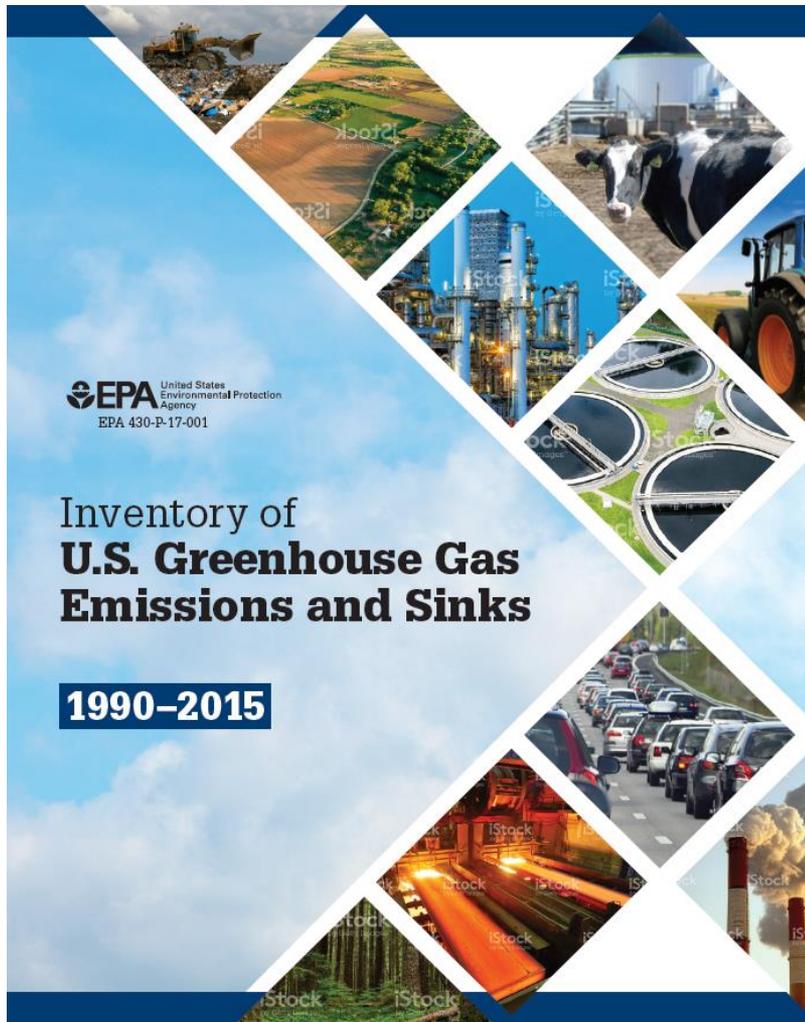


# *Annual Inventory of U.S. GHG Emissions and Sinks*



FIA User Group Meeting  
Madison, WI—April 4, 2017

Tom Wirth  
US EPA—Climate Change Division

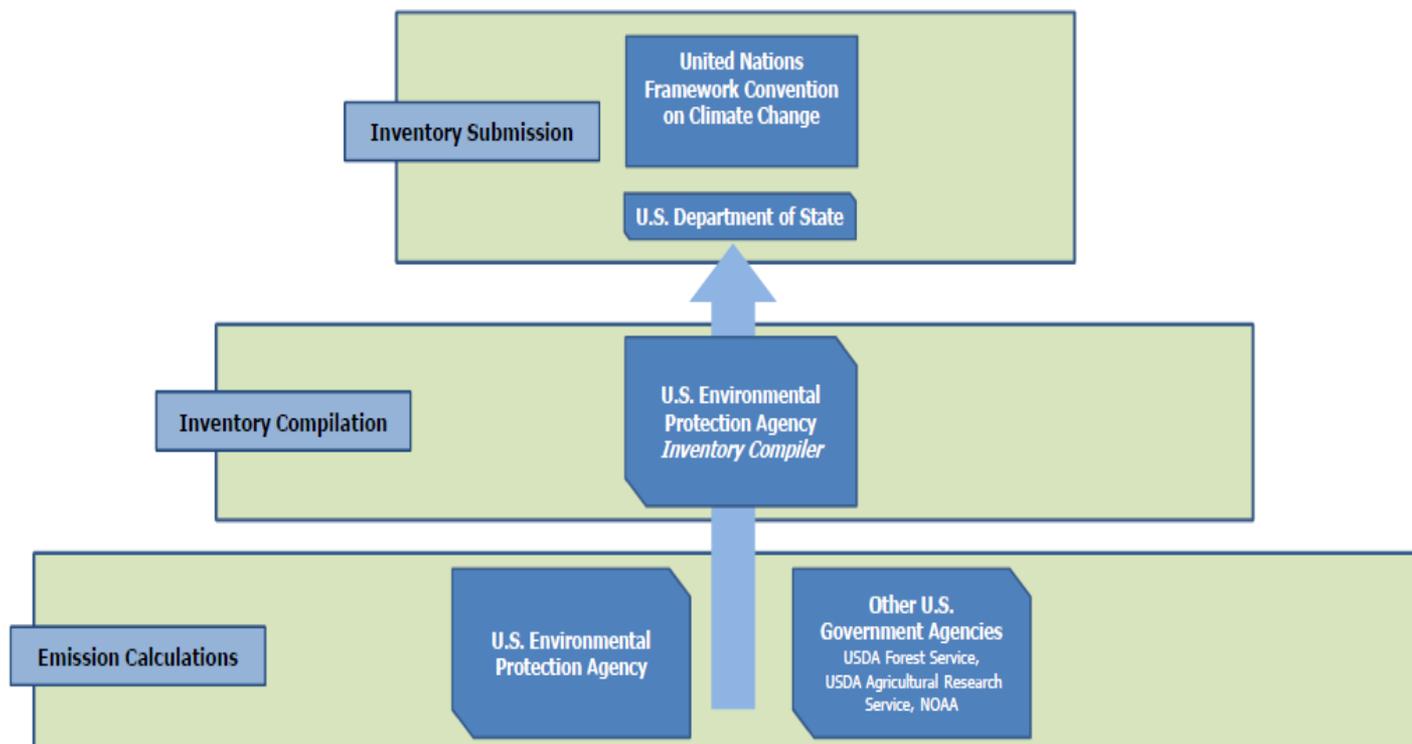
# National GHG Inventory



- Produced annually—due on April 15
- Reports on anthropogenic GHG emissions and removals over time: 1990 to the present
- Five methodological chapters
  - Energy
  - Industrial Processes and Product Use
  - Waste
  - Agriculture
  - Land Use, Land-Use Change and Forestry
- Six primary gases
  - CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>
- Used to track our commitments under the UNFCCC



# United States National Inventory Arrangements



## Data Collection

### Energy

- U.S. Department of Energy and its National Laboratories
- Energy Information Administration
- U.S. Department of Transportation
- Bureau of Transportation Statistics
- Federal Highway Administration
- Federal Aviation Administration
- U.S. Department of Defense – Defense Logistics Agency
- U.S. Department of Commerce – Bureau of the Census
- U.S. Department of Homeland Security
- U.S. Department of Labor’s Mine Safety and Health Administration
- EPA Office of Transportation and Air Quality MOVES Model
- EPA Greenhouse Gas Reporting Program (GHGRP) and Acid Rain Program
- American Association of Railroads
- American Public Transportation Association
- U.S. Department of Labor – Mine Safety and Health Administration
- Data from research studies, trade publications, and industry associations



### Agriculture/LULUCF

- U.S. Department of Agriculture (USDA) National Agricultural Statistics Service
- USDA Natural Resources Conservation Service
- USDA Economic Research Service
- USDA Farm Service Agency
- USDA Animal Plant Health Inspection Service
- Conservation Technology Information Service
- U.S. Geological Survey
- USDA Forest Service
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Department of the Interior Bureau of Land Management
- EPA Office of Solid Waste
- U.S. Census Bureau
- Alaska Department of Natural Resources
- American Society of Agricultural Engineers
- Association of American Plant Food Control Officials
- Tennessee Valley Authority
- Data from research studies, trade publications, and industry associations



### Industrial Processes and Product Use

- U.S. Geological Survey National Minerals Information Center
- EPA GHGRP
- U.S. Department of Commerce
- American Iron and Steel Institute (AISI)
- American Chemistry Council (ACC)
- U.S. Aluminum Association
- Air-Conditioning, Heating, and Refrigeration Institute
- Data from research studies, trade publications, and industry associations



### Waste

- EPA GHGRP
- EPA Office of Land and Emergency Management
- Data from research studies, trade publications, and industry associations



# IPCC Guidelines and UNFCCC Reporting for National GHG Inventories



## IPCC Guidelines Agriculture, Forestry and Other Land Uses (AFOLU)

UNFCCC Reporting

### Agriculture

- Enteric Fermentation ( $\text{CH}_4$ )
- Manure Mgt. ( $\text{CH}_4$  and  $\text{N}_2\text{O}$ )
- Agric. Soil Mgt. ( $\text{N}_2\text{O}$ )
- Rice ( $\text{CH}_4$ )
- FBAR ( $\text{CH}_4$  and  $\text{N}_2\text{O}$ )
- Liming/Urea ( $\text{CO}_2$ )

### LULUCF

(36 LU/LUC Categories)

- Forestland & LCF
- Cropland & LCC
- Grassland & LCG
- Wetlands & LCW
- Settlements & LCS
- Other Land & LCO

Five C Pools &  
Non- $\text{CO}_2$  Gases

# Evolution of IPCC AFOLU Methodological Guidance



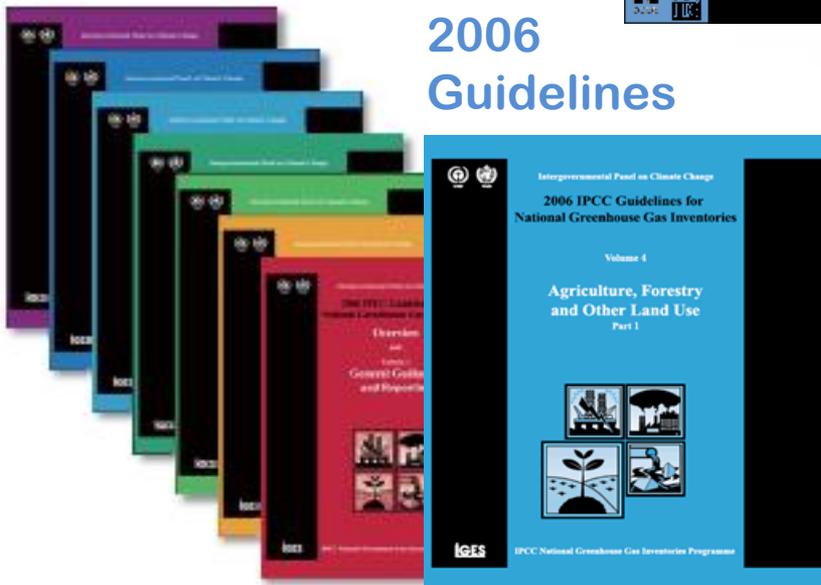
## 1996 Guidelines



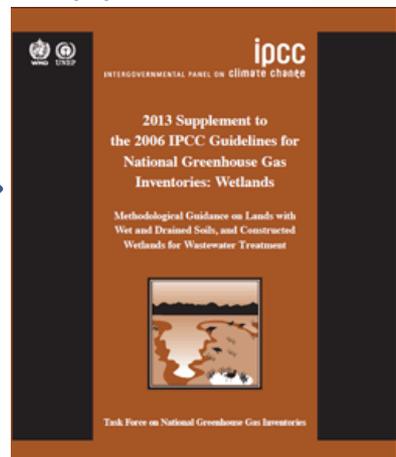
## 2000 & 2003 GPG



## 2006 Guidelines



## 2013 Wetlands Supplement



## 2019 Methodology Report



# Inventory Quality Indicators and Good Practice Guidance



- Transparent
- Consistent
- Complete
- Comparable
- Accurate

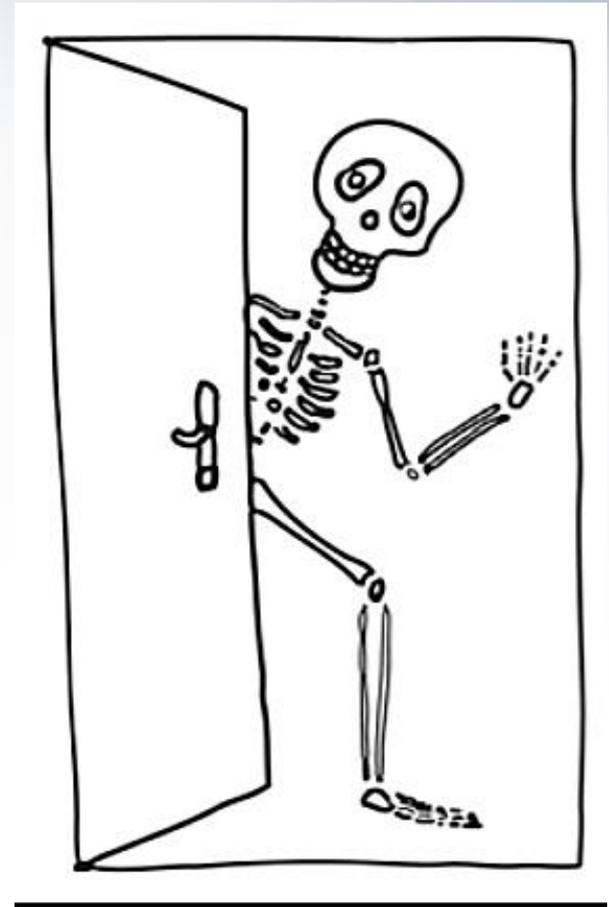
- Assessed for Uncertainties
- Subject to QA/QC
- Efficient use of resources
- Uncertainties reduced over time

- Credible
- Reliable
- Useful

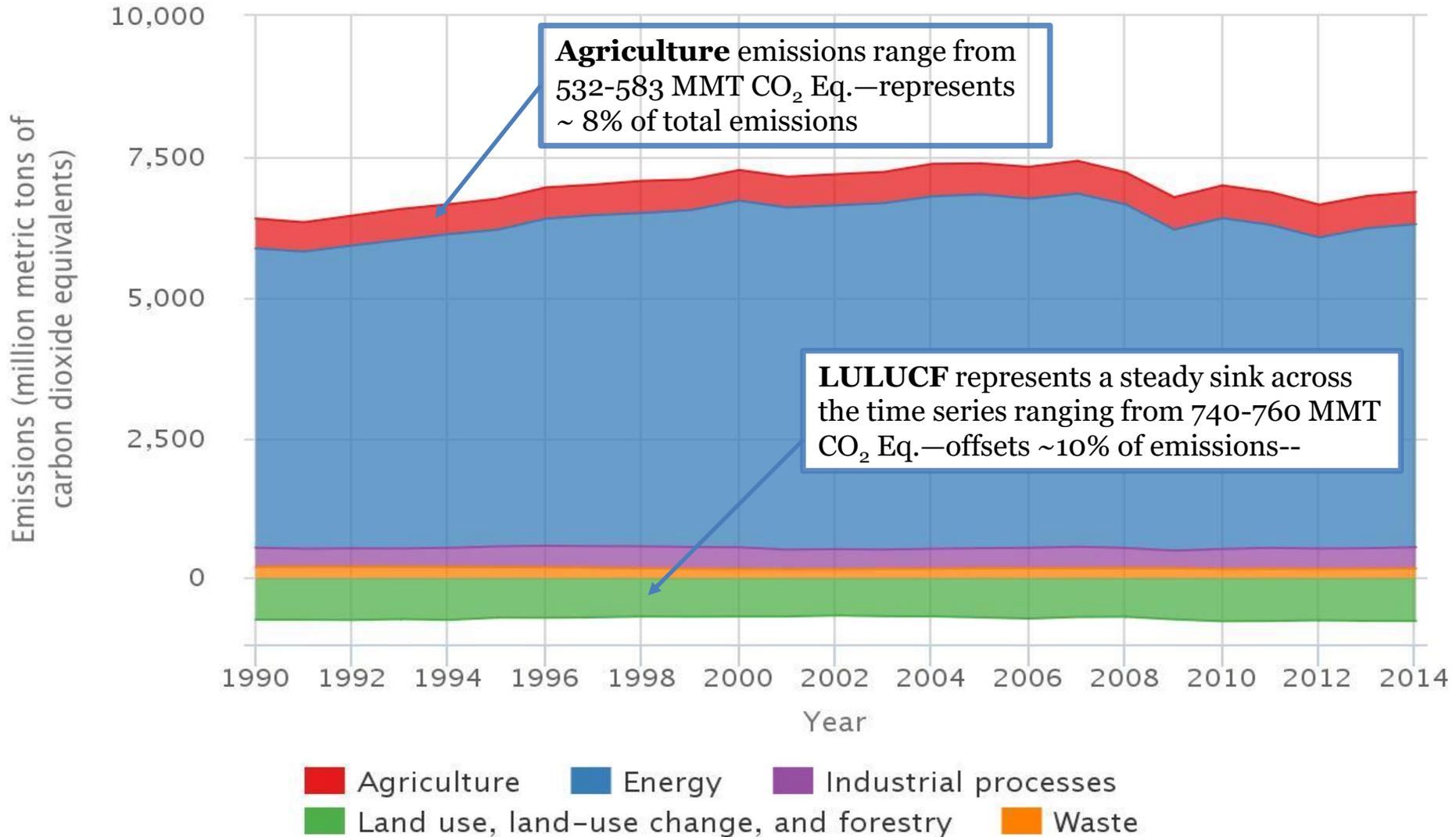
# Domestic and International Review Processes



- Annual Domestic Reviews
  - Expert and Public reviews
    - Thirty days each
    - Not formal reviews, as with regulations, but becoming more so
- Annual UNFCCC Reviews
  - Centralized in Bonn
  - In-Country by multidisciplinary team
  - Annual review report developed
    - Inventory team must respond to recommendations in the report



# U.S. Greenhouse Gas Emissions by Inventory Sector, 1990–2014



# Final Points



- US Inventory is one of the highest quality inventories of any country e.g., completeness, transparency, methods/activity data
- However, significant improvements are necessary, such as:
  - Improve tracking of land use conversion i.e., areas and resulting carbon stock changes
  - Decrease the latency in the reporting e.g., more frequent NRI updates, use of remote sensing imagery
  - Report on C stock changes from interior AK

# Questions?

Thanks for listening!

Tom Wirth  
US EPA  
Climate Change Division  
GHG Inventory Coordinator—  
AFOLU  
(202) 343-9313  
[Wirth.tom@epa.gov](mailto:Wirth.tom@epa.gov)

To download a copy of the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*:

<http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>

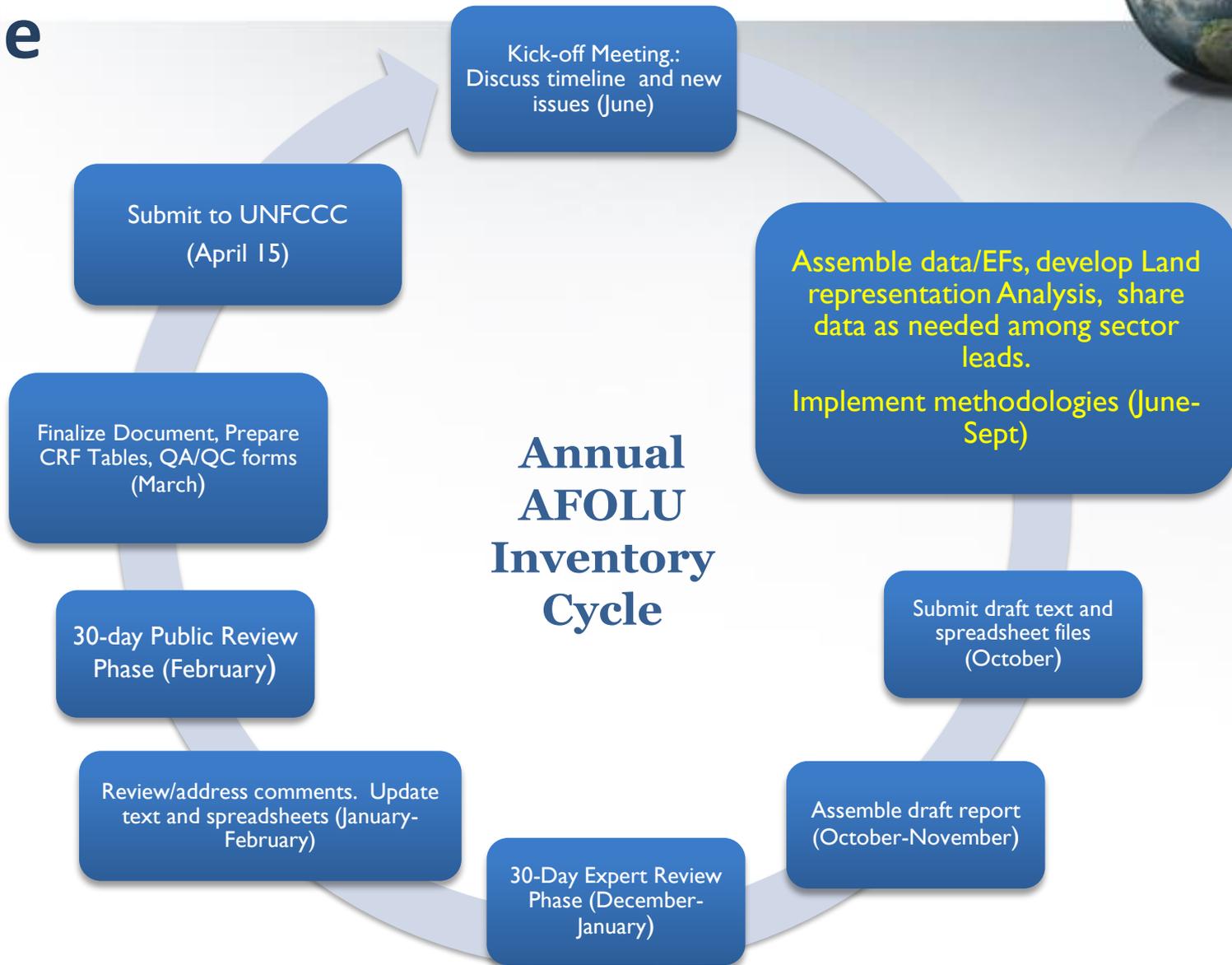
# Chapter Structure Based on UNFCCC Reporting Requirements



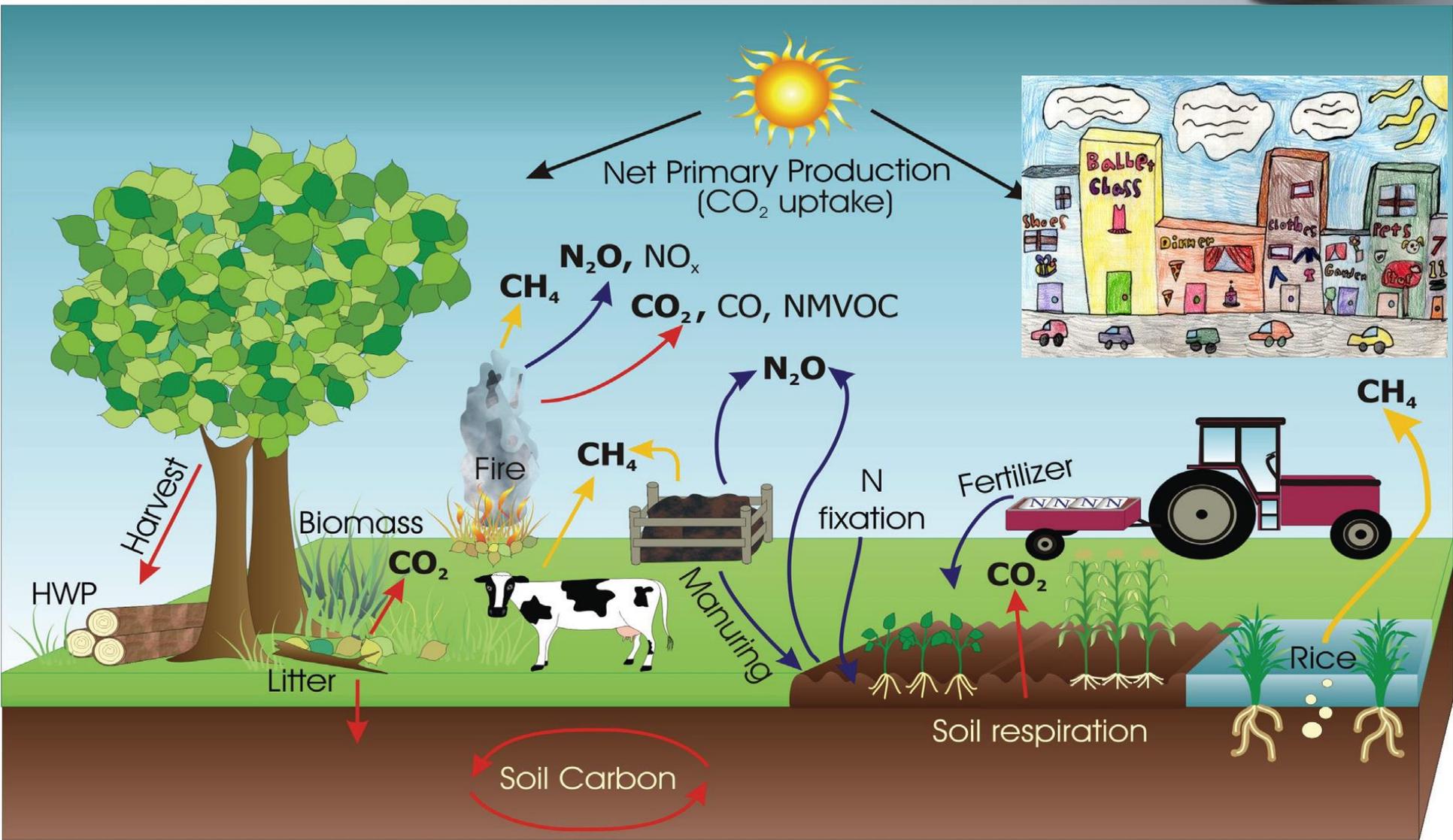
- Overview
  - Description of source/sink—cause of emission/removal
  - Trends/drivers
  - Emissions/removals in MMT CO<sub>2</sub> eq. and kilotons of gas
- Estimation methodology and activity data
- Uncertainty; Monte Carlo simulation for a 95% confidence interval with lower and upper bounds around the central estimate
- Time series consistency
- QA/QC and verification
- Recalculations Discussion
- Planned Improvements



# “Idealized” Annual AFOLU Inventory Cycle



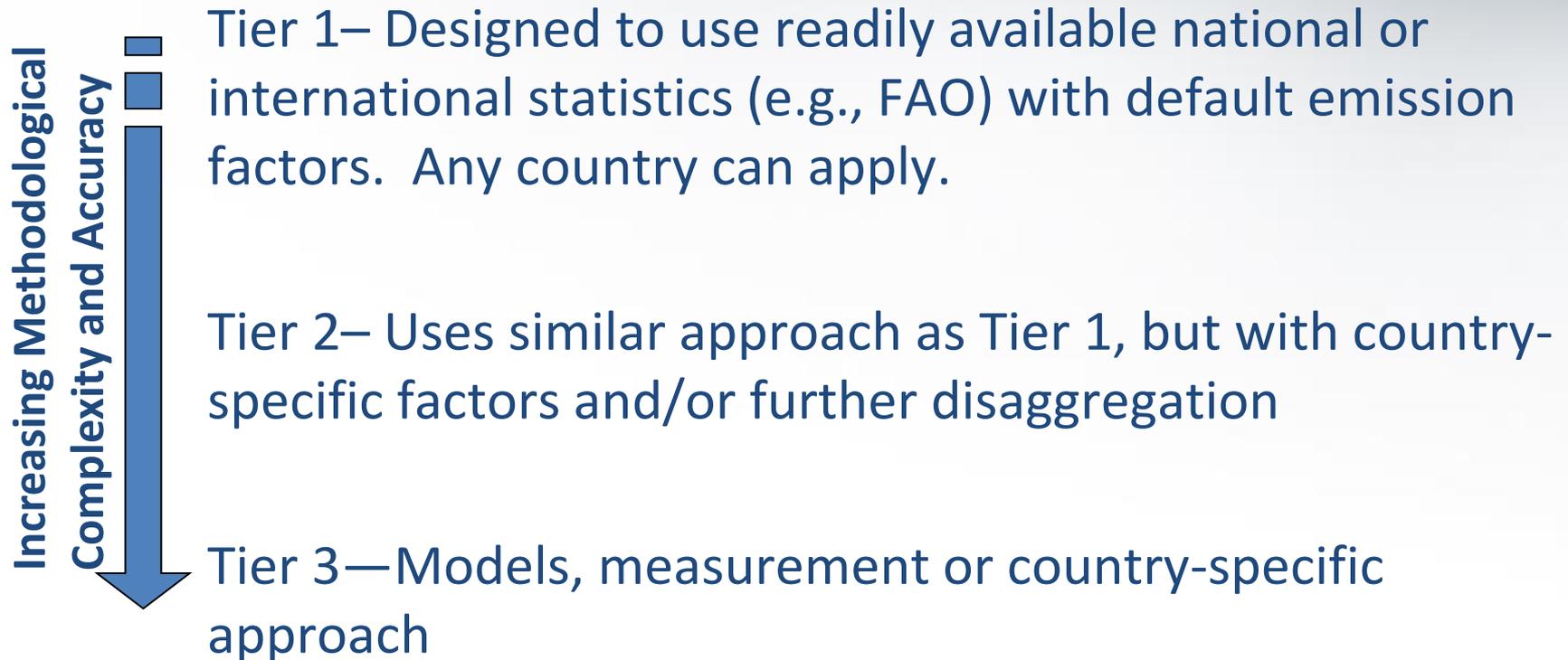
# GHG Emissions and Removals from Agriculture, Forestry and Other Land Use (AFOLU)



# IPCC Tiered Methodologies



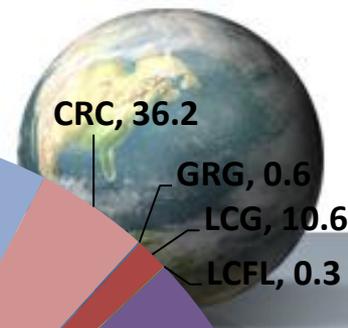
For each source/sink category methods are provided at three tier levels:



The Tier used is driven by the significance of the flux and availability of data

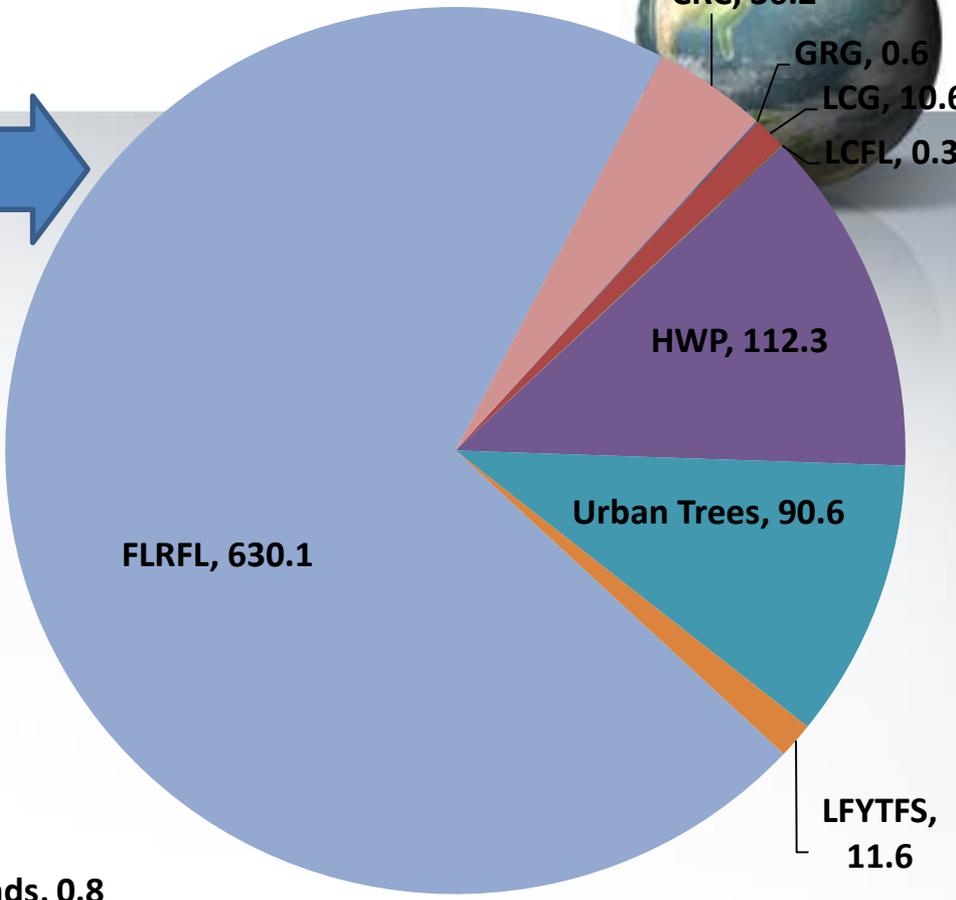
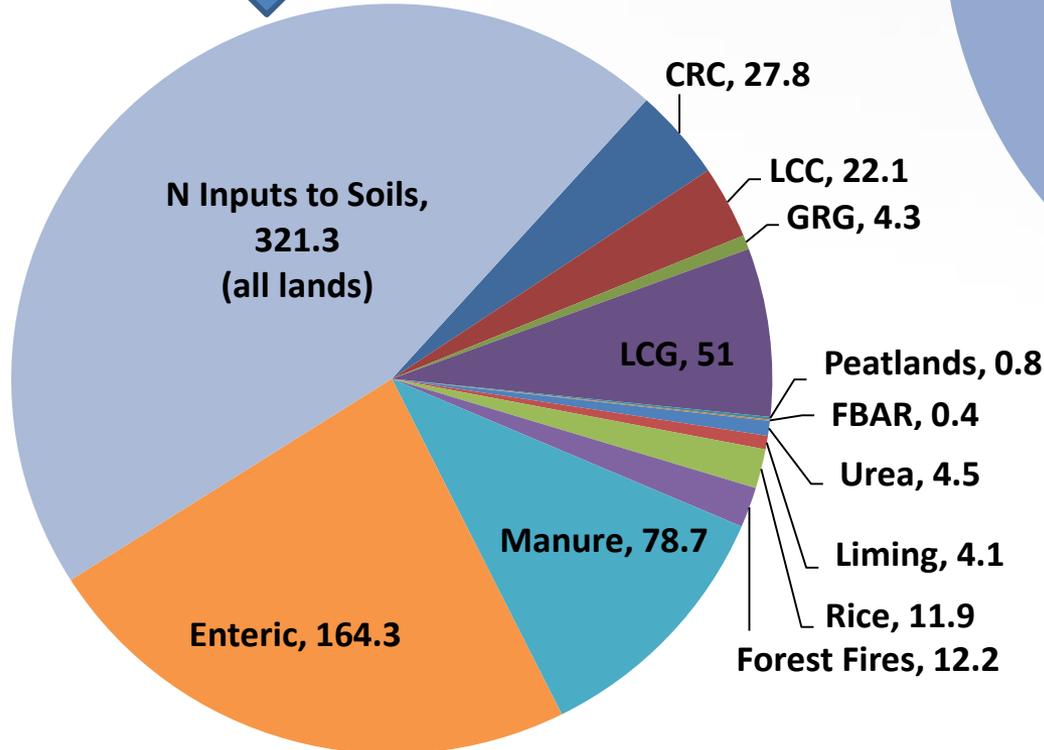
# AFOLU Emissions and Removals:

2014



**SOURCES**  
**703.4** (MMT CO<sub>2</sub> Eq.)\*  
 (Agric. & LULUCF Sources)

**SINKS**  
**892.3** (MMT CO<sub>2</sub> Eq.)  
 (LULUCF sinks only)



**Net AFOLU Flux = (188.9)**  
**(MMT CO<sub>2</sub> Eq.)**  
 \*An additional 52 MMT CO<sub>2</sub> Eq. is emitted from on-farm mobile and stationary combustion (e.g., tractors, generators)

# IPCC Managed Lands Criteria i.e., Anthropogenic Fluxes



- **All Croplands and Settlements**
- **All Forest Land with active fire protection**
- **All Grassland if affected by livestock; accessible by roads and/or other infrastructure**
- **Protected lands maintained for recreational and conservation purposes**
- **Lands with active and/or past resource extraction**
- **Lands that were previously managed remain in managed land base for 20 years**



**Managed land = 890 Mha**  
**Unmanaged land = 46 Mha (Alaska)**  
**Total Land Base = 936 Mha**