

Reducing GHG With Coal By-Products



Appalachian Carbon Forum
Gatlinburg, TN

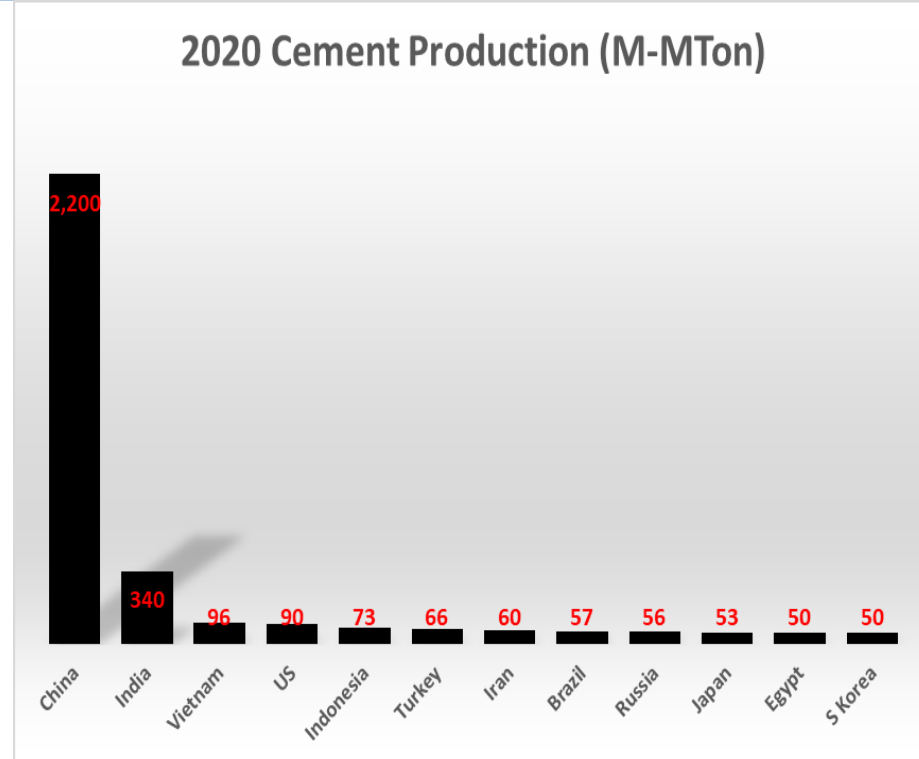
Oak Ridge National Lab

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Cement Manufacturing – GHG Source

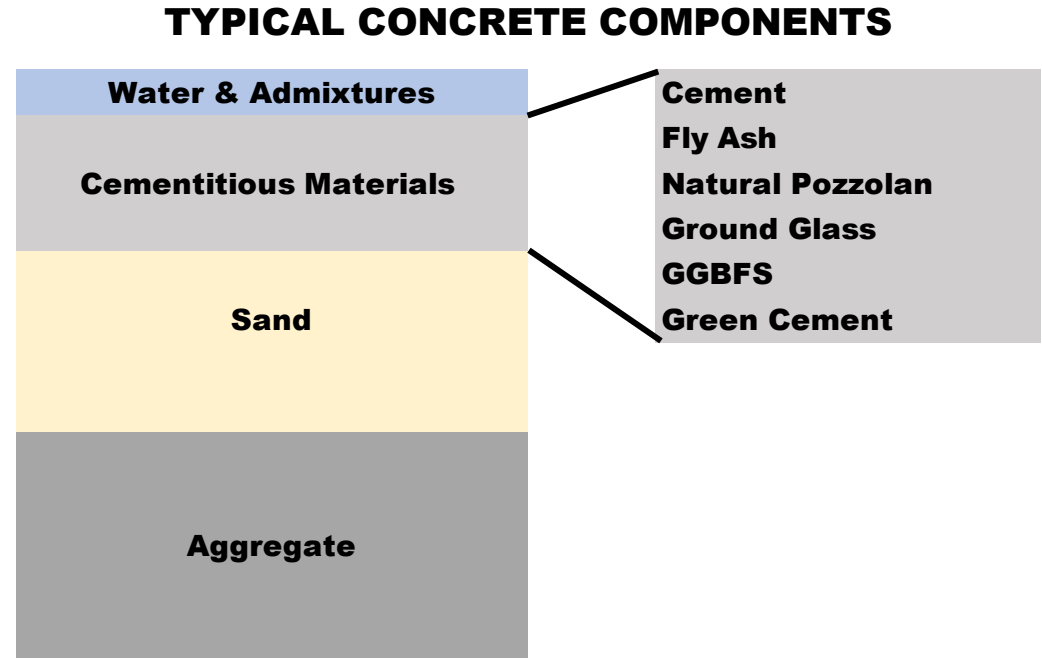
- **Cement Is A Critical Mineral for Modern Civilization – Concrete -68% Pop-Metro**
- **World Cement Production Is 4.1 Billion Tonnes/Yr**
- **Projected Cement- 5B TPY-2030**
- **Cement Represents ~ 8% Of Global CO2 Emissions- After Transportation & Energy**
- **China Produces >50% of All Cement**



* Source: USGS

Concrete – Critical Driver For Cement

- Concrete – 2nd Most-Consumed Substance on Earth Behind Water – 14Bil CM/Yr* – 40% Residential
- Concrete- Cement Critical Mineral Relationship
- Typical Mix – 500-600 lb/CY
- SCM Replace 15-50%
- Novel Cements Target CO2



Cement SCM Substitution – CO2 Reduction

- **Cementitious 12%-15% Of Concrete Mix But 77% Of CO2 Of Concrete**
- **SCM Substitution Accounts For Most Concrete CO2 Savings At Present In US**
- **Fly Ash- Primary SCM With 16% Sub – But Volume Declining**
- **GGBFS- Allows 50% Sub But Blast Furnace Slag Going Away**
- **Cement Manufacturers Push Lime Addition To Decrease Clinker Ratio- 15%; But May Not Reduce Concrete CO2**
- **New Technologies Offer Promise**



Cement
Fly Ash
Natural Pozzolan
Ground Glass
GGBFS
Green Cement



Thank You Questions?

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