

LIFE CYCLE ENERGY AND ENVIRONMENTAL IMPACTS OF CONCRETE: GREET UPDATE



Source: <https://pixabay.com/photos/country-road-highway-desert-summer-893231/>

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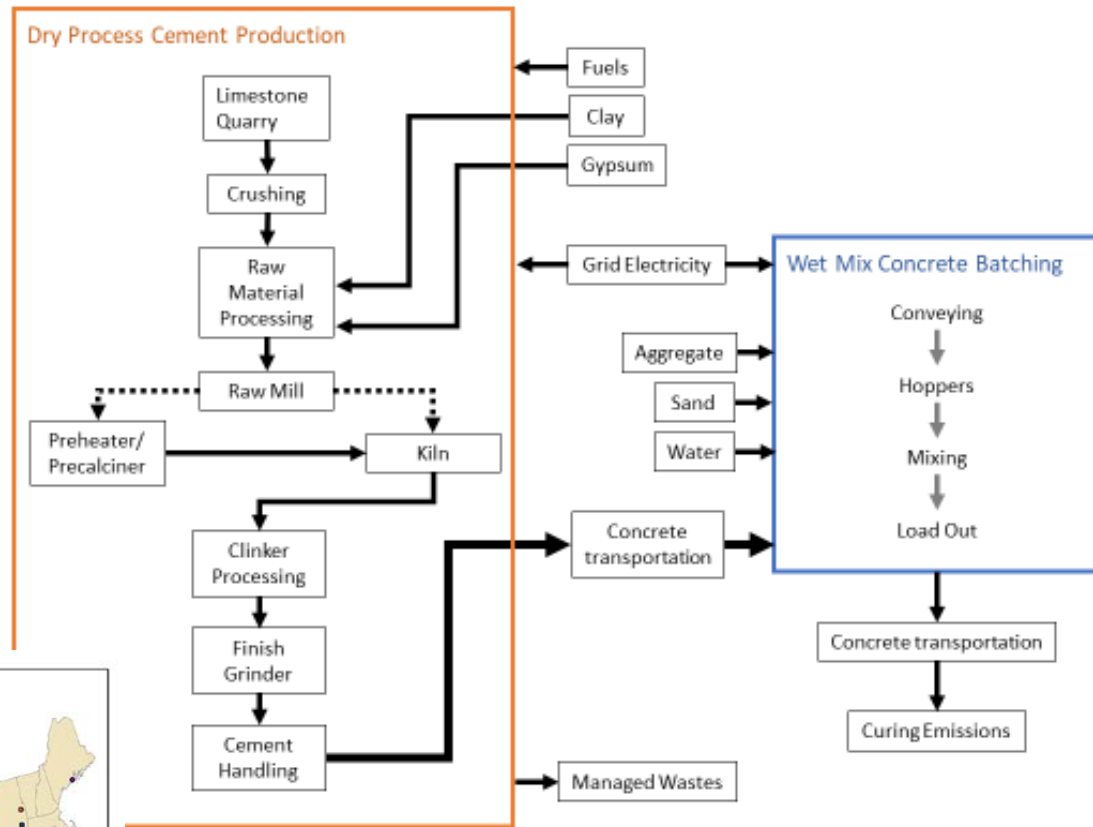
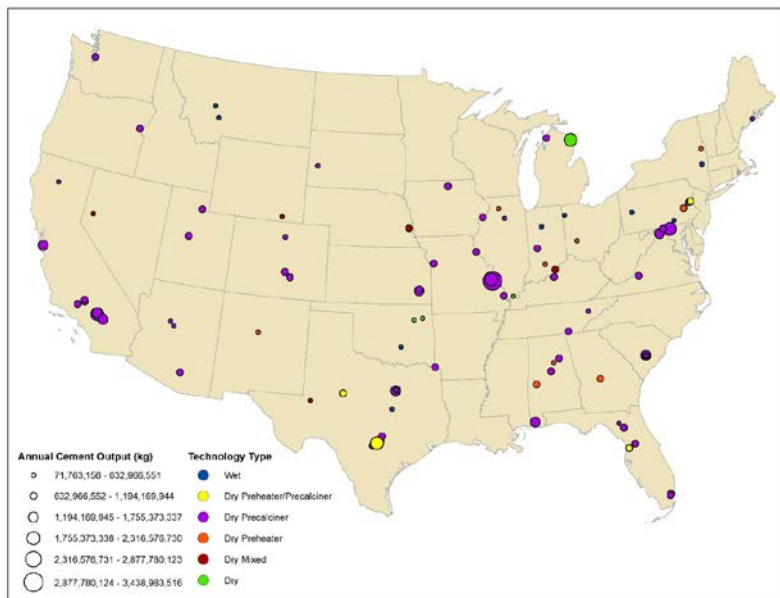
U.S. DEPARTMENT OF
ENERGY

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Project Update Briefing
May 19, 2020

GREET Cement/Concrete Inventory

- Incorporating publicly available data for 83 cement producers.
- Strong regional representativeness.



- Parsing results by technology: wet, dry, preheater, and precalciner.

VALIDATED BY RECONCILING BOTTOM UP AND TOP DOWN ESTIMATES ACROSS DATA SOURCES

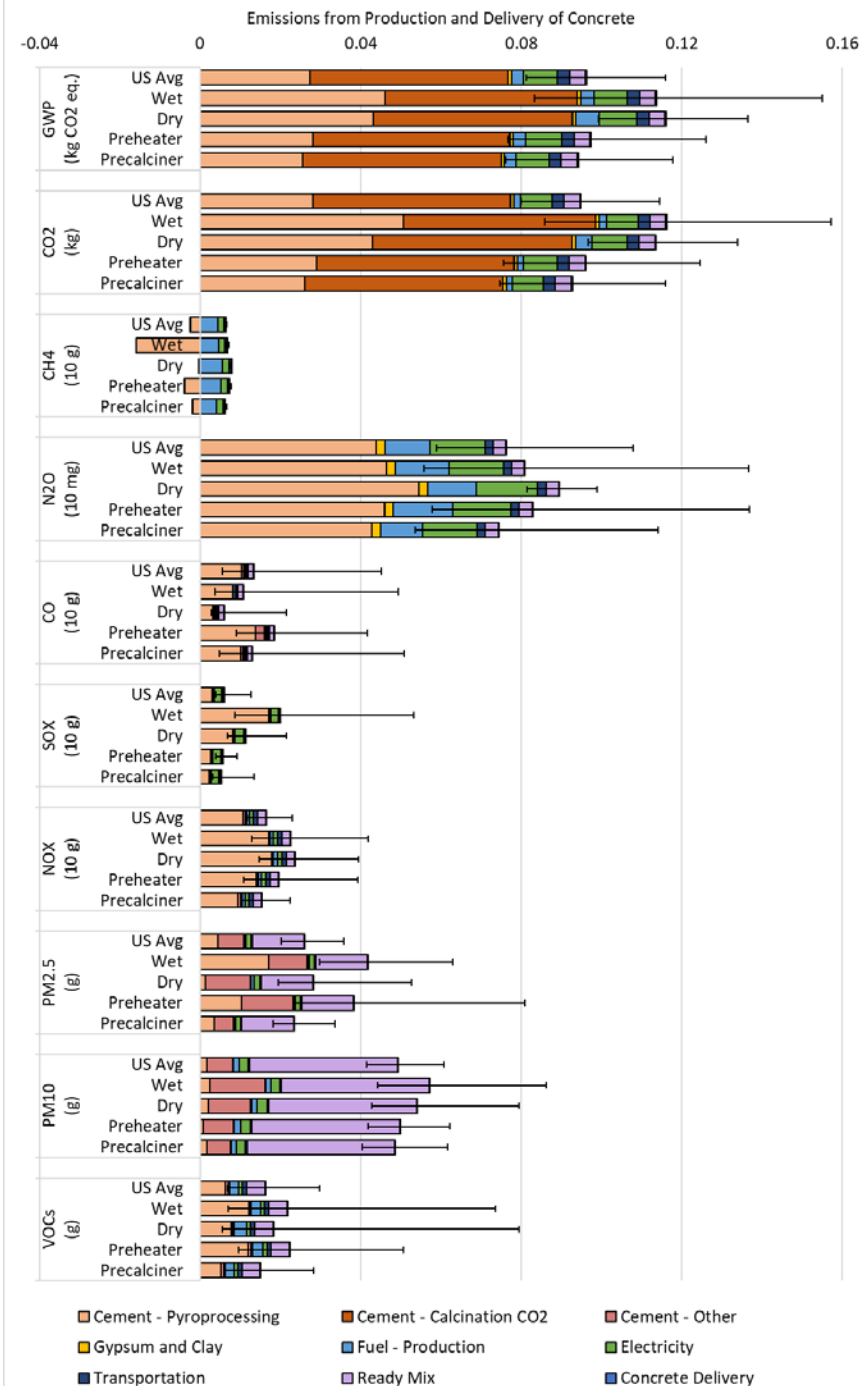
- Considered fuel use and emissions at the facility level based on the US EPA Greenhouse Gas Reporting Program (GHGRP) datasets and facility data from the Portland Cement Association.
- Facilities categorized by kiln technology and fuel mix.
- Variability across facilities used to assess uncertainty for each emission.

		Wet		Dry		Preheater		Precalciner	
Tech. Contribution to Nat. Avg.		3%		5%		12%		80%	
Cement Production (tonnes)		2,598,646		4,492,249		9,922,479		65,720,796	
Total Energy Use at Kiln (MMBtu)		17,529,988		24,020,491		42,517,865		249,031,116	
Fuels	CO ₂ EFs (g/MMBtu)	Share	CO ₂ (tonnes)	Share	CO ₂ (tonnes)	Share	CO ₂ (tonnes)	Share	CO ₂ (tonnes)
Resid. Oil	85,081	0.1%	1,491	0.0%	-	0.4%	14,470	0.4%	84,751
Diesel	78,199	0.2%	2,742	1.9%	35,689	0.6%	19,949	0.8%	155,792
Gasoline	76,839	0.0%	-	0.0%	-	0.0%	-	0.0%	-
Pet Coke	106,976	13.9%	260,665	61.2%	1,572,605	7.6%	345,678	16.1%	4,289,097
Natural gas	59,413	11.5%	119,774	5.9%	84,201	22.2%	560,797	15.5%	2,293,331
Coal	89,920	21.2%	334,175	19.0%	410,385	45.5%	1,739,559	40.9%	9,158,687
Waste	145,882	16.8%	429,628	0.7%	24,529	6.9%	427,979	3.9%	1,416,837
Tire Fuel	60,876	4.4%	46,955	1.6%	23,396	5.6%	144,946	3.9%	591,241
Solvents	72,298	24.9%	315,578	0.0%	-	0.0%	-	5.4%	972,240
Waste Oil	77,758	0.4%	5,452	0.0%	-	0.0%	-	0.9%	174,277
Renewables	0	0.1%	-	0.0%	-	0.0%	-	0.9%	-
Fuel CO ₂ Subtotal (tonnes)		1,516,460		2,150,806		3,253,377		19,136,254	
Calcination CO ₂ (tonnes)		1,437,051		2,484,214		5,487,131		36,343,600	
Total Calculated CO ₂ (tonnes)		2,953,512		4,635,019		8,740,508		55,479,854	
CO ₂ EFs GHGRP (tonnes per tonne)		0.96		0.87		0.85		0.78	
Total CO ₂ GHGRP (tonnes)		2,506,110		3,889,504		8,447,787		51,468,022	

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UPDATED EMISSIONS ESTIMATES BY TECHNOLOGY

- Portland cement manufacturing is most significant for most emissions.
- Calcination itself is the most significant contributor to CO₂ emissions.
- Downstream ready mix distribution is a significant source of PM emissions.



An aerial photograph of the Argonne National Laboratory campus, showing various buildings, parking lots, and a large circular structure, all overlaid with a semi-transparent blue filter.

THANK YOU!



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