The Superpower Institute

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Methane mitigation to unlock 1.5

Submission to the Belém Mission to 1.5

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About The Superpower Institute

The Superpower Institute's (TSI's) mission is to help Australia seize the extraordinary economic opportunities of the post-carbon world.

A net zero Australian economy will reduce global emissions by just over 1 per cent. But if Australia successfully seizes the economic advantage in exporting zero emissions goods, this can create an opportunity for full employment with rising incomes for a growing population sustained over more than a generation, and reduce global emissions by up to 10 per cent.

Renowned economist Ross Garnaut and economic public policy expert Rod Sims have joined forces through The Superpower Institute, to focus on practical research and policy to unlock this opportunity. The Institute specialises in the policy settings and market incentives needed to make Australia an economic superpower and provides practical knowledge to governments and industry to realise this opportunity.

TSI works across the building blocks of the superpower economy including: renewable energy, green hydrogen, land carbon and minerals processing; the potential zero carbon export products including green iron and green aluminium; and the enablers of this economy including economic and fiscal policy, trade policy and regional development.

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Introduction

TSI welcomes the opportunity to contribute to the Belém Mission to 1.5.

The aim of this submission is to highlight the role of **methane monitoring and mitigation** as a priority solution for limiting anthropogenic climate change to **1.5°C**. During the period from 1750 to 2019, the atmospheric concentration of methane has increased from around 722 parts per billion (ppb) to 1,866 ppb, a factor of roughly 2.5. The increase in methane concentration has contributed **0.28°C** of the observed temperature increase due to anthropogenic climate change.

Methane's short lifetime in the atmosphere and very high potency compared with carbon dioxide mean that a rapid reduction in methane emissions - provided we also reduce emissions of other greenhouse gases - is one of the best actions we can take in the near term to reduce climate change. This is particularly true if we intend to limit temperature overshoot beyond 1.5°C and **reduce** the **risk** of reaching **climate tipping points**, some of which (such as thawing permafrost) will themselves release significant quantities of methane, leading to a climate feedback loop.

The importance of monitoring and verification

Ensuring that methane emissions are **accurately reported** is the first step in ensuring that technology and policy approaches for methane emissions reductions are effective and **well-targeted**.

Except for direct measurement techniques, which can be expensive and difficult to implement in some cases, most process-driven methane monitoring relies on **emission factors**. There are different bases for determining emissions factors, which introduce **uncertainties** into the calculation of methane emissions. For example, a method for coal mining that uses an emissions factor based on **averages** over a **specific geography** (such as a subnational or national average) may **underestimate** the amount of **fugitive methane** released from a mine that is more gaseous than average.

In addition to underestimating the methane emissions from the mine, this also represents **foregone revenue** to the mine operator from **capturing** and **utilising** methane, which (potentially mistakenly) dismissed it as not cost-effective to capture based on the estimate of the methane available.

The technique of using other **measurement technologies** to **verify** emissions estimates, such as satellite observations, flyovers, and tower-based monitoring, is **well-established**. Unfortunately, such techniques have indicated that the emissions from fossil fuel production are considerably higher than reported in national emissions inventories. For example, in the case of Australia the IEA compared general evidence from atmospheric measurements with process-based estimates and found that methane emissions from **Australian coal mines** may be **60% higher than reported**.[1] This aligns with other studies, which have found similar results for Australian mines using both **satellite** and **flyover** techniques.[2]

TSI performed its own analysis of methane emissions from large emitters over Australia in 2024, using its **Open Methane** tool.[3] The study calculated the so-called local enhancement of methane concentration, defined as the average concentration within 20km of an emission minus the concentration between 20 and 100 km away. We compared this local enhancement as measured by the best available global satellite data set and the expected values from a high-resolution air quality model. The study noted that the model significantly underestimated the local enhancements with the underestimate growing with the emission strength as predicted by the inventory. The relationship between measured and modelled enhancements can be used to estimate the required multiple of emission strengths to bring the two data sets into agreement. While the small number of points allows considerable scatter, in this estimate the calculation yields a best value of twice the inventory emissions with a 50% chance that the emissions are larger than this and a **95% likelihood** that the **emissions** are **stronger** than the **official inventory**.

Methane priority solutions

There are a number of solutions that can be implemented across methane mitigation, measurement, and verification, that will assist the world in realising the vast opportunity that methane emissions reductions represent for slowing global warming in the short term.

1. Encouraging the use of more **accurate** process-based reporting methods for methane emissions from high-emitting point-source facilities, such as fossil fuel production sites, landfills, and wastewater treatment plants. In particular, the use of state-based or country-based emissions factors should be wound back in preference for **mine-based estimates**.

2. Reported methane emissions from **point-source facilities** should be **verified** using other methods, including **satellite monitoring**, **inversion models**, **flyovers**, and **local measurements** through vehicular- and tower-based monitoring. This will require public and scientific investment in the implementation of these monitoring methods.

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[1] International Energy Agency, *Global Methane Tracker. Documentation - 2024 Version*.
[2] See for example Sadavarte et al., 'Methane Emissions from Superemitting Coal Mines in Australia Quantified Using TROPOMI Satellite Observations', and Borchardt et al., 'Insights into Elevated Methane Emissions from an Australian Open-Cut Coal Mine Using Two Independent Airborne Techniques'.
[3] https://openmethane.org/

3. Further **research** and **development** is needed to reduce emissions from diffuse methane sources, such as **agriculture** and **land use**.

4. As solutions for reducing emissions across a sector are developed, the adoption of these solutions should be incentivised through **policy** incentives or **market** mechanisms to speed up uptake. This will also require the investment of public resources in evaluating these solutions for factors such as **efficacy** and **scalability**.

5. Jurisdictions should develop **abatement cost curves** for methane. International organisations should provide toolkits to facilitate these where **in-country expertise** is not available. Abatement priorities will differ depending on relative contributions of different sectors and technical capacity.

Further Information

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