



# AAFC Sustainability Metrics Project

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## Our Vision

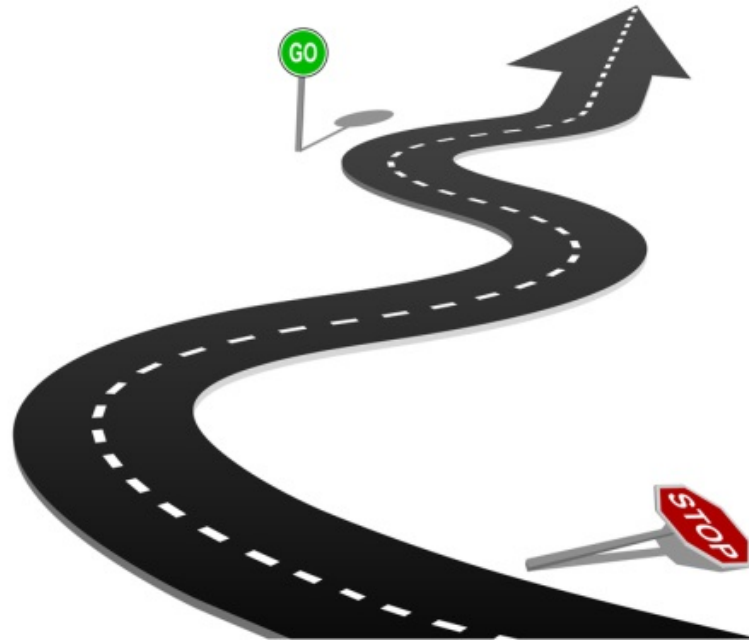
Driving innovation and ingenuity to build a world leading agricultural and food economy for the benefit of all Canadians.

## Our Mission

Agriculture and Agri-Food Canada provides leadership in the growth and development of a competitive, innovative and sustainable Canadian agriculture and agri-food sector.

## *AAFC Sustainability Metrics Work*

1. Why
2. What
3. How
4. Where
5. When
6. Who



## AAFC Sustainability Metrics Work

**1. Why**

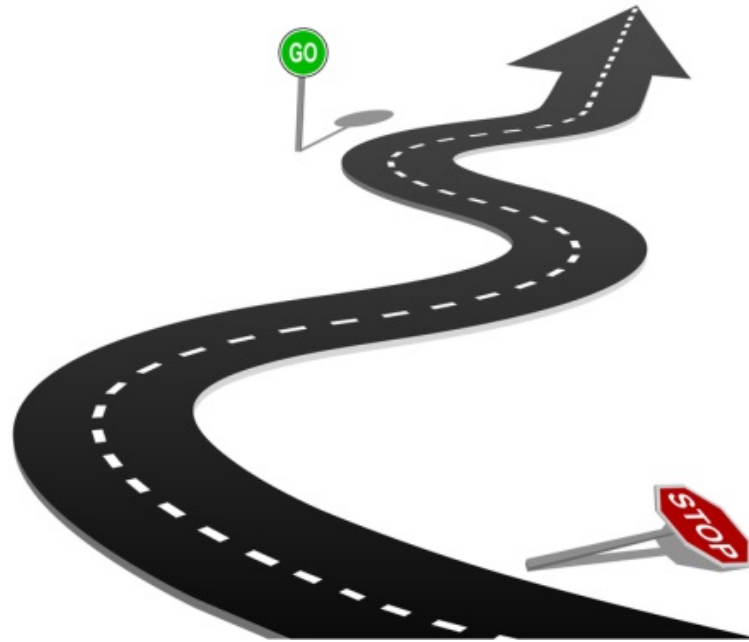
2. What

3. How

4. Where

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# 1. Domestic Government Clients

- **Senior governments**
  - Government of Canada
  - Provinces and Territories
- **Local governments**
  - Municipal
  - Watershed conservation areas, etc.
- **Uses**
  - Target, develop and evaluate policies and programming for environmental goals
  - Reporting obligations (international such as for climate change or domestic such as Federal Sustainable Development Goals)

# 2. Value-Chain Clients

- **Value Chain**
  - Farm input and service providers
  - Farmers, farm managers, farmer organizations
  - Commodity traders
  - End users of farm commodities
  - Commodity associations
  - Consumer associations
- **Uses**
  - Build reputation and maintain social licence
    - Pro-actively address stakeholder concerns
    - Prevent regulations
  - Marketing, market access,
  - Identify and track improvements in management effects on environment
  - Assess potential liabilities

# 3. Other Clients

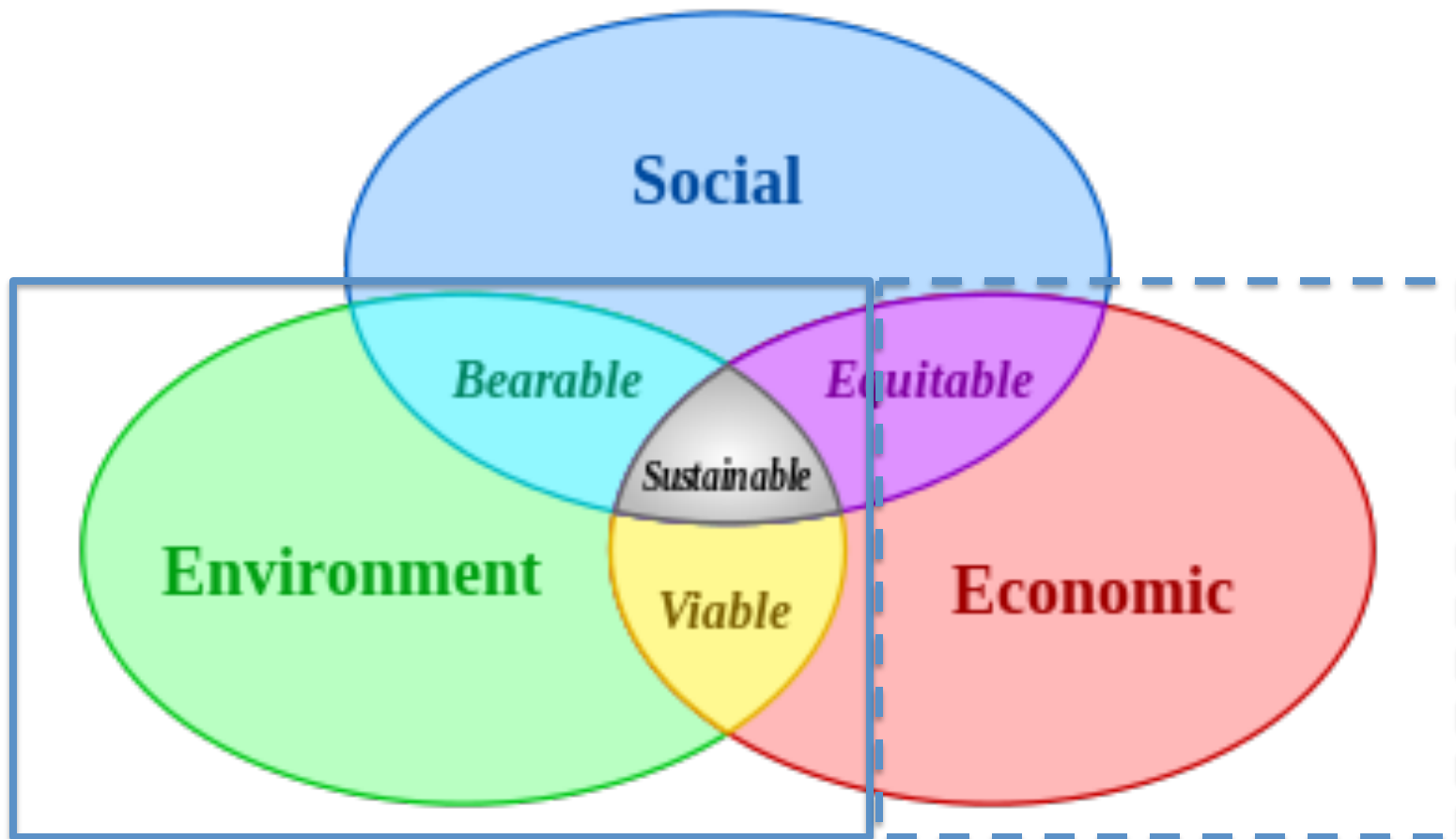
- **Civil society**
  - Environmental NGOs, CSOs, engaged public
- **International governments**
  - Examples: California and EU regarding biofuel sustainability
- **Broader scientific applications**
  - Life-cycle assessment practitioners, developers of decision support tools (e.g. AAFC Holos “what-if” Farm Model ), etc.
- **Intergovernmental organizations**
  - Reporting to OECD and UNFCCC, etc.

# Outline

1. Why
- 2. What**
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# Sustainability – Three Pillars



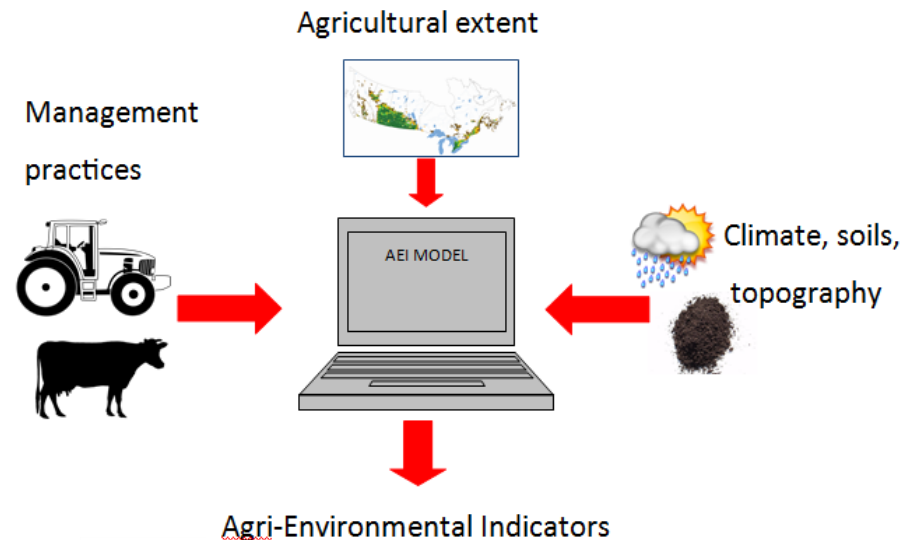
AAFC Science and Technology Branch  
*Sustainability Metrics Work*

AAFC Strategic Policy Branch  
*Analysis of industry situation*



# What are Sustainability Metrics?

- Evolving from the former National Agri-Environmental Health and Reporting Program (NAHARP), the goal of Sustainability Metrics\* is to provide scientifically credible, timely and relevant measurements of the environmental sustainability of Canadian agriculture to support AAFC's mission and mandate. The best known of these measures are the Agri-Environmental Indicators (AEIs)
- The AEIs are grouped into five themes:
  - Soil Health, Water Impact and Air Quality, Biological Health and Resource Use.
- Model integrate information on soils, climate and topography with statistics on land use and crop and livestock management.
- Top-Down Measures
  - Based on coarse activity data
  - (Implemented as if from bottom-up production data)



# Soil Health Measures

Soil-quality relevant indicators	Attributes
Soil organic carbon*	SOC change and relative SOC
Erosion*	Wind, water, tillage erosion
Soil cover*	Equivalent annual duration that soil is covered
RES-N*	Soil residual N after harvest
Risk water contamination –Phosphorous*	Outputs soil residual P after harvest
Soil NOx emissions*	Direct and indirect emissions
Salinity	Risk of salinization
Land-use change*	Conversion of land to agriculture use

\* Priority for 2018 delivery

# Water Impact Measures

Water-health relevant indicators	Attributes
Risk water contamination-P*	Loss of P to surface water
Risk water contamination-N*	Loss of N to groundwater
Risk water contamination-Coliform	Loss of intestinal microbes to surface water
Risk water contamination-Pesticides	Loss of pesticides to surface and ground water
Water use*	Water consumed by agriculture

# Air Quality Measures

Air-quality relevant indicators	Attributes
GHG*	Aggregate greenhouse gas emissions (CH <sub>4</sub> , N <sub>2</sub> O, CO <sub>2</sub> )
Ammonia*	Agricultural emissions of ammonia to the atmosphere
Particulate matter	Particulate matter contribution from agriculture to the atmosphere

# Biological Health Measures

Biological-health relevant indicators	Attributes
Wildlife habitat sustainability*	Habitat availability for wide range of species
Land-use change*	Conversion of land to agricultural uses
Land use*	Land use involved to produce a unit of product

# Resource Use Measures

Resource-use relevant indicators	Attributes
Water use*	Water consumed to produce a unit of product
Land use*	Land use involved to produce a unit of product
Nutrient use*	Purchased nutrients used to produce a unit of product
Energy use*	Purchased energy inputs by primary agriculture
Pesticide use	Active ingredient used to produce a unit of product

# Outline

1. Why
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- Agri-environmental indicator
  - First report 2000
  - Reports on each Census year with about 5 year delay



Agriculture and  
Agri-Food Canada

Agriculture et  
Agroalimentaire Canada

Canada



Report #4

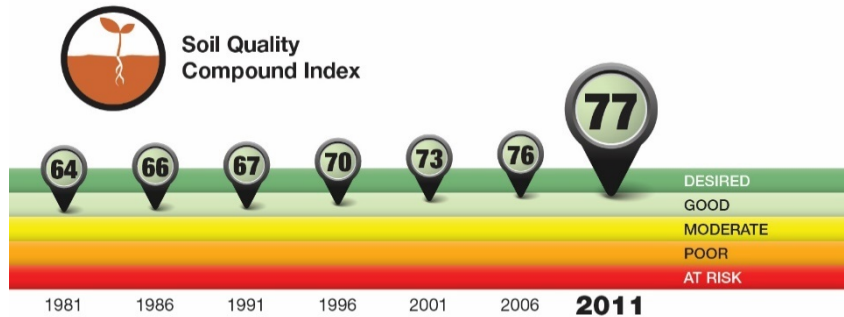
Agri-Environmental Indicators Report Series

## Environmental Sustainability of Canadian Agriculture

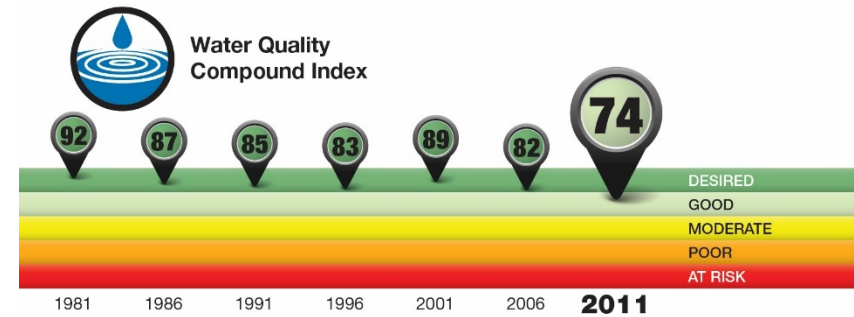




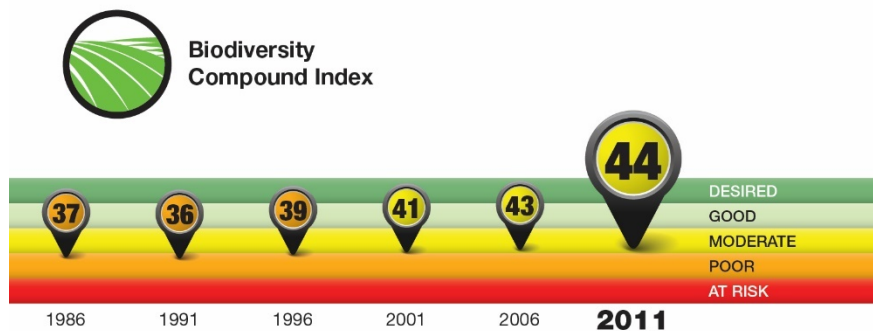
# Summary of compound indices



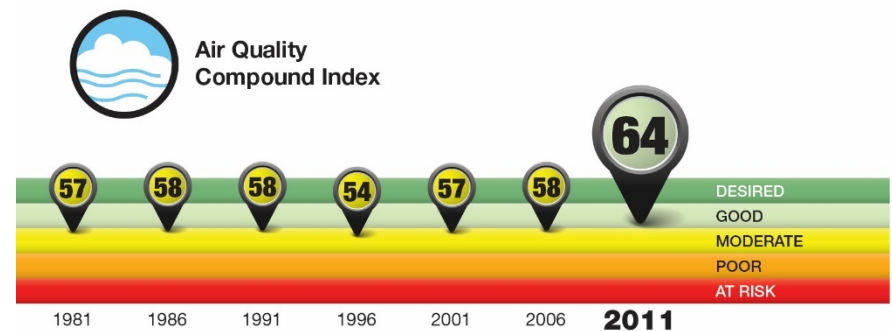
Consistent improvements each year since 1981, attributed to soil improvement practices (cessation of summerfallow, conversion to perennial cover and rise in the use of no-till)



Steady decline overall since 1981, attributed to increase in fertilizer and manure as well as greater reliance on pesticides.



Consistent improvements each year since 1981, attributed to improvements in the soil cover indicator, however the wildlife component of this index has declined significantly.



Significant improvement since 1981, attributed to increased carbon sequestration (GHG indicator), reduction in intensive tillage (Particulate matter) and decline in cattle (Ammonia).

- Evolution from NAHARP
  - Move away from silo data structures to a common datasets

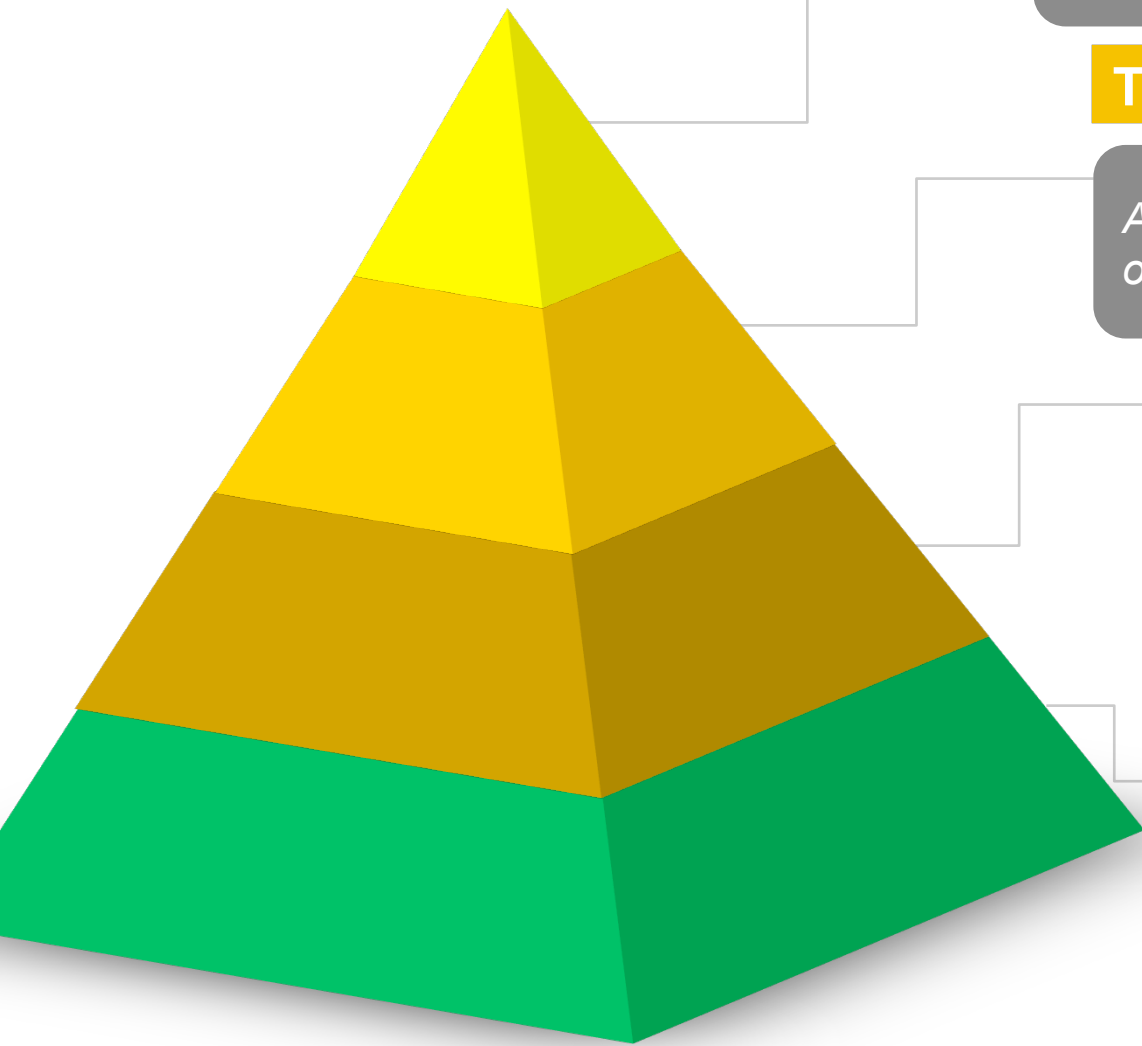


- Competitiveness of Industry
  - Commodity based reports and annualized estimates.



- Improved ability to report on different spatial scales
  - Break away from heavy reliance on SLC polygon





## Commoditization

*Inbuilt implementation of commoditization and annualization*

## Traceability

*Ability to track input and output of the unit*

## Spatial Flexibility

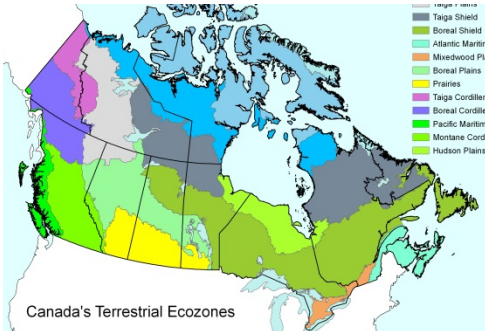
*Handle current SLC model and ready for raster based data structures*

## Consistency

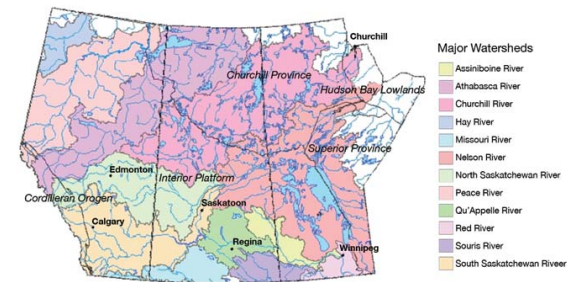
*System that enforces consistency in naming, data structure and underlying assumptions*

# Flexibility in spatial scales

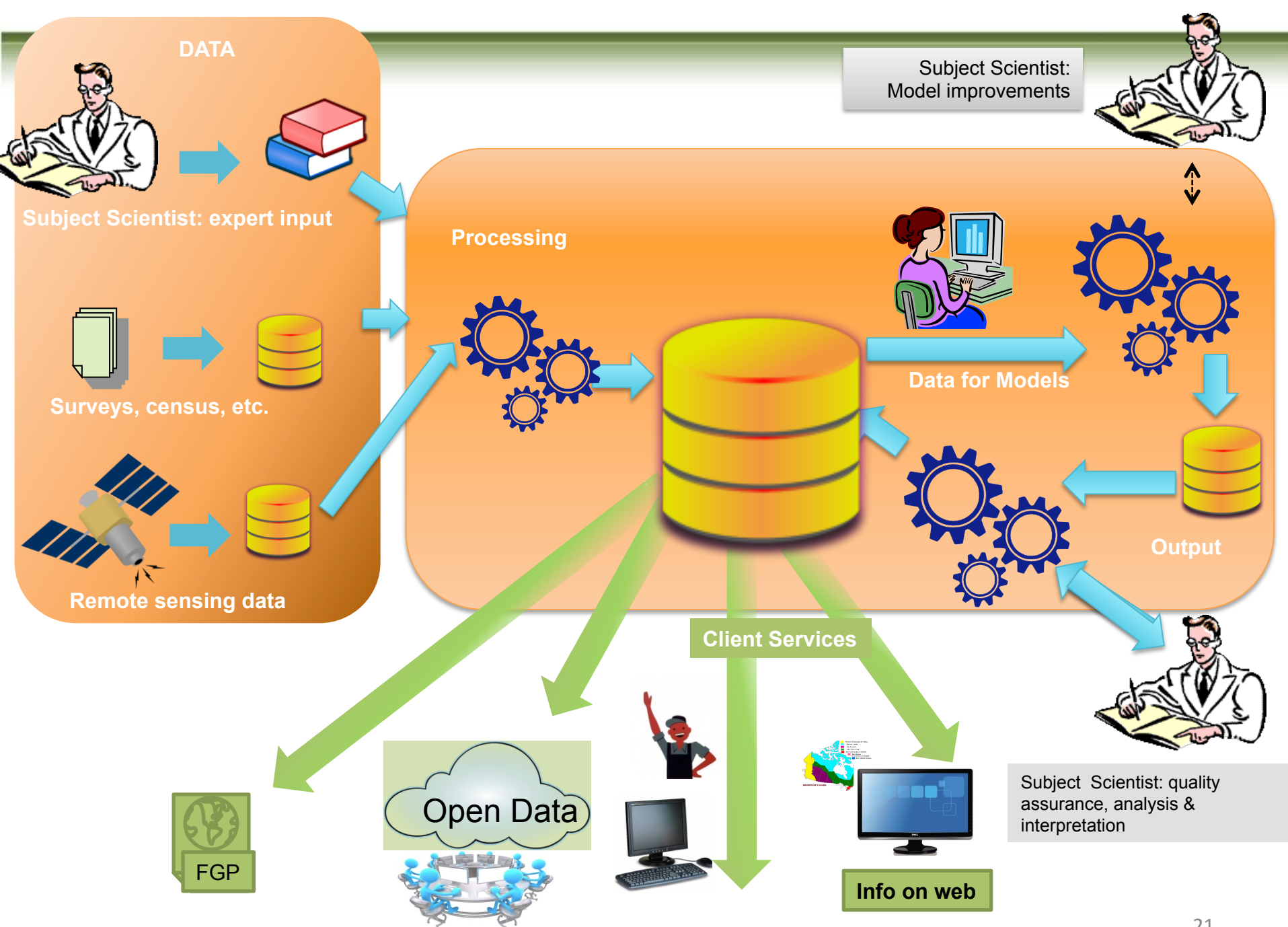
- National
- Provincial
- Watershed
- Eco-district (~ county scale)
- Custom runs for desired scale (defined geographical areas e.g., township)



Source : <http://www.nrcan.gc.ca/>

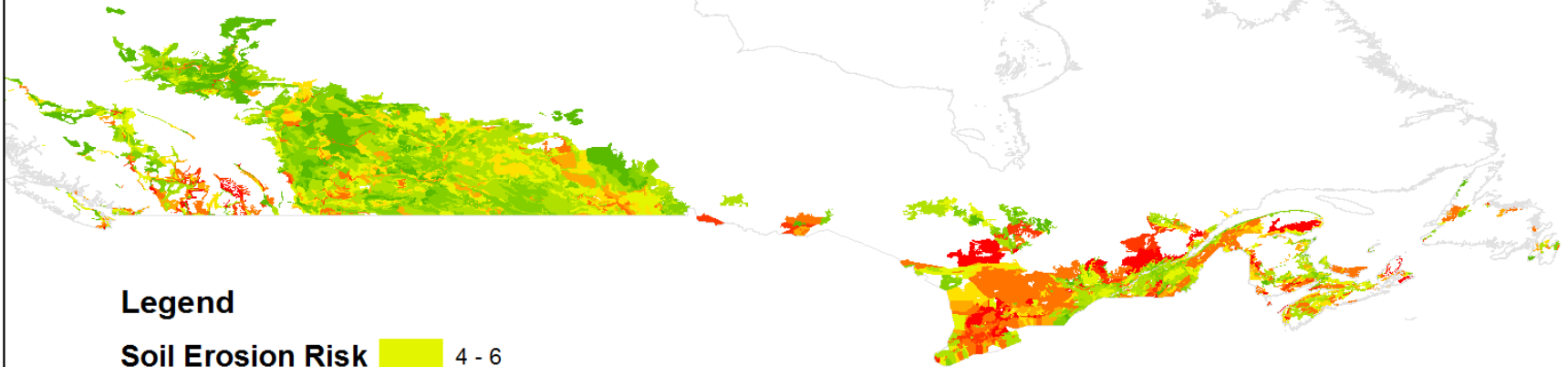


Source : <http://www.nrcan.gc.ca/>



# Erosion Risk - 2015

## All Crops



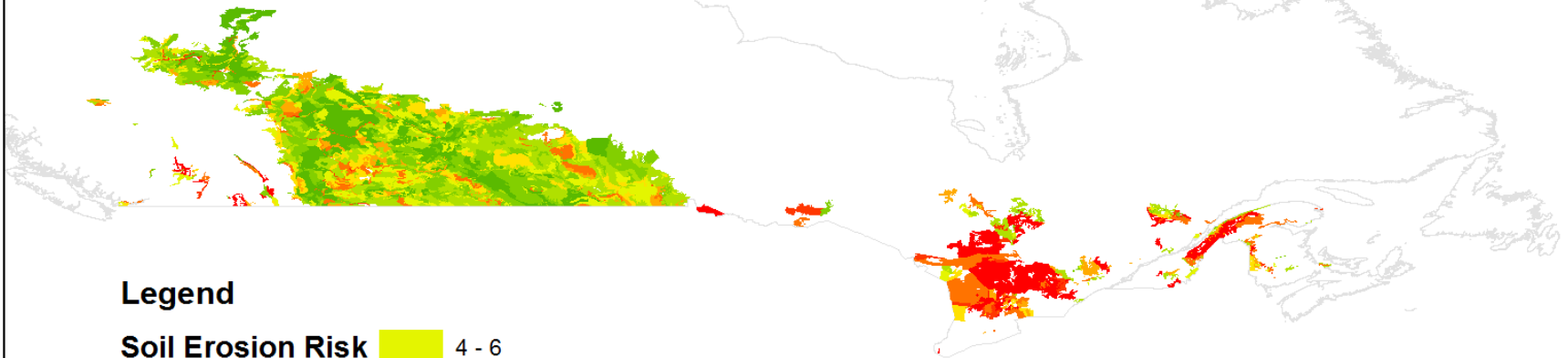
### Legend

Soil Erosion Risk	
t / ha	
No crop	4 - 6
0 - 1	6 - 8
1 - 2	8 - 11
2 - 4	11 - 22
	22 - 33
	> 33










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# Erosion Risk - 2015

## Canola and Mustard



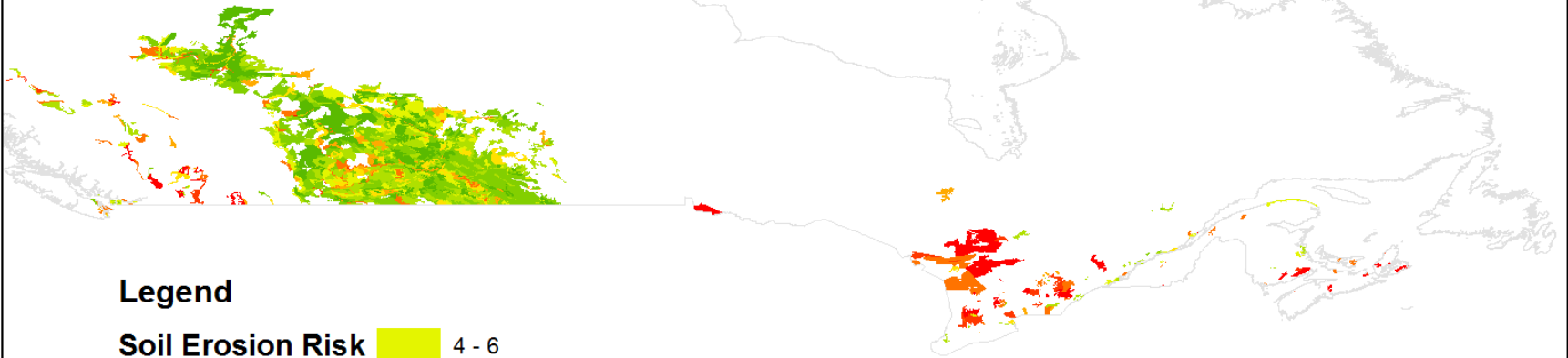
### Legend

Soil Erosion Risk	
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	6 - 8
	8 - 11
	11 - 22
	22 - 33
	> 33
No crop	
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	1 - 2
	2 - 4

DRAFT

# Erosion Risk - 2015

## Pulses



### Legend

Soil Erosion Risk	
t / ha	
No crop	4 - 6
0 - 1	6 - 8
1 - 2	8 - 11
2 - 4	11 - 22
	22 - 33
	> 33

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# Where

- A. Nationally, all agriculture and commodities
  - Horticulture and N of 60° remains objective for future
- B. Reporting Scale
  - No longer married to ecostratification (SLC polygon, ecoregion, etc.)
  - Will report over larger area than current aggregate agriculture reporting
    - “County” (many producers) to provincial region (few producers) to province or region (very few producers ) scales versus SLC polygon
    - Provide input and output in actual values with the variation in input used in calculation and in resulting output
      - Understandable benchmarks for comparison

# Where Access

- C. Access
  - OpenCanada.ca
    - Package of data for SM purposes
    - As much as possible the actual
      - Privacy, perceived privacy, and
    - Notes on how used
  - Web site with interpreted summaries
    - Series that cover different commodities and geographies over time
    - (Big summary report every 5 years not centrepiece)
  - User tools
    - Query and extraction
    - Cross-indicator analysis
  - Collaboratively through Sector mechanisms (e.g. CRSC platform)

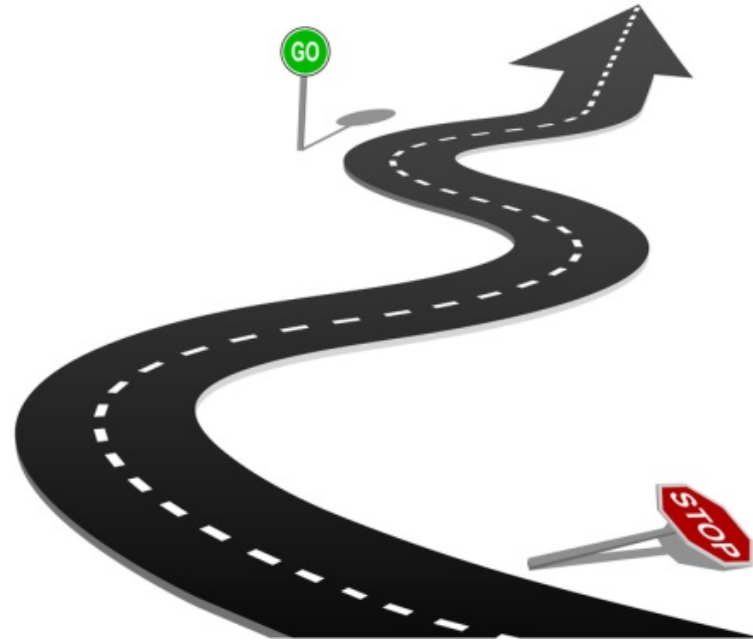
# Data Access

- Data will be available on Canada's Open Data Portal and Industry Portals (E.g. data and knowledge portal for Canadian Roundtable on Sustainable Grains)
  - Input data
  - Output data
  - Interoperable formats
  - Web Services

The screenshot shows the Government of Canada Open Data Portal homepage. At the top, there is a navigation bar with the Canadian flag, the text 'Government of Canada' and 'Gouvernement du Canada', and a search bar labeled 'Search Canada.ca'. Below the navigation bar is a menu with categories: Jobs, Immigration, Travel, Business, Benefits, Health, Taxes, and More services. The main content area features a large 'Open Data' heading with a sub-heading 'Search through our Open Government Portal.' and a search input field with a 'Find' button. Below this, there are several sections with links and descriptions: 'Search through our Open data portal', 'Open maps', 'Open data 101', 'Open Data Inventory', 'Working with data and application programming interfaces', 'Suggest a dataset', 'Apps gallery', and 'Submit your app'.

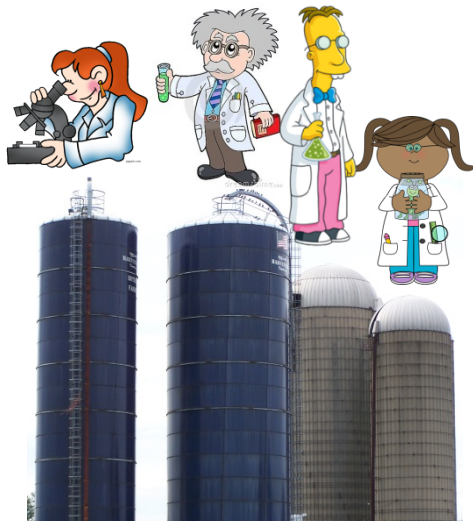
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# Improving Efficiency, Maintainability, and Information Usefulness

< GF2  
NAHARP  
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Each indicator in own silo,  
Slow, inefficient,  
Limited comparability  
Minimum data accessibility,  
By geography but not by product,

GF2  
Sustainability Metrics  
\$



Single Project,  
Transition to integrated system,  
Consistent, comparable  
Increase data accessibility  
By geography and by product for  
some indicators

CAP  
AGMAR  
\$\$



Integrated system,  
Timely, efficient, responsive,  
By geography and by product,  
Data accessible across full range  
of indicators,

# When

- Goal: estimated annual with 2-yr delay (e.g. 2019 report on 2017)
  - Always time series going back as far as underlying data is valid (some to 1981)
  - Whole time series always recalculated when annual update
- Varied March 2018 Products
  - Some with full usability (annual, commodity, input and output values accessible)
  - Livestock commodities will be delayed (need land-based first)
  - Most like old NAHARP format (i.e. like 2016 Agri-Environmental Indicators Report #4)
- CAP (2018-2022)
  - Greater human resources (?) to provide full usability of all indicators, targeted interpreted summaries

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# Who

- AAFC sees basic work to develop high-quality indicator based on best scientific understanding that accurately describe Canadian conditions as a good public investment
  - Support policy development and evaluation
  - Reporting obligations
  - Provide the agriculture and agri-food sector with overview of their environmental impact
- Collaboration with Sector, Provinces, and other stakeholders
  - Better detail
  - Improved mechanisms to transfer information to aid decision makers
  - Custom investigations and analyses

# Data Needs

- Industry assistance required
  - Management details
    - Seeding dates
    - Fertilizer type, rate, application,
    - Etc., etc.
  - Crowd sourcing?
  - Common data structure means data incorporated once and used for all relevant measures

**Submit Impact**

By submitting this report, you agree and consent to the AgriClimate Impact Reporter [Terms of Use](#), which include AAPIC privacy practices.

Please provide your input in the fields below. Instructions and helpful hints are provided where applicable. Click on the question mark for additional information. Required fields are marked with an asterisk (\*).

Please provide a one-sentence title generalizing the impact(s) and location(s) affected (eg. Weibum experiencing drought conditions). Maximum 300 characters.

**Title:**

Please provide a detailed description of how the impact is affecting your agricultural operations (eg. 3-8 sentences). Maximum 1000 characters.

**Description:**

**Time Interval**

A Start Date is required. An end date is desired but optional. It is OK to leave the End Date blank if the impact is ongoing or if you don't know when it ended. Use alt and down arrow to access the calendar functions on your keyboard.

**Start Date:**

**End Date:**

**Category**

You must provide a severity for at least one of the following impact types.

Drought	None
Excessive Moisture	None
Frost	None
Heat Stress	None
Severe Weather	None
Other	None

**Location**

To choose your reporting location, zoom directly to your location. When you have zoomed to a fine enough scale to select your location, a red diamond will appear. You will also know when you are successful, as the longitude and latitude fields below map will autofill. If you do not have a mouse, use the plus or minus keys on your keyboard to zoom in and out of the map, use the Alt + Enter key to set the coordinates for the map. If you are having difficulty selecting a location, please see the [help](#) section.

- Sustainability Metrics and Holos are complimentary
  - SM project can provide “average” inputs and outputs for subsystems that provide initial benchmark to Holos user
  - Increased similarities with Holos that deals with production systems (farms)
- Links between SM project and Holos intensifying
- Links to other management software?  
CFPI two-way?



# Summary

- Strong demand for top-down comprehensive suite of environmental sustainability indicators
  - Government for policy and reporting
  - Sector for information and methods
- Moving to better timeliness (annual, 2-yr delay) and usability (commodities, accessibility) under Canadian Agricultural Partnership (2018-22)
- Need to forge better two-way communications and collaboration with the value chains and other stakeholders

# Thank You

## Questions?



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