



The Carbon Footprint

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Globalising Murray & Roberts



Carbon Footprint

- What is it?
 - Total amount of GHG emitted in activities
 - Includes both direct and indirect emissions
 - Unit: CO₂ - e

The demand on the bio-capacity required to sequester the CO₂ emissions from fossil fuel combustion. (Photosynthesis)

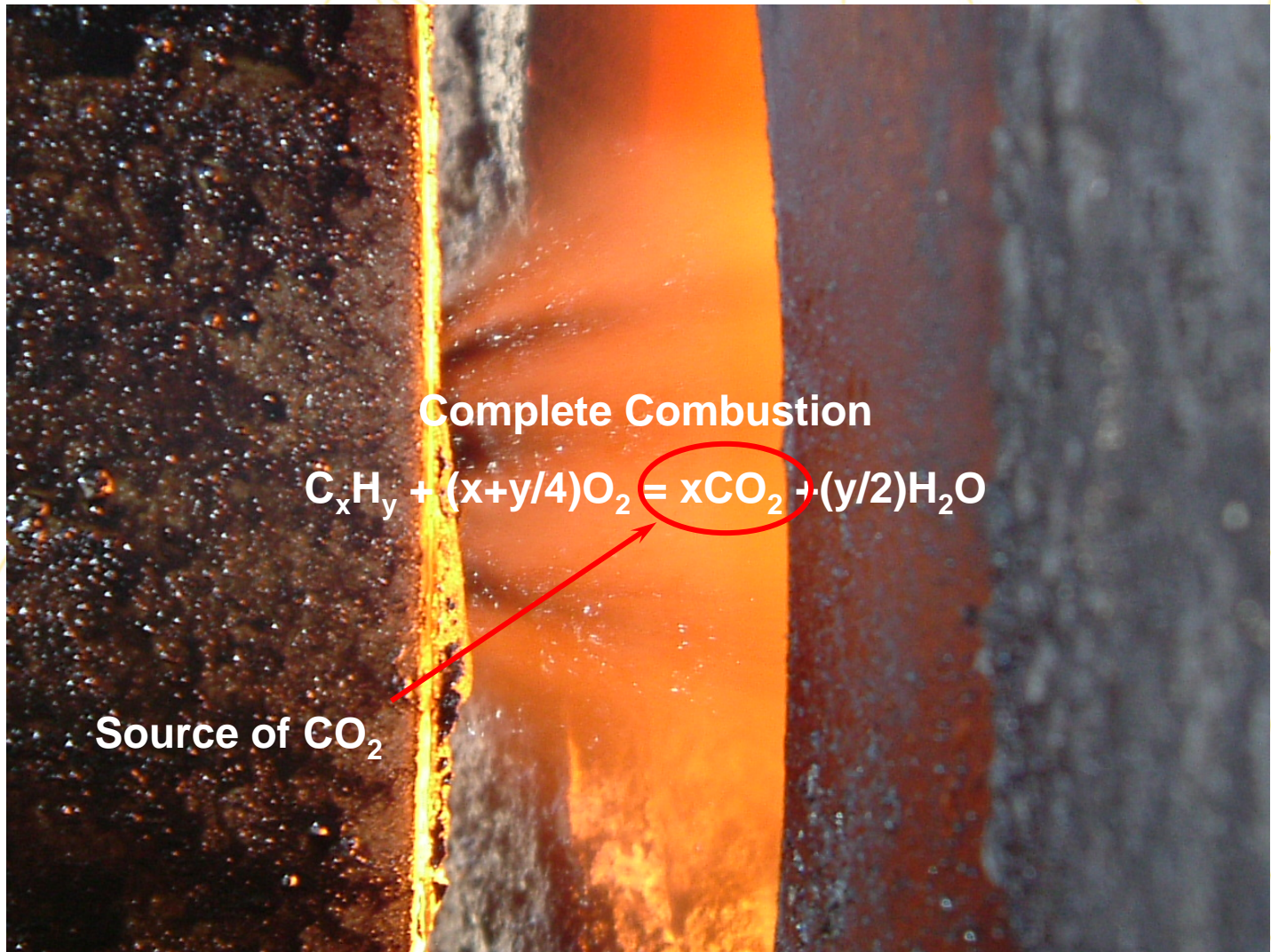


Carbon Footprint

- Not limited to CO₂ emissions
- Global Warming Potential
 - Absorption of infra-red and near infra-red
- Other GHG's
 - Methane (CH₄) – GWP ≈ 25₁₀₀
 - **Nitrous Oxide (N₂O)** – GWP ≈ 298₁₀₀
 - HFC & Sulphur Hexafluoride

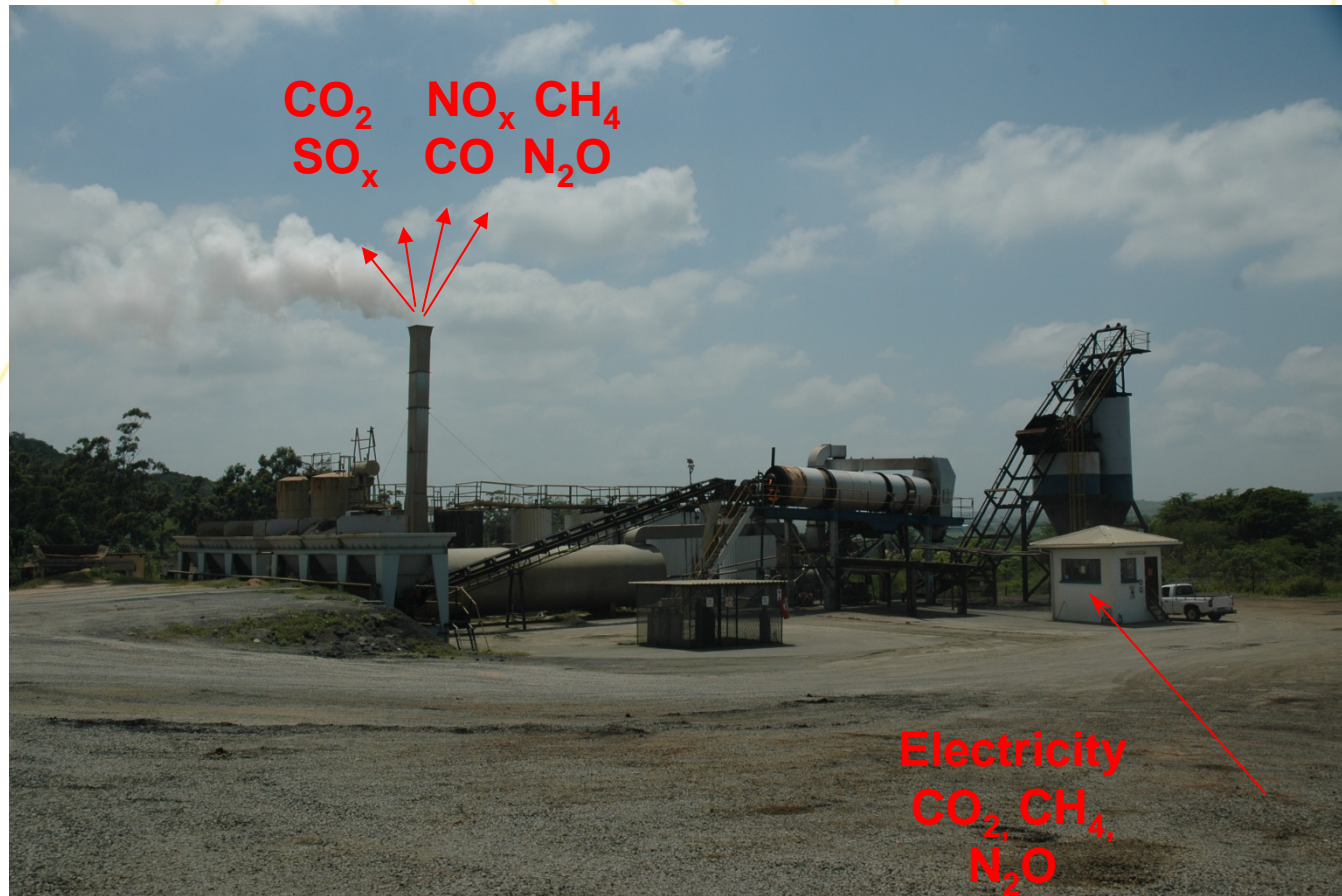


Carbon Footprint





Asphalt Plant Footprint



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Asphalt Plant Footprint

- Measurable energy use
 - Aggregate heating fuel
 - Purchased Energy consumption
 - Electricity & Steam
 - Paraffin, Diesel & LPG consumptions
 - Loader
 - Bitumen Heating



Asphalt Plant Footprint

- **Some Interesting Facts**
 - Asphalt footprint globally small
 - Biggest culprits
 - Coal Power Stations
 - Motor Vehicles
 - Deforestation (slash & burn)



GHG Calculators

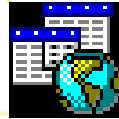
- Many available
 - European Commission LCA
<http://lca.jrc.ec.europa.eu/lcainfohub/introduction.vm>
 - Greenhouse Gas Protocol Initiative
<http://www.ghgprotocol.org/calculation-tools/all-tools>
 - In RSA: SABITA – Energy/Carbon Footprint Calculator





GHG Calculators

SABITA – Energy/Carbon Footprint Calculator



Microsoft Office
Excel Worksheet

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Calculator Results

	PROD TONNES	CO ₂ -e (tonnes)						kg CO ₂ -e per Tonne prod
		AGG HEAT	HEAT	ELEC	SCOPE 1 TOTAL	SCOPE 2 TOTAL	TOTAL	
CK	120,541.06	2246.955	38.86775	1,556.40	2,285.82	1,556.40	3,842.22	31.875
RPT	135,147.80	3197.76	5.559754	991.09	3,203.32	991.09	4,194.41	31.036
PMB	88,493.22	1644.616	3.941655	909.18	1,648.56	909.18	2,557.74	28.903

Location: Contermanskloof
Plant Type: Batch

Figures year to date:

Fuel consumption 30,946 GJ
Electricity 1,297,000 kWh
Carbon footprint 3,825 ton CO₂
Production 120,541 ton
Key figure 296 MJ/ton
Key figure corr. for Moisture 260 MJ/ton
Carbon footprint per ton 32 kg CO₂/ton





Calculator Results

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Location: Pietermaritzburg

Plant Type : Drum

Figures year to date:

Fuel consumption 22,030 GJ
Electricity 700,433 kWh
Carbon footprint 2,455 ton CO₂
Production 88,493 ton
Key figure 285 MJ/ton
Key figure corr. for Moisture 266 MJ/ton
Carbon footprint per ton 29 kg CO₂/ton



Calculator Results

- **Benchmarks**
 - 1st World: 25 kg CO₂-e/tonne (production only)
 - Generally acceptable figures of 26 – 35 kg CO₂ -e/tonne
 - Equates to 2,500 tonnes CO₂ for 100,000 tonnes production (car ≈ 6 tonnes p.a.)
- **SABITA Calculator**
 - Only for primary asphalt production
 - Vehicles traveling from plant to site not covered



Calculator Results

- **Some Observations on SABITA Calculator**
 - Need to distinguish between different diesel usages
 - Efficiency improvement can be small and will possibly not show up as an improved footprint
 - Electricity emission factors unconfirmed



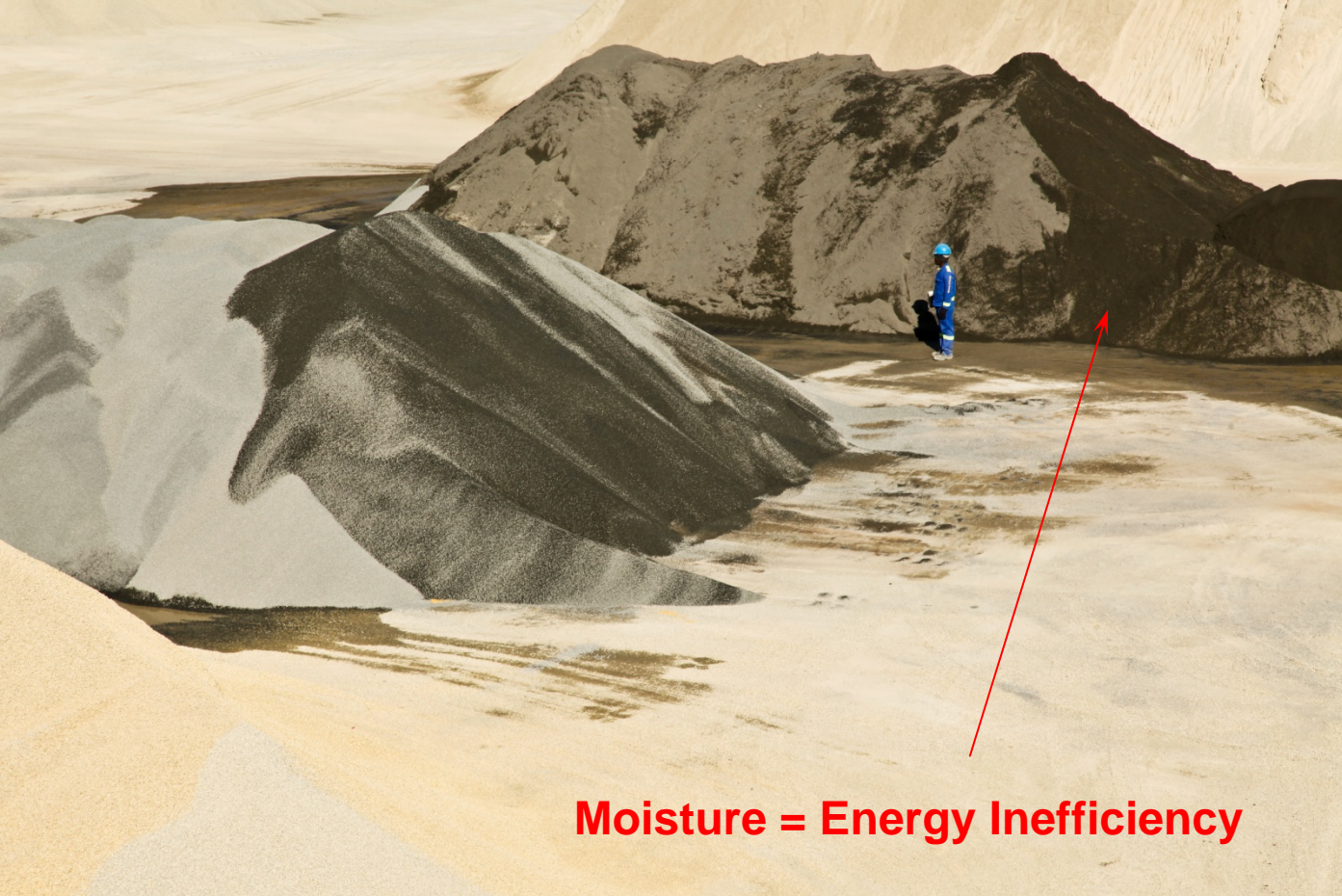
Reducing Carbon Emissions

- Reduce energy consumption
 - Use efficient motors and gearboxes
 - VSD's
 - Plant & burner setup (look for inefficiencies)
 - WMA
 - Operating at plant capacity
 - Dry stockpiles – moisture reduction !!
- Evaluate different fuel types





Reducing Carbon Emissions



Moisture = Energy Inefficiency

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Reducing Carbon Emissions

- The effect of moisture
 - 1% H₂O ≈ 13% fuel usage increase
 - 1% H₂O ≈ 2kg CO₂/tonne increase
 - Knock on effect on production capacity

To put this in perspective:

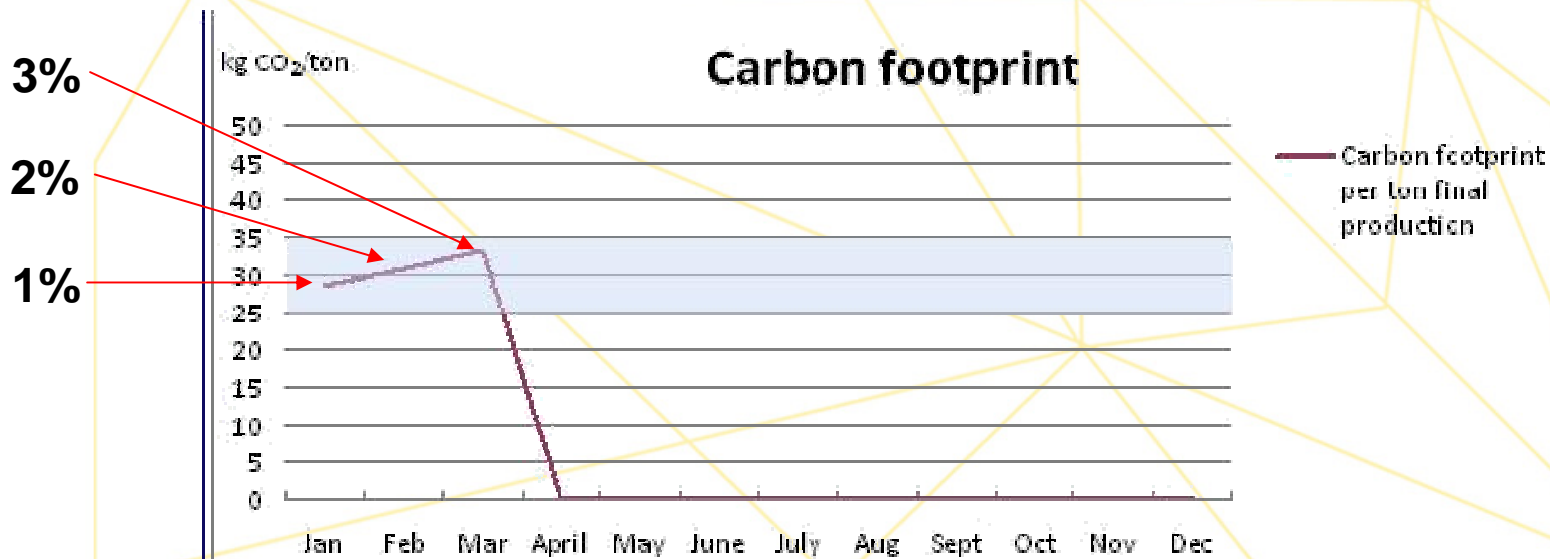
The vaporization of 10kg of water requires 22.5MJ, as much energy as required to heat 154 kg of coarse aggregate from 20°C to 195°C!





Reducing Carbon Emissions

Key Figures	Key figures per ton final production MJ/ton	Key figures corrected for Moisture MJ/ton	Carbon footprint per ton final production ton CO ₂ /ton prod
Jan	288	283	29
Feb	321	310	31
Mar	352	335	33



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Reducing Carbon Emissions

- **Moisture Reduction**
 - Cover stockpiles
 - Surface stockpile area
 - Build stockpiles on sloped area
 - Introduce drainage system
- **Plant Efficiency**
 - Check CO levels – incomplete combustion
 - Compressed air wastage



Reducing Carbon Emissions

- WMA
 - Additives
 - Carbon emissions not quantified
 - Definite fuel saving – 1 lit/tonne (in trials)
 - Foaming
 - Capital outlay
 - Expected fuel saving





Offsetting Carbon Emissions



Use Recycled Asphalt

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Offsetting Carbon Emissions

- Use of RA
 - 20% - 25% RA in asphalt mixes
 - Equates to 2,500 tonnes of CO₂ offset in 100,000 tonnes production
 - Production of aggregate ≈ 8 kg CO₂/tonne @ 95% of asphalt mix = 7.6 kg CO₂/tonn
 - Production of bitumen ≈ 285 CO₂/tonne @ 5% of asphalt mix = 14.25 kg CO₂/tonne



Conclusion

- GHG are part of our lives & activities
- CO₂-e emissions can be calculated
- We have a tool to benchmark ourselves against
- There are ways to reduce and/or offset carbon emissions
- We can make a difference albeit small





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