Opening Statement,
Professor Peter Thorne,
20.07.22

Opening Statement on 'Calculation of methane emissions' by Prof. Peter Thorne, ICARUS Climate Research Centre, Maynooth University

Dear Chair, Clerk, Deputies and Senators,

Thank you for the opportunity to come before you to speak to the topic of 'Calculation of methane emissions'. I would note that the topic is broad ranging and I have tried to avoid repeating what my colleague from the IPCC WGI report, Dr. Joeri Rogelj, has covered, or what you may have heard in your prior session. You are very fortunate to have the opportunity to hear from Dr. Rogelj in this session, as he is arguably the global authoritative expert in the area of global carbon budgeting and the effects of different greenhouse gases thereon.

I want to start by stepping back and taking the very longest term view on the importance of methane in our climate system. We can use gas trapped in tiny air pockets in ice cores from Greenland and Antarctica over the past 800,000 years to look at how methane, along with carbon dioxide and nitrous oxide have evolved. These constitute the three most important greenhouse gases. All three have varied over time.

Prior to human activity, these variations were in response to slow changes in incoming energy from the sun over thousands of years. Feedbacks within the earth system have led to these gases being repeatedly stored and released in a way that amplifies the variations in solar energy receipt. Typical ranges of methane between successive glacials – when great ice sheets covered much of the northern hemisphere high latitudes - and interglacials – similar to today's climate - were of the order 210-430 parts per billion with higher concentrations during interglacials.

Since 1750, methane concentrations have increased rapidly to stand today at about 1900 parts per billion and climbing. **This represents an almost 160% overall increase and at about 1150 parts per billion the increase dwarfs the changes seen over the past 800,000 years**. The increase is also much greater than that for either carbon dioxide (c.50%) or nitrous oxide (c.25%) over the same period.

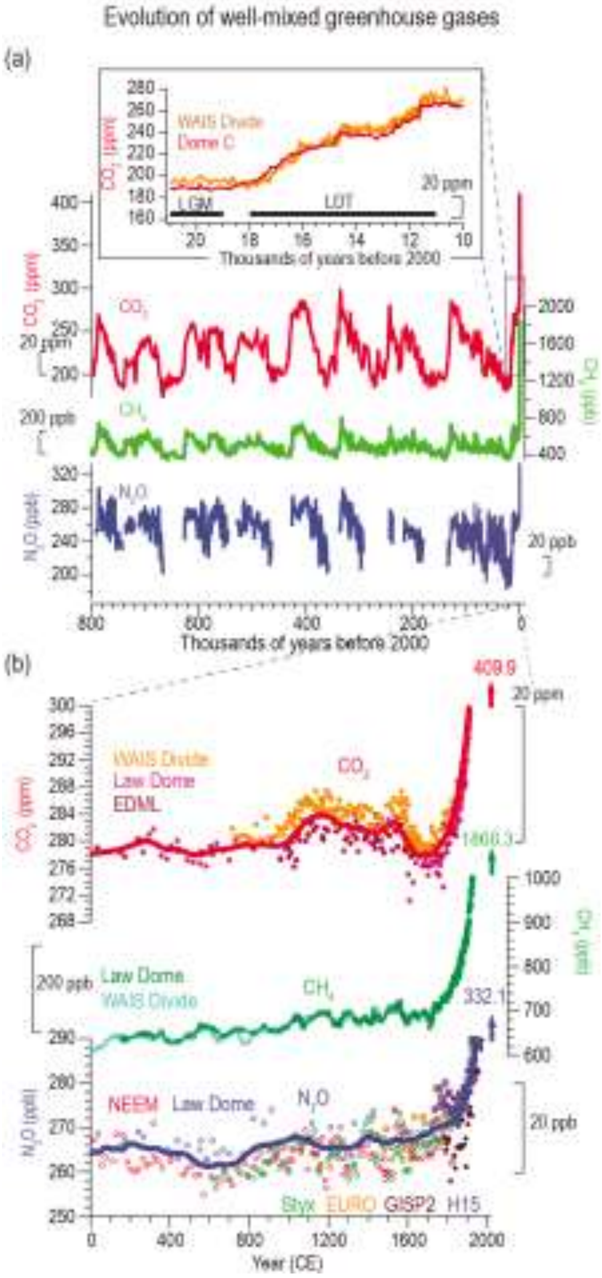

Figure 2.4 from IPCC WGI report published in August 2021. Figure shows in panel a records for carbon dioxide (red), methane (green) and nitrous oxide (blue). Panel b shows the same for the years 0-1950 CE from multiple cores.

There is no doubt that the increased methane burden is down to us, arising from a combination principally of fossil fuel gas use, ruminant and rice field intensification, and waste landfill. These have served to change the methane cycle in important ways. There is also no doubt that **elevated greenhouse gas burdens are principally responsible for the changes in climate we are seeing,** including increasing the frequency and magnitude of extreme heat events such as that we have just experienced.

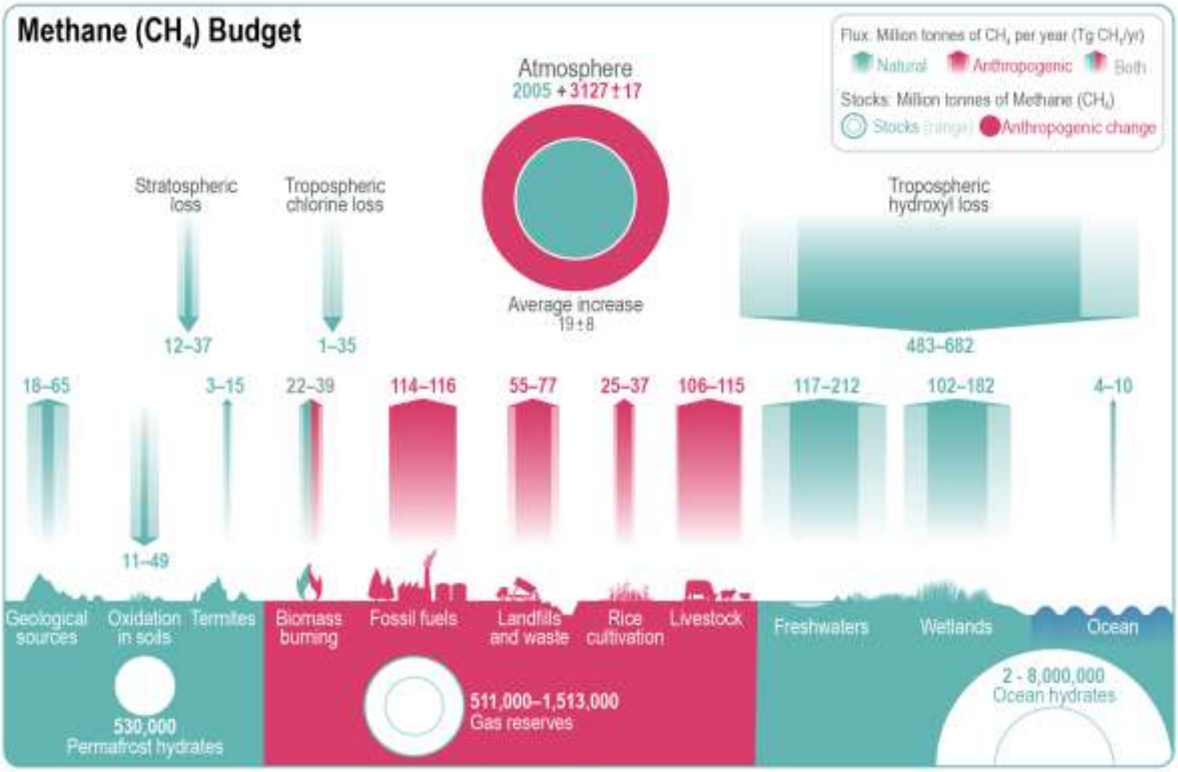

Figure 5.15 from IPCC AR6 WGI showing methane stocks and flows. Components in green are natural cycle components which approximately balance. Components in red represent human components which are serving to perturb the budget and increase burdens in the atmosphere.

As noted by Dr. Rogelj, the IPCC assesses that the contribution of methane changes alone accounts for about 0.5 degrees of the approximately 1.1 degrees of warming to date since 1850, being second only to the impacts of carbon dioxide increases.

You will have heard from others today that methane differs from carbon dioxide and nitrous oxide in that its lifetime is much shorter, but its radiative impact is much greater. On this there can be no disagreement. Unlike the two much longer lived principle greenhouse gases there are therefore almost immediate climate benefits to reducing emissions, or penalties to increasing emissions, irrespective of source. **If we are to avoid the worst impacts of climate change and keep warming below 1.5 degrees, then globally we must rapidly reduce overall methane emissions whilst also cutting carbon dioxide emissions to net zero**.

The legislation in the 2021 amended climate act speaks to 'the distinct characteristics of biogenic methane'. Methane in terms of the chemical structure and physical properties is identical regardless of source. **The only physical distinction between methane sources arises from whether the source arises from fossil fuels or from the active component of the carbon cycle**. If it arises from the active carbon cycle – such as from a cow or sheep's digestion – then it is effectively recycling the carbon and no long-term additional impact accrues following oxidation. Thus the climate impact is limited to the lifetime of the emission. Whereas if it arises from a fossil source it is a new addition to the active carbon cycle pool and thus a long-term additional warming impact accrues beyond the lifetime of the methane emission itself.

This, sadly, is where physics ends and necessarily policy and politics takes over. **Quite rightly policy requires consideration of the relative efficacies of different options in mitigating the impacts of climate change**. Because the gases differ in their radiative impacts and lifetimes there is no single simple metric that can capture the full range of outcomes. Different metrics have distinct inherent strengths and weaknesses.

You will have heard from colleagues in the last session and my colleagues in this session well-reasoned arguments that metrics X or Y either increase or decrease the need for mitigation efforts on methane more generally and / or biogenic methane specifically. In addition, **different assumptions around immediacy of climate goals, historical responsibility and/or grandfathering of historic emissions (the natural state of Ireland would not be to have several million ruminants after all), equity, and appropriateness of policy targets, amongst others, can lead to very distinct advice**.

At the end of the day, however, it is important to note that reporting to UNFCCC and the European Union, as well as the national climate act as amended, stipulate reporting must be in GWP_{100}. **It would make little logical sense for national reporting to diverge from European and global reporting obligations which would be simply asking for divergence of outcomes and possibilities of e.g. substantial non-compliance penalties.** Any change to approach would, instead, to my view have to start at global and EU levels and cascade to national policy.

Within the science community there is recognition that some form of bundling of short lived climate forcers such as methane and long lived climate forcers such as carbon dioxide and nitrous oxide in separate ways may lead to improved policy outcomes. Even if there is, as you will become acutely aware, a broad range of views as to what these improved outcomes may be. But, for now, proverbially, to my view we have no option but to play with the cards we have been dealt.

Finally I would like to make some very brief observations about the broader picture. **It is critical that the climate mitigation debate nationally does not myopically focus upon the agricultural sector**. In the words of the late great Douglas Adams that risks in the public mind climate mitigation being seen as somebody else's problem, specifically our farmers'. It is not. Even were agricultural emissions to reach zero we would still have approximately 2/3 of our emissions remaining outstanding that arise from other sectors. We need action across the board.

It is also critical that as we undertake climate mitigation efforts in the agricultural sector that it constitutes **a meaningful and effective just transition that protects our farmers and reinvigorates our rural communities, whilst opening up new markets and opportunities for them**. It is this implementation aspect that will be key and should be a real focus of government and policy makers over coming years. **I believe in the ingenuity and adaptability of our agricultural sector, if appropriately enabled, to address the mitigation challenge before us.**