The Methane Project
at Cornell University

# The scientific importance of GWP20 as a policy and communication tool

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A recent blog (1) by Zeke Hausfather criticized a letter (2) that we and 65 other experts sent to New York Governor Kathy Hochul on March 7, 2026. Our letter urged the Governor and other political leaders in New York to leave the Climate Leadership and Community Protection Act (CLCPA) of 2019 intact, particularly with regard to greenhouse-gas accounting (2). The CLCPA has two innovative aspects for greenhouse-gas accounting: first, the Act specifies that New York take responsibility for emissions that occur outside of the boundaries of the State if they are associated with the production of a fuel that is transported to and used within the State; and second, the Act requires the use of the 20-year global-warming potential (GWP20) rather than a 100-year global-warming potential (GWP100) for comparing the potential climate impacts of methane and carbon dioxide ($CO_2$) emissions (3). Hausfather's blog was particularly critical of the CLCPA's use of GWP20, writing "unfortunately a number of climate scientists who know better are defending it" (1). We believe the CLCPA's use of GWP20 is scientifically correct and represents good policy. We stand by our defense of it.

The history of New York's approach in the CLCPA for greenhouse gas accounting is based on a long policy debate: the CLCPA only became law in 2019, but earlier versions of the bill passed the State Assembly in each year since 2015. The greenhouse gas accounting approach was written in each of these drafts from 2016 onward. New York banned high-volume hydraulic fracturing ("fracking") for shale gas development in late 2014 (4), yet New York's use of out-of-state fossil gas has remained high since that time. Most of the gas used in New York is shale gas imported from Pennsylvania and other states (5). In adopting the CLCPA greenhouse gas accounting approach, the political leaders of New York were sending a signal that New York takes responsibility for the consequence of its use of shale gas, and particularly for the resulting upstream and midstream methane emissions, even though most of these emissions occur outside of New York State (3).

Aside from New York, two other states stipulate the use of GWP20 by law: California, which adopted GWP20 in 2016 (6), and Maryland, which adopted GWP20 in 2021 (7). In California, GWP20 for rulemaking was set when with the passage of California Senate Bill 1383 established short-lived climate pollutant (SLCP) emission targets. SLCPs include methane, black carbon, tropospheric ozone, and fluorinated gases. California's 2017 Short-Lived Climate Pollutant (SLCP) Reduction Strategy, which implements SB 1383 specifically "uses a 20-year GWP because the SLCP has greater climate impact in the near term compared to the longer-lived GHGs, such as $CO_2$." (6). As stated in the Bill Analysis for SB 1383 (8), the reason to focus on SLCPs, and thus use a GWP20, is as follows:

> "Because SLCPs remain in the atmosphere for a relatively short period of time, but have a much higher global warming potential than CO2, efforts aimed at reducing their emissions in their near term would result in more immediate climate, air quality, and public health benefits, than a strategy focused solely on $CO_2$. According to ARB's SLCP draft strategy, 'while the climate impacts of $CO_2$ reductions take decades or more to materialize, cutting emissions of SLCPs can immediately slow global warming and reduce the impacts of climate change.' Recent research estimates that SCLPs are responsible for about 40% of global warming to date and that actions to reduce SLCP emissions could cut the amount of warming that would occur over the next few decades by half."

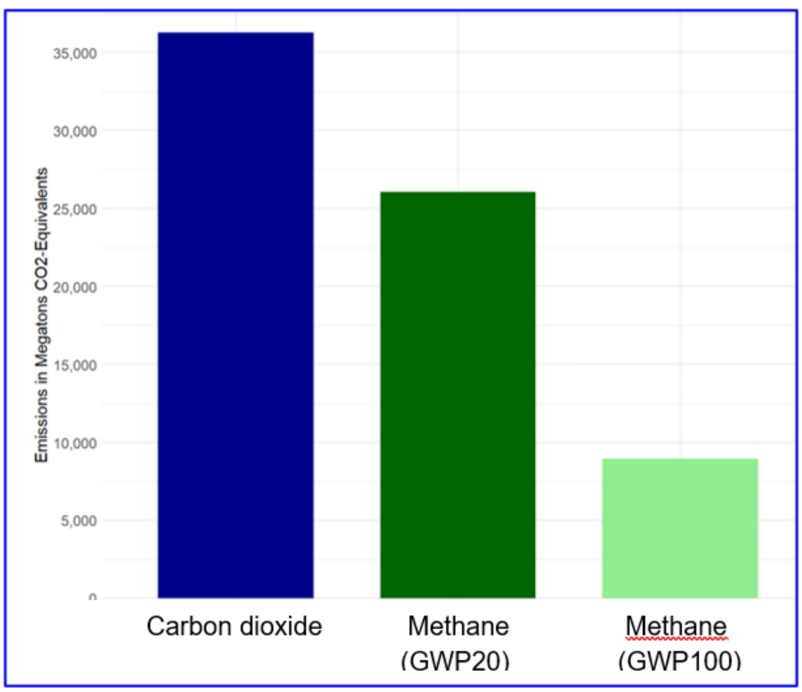
Aside from New York, California, and Maryland, all other states as well as the US federal government and other national governments use GWP100 rather than GWP20. However, this is an outdated policy choice, and not a choice based on science. As the IPCC AR5 synthesis stated in 2013, "there is no scientific argument for selecting 100 years compared with other choices… " (9). The GWP100 precedent is merely a legacy from the Kyoto Protocol of the early 1990s, and as we wrote in our recent letter to Governor Hochul:

> "The choice of GWP-100 by the Kyoto negotiators was not based on any specific recommendation from the IPCC. At the time in the early 1990s, the role of methane was under-appreciated by both scientists and policymakers, and negotiators chose the middle value from the early IPCC reports (i.e., GWP100), in part because at that time, catastrophic climate change was a relatively distant reality and most climate projections were looking out to the year 2100 – about 100 years in the future" (2).

In our letter, we argued for continuing to use GWP20 in New York and called for other states and nations to adopt this standard (2). Why? Because GWP100 severely understates methane's and other short-lived climate pollutants' roles in global warming over the past few decades and the role that SLCPs will play in warming over the next several decades. From our letter to the Governor:

"Of note, the latest IPCC report states that methane has contributed 0.5 °C (0.9 °F) of all warming and carbon dioxide 0.75 °C (1.4 °F) of all warming since the 1800s. That is, methane's contribution to global warming is equal to 67% of that of carbon dioxide since the start of the Industrial Revolution. If we brought the human-caused methane emissions rate to zero today, in less than 20 years, we would have reduced global warming from methane and $CO_2$ emissions by 40% – it would take over 100 years to do the same with an equivalent decrease in $CO_2$ emissions. The use of GWP-100 hugely underestimates this impact and suggests far less urgency to reduce methane emissions. GWP-20 far more effectively represents the historical importance of methane to global warming documented in the IPCC AR6 synthesis. On the significance of methane emissions, AR6 states: "Over time scales of 10 to 20 years, the global temperature response to a year's worth of current emissions of SLCFs [Short-Lived Climate Forcers] is at least as large as that due to a year's worth of $CO_2$ emissions (high confidence). Sectors producing the largest SLCF-induced warming are those dominated by methane emissions: fossil fuel production and distribution, agriculture and waste management (high confidence)" (2).

**Figure 1.**

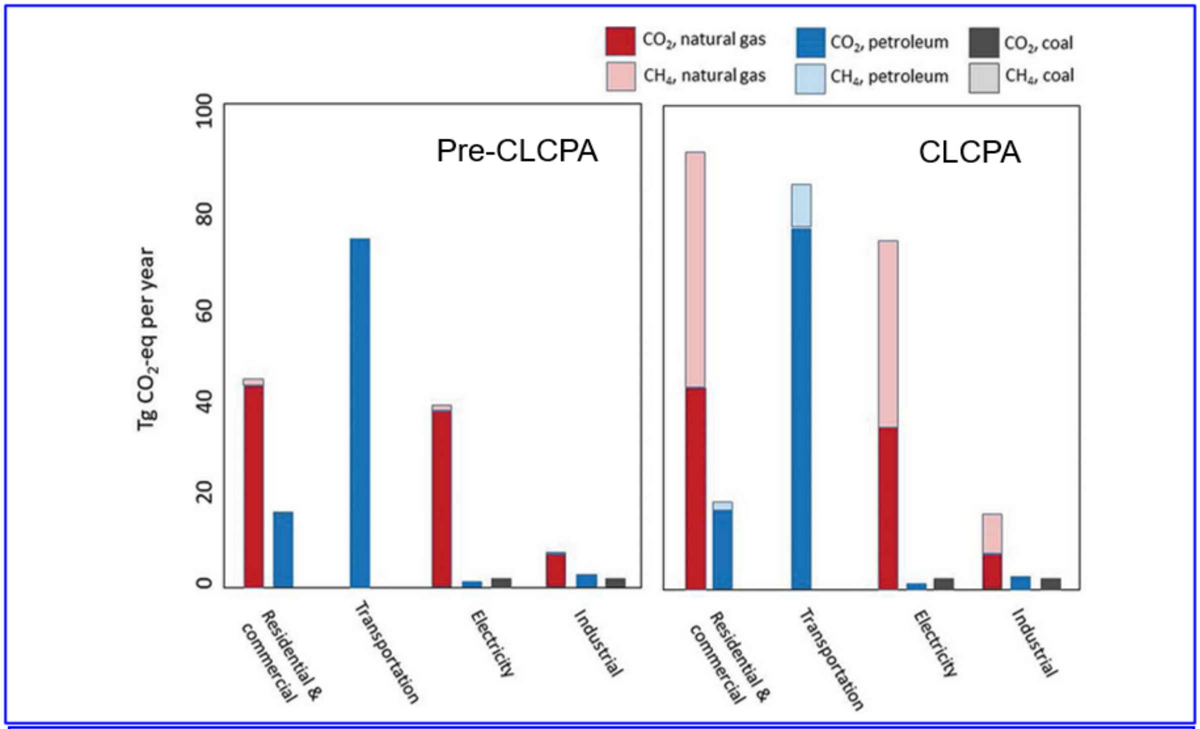



Reprinted from K. Mar (2024), Methane: A short-lived gas with far-reaching effects.

Figure 1 (left) compares current global emissions of $CO_2$ with current total global emissions of methane, with methane converted to $CO_2$-equivalents using both GWP20 and GWP100 (10). Consistent with California's 2017 SLCP Reduction Strategy, New York's use of GWP20 captures the urgency expressed in the IPCC AR6 synthesis report from 2022 for considering short-lived climate pollutants such as methane and black carbon, while the use of GWP100 does not.

Figure2 (below) compares the $CO_2$-equivalent emissions estimated for the State of New York using the new CLCPA approach (right) versus the pre-CLCPA approach (left) (3). In both cases, emissions are shown by economic sector and fuel type, including both $CO_2$ and methane for each fuel type. In the "pre-CLCPA" approach, methane is converted to CO2-equivalents using GWP100, and only emissions that physically occur within New York State are shown. In the CLCPA approach, methane is converted to CO2-equivalents using GWP20, and emissions occurring outside of the State are included if associated with fuel use within New York.

**Figure 2.**




**Reprinted from Howarth (2020), Methane emissions from fossil fuels: exploring recent changes in greenhouse-gas reporting requirements for the State of New York, *Journal of Integrative Environmental Sciences.* *https://www.tandfonline.com/doi/ref/10.1080/1943815X.2020.1789666?scroll=top***

Note that the methane emissions are hardly discernible in the "pre-CLPA" approach, and emissions are overwhelmingly dominated by $CO_2$. On the other hand, methane emissions are quite noticeable in the CLCPA approach, particularly for natural gas. Note further that the CLCPA approach highlights the emissions from residential and commercial buildings (3). When the New York Climate Action Council produced the Final Scoping Plan for the CLCPA in December 2022, they emphasized the need to reduce the use of natural gas in order meet the CLCPA climate goals (11). The Council is the group charged by law with developing the blueprint (called the "Scoping Plan") for implementing the CLCPA.

In his blog, Hausfather conclude by suggesting greenhouse gas inventories separately report emissions of $CO_2$ and methane (1). We agree in part, noting that this is already part of the requirement for greenhouse gas accounting under the CLCPA; see section 75-0105, part 1 (12). $CO_2$ and methane emissions are routinely reported separately. For example, emissions of methane and $CO_2$ are shown separately in the figure above for New York State. We also reported $CO_2$ and methane emissions separately in our lifecycle assessments (recently published in peer-reviewed journals) for "blue hydrogen" (13) and for the export of liquefied natural gas (LNG) from the US (14). See the table below from our paper on greenhouse gas emissions from LNG exports, in which methane emissions are presented both in terms of mass of methane per MJ of energy and methane converted to $CO_2$-equivalents per MJ of energy using GWP20. However, in his blog, Hausfather calls for simply showing methane emissions as mass of

HOWARTH SCI 4855

**TABLE 4** Greenhouse gas emissions for liquefied natural gas (LNG) exported from the United States compared with those for diesel oil and coal produced domestically near the final site of consumption.

| | Carbon dioxide g $CO_2$/MJ | Methane g $CH_4$/MJ | Methane g $CO_2$-equivalent/MJ | Total combined g $CO_2$-equivalent/MJ |
|---|---|---|---|---|
| Average for LNG | | | | |
| Upstream and midstream emissions | 15.5 | 0.73 | 60.1 | 75.6 |
| Liquefaction | 7.7 | 0.078 | 6.5 | 14.2 |
| Emissions from tanker | 4.9 | 0.053 | 4.4 | 9.3 |
| Final transmission and distribution | 0 | 0.066 | 5.4 | 5.4 |
| Combustion by final consumer | 55.0 | 0 | 0 | 55.0 |
| **Total** | **83.1** | **0.93** | **76.5** | **160** |
| Diesel oil | | | | |
| Upstream and transport emissions | 15.8 | 0.40 | 33.0 | 48.8 |
| Combustion by final consumer | 75.0 | 0 | 0 | 75.0 |
| **Total** | **90.8** | **0.40** | **33.0** | **123.8** |
| Coal used domestically | | | | |
| Upstream and transport emissions | 3.4 | 0.21 | 17.3 | 20.7 |
| Combustion by final consumer | 99.0 | 0 | 0 | 99.0 |
| **Total** | **102.4** | **0.21** | **17.3** | **119.7** |

*Note*: LNG estimates are the averages for the three scenarios shown in Table 2 for tankers that are fueled by LNG, using world-average voyage times (38 days). Methane emissions are shown both as mass of methane and mass of carbon-dioxide equivalents based on $GWP_{20}$. Values expressed per quantity of energy available from the fuel.

methane (1) rather than as $CO_2$-equivalent. We disagree with him on this. We believe common units for $CO_2$ and methane are essential for communicating the relative importance of each gas with respect to climate impact. For example, as shown in this table, switching from coal to LNG decreases $CO_2$ emissions by 19%, from 102.4 g $CO_2$/MJ to 83.1 g $CO_2$/MJ. However, methane emissions increase 4.4-fold when switching from coal to LNG, from 0.21 g methane/MJ to 0.93 g methane/MJ.

Without showing the methane emissions in $CO_2$-equivalents, the policy maker has no context for evaluating the overall consequences of using LNG vs coal. When methane emissions are expressed in $CO_2$-equivalents using GWP20, we see that total emissions – considered on the time scale of the next few decades – are much greater for LNG (160 g $CO_2$-eq/MJ) than for coal (119.7 g $CO_2$-eq/MJ). A common unit for $CO_2$ and methane emissions is necessary to communicate to policy makers the net effect of changes in emissions on the climate system. If the only policy interest were $CO_2$ emissions, then LNG would win out over coal because of lower $CO_2$ emissions. But when methane is considered as well, and particularly if the impacts of emissions on climate damage over the next several decades are of concern, then switching from coal to LNG will result in more climate damage over these coming decades.

Hausfather stated that the long-term trajectory of $CO_2$ in the atmosphere over coming centuries and beyond is paramount, and from that perspective he prioritizes reduction in $CO_2$ emissions over methane (1). We believe he is wrong. Global warming on the time scale of coming decades is critical to consider, as it threatens the stability and functioning of both human societies and natural ecosystems. Beyond this, though, global warming over the coming few decades may cross thresholds which could accelerate the accumulation of $CO_2$ in the atmosphere. Currently, roughly half of anthropogenic $CO_2$ emissions are taken up by the oceans and terrestrial biosphere. This may well change in the future, due to a variety of climate feedbacks. For instance, warming in the arctic and drying in the Amazon may well reduce carbon storage in these systems. And warming of the oceans and climate-induced slowing of ocean circulation may reduce carbon storage in the oceans. The precautionary principle suggests taking all actions necessary to reduce warming as quickly as possible, and that calls for rapidly reducing methane emissions.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