from the number of indicators included in the model to the methodology used to normalize, weight, and aggregate results. A successful CI finds a balance between accurately measuring local conditions and presenting results that are easily interpretable and communicable. Regarding weight selection, initiatives tended to either use an equal weights approach or apply statistical methods to determine weights endogenously. The equal weights approach is popular for its simplicity and it is generally used to avoid the subjectivity of assigning importance to different variables. The main critique of this approach is that assigning equal weights is as arbitrary as any other scheme. In contrast, statistical methods use the data itself to determine weights. Although this process is perceived to be more objective, it significantly increases complexity and may reduce the communicability of a CI. Given that weights can drastically affect results and that priorities may vary significantly across communities, choosing a weighting scheme remains a complex choice that incurs significant trade-offs.

The review has shown that most initiatives reviewed used linear aggregation processes (i.e., weighted average) to turn the many indicator values into a single composite indicator score. The option for a linear aggregation process is probably due to its relative simplicity to calculate and communicate. The key issue with linear aggregation is that it assumes full compensability between indicators. Full-compensability means that bad performance in a variable can always be compensated by strong performance elsewhere. That is a strong assumption, as it is unlikely that many variables can be compensated for. For example, it is not plausible that a community can compensate for a high climate change vulnerability by increasing population growth or decreasing unemployment. Furthermore, the linearity of the aggregation process means that returns are constant for all variables. That means that increasing an indicator that is already high, results in the same benefit as improving a low-performing indicator. Despite these weaknesses, we were unable to find rural-focused CIs that use non-compensatory approaches, likely due to their complexity.

## 5.0 Conclusions

This jurisdictional scan aimed to demonstrate how CIs have been used to help understand local conditions in rural areas of Canada and other comparable countries. Based on the examples considered, this exploration demonstrated that CIs are complex tools that can be built in a variety of ways. The results and the quality of a CI hinge on a series of choices, and for this reason, they need to be well justified. Thus, it is important to follow good practices in CI construction, such as creating a solid theoretical framework on which all other choices will be anchored on. The theoretical framework defines the phenomenon being measured, identifies its dimensions and determines the types of indicators to be included. The theoretical framework brings consistency and credibility to the variable selection process and provides a set of criteria to determine what variables should be included and how they should be organized.

The initiatives presented in this paper exemplify the breadth of CIs that can be used for similar purposes, including prioritization and comparison. Their construction ranges from highly complex statistical models that synthesize hundreds of indicators to the simple average of a few indicators. This paper is not an exhaustive review of CIs, nor does it aim to determine what is the best approach to creating a CI, as this answer will inevitably be determined by the context and the purpose of the tool. If the purpose of a CI is to simplify and bring attention to a complex issue, a simple construction that is easily understood may be desirable. In contrast, if the tool is to be used to help steer policy decisions, then a more complex construction may be required to ensure the CI creates an accurate and objective representation of the conditions in rural communities. At their best, CIs can be a powerful tool to help to understand and communicate local conditions in rural areas, but at their worst, they may misinform and lead to bad decision-making.

This comparative review points to three key practices in CI construction that may help ensure its quality:

1. *Have a clear purpose and know your audience***.** The CI should be grounded in a robust theoretical framework: it is important to clearly define the phenomenon being measured; understand its dimensions and how they are related and develop clear criteria to select indicators for each dimension.
    - For 'public use' CIs, which are intended to help communities, it is generally desirable to (a) use a simpler construction that is easily understandable by individuals with different levels of data literacy; (b) use public datasets from credible sources, and (c) describe the rationale for choices and be upfront about limitations
    - For 'internal use' CIs, more complex construction—including the use of internal data sources—may be warranted if it is believed to increase accuracy. However, unnecessary complexity should generally be avoided. It is important to understand what information decision-makers require and to review data sources and recognize where gaps exist. If possible, consider collecting data to reduce gaps.
2. *If the CI is a continuous effort, use data sources that are frequently updated when available for the area and variable of interest.* This will make the CI more responsive to changes in context and will provide more accurate information.
3. *Use CI along with disaggregated data.* CIs are great tools to simplify complex phenomena and bring attention to them, but they should not be used as the only source of information for decision-making. Apply them as a coarse filter, but use disaggregated data, as well as local knowledge to make final policy choices.

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