

# Climate Change Mitigation Plan

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## Agriculture Emissions Calculations

August 2020

# Overview



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Before you start

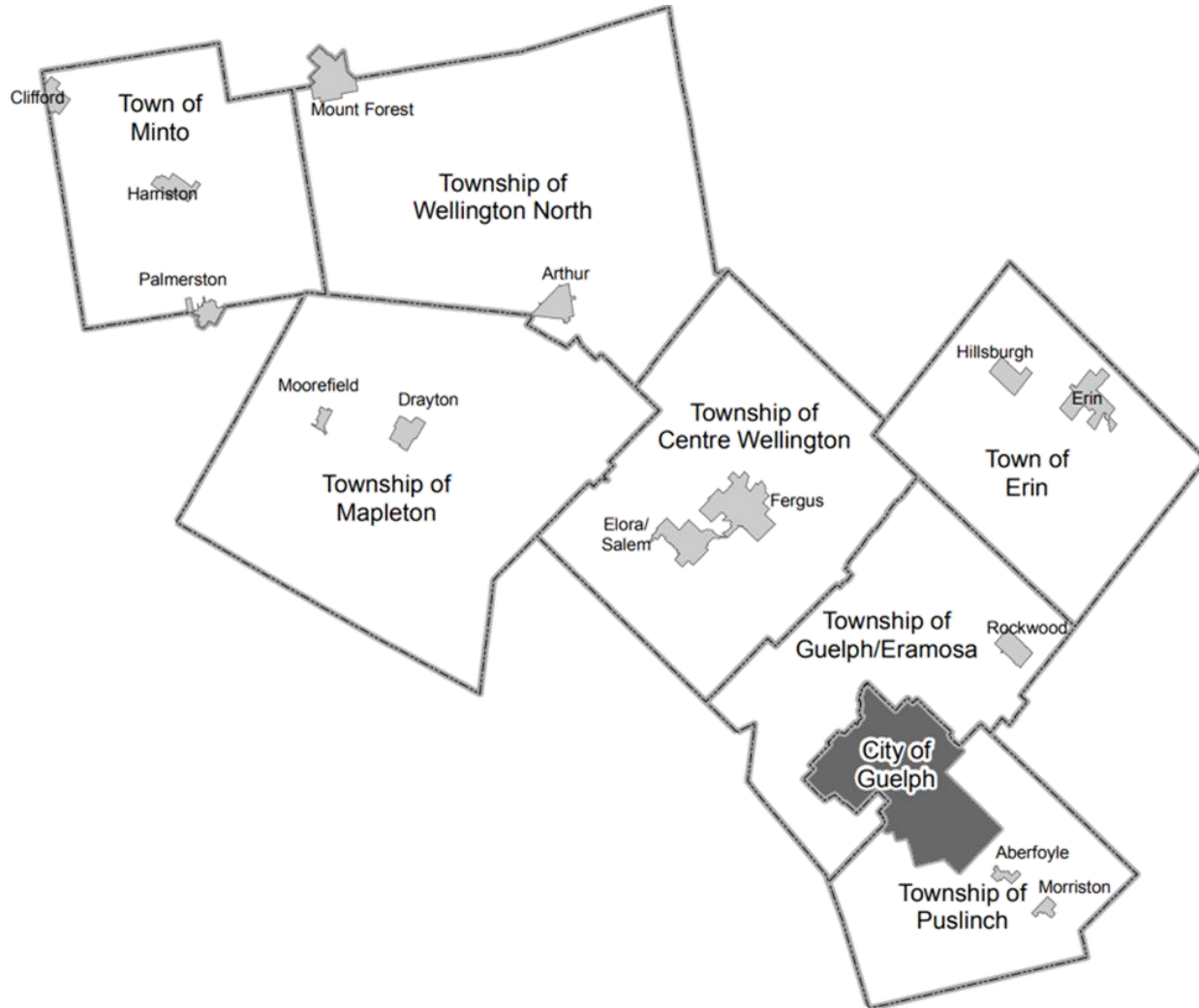
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Calculations, Data Sources and Assumptions

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Tips

# Background



- Wellington County land use is predominantly agricultural
- Agriculture is the third largest employer in the County and a focus area for growth in the County's 3-year Economic Development Plan
- GHG calculation methodology followed IPCC 2006 protocol, Volume 4: Agriculture, Forestry and Other Land Uses.
  - Tier 1: default method
  - Approach 1: net changes in land use as a whole

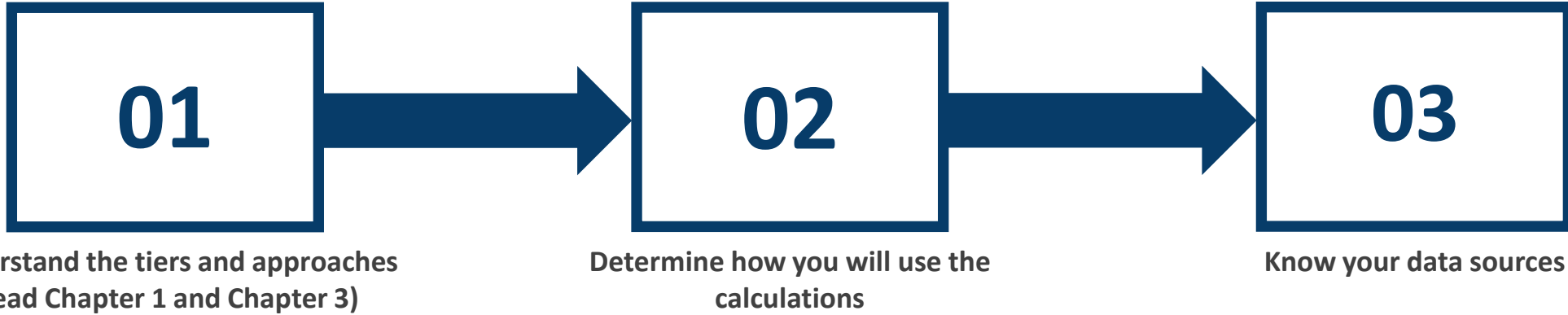


# Scope of Emissions



- Emissions from Livestock and Manure Management
- Nitrous Oxide from Managed Soils and CO<sub>2</sub> Emissions from Lime and Urea Application
- Cropland (Soil Carbon, Non-CO<sub>2</sub> GHG emissions from crop burning)

# Before you start



# Emissions - Livestock and Manure Management

## Methane - Enteric Fermentation



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### DATA NEEDS

- LIVESTOCK HEAD COUNT
- EMISSIONS FACTORS ( $\text{CH}_4$ ,  $\text{N}_2\text{O}$ )
- CONVERSION FACTORS

### DATA SOURCES

- STATISTICS CANADA CENSUS DATA
- CANADA'S NATIONAL INVENTORY REPORT
- IPCC FOURTH ASSESSMENT REPORT

### ASSUMPTIONS

- NONE



# Emissions - Livestock and Manure Management

## Methane - Manure Management



### DATA NEEDS

- LIVESTOCK HEAD COUNT
- EMISSIONS FACTORS (CH<sub>4</sub>)
- CONVERSION FACTORS

### DATA SOURCES

- STATISTICS CANADA CENSUS DATA
- CANADA'S NATIONAL INVENTORY REPORT
- IPCC FOURTH ASSESSMENT REPORT
- SWINE CATEGORIES – OMAFRA

### ASSUMPTIONS

- NONE



# Emissions - Livestock and Manure Management

## Nitrous Oxide - Manure Management



### DATA NEEDS

- LIVESTOCK HEAD COUNT
- EMISSIONS FACTORS (KG N<sub>2</sub>O-N/KG N WASTE MANAGEMENT SYSTEMS)
- CONVERSION FACTORS
- PROPORTIONAL USAGE OF WASTE MANAGEMENT SYSTEMS
- EXCRETION RATES (KG N/HEAD/YEAR)

### DATA SOURCES

- STATISTICS CANADA CENSUS DATA
- CANADA'S NATIONAL INVENTORY REPORT
- IPCC FOURTH ASSESSMENT REPORT
- SWINE CATEGORIES - OMAFRA

### ASSUMPTIONS

- NONE





# Emissions - Managed Soils

## Nitrous Oxide – Managed Soils (N<sub>2</sub>O direct)



### DATA NEEDS

- LIVESTOCK HEAD COUNT
- EXCRETION RATES
- PROPORTIONAL USE OF WASTE MANAGEMENT SYSTEM
- CARBON STOCK CHANGE FOR MANAGED SOILS
- CROP YIELDS, DRY WEIGHT CONVERSION FACTORS, % RESIDUE REMOVED
- NITROGEN APPLIED AS FERTILIZER (BY CROP TYPE)
- CONVERSION FACTORS

### DATA SOURCES

- STATISTICS CANADA CENSUS DATA
- NATIONAL INVENTORY REPORT
- OMAFRA
- LOCAL EXPERT OPINION
- IPCC FOURTH ASSESSMENT REPORT

### ASSUMPTIONS

- NONE



# Emissions – Lime Application

## Carbon Dioxide – Lime Application



### DATA NEEDS

- PROVINCIAL LIME AND UREA EMISSIONS
- ACRES WHERE LIME WAS APPLIED IN PROVINCE AND COUNTY.

### DATA SOURCES

- NATIONAL INVENTORY REPORT
- STATISTICS CANADA CENSUS DATA

### ASSUMPTIONS

- APPLICATION RATES ARE CONSISTENT ACROSS THE PROVINCE



# Emissions – Urea Application

## Carbon Dioxide – Urea Application



### DATA NEEDS

### DATA SOURCES

- NO DATA AVAILABLE – NOT RECORDED IN CENSUS

### ASSUMPTIONS





# Emissions – Cropland

Non-Carbon Dioxide – **Biomass burning**



## DATA NEEDS

## DATA SOURCES

LOCAL EXPERTS AGREED THIS IS NOT A  
COMMON OCCURRENCE AND SHOULD NOT  
BE INCLUDED IN THE CALCULATION

## ASSUMPTIONS



# Sequestration - Cropland

Soil Carbon – Carbon stock change



## DATA NEEDS

- ACREAGE OF CROPS FOR 2 CENSUS YEARS (2006, 2016)
- TILL OR NO TILL PRACTICES
- MANURE AND CARBON-BASE FERTILIZER

## DATA SOURCES

- STATISTICS CANADA CENSUS DATA
- IPCC 2006 PROTOCOL
- LOCAL EXPERT OPINION

## ASSUMPTIONS

- % APPLICATION OF MANAGEMENT PRACTICES PER CROP
- % APPLICATION OF MANURE PER CROP



# Challenges

- The data needs and data available don't always line up. Assumptions need to be made to achieve best fit. Expert opinion is helpful.
- Many areas have high uncertainty due to assumptions and unavailable data. Decisions need to be made as to how to present/use the data.
- There is a growing movement to recognize bio-generated methane as a closed loop in the carbon cycle.
- IPCC 2006 protocol is for Country-level. This protocol may not be suitable to scale down to municipal-level.
- There is currently no guidance or support regarding agriculture at the municipal-level. A community of practice would be helpful.





# Tips

Below are some pointers to help you be successful



- Understand what you are calculating, why you are calculating it and how you will use it
- Gather local experts (academia, practitioners, industry leaders, farmers, etc.)
- Find cheerleaders
- Use the worksheets (IPCC, 2006, Annex 1)
- Find reviewers

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- LOCAL AGRICULTURE EXPERTS GROUP
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- MEGAN BIRBECK, WEST LINCOLN

## REFERENCES

- NATIONAL INVENTORY REPORT (2017)
- STATISTICS CANADA CENSUS DATA
- IPCC 2006 PROTOCOL
- ONTARIO MINISTRY OF AGRICULTURE FOOD AND RURAL AFFAIRS (OMAFRA)
- ROYALTY-FREE PHOTOS: UNSPLASH.COM, PEXELS.COM





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