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SMART CITIES
URBAN GREENHOUSE GAS INVENTORY
SPECIALIST TRAINING COURSE
KRISHNAJI PAWAR, LEED AP BD+C,GSAS CGP,ISO 14001:2015,GCP
GHG AND CLIMATE CHANGE SPECIALIST CURRICULUM

AGRICULTURE ,FORESTRY AND OTHER LAND USES
FOR GHG & CLIMATE CHANGE PROFESSIONALS
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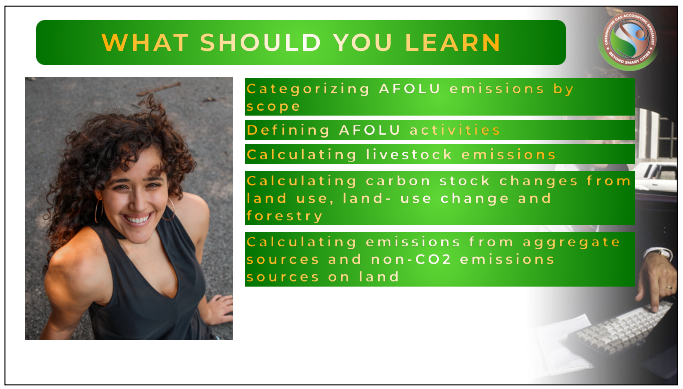
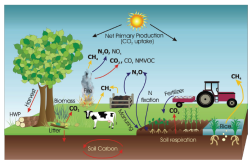
GHG AND CLIMATE CHANGE SPECIALIST CURRICULUM


WHAT SHOULD YOU LEARN
Categorizing AFOLU emissions by scope
Defining AFOLU activities
Calculating livestock emissions
Calculating carbon stock changes from land use, land- use change and forestry
Calculating emissions from aggregate sources and non-CO2 emissions sources on land

INTRODUCTION

The Agriculture, Forestry and Other Land Use (AFOLU) sector produces GHG emissions and removals through a variety of pathways, including land-use changes that alter the composition of vegetation and soil, management of forests and other lands, methane produced in the digestive processes of livestock, and nutrient management for agricultural purposes.



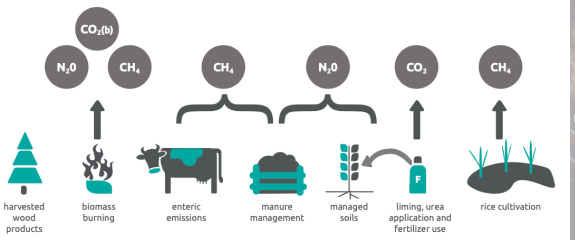
- ☑Cities shall report all GHG emissions resulting from the AFOLU sector within the city boundary in scope 1.
- ☑Scope 1 (territorial): In-boundary emissions from agricultural activity, land use and land use change within the city boundary

DEFINING AFOLU ACTIVITIES

Some cities, where there are no measurable agricultural activities or relatively little woody vegetation within the city boundary, may have no significant sources of AFOLU emissions.

- ☑Cities shall report all GHG emissions resulting from the AFOLU sector within the city boundary in scope 1.
- ☑ IPCC Guidelines divides AFOLU activities into three categories:
  - ➡ Livestock
  - ➡ Land
  - ➡ Aggregate sources and non-CO2 emissions sources on land
- ☑Calculating livestock emissions :
  Livestock production emits CH4 through enteric fermentation, and both CH4 and N2O through management of their manure. CO2 emissions from livestock are not estimated because annual net CO2 emissions are assumed to be zero.

OVERVIEW OF AFOLU EMISSION SOURCES



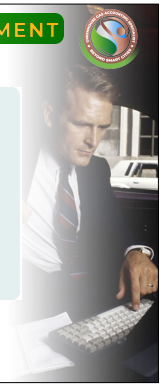
CH4 EMISSIONS FROM ENTERIC FERMENTATION

$$CH_4 = N_{(T)} \times EF_{(Enteric,T)} \times 10^{-3}$$

Description			Value
CH_4	=	CH_4 emissions in tonnes	Computed
T	=	Species / Livestock category	User input
N	=	Number of animals (head)	User input
EF	=	Emission factor for enteric fermentation (kg of CH_4 per head per year)	User input or default values

Source: Adapted from *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 4, Agriculture, Forestry and Other Land Use. Available at: www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

N2O EMISSIONS FROM MANURE MANAGEMENT

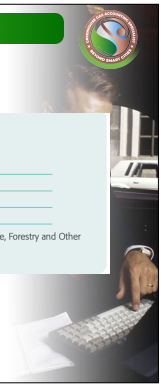


$$N_2O = [\Sigma_S [\Sigma_T (N_{(T)} \times Nex_{(T)} \times MS_{(T,S)})] \times EF_{(S)}] \times 44/28 \times 10^{-3}$$

N_2O	=	N_2O emissions in tonnes
S	=	Manure management system (MMS)
T	=	Livestock category
$N_{(T)}$	=	Number of animals for each livestock category
$Nex_{(T)}$	=	Annual N excretion for livestock category T, kg N per animal per year (see Equation 10.4)
MS	=	Fraction of total annual nitrogen excretion managed in MMS for each livestock category
$EF_{(S)}$	=	Emission factor for direct N_2O-N emissions from MMS, kg N_2O-N per kg N in MSS
44/28	=	Conversion of N_2O-N emissions to N_2O emissions

Source: Equation adapted from 2006 IPCC Guidelines for *National Greenhouse Gas Inventories* Volume 4 Agriculture, Forestry and Other Land Use available at: www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

ANNUAL N EXCRETION RATES



$$Nex_{(T)} = N_{rate(T)} \times TAM_{(T)} \times 10^{-3} \times 365$$

$Nex_{(T)}$	=	Annual N excretion for livestock category T, kg N per animal per year
$N_{rate(T)}$	=	Default N excretion rate, kg N per 1000kg animal per day
$TAM_{(T)}$	=	Typical animal mass for livestock category T, kg per animal

Source: Equation adapted from *2006 IPCC Guidelines for National Greenhouse Gas Inventories* Volume 4 Agriculture, Forestry and Other Land Use available at: www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

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