



EPA's Coalbed Methane Outreach Program (CMOP)

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Why Methane Matters

Methane Emissions

Trap 28 times more heat than carbon dioxide over 100 years*

Contribute to ground-level ozone pollution

Create industrial safety problem

Methane Mitigation

Opportunity to capture and convert methane to useful energy

Positive Outcomes of Capturing and Using Methane



- ✓ Better air and water quality
- ✓ Improved human health
- ✓ Increased worker safety
- ✓ Enhanced energy security
- ✓ Economic growth

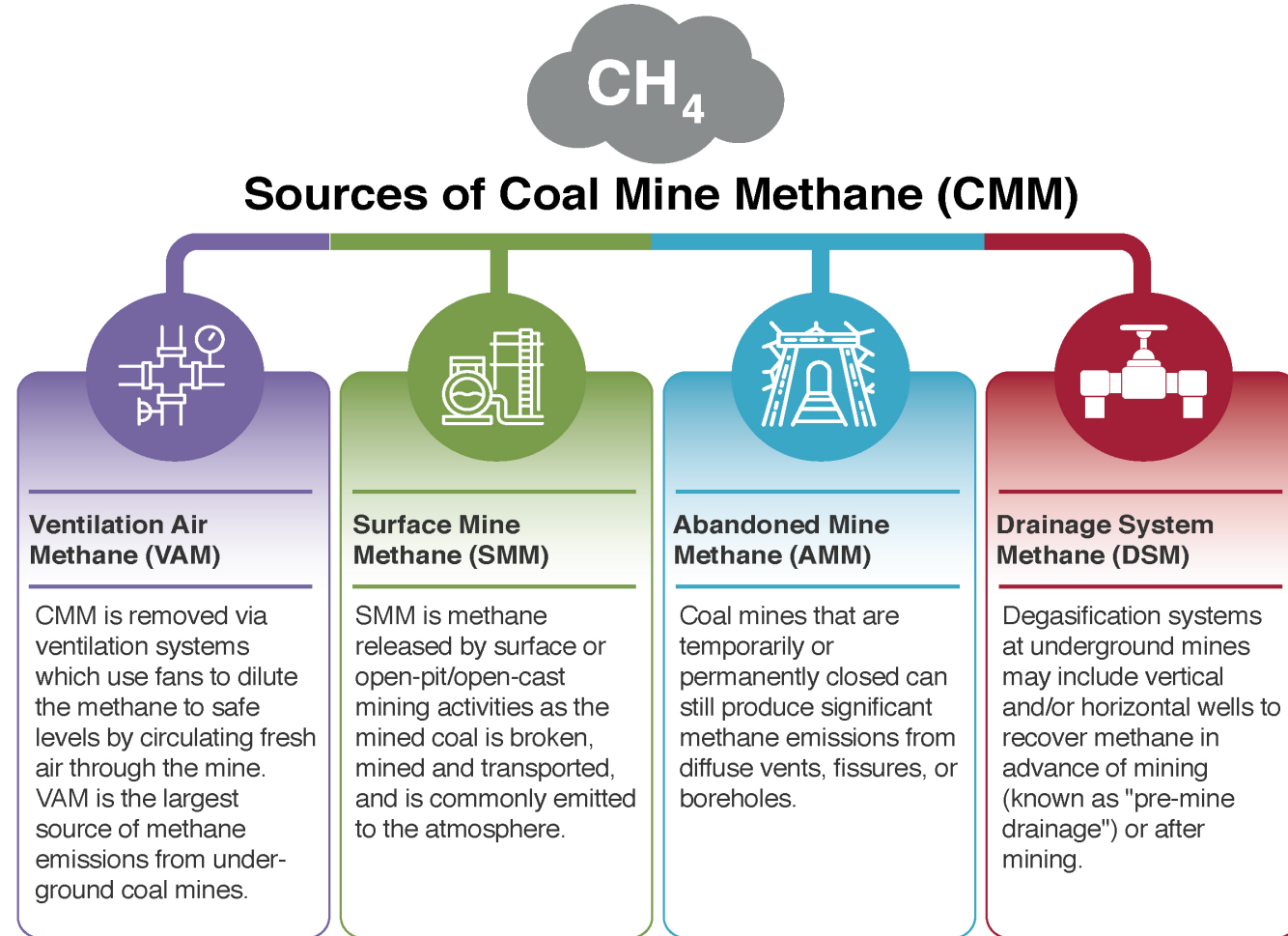
*<https://www.epa.gov/ghgemissions/understanding-global-warming-potentials>

Methane Emissions from Coal Mining



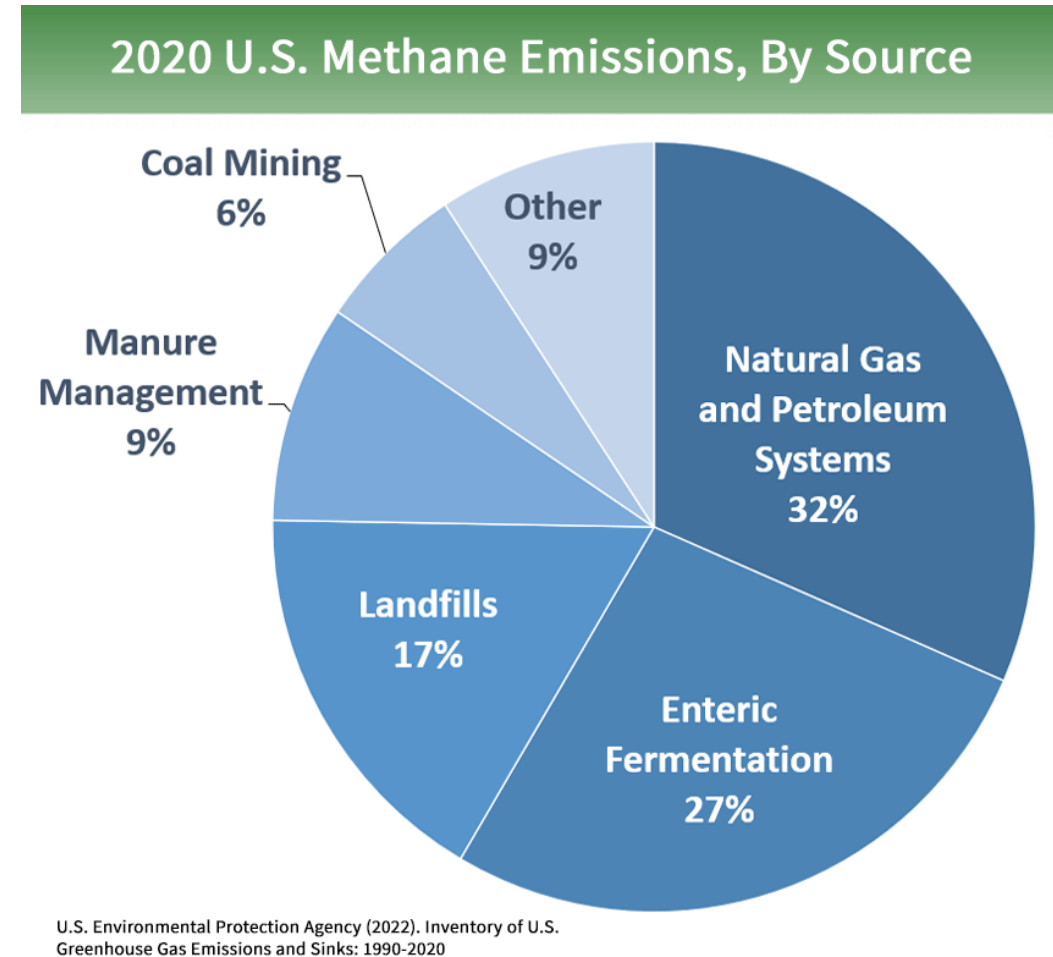
CMM is emitted from 5 sources:

- **Degasification systems** at underground coal mines (also referred to as drainage systems).
- **Ventilation air** from underground mines, which contains dilute concentrations of methane.
- **Abandoned, or closed, mines**, from which methane may seep out through vent holes or through fissures or cracks in the ground.
- **Surface mines**, from which methane in coal seams is directly exposed to the atmosphere.
- **Fugitive emissions** from post-mining operations, in which coal continues to emit methane as it is stored in piles and transported.



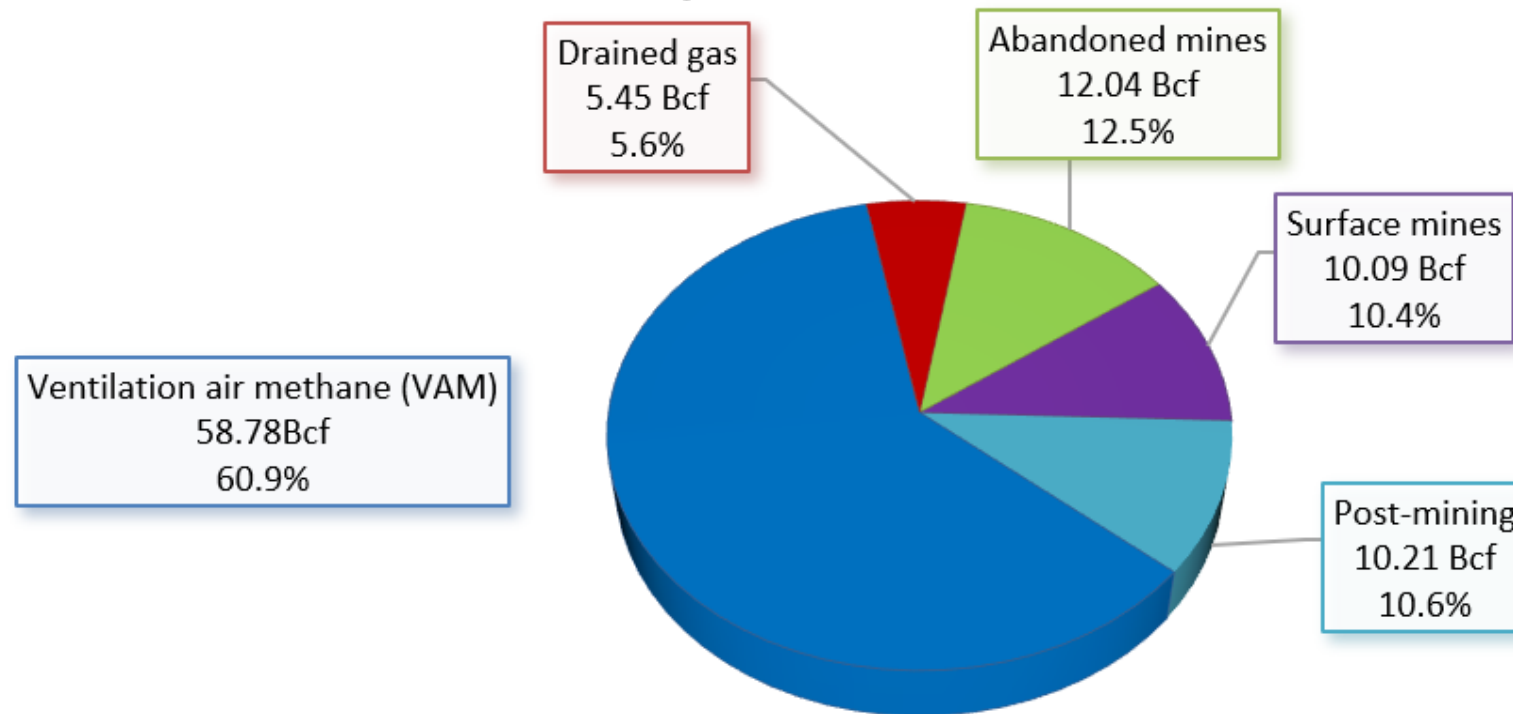
Methane Emissions in the United States

- U.S. EPA annually compiles data on greenhouse gas emissions from different economic sectors
- In 2020, coal mining accounted for 6% of total U.S. methane emissions



Methane Emissions from U.S. Coal Mines

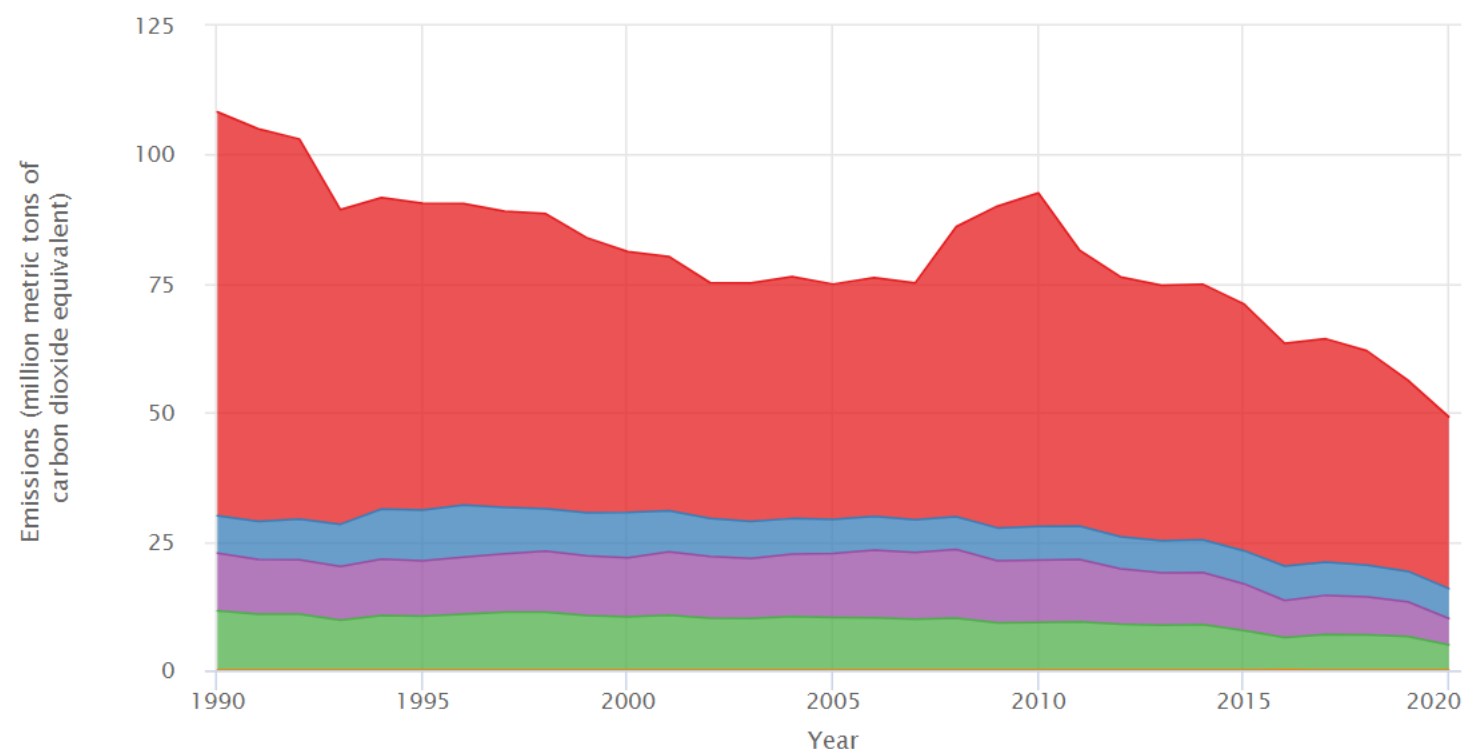
- Methane from coal mining activities comprises 6% of total US methane emissions (2020)
- Ventilation Air Methane (VAM) from underground coal mines is the largest source of methane emissions from coal mining.



Data Source: U.S. EPA,
National Inventory, 2022

Methane from Coal Mines in the United States

U.S. Greenhouse Gas Emissions from Coal Mining, by Subcategory, 1990–2020



- Underground mining
- Abandoned underground mines
- Surface mining
- Post-mining (surface and underground)
- Carbon dioxide from methane flaring

Percent change:

1990–2020

Underground mining:

▼ 57.5%

Abandoned underground mines:

▼ 19.7%

Surface mining:

▼ 54.4%

Post-mining (surface and underground):

▼ 57.4%

Carbon dioxide from methane flaring:

Trend not available

Total: ▼ 54.6%

Data Source:

<https://cfpub.epa.gov/ghgdata/inventoryexplorer/#energy/coalmining/allgas/subcategory/all>

EPA's Coalbed Methane Outreach Program



Mission

- The Coalbed Methane Outreach Program (CMOP) aims to work with the coal mining industry to reduce coal mine methane (CMM) emissions through recovery and use projects.

Focus

- Greenhouse gas emission reduction opportunities

Activities

- Identify profitable opportunities for CMM recovery
- Identify and help overcome market, regulatory, and technical barriers
- Offer technical and analytic support where appropriate
- Conduct direct outreach to coal mines

Impact

- Since the program's launch in 1994, CMOP has helped the US coal industry reduce methane emissions by approximately 226 MMTCO₂e

EPA Work on Ventilation Air Methane



- Recovery of methane from drainage systems is the "low-hanging fruit" of reducing methane emissions from coal mining. As of January 2023, EPA is aware of 25 coal mine methane projects at 16 active mines. Ventilation Air Methane (VAM) remains one of the biggest gaps in CMM mitigation.
- About two decades ago, CMOP supported a technology demonstration project in collaboration with DOE and Consol Energy that resulted in first VAM project in US showcasing thermal oxidizer VAM recovery
- The program has developed resources and tools targeted to VAM recovery, e.g.:
 - CMM Cash Flow Model www.epa.gov/cmop/cmm-cash-flow-model
 - A web-based tool that allows users to evaluate the financial viability of recovering and utilizing CMM from abandoned mine drainage wells or mine ventilation air systems
 - Map of US Coal Mine Methane Current Projects and Potential Opportunities www.epa.gov/cmop/map-us-coal-mine-methane-current-projects-and-potential-opportunities
 - A screening tool to identify potential mines capable of hosting methane utilization projects

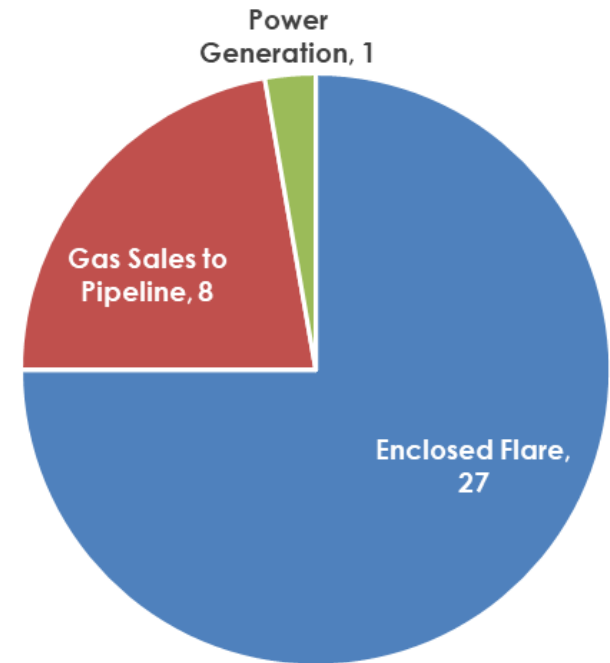


U.S. Abandoned Mine Methane Emissions



- Methane is also emitted from abandoned (or closed) mines
 - In 2020, Abandoned Mine Methane (AMM) accounted for 12% of the total U.S. coal mine methane emissions
 - As of January 2023, EPA is aware of 35 abandoned mine methane projects at 66 abandoned (closed) mines, most of which flare methane (note: chart data is as of fall 2022)

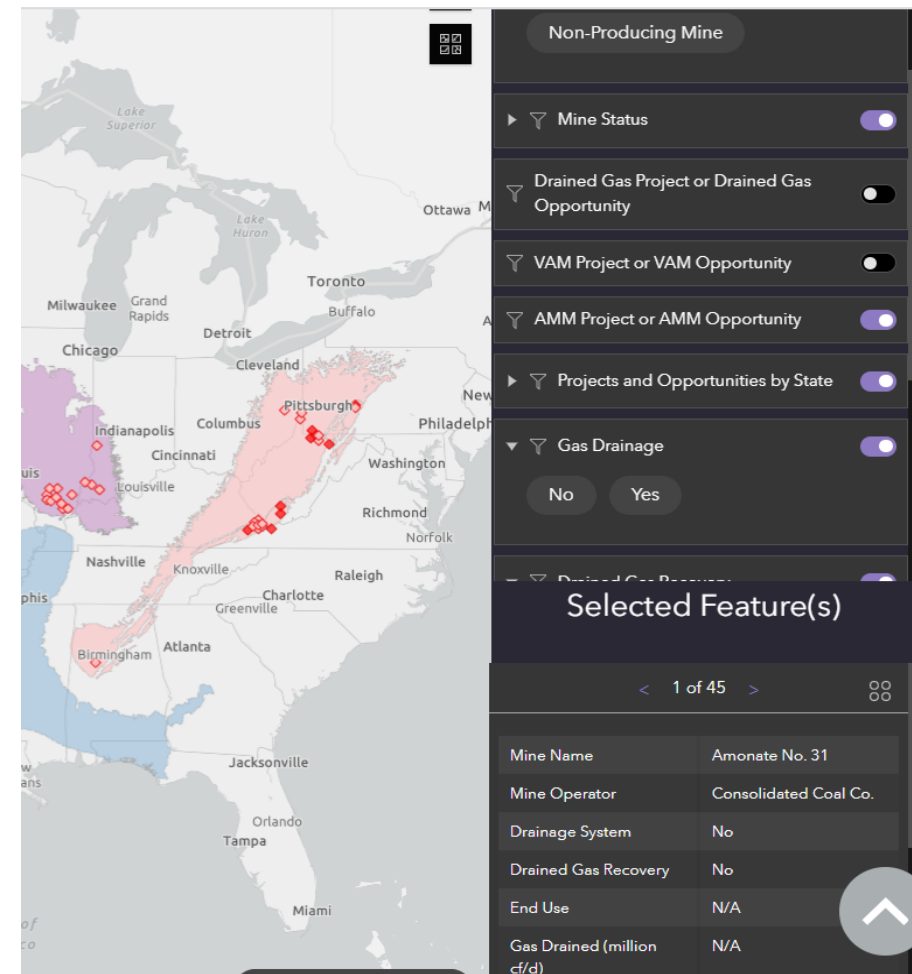
Number of AMM Projects by End Use



EPA Efforts on AMM



- EPA developed a map with an online database of AMM projects. Users can
 - Filter to select AMM projects and opportunities to view
 - Download AMM projects and opportunities data from the map
 - The data are current as of 2020 (the latest available inventory data)

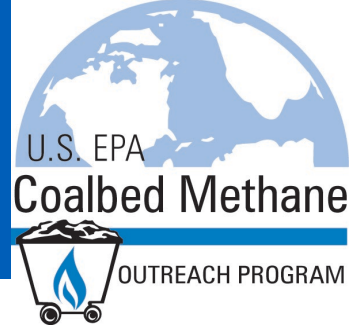


Key Challenges to CMM Mitigation



- Economic feasibility of projects
 - When natural gas prices are relatively low, projects aren't as economically attractive
 - VAM projects are especially costly since they involve treating large volumes of low-methane concentration mine exhaust air
- Lack of industry familiarity with technologies for VAM
 - Mine drainage and methane collection techniques are standard industry best practice
 - Only 16 active US mines have operational VAM projects
- Uncertainty about methane concentrations and resources
 - At many active underground mines, measurement techniques are generally periodic rather than continuous. Better understanding of the fluctuations in methane concentrations and emissions would make a more compelling case to mine operators and project developers about technical and economic potential for methane mitigation
 - At many abandoned (closed) mines, modeling of methane emissions is used as basis for project economic / technical assessments, rather than measurement
- Coal mining industry culture
 - CMM project development is not the “core business” and is likely not top priority for investments especially in challenging economic times

Thank You!



For more information on EPA's Coalbed Methane Outreach Program:

www.epa.gov/cmop

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