

Angas Zinc & Greenhouse gas

- **Purpose of this talk**
 - Greenhouse gases & the greenhouse effect
 - Policies
 - Greenhouse accounting
 - Calculations, estimations and limits of certainty
 - Mitigation
 - Alternatives

The image shows the logo for Terramin Australia Limited, which consists of a stylized 'T' and 'A' in orange and red. Below the logo is the title 'Angas Zinc & Greenhouse gas' in orange and red. Below the title is a bulleted list of topics to be discussed in the talk.



The Greenhouse effect

- **6 Greenhouse gases (Kyoto Protocol)**
 - Carbon dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous oxide (N₂O)
 - Hydrofluorocarbons (HFC's)
 - Perfluorocarbons (PFC's)
 - Sulphur hexafluoride (SF₆)



The Greenhouse effect

- **Greenhouse effect is the warming of the atmosphere due to the trapping of longwave radiation being radiated to space.**
 - Global warming is caused by man made emissions of greenhouse gasses trapping more heat than would occur naturally. The current trend of global warming reflects the increased emissions of the Kyoto gasses.



Carbon counting

- **Carbon counting:** the approach taken to measure the impact of greenhouse gases a company or project emits on an annual basis
- **World Resources Institute: The Greenhouse Gas Protocol:**
- **AGO: Greenhouse Methods & Factors Workbook**



International standards for reporting

WRI Standard

- **Scope 1:** Direct GHG emissions. Sources owned and operated by the company: boilers, furnaces, vehicles. Physical or chemical processing. Transportation of materials, products, waste, employees.
- **Scope 2:** Electricity indirect GHG emissions. Accounts for GHG emissions from the generation of purchased electricity consumed by the company.
- **Scope 3:** Other indirect emissions. Consequences of the activities of the company, but occur from sources not owned or controlled by the company (Scope 3 reporting not compulsory)



Australia's inputs

- Australia's current carbon dioxide equivalent (CO₂-e) emission levels

	Emissions Mt CO ₂ -e ^(a)		Change in emissions (%)
	1990	2004	1990 - 04
All Sectors	551.9	564.7	2.3
Primary Industries	256.4	179.5	-30.0
Agriculture, Forestry and Fisheries	223.5	134.6	-39.8
Mining	32.9	44.9	36.5
Manufacturing	65.0	70.8	8.9
Electricity, Gas and Water	138.1	202.7	46.7
Services and Construction	48.7	60.0	23.3
Residential	43.8	51.8	18.3



Calculations

- Calculations: based on the formulas presented by the Australian Government

Fuel/process	Consumption units	Unit	Basic units	factors	kg CO ₂ -e	Tonnes CO ₂ -e
Electricity		kwh	0.00 kWh	1.467 kg CO ₂ -e/kWh	0	0.0
Natural Gas (non transport)		GJ	0.00 GJ	63.6 kg CO ₂ -e/GJ	0	0.0
LPG - (non-transport)		t	0.00 t	3.3 t CO ₂ /t	0	0.0
Industrial Diesel Oil		kL	0.00 kL	3.1 t CO ₂ /kL	0	0.0
Petroleum Products Transport						
Petrol/Gasoline		kL	0.00 kL	2.8 t CO ₂ /kL	0	0.0
Automotive Diesel Oil		kL	0.00 kL	3 t CO ₂ /kL	0	0.0
LPG - transport		kL	0.00 kL	1.8 t CO ₂ /kL	0	0.0
Natural Gas/CNG LDV		m ³	0.00 m ³	2.7 kg CO ₂ /m ³	0	0.0
Natural Gas/CNG HDV		m ³	0.00 m ³	2.6 kg CO ₂ /m ³	0	0.0
Marine/Industrial diesel fuel		kL	0.00 kL	3.1 t CO ₂ /kL	0	0.0
Aviation Gasoline		kL	0.00 kL	2.6 t CO ₂ /kL	0	0.0
Aviation Turbine		kL	0.00 kL	2.9 t CO ₂ /kL	0	0.0
Waste						
Co-mingled		t	0.00 t	0.9 t CO ₂ -e/t	0	0.0
Paper and paper board		t	0.00 t	2.5 t CO ₂ -e/t	0	0.0
Textiles (excluding synthetics)		t	0.00 t	1.5 t CO ₂ -e/t	0	0.0
Wood/straw		t	0.00 t	2.7 t CO ₂ -e/t	0	0.0
Garden		t	0.00 t	1.1 t CO ₂ -e/t	0	0.0
Food/Garden		t	0.00 t	0.9 t CO ₂ -e/t	0	0.0
Medical		t	0.00 t	0.3 t CO ₂ -e/t	0	0.0
Concrete/metal/plastic/glass		t	0.00 t	0.0 t CO ₂ -e/t	0	0.0

<http://www.greenhouse.gov.au/challenge/members/emissions.html>



Angas Zinc Project: Construction Phase

- **Construction:** comprises development of mine and TSF. Will require electricity (i.e. for jumbo) and diesel (i.e. for earthmoving equipment)
- **Assumptions:** 18,000 hours (6,000 each for excavator, tipper, grader) to construct TSF, 12L/h
- **Electricity:** 2277600 kWh
- **Estimated impact:** 2943 tCO₂-e
- **Once off effect**



Angas Zinc Project: Ongoing Operations

- **Scope 1**
 - **Vehicles:** 2 X Volvo trucks (527 t CO₂-e)
 - **Fugitive emissions from blasting**
 - 1.5 t explosive/day; output of 0.32 tCO₂/ t explosive & 0.008 tNO_x/ t explosive (175 & 127 tCO₂-e)
 - **Total of 828 t CO₂-e year**



Angas Zinc Project: Ongoing Operations

- **Scope 2**
 - Electricity usage onsite
 - Crushing 1,552 tCO₂-e
 - Ore storage 7,259 tCO₂-e
 - Flotation 2,381 tCO₂-e
 - Thickeners 979 tCO₂-e
 - Reagents 183 tCO₂-e
 - Water storage 432 tCO₂-e
 - Compressed air 794 tCO₂-e
 - Mining 8,450 tCO₂-e
- Total Estimated: 22,034 tCO₂-e



Angas Zinc Project: Total GHG Production

Mine life - years	7
Construction	2,942
tCO ₂ -e/year	22,862
Total - tCO ₂ -e	162,976



Mitigation

- Plants are an excellent “sink” for carbon (emissions are “sources”)
- Planting & maintaining native plants achieves multiple objective:
 - Carbon offsets/mitigation for emissions
 - Habitat recreation in habitat poor areas



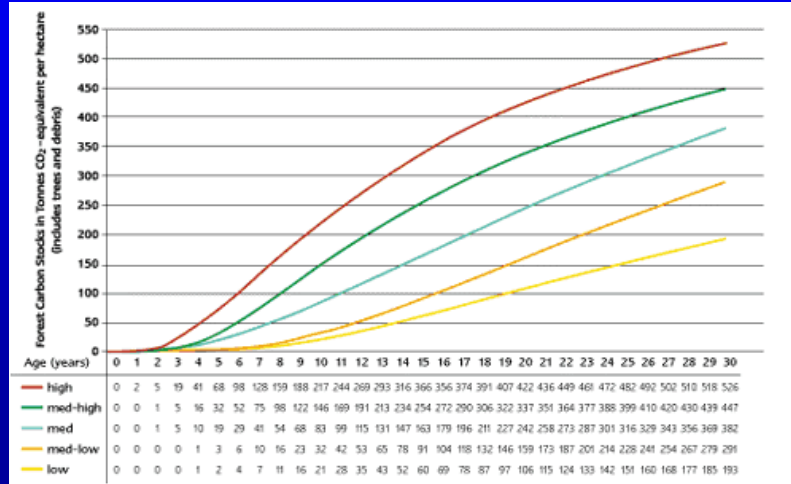
Mitigation

Locations for revegetation:

- Entire site (years 1-7; 11.7 hectares)
- TSF site (post closure; 17 hectares)
- Other potential Terramin owned land (approximately 32 hectares)

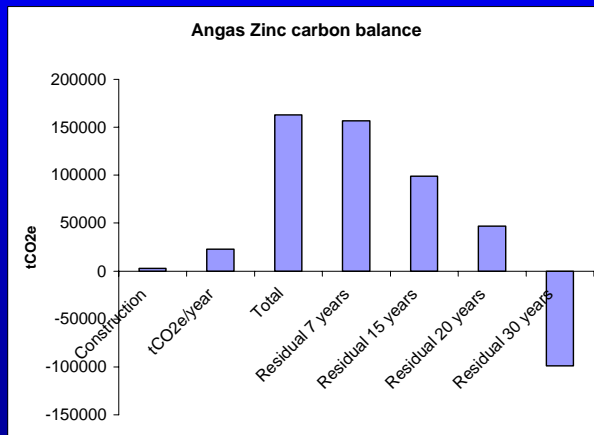


Mitigation Native vegetation



Mitigation

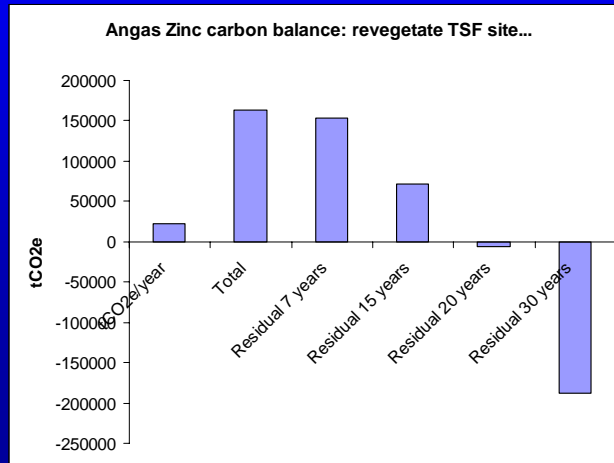
- Carbon neutral in 23 years





Mitigation

- Carbon neutral in 22 years



Angas Zinc: Contribution

Source	Mt CO ₂ -e	Terramin as %
Australia	564.7	0.0004
Australian mining	44.9	0.0051
SA	27.6	0.0083
SA mining	2.2	0.1039



Angas Zinc Project: Summary

- **Carbon outputs mitigated over longer time frames than mine operations.**
- **Net carbon negative after 22 years**
- **Potential for a positive sustainable development using long term carbon trading via valuable native landscapes and rehabilitated mine areas.**
- **Sustainability is a long term objective.**
- **Terramin is committed to achieving ISO14001 environmental certification.**