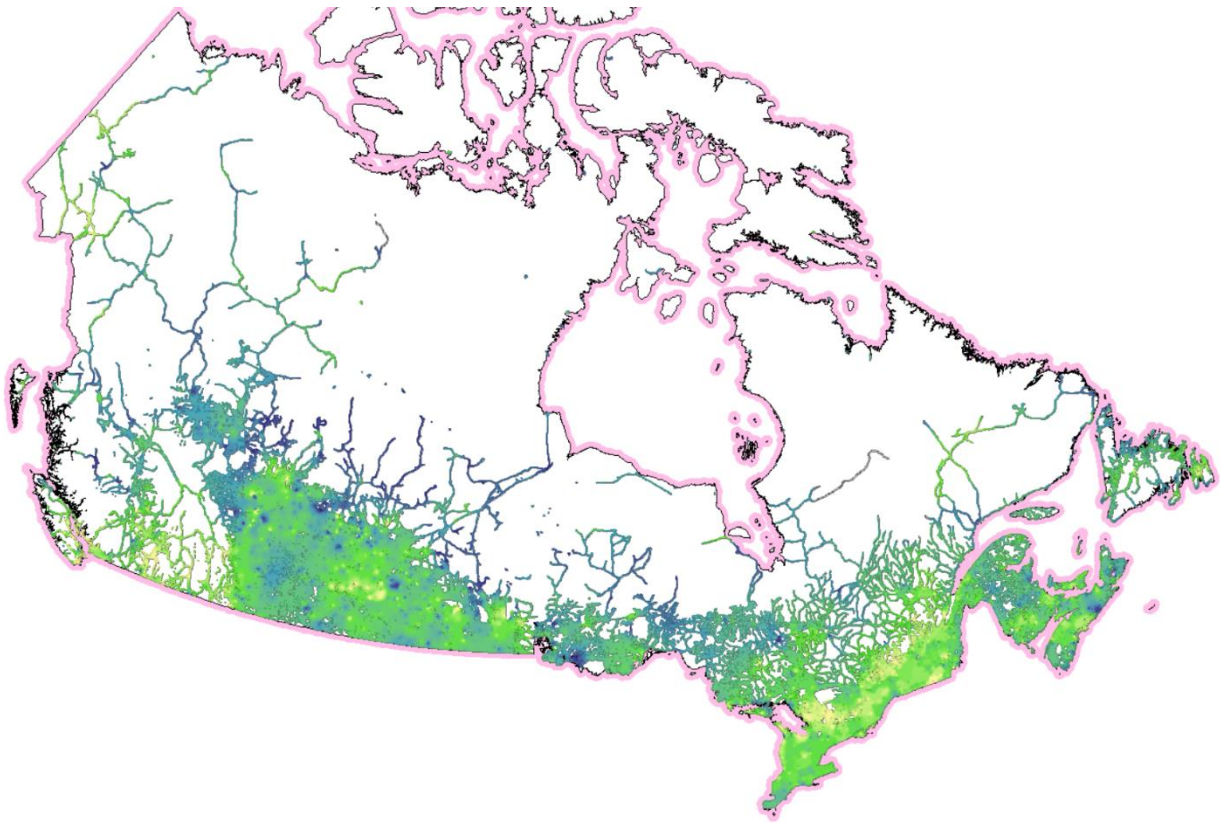


# CanEcumene 3.0 GDB

## Regional and Community Vitality Index Mapping



**Technical Reference 2.0**

**January 2025**

## Introduction

This document provides technical reference information for the Regional and Community Vitality Index (RVI/CVI) database published in the GeoDiscovery platform of the Government of Canada.

The purpose of the RVI/CVI database is twofold:

1. To provide georeferenced socio-economic conditions of communities and regions for use in natural resource and environmental management applications, particularly for Cumulative Effects Assessment (CEA) and Climate Change Adaptation (CCA)
2. To analyze socio-economic conditions in according to their spatial and temporal variability on a local, regional, or national basis, and in relation to their natural environmental or ecological settings.

## Description

The RVI/CVI database is derived from the CanEcumene 3.0 GDB (Eddy, et. al. 2023) using a selection of socio-economic variables identified in Eddy and Dort (2011) that aim to capture the overall state of socio-economic conditions of communities as ‘human habitats’.

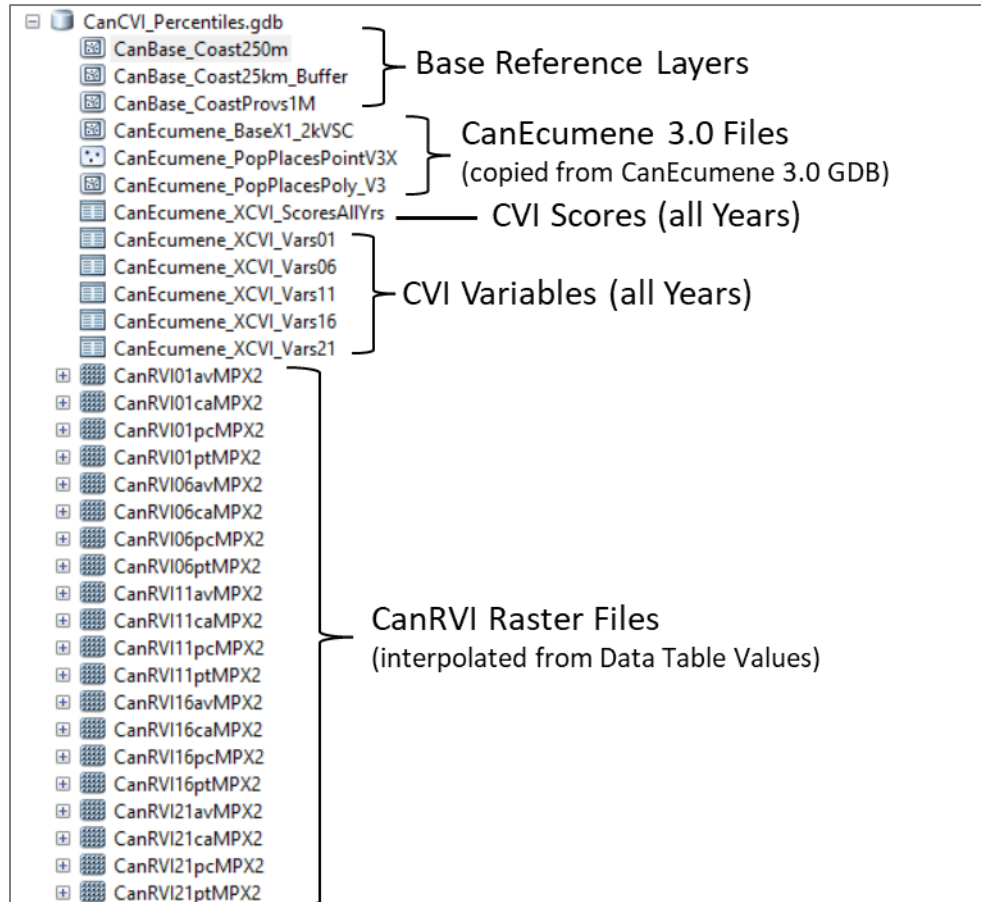
The RVI/CVI is comprised of five sub-indicators: 1) population change, 2) age structure, 3) education levels, 4) employment levels, and 5) real estate values. Index values are based on percentile ranks of each sub-indicator, and averaged for each community, and for three ranked groups: 1) all of Canada, 2) by province, and 3) by population size. The data covers the Census periods of 2001, 2006, 2011 (NHS), 2016, and 2021 (StatsCan, 2023).

The index is mapped in two ways: 1) as ‘points’ for individual communities (CVI), and 2) as ‘rasters’ for spatial interpolation of point data (RVI). These formats provide an alternative spatial framework to conventional StatsCan CSD framework. (For more information on this approach see Eddy, et. al. 2020).

This document provides technical reference information to assist users.

## Data Contents

The contents of the CanCVI\_Percentiles.gdb are as follows (Figure 1):



**Figure 1. Data layer contents of the CanCVI\_Percentiles.gdb.**

The main data table for the CVI data is the XCVI\_ScoresAllYrs table. The data used to calculate the scores are stored in the XCVI\_Vars{YR} tables. The Base Reference and CanEcumene 3.0 layers are provided for convenience.

CVI data can be mapped as for individual communities by joining the XCV\_ScoresAllYrs table to the PopPlacesPointV3X or PopPlacesPoly\_V3 layers using the ECUID as the common link field. The Raster layers are individual spatial interpolations of each CVI field in the XCVI\_ScoresAllYrs table.

## Table Structures

The structure of the CVI Scores (XCVI\_ScoresAllYrs) table is as follows (Figure 2):

	ECUID	Ecumene Unique ID
	ECUName	Ecumene Name
	ProvTerr	Province/Territory
Individual Group CVI Values	CVI01ca	<i>These fields are the individual CVI 'score' values calculated in three (3) categories: ca = Canada pt = Province/Territory pc = Population Class  (These scores are calculated relative' to each of these groups)  (Note: Population Class categories are provided in the CanEcumeneMaster table)</i>
	CVI01pt	
	CVI01pc	
	CVI06ca	
	CVI06pt	
	CVI06pc	
	CVI11ca	
	CVI11pt	
	CVI11pc	
	CVI16ca	
	CVI16pt	
	CVI16pc	
	CVI21ca	
	CVI21pt	
CVI21pc		
Average CVI Score Values	CVI01avg	<i>These CVI fields are values calculated for each year as an 'average' of the three groups listed above.</i>
	CVI06avg	
	CVI11avg	
	CVI16avg	
	CVI21avg	

**Figure 2. Data field descriptions for the XCVI\_ScoresAllYrs table.**

The initial calculations were done for all communities in Canada as a total set. This means that scores for all community types and locations were compared with all others in Canada ('ca' fields). However, since it may be deemed unfair to compare small, rural, remote communities, and larger cities in the same group, calculations were repeated for two other groupings: to compare all communities with those of their own province or territory ('pt' fields), and comparisons of

communities only with those of their respective population classes ('pc fields). The final CVI scores are calculated as an average of the three groups.

The table structure for the CVI Variables (XCVI\_Vars{yr}) table is as follows (Figure 3):

ECUID	Ecumene ID
ECUName	Ecumene Place Name
ProvTerr	Province/Territory
Latitude	Latitude
Longitude	Longitude
TotPop{yr}	Total Population
PopCh{yr}	Population Change (5 yr)
[1] Age{yr}	Age Structure (ratio of Youth/Seniors)
[2] Edu{yr}	Education (% with post-secondary education)
[3] Emp{yr}	Employment (% of Workforce Employed)
[4] Econ{yr}	Economy (Total Residential Real Estate Value per Capita)
Notes: [1] Youth=1-15 yrs, Seniors=> 65 yrs	
[2] Includes all trades, college and university levels	
[3] This is the inverse of the Unemployment Rate	
[4] The sum of all Dwelling values / Population	

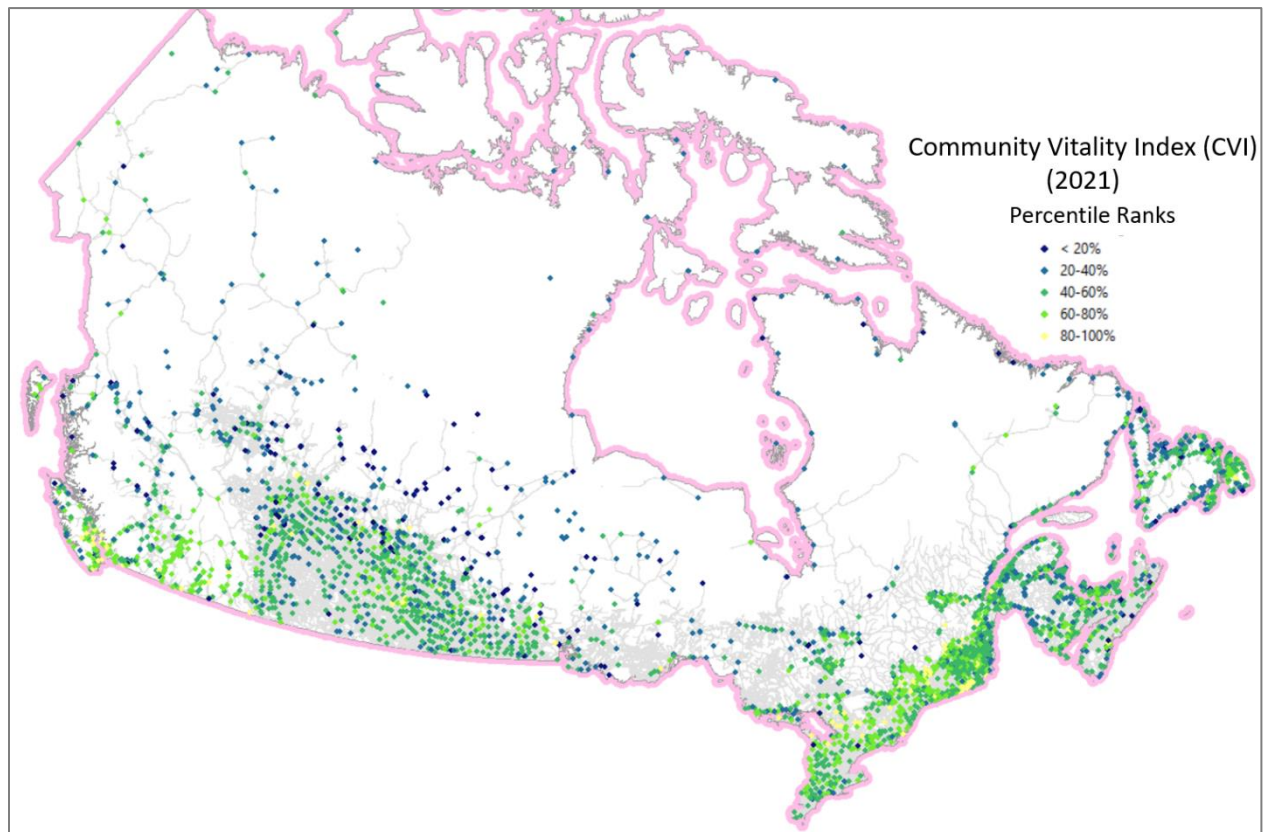
**Figure 3. Data field descriptions for the XCVI\_Vars{YR} tables.**

These tables contain the CVI variables from which the CVI Percent Rank scores were calculated. The variables were derived from Census data for the years indicated.

Percent Rank scores were calculated for each variable and averaged as a final CVI score for each community. This process was repeated for each year, and each grouping category: ca, pt, pc as described above. (Note: these calculations were completed in other tables not provided as part of this database, but may be obtained by request to the author).

## Interpretation and Use

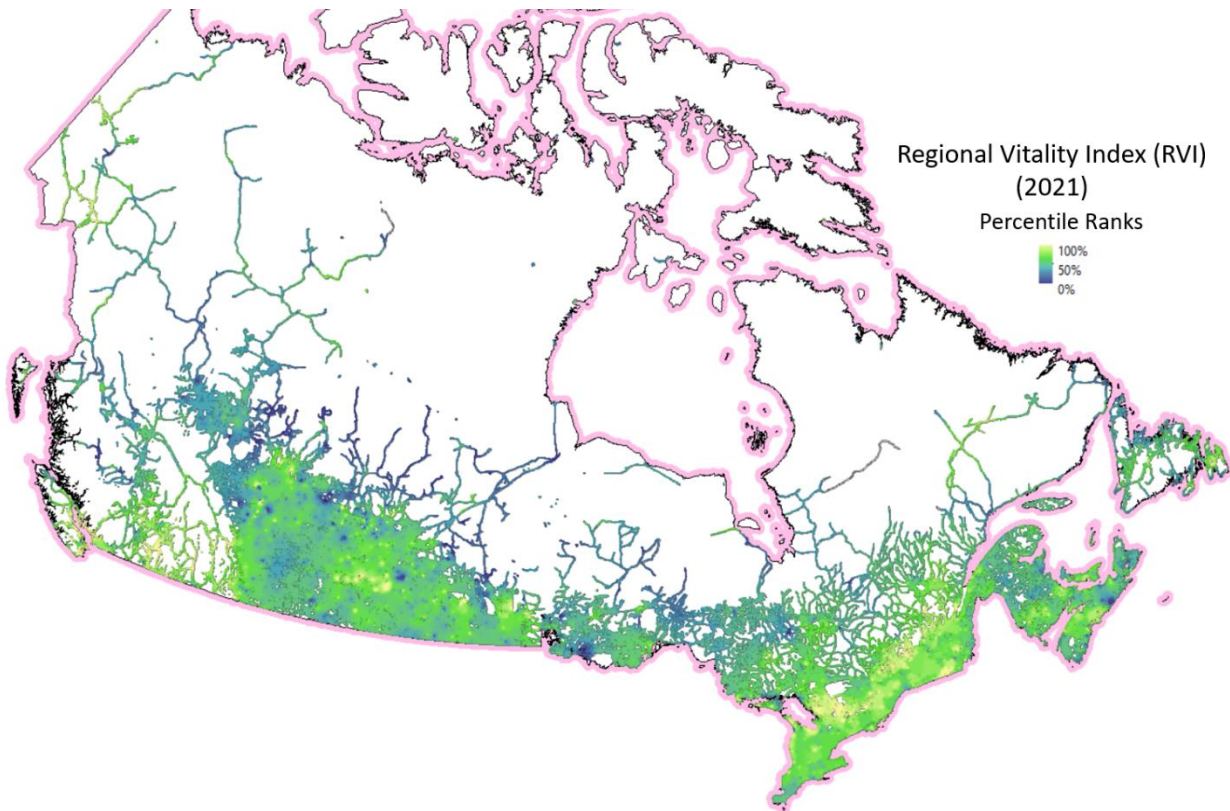
The primary spatial unit of analysis with this data is the individual community as represented by point and polygon features stored in the CanEcumene 3.0 GDB. CVI Scores can be mapped using either points or polygons on their own, such as in the national scale map in Figure 4.



**Figure 4. Mapping CVI point data at a national scale.**

It is possible to visualize CVI patterns using point data at a national scale. Some patterns that are discernable at this scale include the medium to high values in the Quebec-Windsor economic core region and in southern BC, the mixed CVI values throughout the Prairie and Atlantic provinces, and the generally lower CVI values in the remote and northern communities. However, due to the large number of communities and limits with symbolization, this is not the most optimal form of visualizing patterns at a regional or national scale.

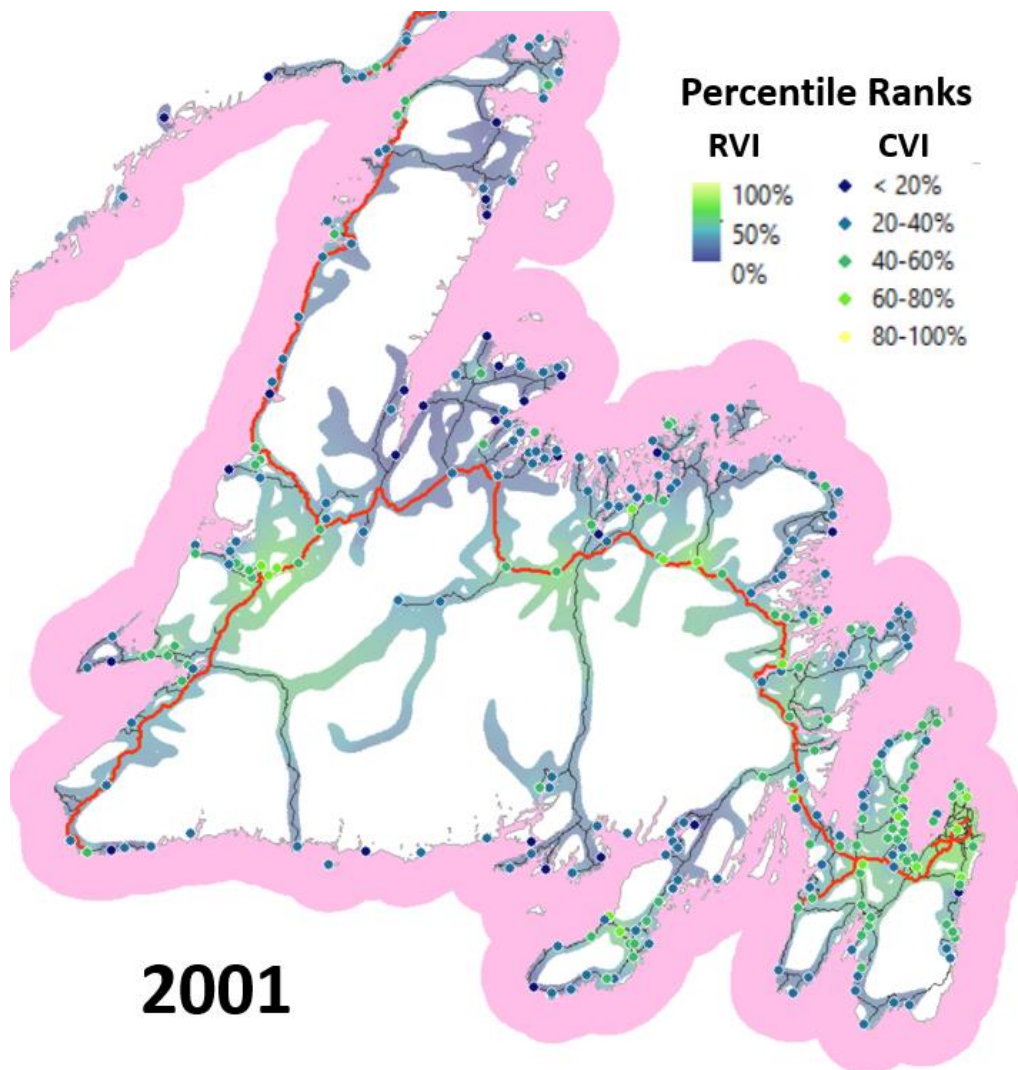
An alternative is to use the raster data that show regional values (RVI's) as a continuous interpolated surface, such as in Figure 5.



**Figure 5. Mapping CVI as an interpolated surface (RVI).**

By using the spatial extents of the settlement ecumene (See: Eddy, et. al. 2023a), individual CVI values are interpolated regionally and show more vividly the how vitality varies across regions. It may be particularly interesting to visualize changes over time by creating a time-series automation using the raster layers. This can aid in interpreting changes in regional vitality over time for specific locations.

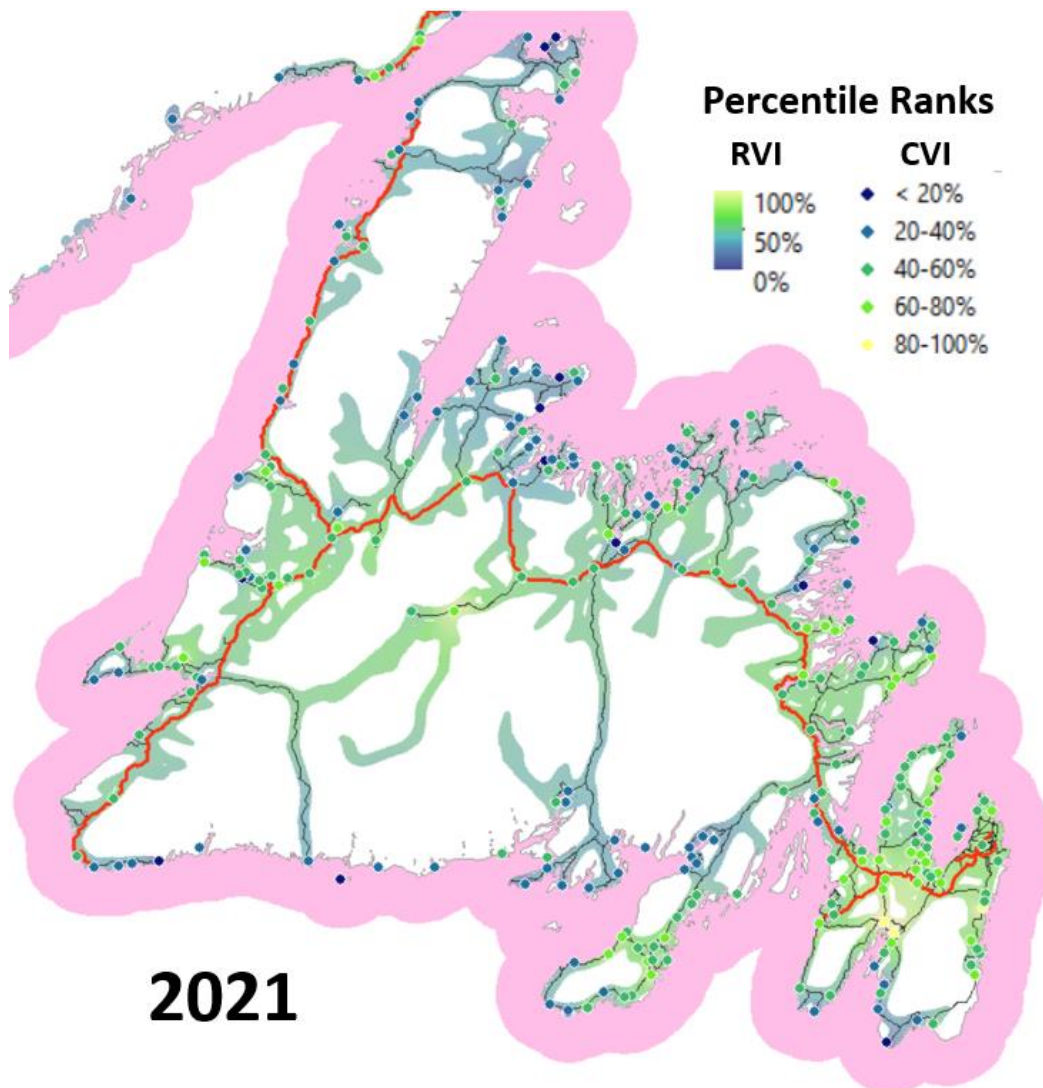
It is also possible to use both point (CVI) and raster (RVI) representations in the same display. This may be more useful for regional or local scale analysis, such as the maps shown in Figures 6a and 6b comparing two time intervals for the island of Newfoundland.



**Figure 6a. Regional map of both CVI (point) and RVI (surface) data for the island of Newfoundland for 2001. (Compare with year 2021 in Figure 6b)**

These maps show both RVI and CVI data simultaneously, along with major highways and roads. It shows below average values for most coastal communities with a few bright (hotspot) areas in larger towns and cities along the Trans-Canada highway. The RVI and CVI data for 2021 (Figure 6b) show a noticeable increase in many regions to average or above average values compared to 2001. As with the 2001 values, most regions and communities with higher values are within close proximity to major transportation routes. While the scores of some coastal communities have also improved by 2021, some remain at or below average values, which is similar to many other rural and remote areas of Canada.





**Figure 6b. Regional map of both CVI (point) and RVI (surface) data for the island of Newfoundland for and 2021. (Compare with year 2001 in Figure 6a).**

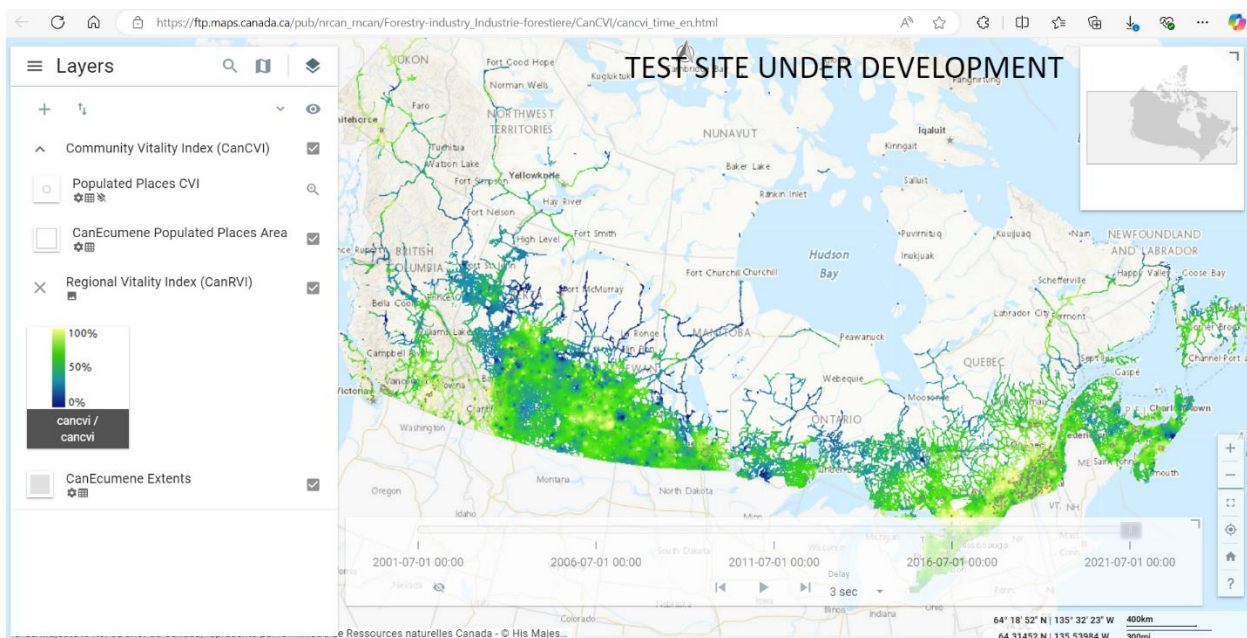
The differences in values between 2001 and 2021 in this case are attributed to poor economic conditions in coastal communities following the cod moratorium in the 1990's. By 2021, the province experienced an economic transition drawing from offshore oil and gas revenues, which were re-invested in many communities that suffered from the fishery closure in the 1990's.

This observation is just one of many possible factors that can be used to interpret reasons for differences in values. The CVI 'variables' tables provided in the database can also be used to examine breakdowns of factors that contribute to

changes in CVI values over time and location. Factors that contribute to persistent lower CVI values can then be used to guide priorities for action.

## Time Series Mapping Tool

In addition to the 'View Map' option in the GeoDiscovery/FGP portal, CVI/RVI data can be visualized online via a 'time series' mapping tool. This tool is provided as a link from the main CVI/RVI page from the main table. When selecting the HTML link, another browser window opens displaying the map illustrated in Figure 4 below.



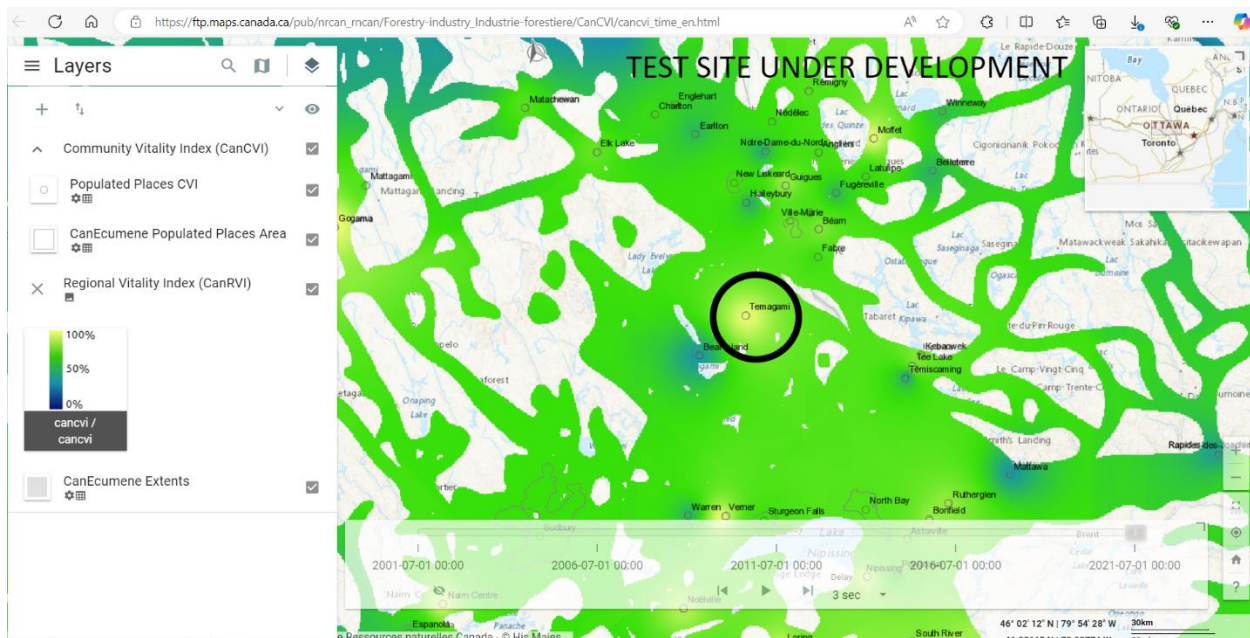
**Figure 4. Initial view of RVI/CVI time series mapping tool.**

This display contains four layers (on the left menu): 1) CVI Populated Places (point file), 2) CanEcumene Populated Places Areas (polygons), 3) Regional Vitality Index (RVI) time-series layers, and 4) the CanEcumene 3.0 Extents layer (polygon) (for reference).

Using the time slider bar on the bottom of the display, users can choose a particular year to display, or use the play button to for the map to cycle through all

years. (Note: it may take some time for the RVI maps to all load depending on the internet and server traffic).

Users may zoom in and out using the middle mouse button or the + and – buttons on the lower right of the display. When zooming in, the boundaries of CanEcumene Populated Places appear as grey polygons over the coloured RVI layer (for reference). Zooming in further will reveal individual places as circles in the centre of each polygon (e.g. Figure 5). This point file contains all of the data attributes used in the calculation of the CVI value for the selected place. By selecting a point location, the data attributes appear on the left as illustrated in Figure 6.



**Figure 5. Illustration of how CVI ‘point’ data is displayed over the RVI interpolation data. This view shows the location for the community of Temagami, ON.**

This table contains the CVI score values and the five variables described above (Figures 2 and 3) plus additional fields for the percentile rank values for each variable (denoted by prefix ‘PR’), and each of the three rank criteria (denoted by suffix ‘ca’=Canada, ‘pc’=Population Category, and ‘pt’=Province/Territory). The fields are repeated for each of the five census years covered (01,06,11, 16,21).

Populated Places CVI	
TotPop01	893
PopCh01	-0.130477
PRPop01ca	0.086
PRPop01pc	0.1
PRPop01pt	0.046
Age01	1
PRAge01ca	0.712
PRAge01pc	0.7
PRAge01pt	0.746
Edu01	0.37514
PREdu01ca	0.756
PREdu01pc	0.84
PREdu01pt	0.626
Emp01	0.92
PREmp01ca	0.608
PREmp01pc	0.66
PREmp01pt	0.37
Econ01	55368.863382
PREcon01ca	0.894
PREcon01pc	0.95
PREcon01pt	0.605

**Figure 6. Partial view of the data attributes for the selected community Temagami, ON in Figure 5. Note: the fields shown in this display are repeated for all five census years (06-21 not shown).**

## For More Information

Contact:

Dr. Brian Eddy  
 Research Scientist-Ecosystems Analyst  
 Atlantic Forestry Centre, Corner Brook  
 Natural Resources Canada

P: 709-660-3607

E: [briang.eddy@nrcan-rncan.gc.ca](mailto:briang.eddy@nrcan-rncan.gc.ca)

## Citations

Eddy, B.G.; Dort, A. 2011. Integrating Socio-Economic Data for Integrated Land Management (ILM): Examples from the Humber River Basin, western Newfoundland. *Geomatica*, Vol. 65, No. 3, p. 283-291. doi:10.5623/cig2011-044.

Eddy B, Muggridge M, LeBlanc R, Osmond J, Kean C, Boyd E (2020) An Ecological Approach for Mapping Socio-Economic Data in Support of Ecosystems Analysis: Examples in Mapping Canada's Forest Ecumene. *OneEcosystem* 5: e55881. <https://doi.org/10.3897/oneeco.5.e55881>

Eddy, B.G., Muggridge, M., LeBlanc, R., Osmond, J., Kean, C., and Boyd, E. 2023. The CanEcumene 3.0 GIS Database. Federal Geospatial Platform (FGP), Natural Resources Canada. <https://open.canada.ca/data/en/dataset/3f599fcb-8d77-4dbb-8b1e-d3f27f932a4b>

StatCan, 2023. Canada Census Tables (2001, 2006, 2011, 2016, 2021). Statistics Canada. <https://www.statcan.gc.ca/en/census?MM=1>