Estimating CO2 production and climate deaths from WCM's proposed coal production figures

By Henry Adams. March 2019. Results first, then explanatory notes:

In summary, I've come up with the following results via calculations on Excel:

(These assume WCM predictions of coal extraction rates are realistic estimates – which they may not be(?)).

GHG EMISSIONS

- 1. CO2 emissions from combustion of WCM coal is likely to reach a peak from year five of **8 million tonnes of CO2 per annum**, and if this is continued over the 50 years this would total around **400 million tonnes CO2**.
- 2. These figures don't include combustion emissions of other GHGs, nor do they include 'upstream emissions' of GHGs which are significant, not just on a Cumbria scale but also on a national scale. Emissions from all stages of life-cycle together are likely to be nearer **9mtCO2pa** and **500 million tonnes over 50 years**.

Please refer to Laurie Michaelis's assessment of likely emissions on-site at Whitehaven. LM is an IPCC contributor with many years of specifically relevant professional experience.

CLIMATE DEATHS

Again – please refer to the assessment by Laurie Michaelis on this in preference to mine. e.g. via this link https://keepcumbriancoalinthehole.wordpress.com/2018/03/02/quaker-charity-and-ipcc-author-blast-coal-mine-plan/ or his more recent work.

My assessment is mainly because climate deaths is something I have wanted to increase awareness on for several years, and I have been wanting to learn this topic by doing it. But please give higher focus to what LM has written.

3. - I have so far only considered climate deaths from a subset of the possible health impacts: WHO: "The assessment takes into account a subset of the possible health impacts, and assumes continued economic growth and health progress. Even under these conditions, it concludes that **climate change is expected to cause approximately 250 000 additional deaths per year between 2030 and 2050**; 38 000 due to heat exposure in elderly people, 48 000 due to diarrhoea, 60 000 due to malaria, and 95 000 due to childhood undernutrition.

DARA: ...

4. I have assumed [yet to complete this write-up]

Spreadsheet screengrabs etc are on next page vvvvvvvvvvvvvvvvvvvvvv

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"The WCM planning submission clearly sets out and responds to all of the questions raised by external parties over the last three years and provides clear scientific evidence based responses to all of these points, clearly demonstrating that there are no risks or significant impacts from the scheme."

https://www.newsandstar.co.uk/news/17453859.anti-mine-campaigners-hope-polar-bear-protest-puts-a-freeze-on-plans/

- Does WCM regard consequent climate deaths as trivial because they are not in the UK?

The following text below is mostly notes – yet to fully write up.

Coal production estimates

"The application states that a total of nearly 2.8 million tonnes of coal will be extracted per year during the main production phase – and the aim is for this level of extraction to continue for 50 years."

The application states that a total of nearly 2.8 million tonnes of coal will be extracted per year during the main production phase.

The aim is for this level of extraction to continue for 50 years.

FoE: for cf.

The application talks of a production life-span of 20-50 years, and a peak of 2.8 million tonnes a year. Assuming a 40 year life (following construction), and an average of 2 million tonnes a year, that is total production of 80 million tonnes, which will emit around 175 million tonnes of carbon dioxide.

[175/80 = 2.1875 tonnes CO2 per tonne of coal]

WCM revised 6june17 - from pdf of application form:

"Metallurgical Coal: 2,430,000 Tonnes Per Annum Industrial Coal: 350,000 Tonnes Per Annum" over a permission period of "50 years"

[Total: 2,780,000 Tpa of which mc=87.41%, ic=12.59%]

WCM Planning Statement pdf 2018

Excavation rates will build over a 5 year period to reach a maximum coal output of approximately 2.8 million tonnes per annum" [A table from their 2018 report:]

2.6.1 The following table provides annual production from the mine



Production	Year 1	Year 2	Year 3	Year 4	Year 5	
Met Coal	410,000	770,000	1,390,000	2,060,000	2,430,000	
Industrial Coal	70,000	130,000	210,000	300,000	350,000	
Refuse	50,000	90,000	110,000	160,000	150,000	

Conversion of tonnes of coal to tonnes of CO2 (or CO2e)

Combustion emissions

(i.e. excluding other life-cycle emissions such as extraction & transport emissions)

The simplistic way is to (i) assume all the coal is pure carbon and (ii) all the coal fully combusts to CO2. Neither of these assumptions in reality are accurate, but they provide a useful hypothetical maximum conversion figure, based on atomic weights of C and O being 12 and 16 respectively. Thus C + O2 = CO2 means 1 tonne of Carbon combusts to (12+(2*16))/12 tonnes CO2 = 3.6667 tonnes CO2.

This figure is useful also as a yardstick to compare conversion factors and get an idea of the % conversion:

Conversion factors as supplied by government (BEIS)

Source: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018 - from which I have copied here a screen-grab from the Excel spreadsheet ('Condensed set' not the 'Full set')

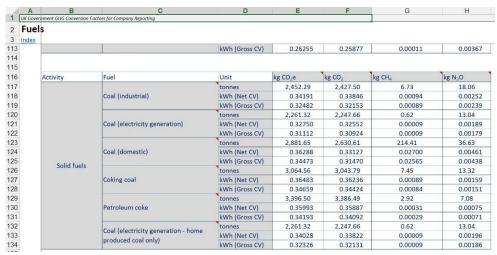
See chart below. Although WCM intend to produce mostly coking coal and partly thermal coal, initially I'll use just the coking coal factors for simplicity – because I am only wishing to calculate orders of magnitude of death rates:

3064.56 kg CO2e or 3043.79 kg CO2 per tonne coking coal 3.044 tonnes CO2 per tonne coking coal

Equivalent to a conversion % of (3.04379/3.6667)% = 83.01245% **83%**

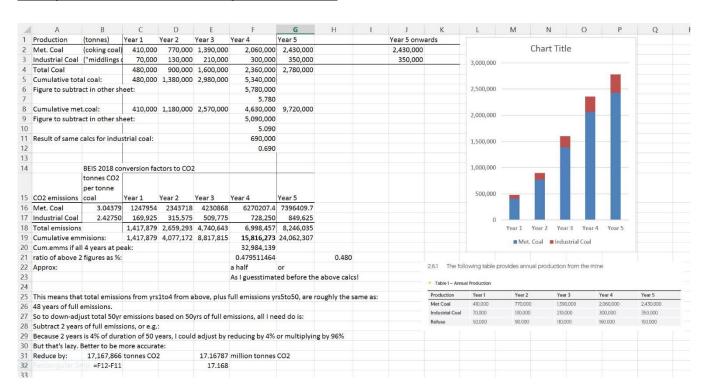
(Note I've omitted to add the extra c.1% from other GHG combustion products)

(Laurie Michaelis uses the rounded figure of 3100kg per tonne from 2017 BEIS figures.)



Source: (BEIS) Greenhouse gas reporting: conversion factors 2018

WCM production and emissions in years 1 to 4 and 5



Calculation of climate deaths, climate-related deaths, climate-caused deaths

NB: Read Laurie Michaelis on this in preference to my analysis.

Though I come up with similar magnitude of results for linear estimate.

I have used 2 sources so far for estimates of climate deaths per annum: WHO (2014) and DARA (2012) NB: These do not provide estimates of *all* climate-related deaths or climate-caused deaths but just those in specific categories.

Thus my calculations are under-estimates of total climate-related deaths – probably by a long way – but I hope are a useful start in getting a rough idea of minimum estimates by orders of magnitude.

I'm not the first to estimate climate deaths from WCM's coal production proposals, nor the first (of a number) to estimate CO2 emissions from WCM's proposals. I strongly recommend you also read Laurie Michaelis's words on climate deaths from WCM proposals, as he has much more experience in climate change research and analysis than I have.

WHO (2014)

Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s - Authors: WHO Publication details

Editors: Simon Hales, Sari Kovats, Simon Lloyd, Diarmid Campbell-Lendrum

Publication date: 2014 https://www.who.int/globalchange/publications/quantitative-risk-assessment/en/

I quote from the above web-page:

Download

Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s

Overview

WHO releases a quantitative assessment of the health impacts of climate change. This constitutes an update and a further development of the assessment that was first published by WHO for the year 2000, now with a wider range of health impacts, and projections for future years.

The assessment takes into account a subset of the possible health impacts, and assumes continued economic growth and health progress. Even under these conditions, it concludes that climate change is expected to cause approximately 250 000 additional deaths per year between 2030 and 2050; 38 000 due to heat exposure in elderly people, 48 000 due to diarrhoea, 60 000 due to malaria, and 95 000 due to childhood undernutrition. Results indicate that the burden of disease from climate change in the future will continue to fall mainly on children in developing countries, but that other population groups will be increasingly affected.

DARA (2012)

https://daraint.org/climate-vulnerability-monitor/climate-vulnerability-monitor-2012/