

The Methane Gun

By Julian Cribb FRSA FTSE¹



Thousands of methane filed bubbles are waiting to explore in Siberia | zmescience.com

In all the sound and fury over climate change, too little public and media attention has been devoted to the ‘methane gun’² – and yet this terrifying phenomenon could usher humans unceremoniously off Earth’s stage for good.

Like CO₂, methane (CH₄) is a greenhouse gas that helps trap the sun’s heat within the Earth’s atmosphere. The big difference is that it is 25-84 times more potent at doing so.

The planet has massive stores of methane, locked as frozen ice in the seabed (the world’s largest natural gas reserve), in the frozen soils of the Canadian, US and Russian Arctic, and buried in the sediments of tropical swamps and peatlands. Like the bubbles in a stagnant pond, the gas is mostly the work of bacteria digesting organic matter over millions of years.

How large these reserves of methane are is still a matter for scientific debate – but estimates fall between 1.5 and 5 trillion tonnes. Very, very large indeed. If released suddenly, these are thought more than capable of driving the Earth’s temperature up by

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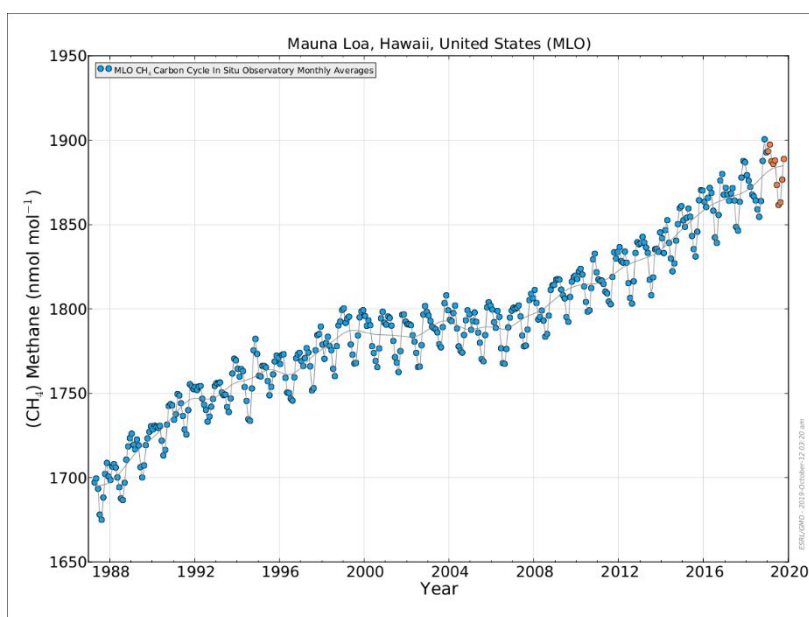
Century’ (Springer 2017) and ‘Food or War’ (Cambridge University Press 2019).

² Originally dubbed the ‘clathrate gun’, the theory describes the abrupt release of oceanic methane as a potential driver of major climate changes of the past, from a cool planet state to a hot one. See Kennett JP et al, Methane Hydrates in Quaternary Climate Change: The Clathrate Gun Hypothesis, Volume 54, American Geophysical Union, 2003. <https://agupubs.onlinelibrary.wiley.com/doi/10.1002/9781118665138.ch0>

another 7-10 degrees, on top of the 2-5 degrees likely to result from human emissions from burning fossil fuels and clearing land (currently rising at record rates ³).

The worst-case scenario – a large-scale, rapid release of trapped gas known as the ‘methane gun’ – could potentially render the Earth uninhabitable by humans and other large animals. This is why we need to pay attention. Now.

What has some scientists concerned – and others frightened – is that atmospheric levels of methane which have doubled since the Industrial Revolution and have been rising for steadily for the past 30 years, began to rise more steeply in the past five years, as the following graph shows:



Atmospheric methane concentrations up to October 2019: Mauna Loa Observatory, USA.

The source of the new methane is debated. Is it mainly caused by the mining of natural gas, petroleum and coal – as several lines of evidence suggest? Is it released by expanding world cattle

and rice production, the draining of tropical swamps and burning of tropical forests? Is it the frozen gas seeping out of the oceans and tundra as the planet warms and its ice vanishes? Or is it all of the above? The evidence is starting to favour the latter view ⁴ – but the scientific jury remains undecided.

We know that a mass-release of methane can be catastrophic for life on Earth, because that’s exactly what took place 55 million years ago in an event known as PETM - the Palaeocene-Eocene Thermal Maximum - when global temperatures shot up by 5-10 degrees, wiping out a number of species. ⁵ There were no humans round then to release

³ Cooper R, Global carbon emissions increased at a record rate in 2018. Climate Action. Mar 17, 2019. <http://www.climateaction.org/news/global-carbon-emissions-increased-at-a-record-rate-in-2018>

⁴ NASA. What is Behind Rising Levels of Methane in the Atmosphere? <https://earthobservatory.nasa.gov/images/91564/what-is-behind-rising-levels-of-methane-in-the-atmosphere>

⁵ Jardine P, The Paleocene–Eocene Thermal Maximum, Palaeontology Online 1.5. https://www.palaeontologyonline.com/articles/2011/the-paleocene-eocene-thermal-maximum/?doing_wp_cron=1571195797.0936520099639892578125

carbon, so it was probably due to one or more of the natural sources rapidly giving up its gas. Recently opinion has narrowed in favour of tropical swamps and peatlands drying out and catching fire during a warming cycle, as the main source. The frozen methane, apparently, remained largely undisturbed in the ocean and tundra.

But that is not the case today. Not only are tropical forests burning and swamps being drained, but scientists have observed major escapes of methane from the Arctic tundra in the form of exploding pingos – mounds of frozen methane, mud and water – and the eruption of melted methane ice from the seabed. In October 2019 veteran Russian researcher Igor Semiletov, from Tomsk Polytechnic University, reported “the most powerful seep I have ever been able to observe” venting in a potent eruption of gas bubbles in the East Siberian Sea.⁶

Two years earlier, in June 2017, Russian reindeer herders reported a violent explosion that left a 50- metre deep crater in the tundra of the Yamal Peninsula, Siberia, which scientists attributed to a methane blast. In recent years researchers have reported numerous craters left by explosions across Siberia, the Canadian and Alaskan tundra – and even craters in the seabed. Many are recent – but some are up to 12,000 years old, and still leaking gas. Therein lies the uncertainty: are the methane explosions observed today part of a process that occurs more or less constantly through Earth history – or do they represent the start of a sudden release, ramping up to runaway global warming? The scientific jury is at odds.

Pennsylvania State climate scientist Prof Michael Mann, for instance, characterises the methane bomb idea as “catastrophism” and claims it is being exploited by the climate denial lobby to discredit climate theory generally. He says the amount of methane released will be “small compared to human emissions” of carbon.⁷ Other scientists, like Gavin Schmidt of the NASA Goddard Institute, argue that it is highly unlikely that a large volume of seabed methane would be released suddenly, i.e. over a period less than thousands of years, because it did not do so in past warming events. Instead it will continue to trickle out.

Oceanography and ice expert Prof Peter Wadhams disagrees. He says loss of Arctic sea ice from the shallow continental margins could trigger such a release which “could happen very suddenly and ... is the greatest single threat that we face”. He says that mainstream science, represented by the Intergovernmental Panel on Climate Change (IPCC), does not generally recognise the threat.⁸

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<https://www.telegraph.co.uk/news/2019/10/08/russian-scientists-find-powerful-ever-methane-seep-arctic-ocean/>

⁷ Mann M, see: <https://www.youtube.com/watch?v=LifcMZyCYmc>

⁸ Wadhams P, see: https://www.youtube.com/watch?v=kv_0dpsxsNY

Australian National University earth scientist Prof. Andrew Glikson cites the Global Carbon project finding that there are 1.4 trillion tonnes of accumulated methane stored on land and 16 trillion tonnes in the ocean, available for release if the planet grew warm enough, and this 'could have catastrophic effects on the biosphere'. He points out there is already clear evidence for the explosive release of methane, on land and at sea. With Arctic temperatures already 3-8 degrees warmer due to global warming, the risks of a sudden methane release "have not yet been fully accounted for in climate projections."⁹

At temperatures above +4 degrees, many scientists now consider the risk is increasing of the planet becoming partly or wholly uninhabitable to humans and large animals. Certainly, such heat and climate instability would destroy most of our current food production systems, spilling billions of climate refugees across the planet and causing wars to break out between and within nation states.¹⁰

How many would die in such an event is not knowable, because we cannot predict how humans will respond, how many wars we will start, or how many nukes we will unleash in the ensuing chaos. Potsdam Institute climatologist John Schellnhuber has said: "At 4 C Earth's... carrying capacity estimates are below 1 billion people." Prof Kevin Anderson of the U.K.'s Tyndall Centre for Climate Change concurs: "Only about 10 per cent of the planet's population would survive at 4 C." Several scientists have voiced the view that the human population will be reduced from 9-10 billion to around 1-3 billion in the long run.¹¹

We already know that our physical survival is in jeopardy in extended periods above 35 degrees Celsius – that is, where daytime temperatures constantly reach 40-50 degrees C or more. Such temperatures will occur frequently with +7 degrees of global warming and will render large parts of the earth uninhabitable – including the most heavily populated. Above +12 degrees of global warming, human survival becomes physically impossible.¹² However long before our heat tolerance limits are reached, local and global food and water supplies will collapse, prompting mass migration and war. Without urgent worldwide action, the global economy – and with it civilized society – are predicted to go down as we approach +4 degrees. Such warnings come, not from 'radical greens', but from authorities no less

⁹ Glikson A, The Methane Time Bomb. International Carbon Conference 2018. www.Sciencedirect.com

¹⁰ Cribb JHJ, Food or War, Cambridge University Press 2019, <https://www.cambridge.org/us/academic/food-or-war>

¹¹ Rees WE, Yes, the Climate Crisis May Wipe out Six Billion People, The Tye, Sep 18, 2019. <https://thetye.ca/Analysis/2019/09/18/Climate-Crisis-Wipe-Out/>

¹² Sherwood SC and Huber M, An adaptability limit to climate change due to heat stress, PNAS, May 25, 2010. <https://www.pnas.org/content/107/21/9552>

conservative than Bank of England governor Marc Carney¹³, who states that the global financial system is currently investing in catastrophe by backing new fossil fuel projects.¹⁴

These numbers represent the current most-informed estimates of the impact of the unfolding climate crisis, should world efforts to halt it fail and should the climate deniers triumph.

The risk for humanity posed by the ‘methane gun’ is that rapid global mass-release may be ‘locked and loaded’ and firing *before* we have sufficient scientific data to confirm it. It is, as they say, an event of low probability – but very high impact. Is it a risk that a rational person would take?

Once the gun has begun to fire, there is practically nothing humans can do to stop it. It will unleash other dangerous feedbacks, potentially leading to runaway warming. It will shift the planet from its present warming state to a ‘hothouse Earth’ state¹⁵ where human survival comes into question.

The only viable strategy – possibly – is preventative: to move civilization far faster towards total elimination of all fossil fuels and land clearing worldwide – and plant billions of trees as quickly as possible, to slow the global warming trend before it triggers the methane gun.

This means that countries like America, Australia, Brazil and Russia must cease their dangerous do-nothing policies, and stop mining coal, oil and gas, and clearing land. Countries like India and China need to cease building coal-fired power stations immediately. And every country needs to scale back carbon emissions on an accelerated time-scale from transport, agriculture, concrete and industry.

While some scientists urge geoengineering solutions, such as the artificial release of sulphate aerosol particles to erect a giant sunshade over the Earth, this represents a counsel of despair. It means allowing the atmosphere to attain virtual temperatures that would cook humans, then trying to chill them down with a planet-sized ‘air-conditioner’. The consequences, should our air conditioner fail, would be terminal. That really only leaves us with the option of trying to contain global warming by eliminating human carbon emissions – before the methane gun fires.

¹³ Carrington D, Firms ignoring climate crisis will go bankrupt, says Mark Carney, The Guardian, Oct 13, 2019. <https://www.theguardian.com/environment/2019/oct/13/firms-ignoring-climate-crisis-bankrupt-mark-carney-bank-england-governor>

¹⁴ Carney, M. Bank of England boss says global finance is funding 4C temperature rise. The Guardian, Oct 16, 2019. <https://www.theguardian.com/business/2019/oct/15/bank-of-england-boss-warns-global-finance-it-is-funding-climate-crisis>

¹⁵ Steffen W et al., Trajectories of the Earth System in the Anthropocene, PNAS, August 2018. <https://www.pnas.org/content/115/33/8252>

In the end, the worst that can happen by banning fossil fuels and greening the planet is that we get a new clean energy system, cheaper energy, renewed economic growth and a more sustainable Earth.

If the climate deniers – fifty huge energy corporates and their political and media cheer squad – get their way, the worst that can happen is human extinction.

Which risk do you prefer?

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