Methane Roadmap Action Programme (M-RAP)

2nd virtual workshop series
Resources for Filling Gaps in National Data
Since 2020, 150 countries signed the Global Methane Pledge (GMP) agreeing to take voluntary national action to contribute to a collective effort to reduce global methane emissions by at least 30% below 2020 levels by 2030.

GMP countries are encouraged to develop or update Methane Action Plans.

The CCAC, as the first point-of-call for GMP countries, has launched the Methane Roadmap Action Programme (M-RAP) to support development and implementation of transparent and consistent national Methane Action Plans or roadmaps.
First series focused on the five building blocks of a methane roadmap. Resources available here

This 2\textsuperscript{nd} M-RAP workshop series will invite GMP countries to a 1-hour virtual workshop every two weeks to address:

- Lessons learned from methane roadmap development
- Preparations for COP28
M-RAP: 2nd virtual workshop series

Resources for Filling Gaps in National Data

Sophie Bonnard – CCAC – Welcome, Introduction to M-RAP and workshop objectives (5 mins)

Chris Malley – SEI – Data available from CCAC regional assessments (15 mins)

Melissa Weitz, US EPA - Data collection and efforts to fill the gaps (15 mins)

Q&A (20 mins)

Nathan Borgford-Parnell – CCAC - Closing (5 mins)
METHANE TECHNICAL ASSISTANCE PORTAL

- **TOOLS**
  - M-RAP Template
  - M-RAP Workshop series
  - General and Sector specific guidelines & tools
- **EXPERT CONSULTATIONS** – match governments with external experts on methane mitigation in the Agriculture, Fossil Fuel and Waste sectors
- **NATIONAL PLANNING SUPPORT** – support integrated planning approach on climate and clean air by assessing emissions, mitigation options, implementation pathways, monitoring/evaluation
- **POLICY & REGULATORY SUPPORT** - policy design and implementation in developing countries through targeted activities such as regulatory analysis, cost-benefit analysis, or peer-to-peer exchanges


GMA Country Projections
Available on request.
National-level GMA data of sources, mitigation options, costs and benefits.
CCAC RESOURCES

▪ CCAC support through sectoral hubs (agriculture, waste, fossil fuels). CCAC topic-specific and national Planning Hubs bring together countries and experts to share best practices, forge collaboration, and develop a community of practice for action to reduce methane and other short-lived climate and air pollutants.

▪ Small-scale expert assistance – $30,000 - $50,000 small-scale fund to support ODA-eligible countries.

▪ Country Expression of Interest and project funding process

▪ GMP partners who are not CCAC partners are eligible to receive funding support to develop national methane roadmap through small scale expert assistance but would need to join CCAC to access other CCAC financial support.

APPLY for technical assistance here: https://bit.ly/MethaneTA
CHRIS MALLEY
RESEARCHER, SEI
DATA FROM CCAC REGIONAL ASSESSMENTS
Methane Roadmap Action Programme (M-RAP)
Large data availability for methane

Reduce global methane emissions by at least 30% below 2020 levels by 2030.
What should data be used for?
M-RAP BUILDING BLOCKS

BB1 – Inventories
(Emissions Sources/Profile)

BB2 – Analytics
(Reduction Commitments/Options)

BB3 – Targets
(Objectives of strategies/plans/policies)

BB4 – Policies and Measures
(Policy implementation pathways)

BB5 – Monitoring, Reporting and Verification

National Context

Agriculture
Fossil Fuels
Waste
BUILDING BLOCK 1: International Emission Inventories

Food and Agriculture Organization of the United Nations

FAOSTAT

Global Greenhouse Gas Emissions
EDGAR v7.0

A Community Emissions Data System (CEDS) for Historical Emissions

A data-driven, open source framework of historical emission estimates for Earth system models, climate models, atmospheric chemistry and transport models, and integrated assessment models.
### BUILDING BLOCK 1: Default Emission Inventory data

#### Task Force on National Greenhouse Gas Inventories

**Publications**
- 2019 Refinement

#### 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

**Volume 5**
- Waste

#### Annex 2A.2 (New) Waste composition—by country and regional averages

<table>
<thead>
<tr>
<th>Countries</th>
<th>Food waste</th>
<th>Garden (yard) and park waste</th>
<th>Paper and cardboard</th>
<th>Wood</th>
<th>Textiles</th>
<th>Nappies (disposable diapers)</th>
<th>Rubber and leather</th>
<th>Plastics</th>
<th>Metal</th>
<th>Class (and pottery and china)</th>
<th>Other</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Central Asia</td>
<td>30.0</td>
<td>1.1</td>
<td>24.7</td>
<td>2.5</td>
<td>5.5</td>
<td>0</td>
<td>0</td>
<td>8.4</td>
<td>0.8</td>
<td>5.9</td>
<td>23.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>1.2</td>
<td>2.8</td>
<td>12.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>8.8</td>
<td>0.0</td>
<td>11.8</td>
<td>34.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>38.4</td>
<td>2.8</td>
<td>22.5</td>
<td>4.9</td>
<td>1.0</td>
<td>0</td>
<td>0</td>
<td>34.0</td>
<td>3.0</td>
<td>11.8</td>
<td>34.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Eastern Asia</td>
<td>40.3</td>
<td>0.0</td>
<td>1.6</td>
<td>1.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>5.5</td>
<td>0.0</td>
<td>10.6</td>
<td>22.9</td>
<td>2.9</td>
</tr>
<tr>
<td>China</td>
<td>59.1</td>
<td>8.5</td>
<td>16.6</td>
<td>4.1</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>12.0</td>
<td>1.0</td>
<td>8.5</td>
<td>8.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Japan</td>
<td>76.0</td>
<td>46.0</td>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>9.0</td>
<td>8.0</td>
<td>4.0</td>
<td>4.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Mongolia</td>
<td>50.8</td>
<td>4.3</td>
<td>3.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>3.8</td>
<td>0.1</td>
<td>17.3</td>
<td>10.11</td>
<td>10.11</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>5.2</td>
<td>0.0</td>
<td>6.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>1.7</td>
<td>2.3</td>
<td>61.7</td>
<td>9.12</td>
</tr>
</tbody>
</table>
BUILDING BLOCK 2: Regional Assessments
BUILDING BLOCK 2: Sectoral Assessments

Methane Abatement

Overview Tracking
Twice as Many Countries Make International Commitments to Tackle Short-Lived Climate Pollutants

by CCAC secretariat - 28 February, 2023
OPPORTUNITIES FOR INCREASING AMBITION OF NATIONALLY DETERMINED CONTRIBUTIONS THROUGH INTEGRATED AIR POLLUTION AND CLIMATE CHANGE PLANNING: A PRACTICAL GUIDANCE DOCUMENT
Global methane abatement cost curve, by policy option
Last updated 7 Oct 2021
The Landscape of Methane Abatement Finance

July 2022

Global Mitigation of Non-CO₂ Greenhouse Gases: 2010-2030
CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

UNEP convened initiative
Improving National CH$_4$ Data—U.S. Experience

Melissa Weitz
U.S. Environmental Protection Agency
September 14, 2023
Outline

▪ Background on U.S. CH₄ Data
▪ GHG Inventory Approach
▪ Addressing Gaps and Improving Data
U.S. Key Methane Data Sources GHG Data: U.S. GHG Inventory (GHGI) and GHG Reporting Program (GHGRP)

- Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHGI), the U.S. official GHG Inventory submission to UNFCCC, tracks total annual U.S. emissions across all sectors of the economy, using mostly national-level data.

- GHGRP collects detailed emissions data from large greenhouse gas emitting facilities in the United States, as directed by the Clean Air Act.
  - GHGRP covers most, but not all, U.S. GHG sources and sinks (i.e., GHGRP does not include agriculture, land use, and small sources).

<table>
<thead>
<tr>
<th>Task</th>
<th>Inventory of U.S. GHG Emission and Sinks</th>
<th>Greenhouse Gas Reporting Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find total U.S. emissions and sinks</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Review trend data for the past 20+ years</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Browse a map to find the largest emitters in your area</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compare facility emissions across an industrial sector</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Find state-level data</td>
<td>Total ✓</td>
<td>Reported ✓</td>
</tr>
</tbody>
</table>
U.S. Example: GHG Inventory Annual Development

- Interagency effort led by EPA’s Office of Atmospheric Programs (OAP)
  - Involves other USG agencies (e.g., DoE/EIA, USDA/USFS, USGS, etc.) academic and research institutions, industry associations and other EPA offices (e.g., OTAQ)

- Methods: 2006 IPCC Guidelines and its Supplements and Refinements
  - Tiers 1-3
  - Continuous improvement

- Annual Timing and Review Process
  - Summer: Review of new data, coordination with other agencies, beginning of stakeholder process for oil and gas
  - October to November: 30-day expert review
  - February: 30-day public review via Federal Register notice
  - Mid-April: Submittal to UNFCCC (April 15 deadline)
  - September: UNFCCC peer review
Overview of Methane in the 2023 U.S. GHGI

Trends since 2011

<table>
<thead>
<tr>
<th>Source</th>
<th>Emissions (MMT CO₂e)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Methane (CH₄)</td>
<td>-5%</td>
<td></td>
</tr>
<tr>
<td>Coal Mining</td>
<td>-44%</td>
<td></td>
</tr>
<tr>
<td>Oil and Natural Gas Systems</td>
<td>-10%</td>
<td></td>
</tr>
<tr>
<td>Landfills and Wastewater</td>
<td>-5%</td>
<td></td>
</tr>
<tr>
<td>Enteric and Manure Management</td>
<td>+6%</td>
<td></td>
</tr>
<tr>
<td>Land Use</td>
<td>+18%</td>
<td></td>
</tr>
</tbody>
</table>

2021 Total Methane Emissions: 793.4 MMT CO₂e

- Coal Mining: 44.7 MMT CO₂e
- Wastewater Treatment: 21.1 MMT CO₂e
- Landfills: 122.6 MMT CO₂e
- Petroleum Systems: 50.2 MMT CO₂e
- Natural Gas Systems: 181.4 MMT CO₂e
- Enteric Fermentation: 194.9 MMT CO₂e
- Manure Management: 66.0 MMT CO₂e
- Land Use: 66.0 MMT CO₂e
- Other: 46.6 MMT CO₂e
Oil and Gas CH₄ Trends (2022 GHG1)

2011-2021 CH₄ Trends
• Total: -10%
• Distribution: -7%
• Transmission and Storage: +19%
• Gas Production: -19%
• Oil Production: +3%
• Gas Processing: +27%
• Exploration: -98%
Calculating Oil and Gas Emissions in the GHG Inventory

- Calculated with IPCC higher tier approaches
- Inventory covers leaks, vents, and flares, and is stratified into natural gas and petroleum pathways of the industry
  - Natural gas - offshore production, onshore production, gas processing, gas transmission, underground gas storage, LNG storage, LNG import and export terminals, and gas distribution
  - Petroleum – offshore production, onshore production, oil transportation, and refineries
- Oil and gas in inventory covers hundreds of types of sources
- General approach is to multiply national activity data by emission factors, e.g.:
  - Miles cast iron pipeline x CH$_4$ per mile cast iron pipeline
  - # residential meters x CH$_4$ per residential meter
GHGI Key Data Sources

- GHGRP—Key source of emission factors and activity data for recent years
  - Examples: hydraulically fractured completions, pneumatic controllers, liquids unloading
- EDF study series
  - Zimmerle et al. 2015 (with GHGRP)—Emission factors for transmission and storage
  - Lamb et al. 2015 (with GRI 1996)—Emission factors for distribution pipeline emissions
- DOE-funded work
  - Zimmerle et al. 2019—Emission factors for gathering and boosting
  - Moore et al. 2019—Emission factors for commercial and industrial meters
- Other research studies
  - Fischer et al. 2018—Emission factors for residential post-meter
  - Pandey et al. 2019, Cusworth et al. 2021, and Maasakkers et al. 2022—Emissions for large well blowout events
- GRI 1996—Primarily used to estimate emissions from early years of time series.
  - For some sources, it is still the best source for emission factors or certain activity data inputs (e.g., component counts for production segment)
Addressing Gaps and Improving Estimates

- Tracking new studies and communicating with researchers—EPA tracks new studies and where possible, communicates with researchers in the study development process to improve relevance of results to EPA’s GHG data.
  - Bottom-up to improve equipment-specific information
  - Top-down to inform where emissions may be over or underestimated and guide improvements
- Stakeholder process—EPA conducts early engagement and communication with stakeholders on new data available.
- Annual data updates—EPA updates the GHG Inventory when new information is available to improve our emissions calculations.
- Gridded Inventory—Improves the ability to compare the national-level Inventory with measurement results that may be at other scales
- Proposed GHGRP regulatory revisions including collecting additional data to help understand potential causes of discrepancy
- Outreach on EPA CH$_4$ data research priority list
### Updates to U.S. GHGI

<table>
<thead>
<tr>
<th>Year</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Implemented basin-level calculation methodologies using GHGRP data for select production sources</td>
</tr>
<tr>
<td>2022</td>
<td>Inclusion of post-meter estimates and large well blowouts, improved estimates for abandoned wells and voluntary reductions</td>
</tr>
<tr>
<td>2021</td>
<td>Updated data on customer meters and produced water</td>
</tr>
<tr>
<td>2020</td>
<td>Use of research study EFs for G&amp;B equipment, use of BOEM and GHGRP data on offshore</td>
</tr>
<tr>
<td>2019</td>
<td>Use of GHGRP data for G&amp;B and transmission pipelines, LNG, HF oil wells, N$_2$O emissions</td>
</tr>
<tr>
<td>2018</td>
<td>Inclusion of abandoned wells estimate, use of GHGRP for CO$_2$ and year-specific EFs</td>
</tr>
<tr>
<td>2017</td>
<td>Inclusion of Aliso Canyon estimate, GHGRP for processing, associated gas venting and flaring,</td>
</tr>
<tr>
<td>2016</td>
<td>Update to production (GHGRP), G&amp;B emission estimate, transmission (GHGRP and research study), distribution (GHGRP and research study)</td>
</tr>
<tr>
<td>2015</td>
<td>Use of GHGRP for refineries, use of latest BOEM for offshore, update to well data source</td>
</tr>
<tr>
<td>2014</td>
<td>Use of GHGRP data for HF gas wells</td>
</tr>
<tr>
<td>2013</td>
<td>Use of API/ANGA data on liquids unloading, use of NSPS OOOO analysis for gas wells</td>
</tr>
</tbody>
</table>
Atmospheric measurement covered under “Quality Assurance, Quality Control, and Verification”

Describes components needed to compare inventories with atmospheric measurements
- Measurements of atmospheric gas concentrations, inverse modeling tools, gridded inventory, collaboration

Describes national experience with use of atmospheric measurements
- Switzerland (CH4), UK (CH4), Australia (SF6, HFCs)

Guidance is consistent with EPA use of gridded inventory for comparisons with atmospheric data
- Identification of areas with potential over- or underestimates
Gridded EPA Methane Emissions Inventory

- Spatially and temporally disaggregated version (~10 x 10 km, monthly resolution) of all methane emission sources in the GHGI
- Allows for more direct comparison between the GHGI and the time and location of atmospheric methane observations/emission rates
- Is used as a prior estimate for inversions of atmospheric methane

Version 1—Published 2016
- Emissions for 2012
- Based on 2016 GHGI
- Research study effort

Version 2—Published 2023
- Timeseries (2012 – 2018, and “express” data set to 2020)
- Based on 2020 GHGI
- Development of a system to streamline future updates
Motivation

- **A GHG inventory is an essential tool** for understanding current emissions and trends, projecting future scenarios, and identifying cost-effective mitigation opportunities.

- Many **developing countries have identified challenges** in implementing aspects of the 2006 IPCC Guidelines, which are required under the Enhanced Transparency Framework (ETF) under the Paris Agreement starting in 2024.

EPA’s Approach

- To **develop tools and work directly with national inventory teams** to help build institutional and technical capacity for sustainable GHG inventory management systems.

Contact us: ghgi.transparency@epa.gov
M-RAP: 2nd virtual workshop series

Resources for Filling Gaps in National Data

Question & Answer
Delivering on methane at COP28
Thursday 28 September, 15:00-16:00 CET / 08:00-10:00 EST / 19:00-21:00 BKK

This virtual workshop will focus on preparations of GMP countries for COP 28 incl. proposed plans for GMP and methane ambition setting at the COP and upcoming Climate Weeks.

Agenda:
- CCAC - Setting ambition for methane at COP-28
- Nigeria - Outcomes of AMCEN and ACW
- UAE - Methane ambition at the COP
- Q&A

More information and registration:
bit.ly/2ndSeriesMRAP
Delivering on methane at COP28
Thursday 28 September, 15:00-16:00 CET / 08:00-10:00 EST / 19:00-21:00 BKK

Stakeholder engagement for national methane roadmap development
Thursday 12 October, 15:00-16:00 CET / 08:00-10:00 EST / 19:00-21:00 BKK

Getting ready for COP28
Thursday 2 November, 15:00-16:00 CET / 08:00-10:00 EST / 19:00-21:00 BKK

Embedding methane roadmaps in national policy processes
Thursday 16 November, 15:00-16:00 CET / 08:00-10:00 EST / 19:00-21:00 BKK

More information and registration
bit.ly/2ndSeriesMRAP
SHARE YOUR PROGRESS WITH US

Your GMP commitment includes:
Maintaining **up-to-date, transparent, and publicly available information** on your country’s methane policies and commitments.

We invite you to share with us any information about your methane related events and actions, GMP implementation progress and to **submit your national Methane Roadmaps or Action Plans**

So we can keep track of the pledge advancement and share your progress with the GMP community!

Thank you!
To share your Methane progress and for questions and support requests:
Nathan.Borgford-Parnell@un.org
Sophie.Bonnard1@un.org
secretariat@ccacoalition.org

Resources and more information: