



A reflection on climate change and renewable process energy

STERG Symposium
Stellenbosch
19 July 2019



Presented by Lina Hockaday
Senior Engineer, Pyrometallurgy Division
Part time PhD at Stellenbosch University

Contents

- A motivation for renewable energy
- Solar resources
- Global overview
- South African overview
- The present
- The future

A motivation for renewable energy – Surprise Quiz

- What is the current estimated degree of global warming? (Based on GMST)
- What are the Paris agreement targets?
- What if we stabilise emissions?
- **What if we stop emitting greenhouse gasses completely?**

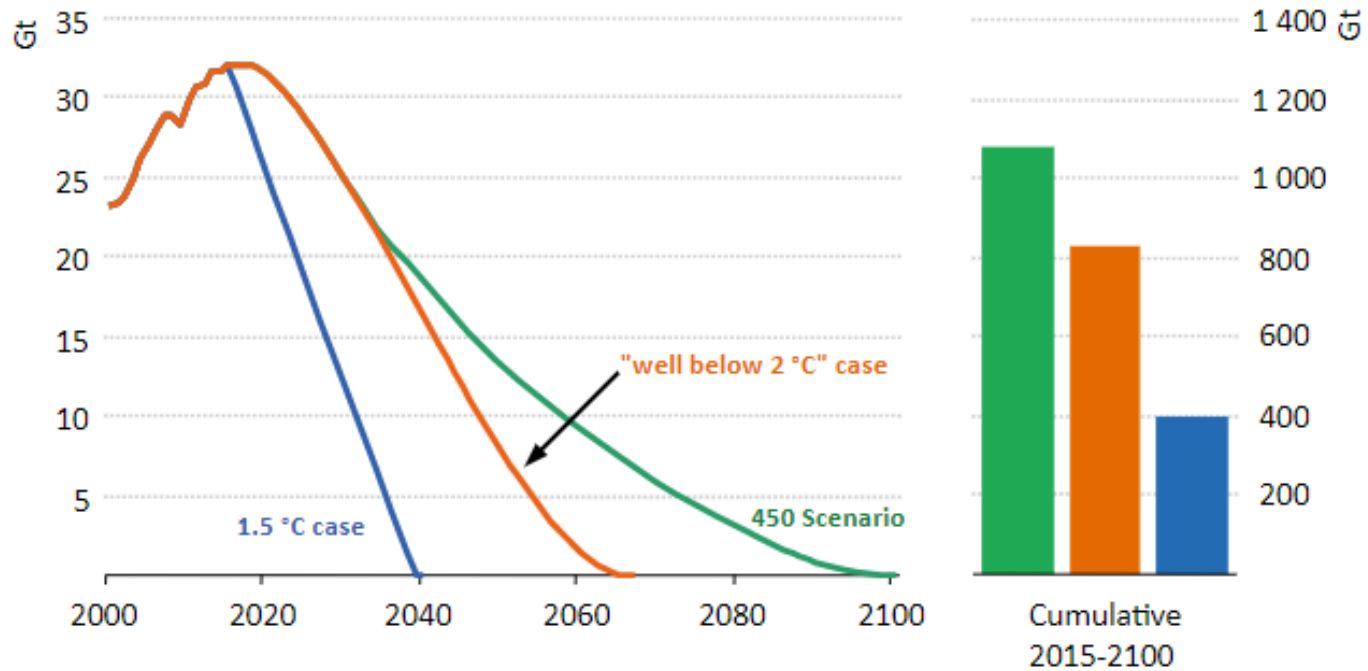
Answers:

Intergovernmental panel on climate change (IPCC) Special report:
Global Warming of 1.5 °C, October 2018

<https://www.ipcc.ch/report/sr15/>

<https://interactive.carbonbrief.org/impacts-climate-change-one-point-five-degrees-two-degrees/>

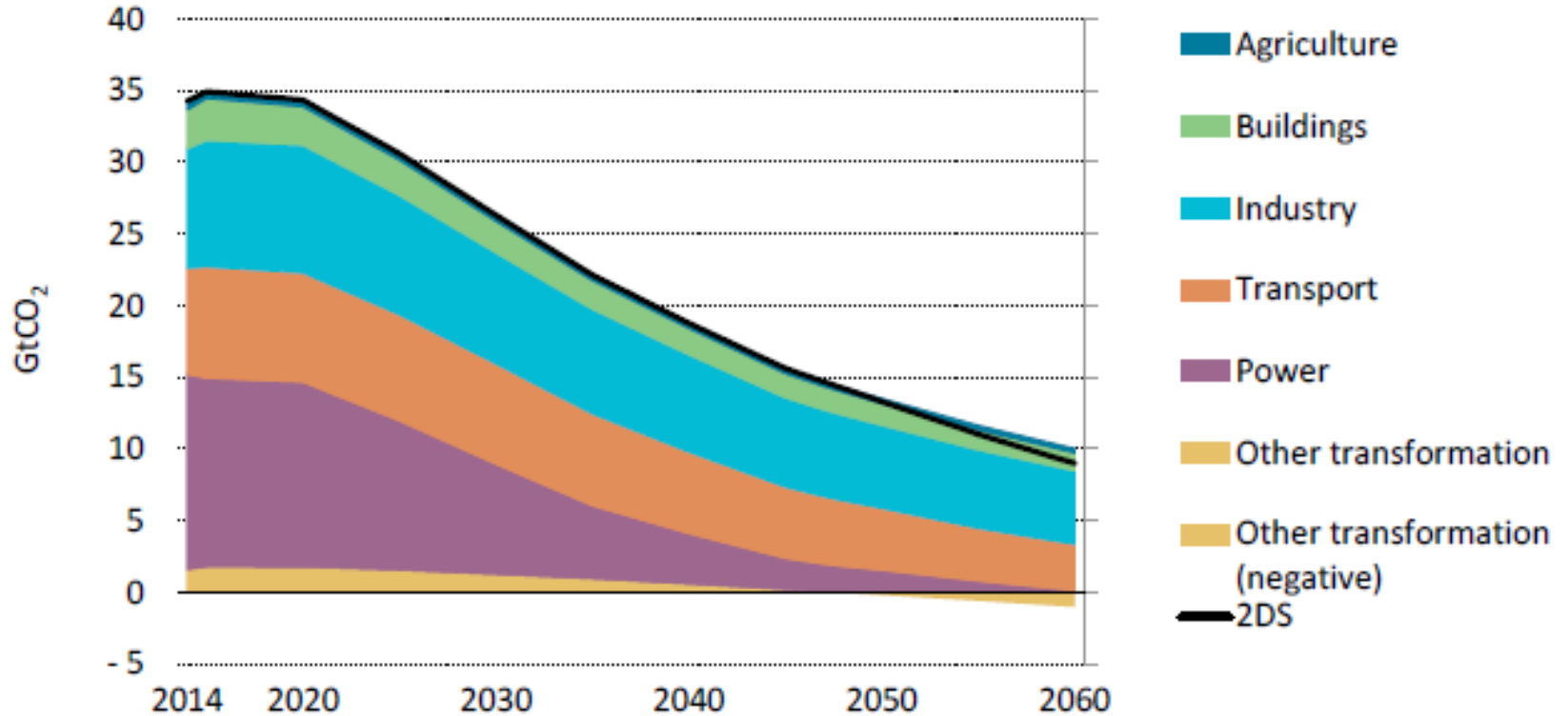
Targets for electricity sector



Without net-negative emissions, energy sector CO₂ emissions fall to zero by 2040 for a 50% chance of 1.5 °C and around 2060 for a 66% chance of 2 °C

Source: IEA (2016) World Energy Outlook 2016

Targets for the industrial sector



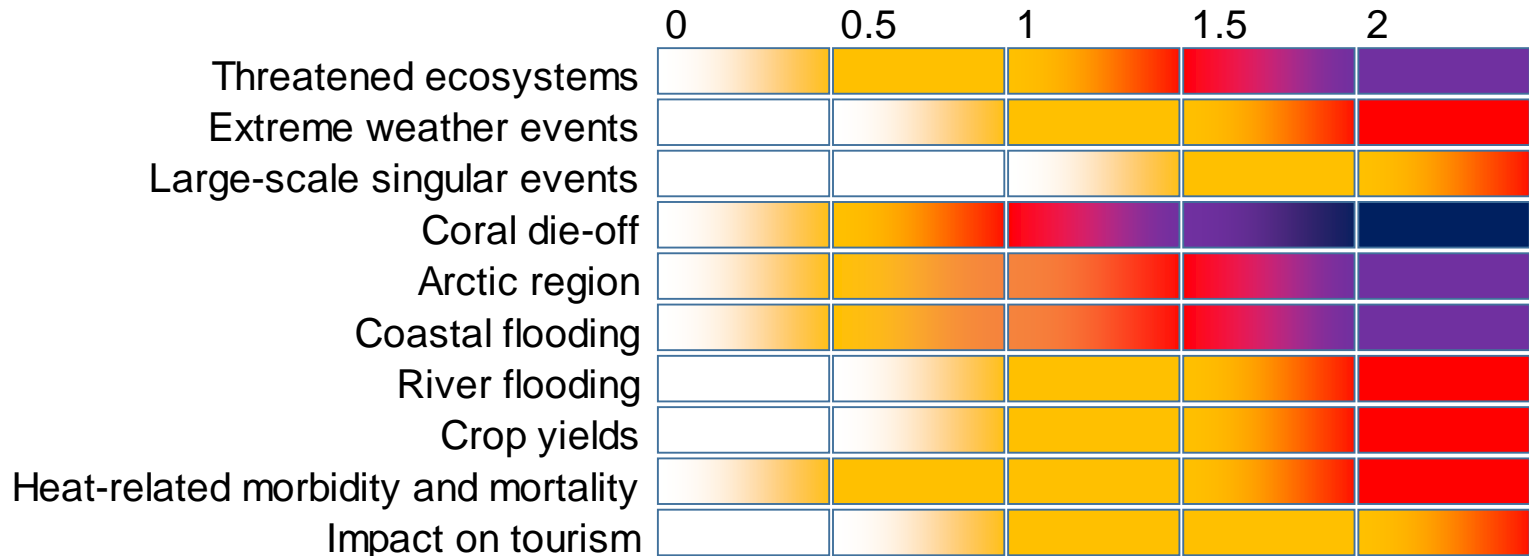
Source: IEA (2017a), *Energy Technology Perspectives 2017*

How bad will it be?

Key to impacts and risks



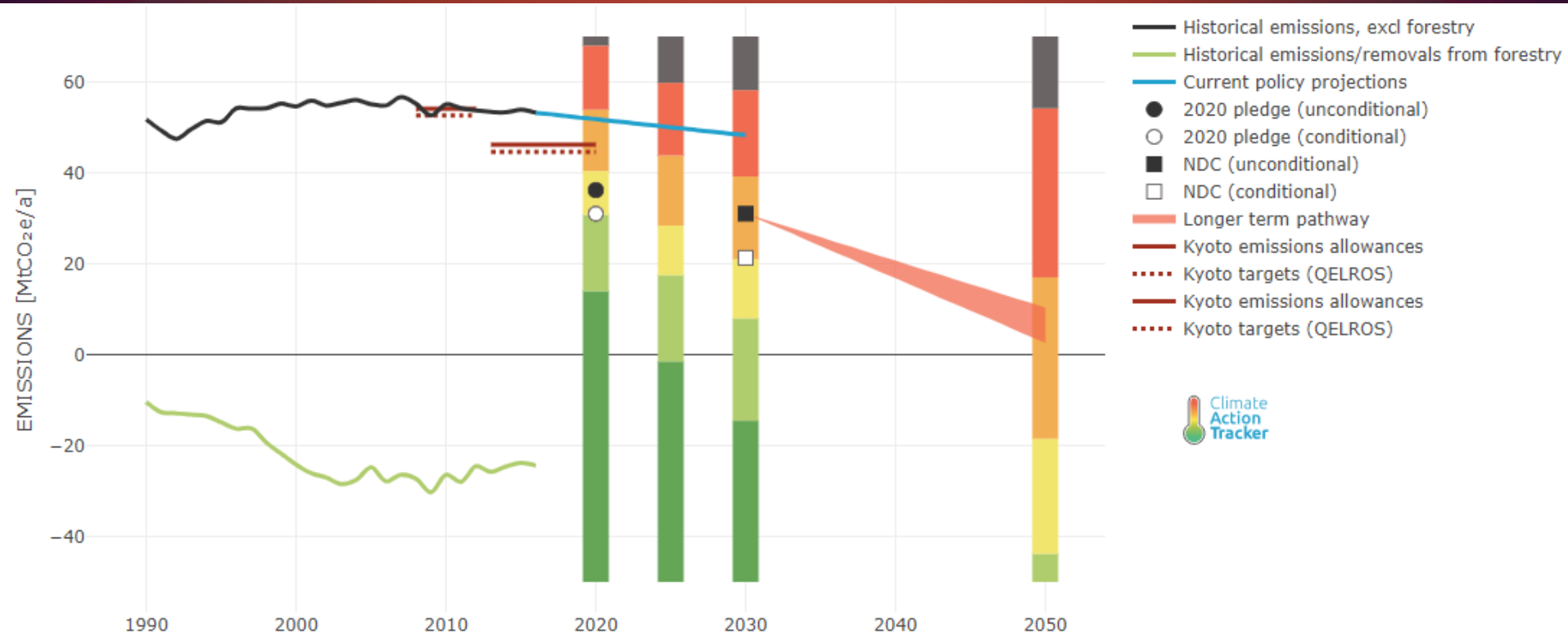
Global mean surface temperature change relative to pre-industrial levels, °C



Adapted from:

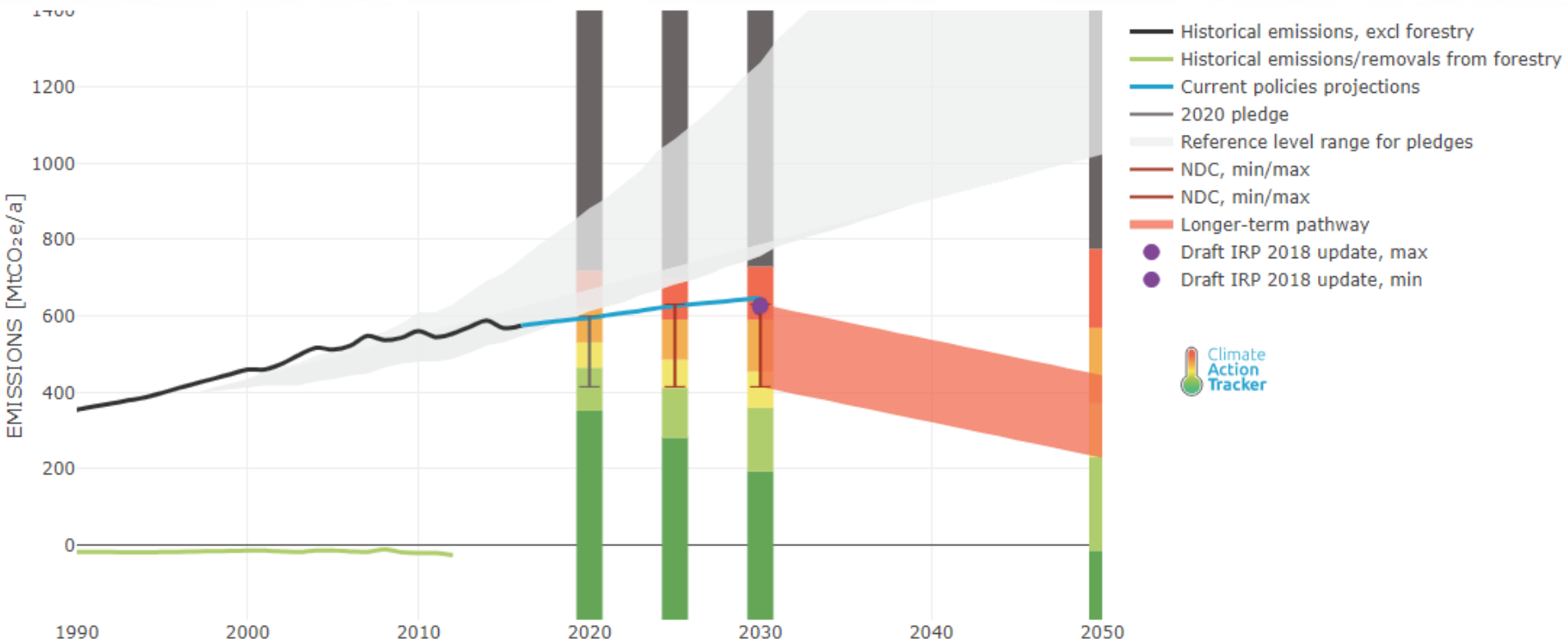
<https://www.theguardian.com/environment/2018/oct/08/global-warming-must-not-exceed-15c-warns-landmark-un-report>

Norway



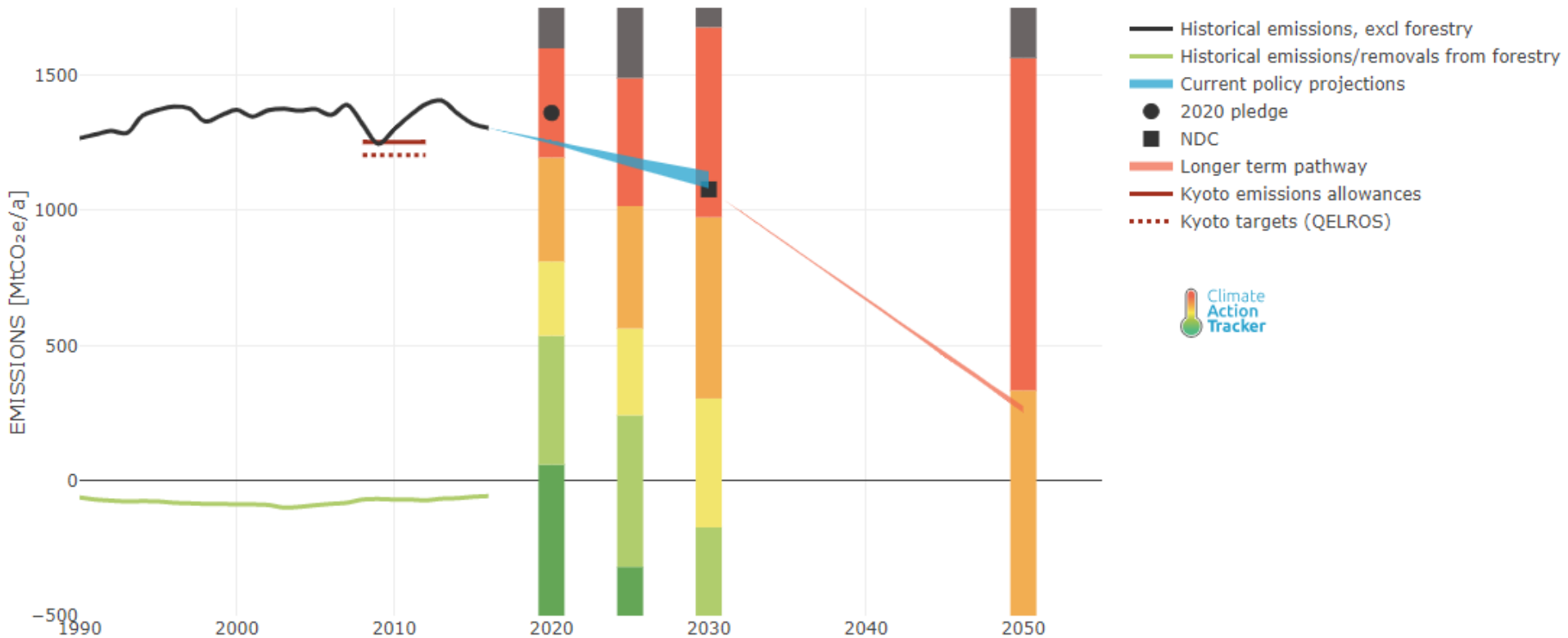
<https://climateactiontracker.org/countries/norway/>

South Africa



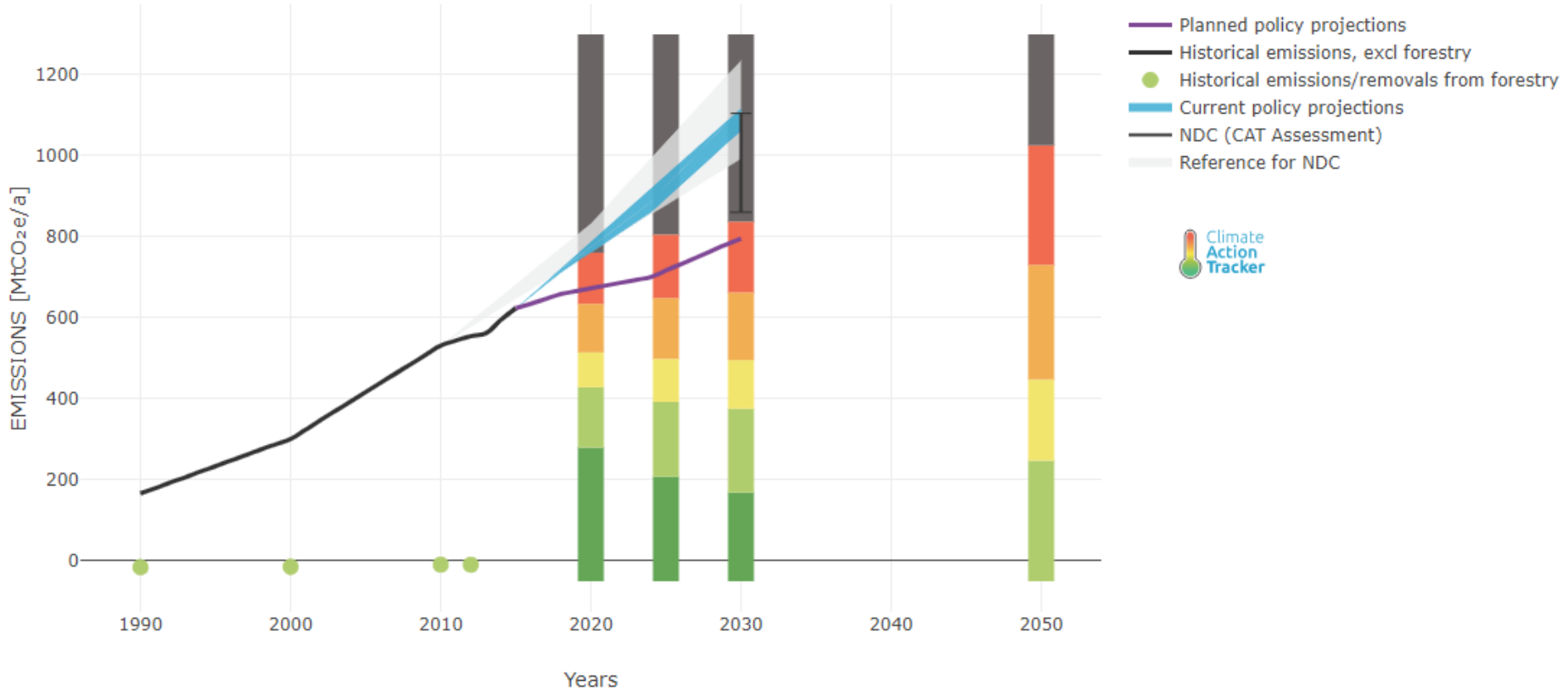
<https://climateactiontracker.org/countries/south-africa/>

Japan



<https://climateactiontracker.org/countries/japan/>

Saudi Arabia



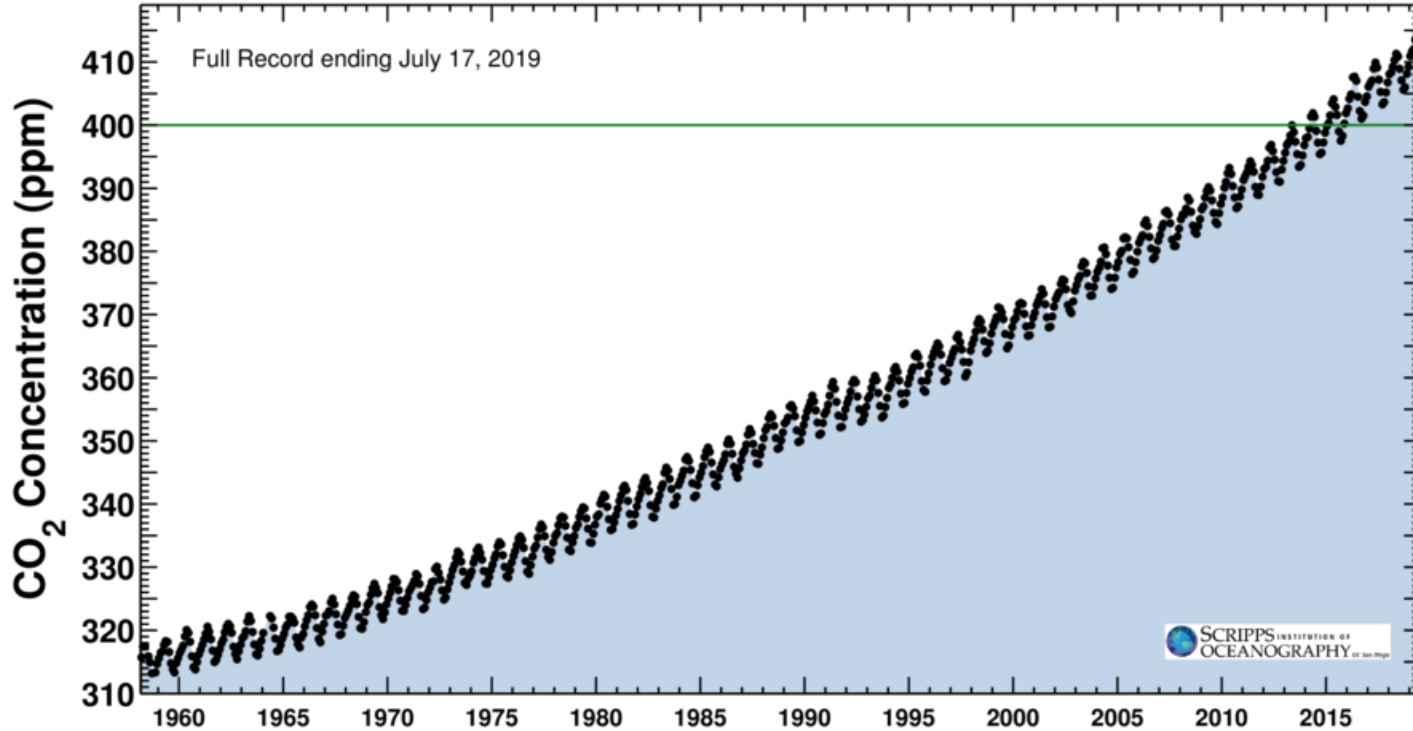
How are we doing?

Latest CO₂ reading

July 15, 2019

412.46 ppm

Carbon dioxide concentration at Mauna Loa Observatory

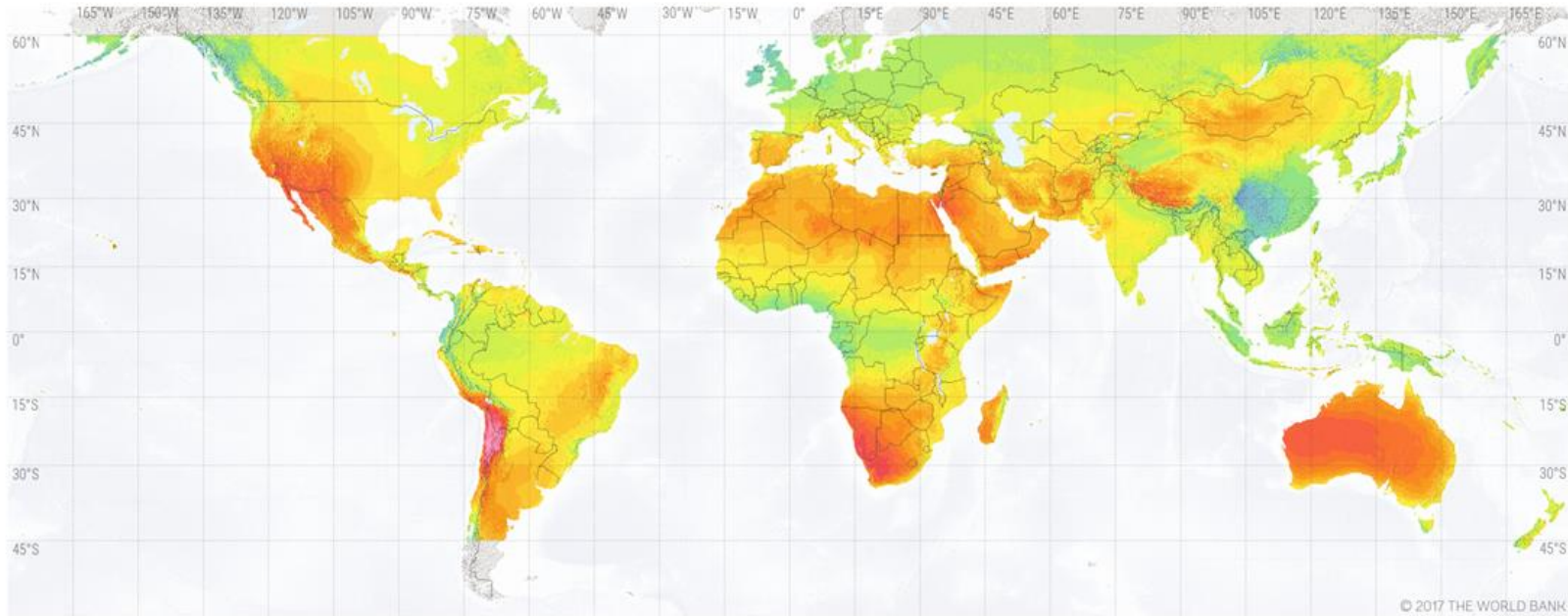


<https://scripps.ucsd.edu/programs/keelingcurve/>

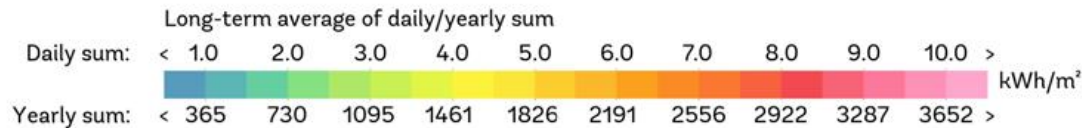
Global Solar Resource

SOLAR RESOURCE MAP

DIRECT NORMAL IRRADIATION

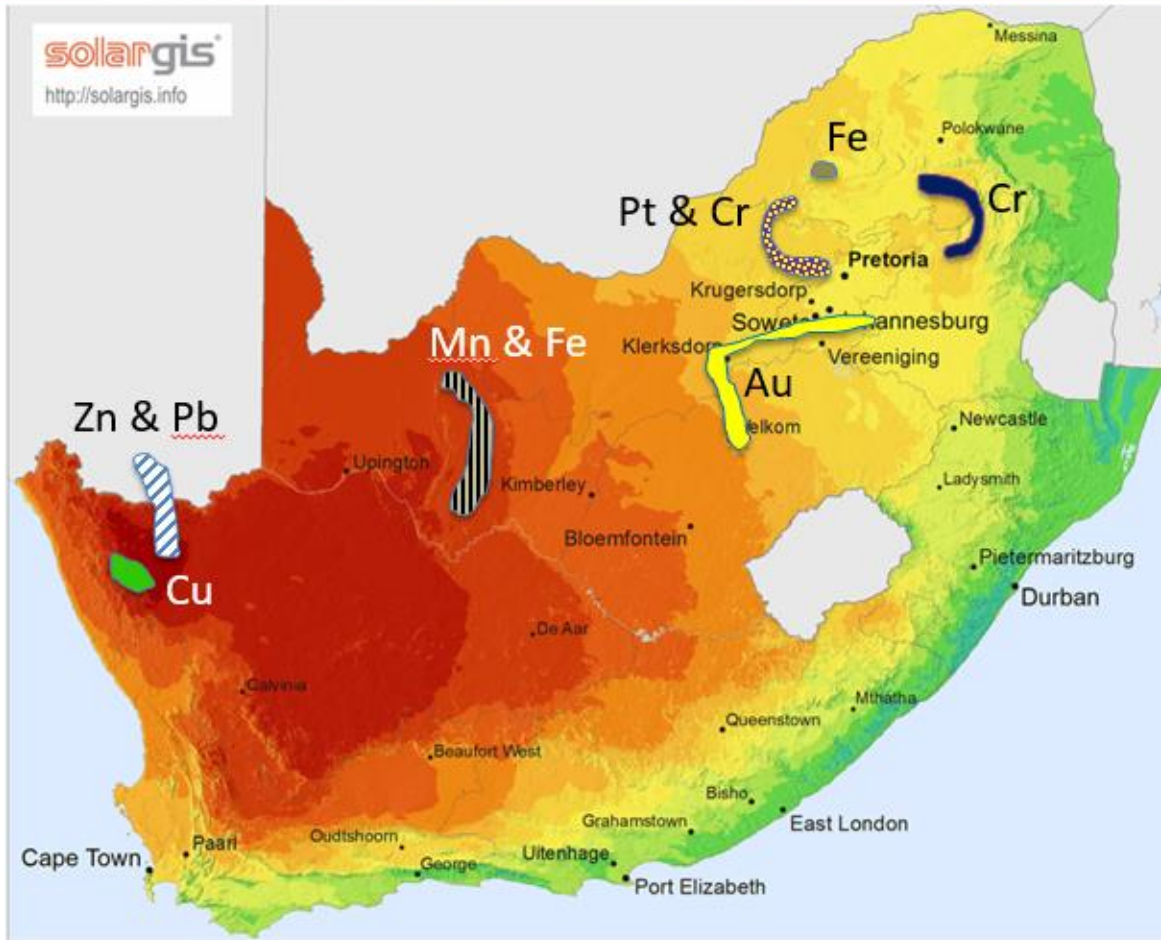


© 2017 THE WORLD BANK



This map is published by the World Bank Group, funded by ESMAP, and prepared by Solargis. For more information and terms of use, please visit <http://globalsolaratlas.info>.

Solar resource compared to active mining

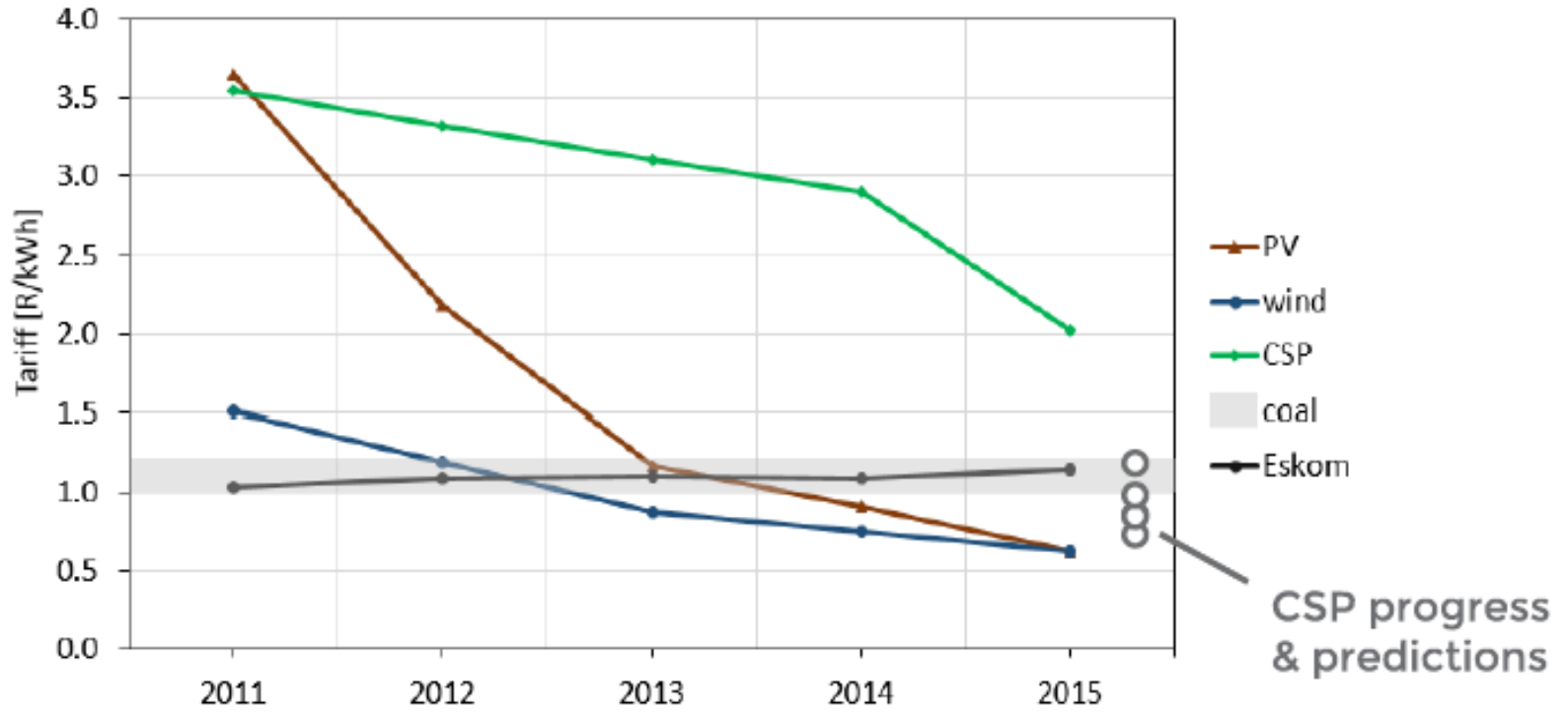


Freehand drawing, not according to scale – visualisation guide only
Not all mineral resources included.

Based on selected active mines data from the Council of Geoscience, 2003

<http://www.geoscience.org.za/images/Maps/selectedactivemines.gif>





Local Utility Scale Renewable Electricity Cost



visit concentrating.sun.ac.za
contact sterg@sun.ac.za



Presented by Dr. Matti Lubkoll (STERG) to PDD @ Mintek, 20 August 2018

- Flat plate/ evacuated tube collectors 
- Fresnel/ Parabolic trough collectors 
- Heliostat & tower systems 
- Solar furnaces 

- Calcination of alumina for Alcoa (Australia)
- Phosphates for the Office Chérifien des Phosphates (Morocco)
- Lime for Cemex (France)
- Codelco mining company's Gaby copper mine in northern Chile ($27.5 \text{ MW}_{\text{th}}$)

- Aluminium recycling (CSIR, DLR)
 - discontinued
- Preheating of manganese ores (PRéMA)
- SHIP in RSA (beverage and textile industry)

- More on future projects later

What is PRéMA?

Horizon 2020 program of European Union, EU project 820561

CE-SPIRE-03-2018: Energy and resource flexibility in highly energy intensive industries

The logo for PRéMA features the word in a bold, orange, sans-serif font. The letter 'E' is stylized with a yellow flame-like shape above it.

Energy efficient, primary production of manganese ferroalloys through the application of novel energy systems in the drying and pre-heating of furnace feed materials

October 2018 to October 2022

Euro 12 mil (Euro 2.5 mil to MINTEK) - IA 50% (Euro 10 mil)

7 WPs (MINTEK in all, Leader of WP2) - TRL4 to TRL7

Where to start...

- Zinc distillation
- Preheating to reduce electricity and fossil fuel demand
- Scrap re-melting and casting for low melting metals
- Hot dip galvanisation
- Hydrometallurgical zinc production
- Rare Earth Elements
- Refractory gold extraction
- Copper electrolytic refining
- Electrowinning of manganese metal

SAIMM 2020 Events – Kathu, South Africa

- Colloquium on Renewable Energy Solutions for Energy Intensive Industry (21 June 2020)
- Visits to mines and solar thermal power plants (22 June 2020)
- Mn School (23 – 24 June 2020)



In conclusion

- Look again at where we get our energy
- Re-visit how we design and build greenfield projects
- Encourage early adoption of renewable technologies
- Engage with R&D + industry
- Global co-operation

Help us build STAMP/SHIP initiatives:

Bring us your case study



Thank You
www.mintek.co.za

linah@mintek.co.za

