

CO₂ emissions from Bazian Cement production (base data)		
	Value and unit	Data source:
Calcinations process	525 kg/t clinker	The Cement CO ₂ Protocol, WBCSD working group Oct. 2001
Fuel firing	3.202 GJ/t clinker	Actual efficiency end of 2009
Electricity consumption	99 kWh/t cement	Actual consumption end of 2009
HFO as fuel	77.4kg CO ₂ / GJ	World Resources Institute (2008) GHG Protocol Tool for stationary combustion, Version 4.0.
Natural gas as fuel	56.1 kg CO ₂ / GJ	World Resources Institute (2008) GHG Protocol Tool for stationary combustion, Version 4.0
Electricity production	636 kg CO ₂ / MWh	Based on assumption of 200 kg heavy fuel/MWh in generators.
Electricity if imported	701 kg CO ₂ / MWh	World Resources Institute (2009) GHG Protocol Tool for stationary combustion, Version 4.0
CO ₂ own electricity production	63 kg CO ₂ / tons cement	636 kg CO ₂ /MWh * 0.099 MWh/t cement
CO ₂ if electricity is imported	69 kg CO ₂ / tons cement	701 kg CO ₂ /MWh * 0.099 MWh/t cement

Clinker percentage in cement (base data)

	Value and unit	Data source:
OPC (ordinary Portland Cement)	90% clinker	Actual operational data end of 2009
Blended cement	70% clinker average	Future operational assumption

Fuel caused CO₂ emissions at Bazian (clinker based):

HFO:	$77.4 * 3.202 =$	248 kg CO ₂ / t clinker
Natural gas	$56.1 * 3.202 =$	180 kg CO ₂ / t clinker

Combined calcinations and fuel caused CO₂ emissions (clinker based):

HFO	$248 + 525 =$	773 kg CO ₂ / t clinker
Natural gas	$180 + 525 =$	705 kg CO ₂ / t clinker

CO₂ emissions per unit product based on fuel type:

Production basis	Electricity basis	HFO	Natural gas
OPC	Own	$0.9*773+63 = 759$ kg CO ₂ /ton	$0.9*705+63 = 698$ kg CO ₂ / ton
OPC	Imported	$0.9*773+69 = 765$ kg CO ₂ /ton	$0.9*705+69 = 704$ kg CO ₂ / ton
Blended	Imported	$0.7*773+69 = 610$ kg CO ₂ /ton	$0.7*705+69 = 563$ kg CO ₂ / ton

Total CO₂ emissions based on 2.4 M tons of clinker per year:

Production basis	Electricity basis	Yearly cement production	Total CO ₂ emission (HFO)	Total CO ₂ emission (gas)
OPC	Own	2.66M tons	2.02M tons CO₂ / year	1.86M tons CO₂ / year
OPC	Imported	2.66M tons	2.03M tons CO₂ / year	1.87M tons CO₂ / year
Blended cement	Imported	3.43M tons	2.09M tons CO₂ / year	1.93M tons CO₂ / year