We give lots of lip service describing climate change as an emergency or existential threat. According to the Climate Emergency Declaration Organization, 2336 jurisdictions around the world have declared it to be an emergency, but we are not really acting like it. There are many possible emergency actions. I'm looking at 6 that could make a significant difference, are doable, but require real sacrifice and hard choices:

1. Ending financing of fossil fuel projects
2. Accelerating renewable siting on- and offshore
3. Fast tracking transmission
4. Requiring large-scale carbon capture
5. International agreement and focus on methane
6. Ending deforestation

Today, it's faster action on methane. (Here's Part 1, Part 2, and Part 3).

At CLEE, we are doing quite a bit of work to promote reduction of methane emissions from all sectors (agriculture (livestock and rice), energy (oil & gas and coal), waste (landfills and sewage)). The reason is simple: methane represents the best short-term opportunity to limit the impacts of anthropogenic warming. Methane has a comparatively short life in the atmosphere (about 12 years, as opposed to 100 years or more for CO2) and high potency (84 times stronger than CO2, averaged over 20 years). Thus, reducing methane emissions today can quickly and dramatically impact the trajectory of the climate crisis. Earth is now expected to breach the Paris Agreement's 1.5 °C "guardrail," after which irreversible climate cascades will become far more likely. But with rapid methane cuts, we could prevent up to 0.3 °C of warming by 2050. Methane forms when organic material decomposes in oxygen-free conditions (e.g., animal stomachs, shale gas formations, piles of food waste). Methane is primarily released by humans through agriculture, energy production, wastewater, and landfills.

California has established a suite of strategies that lead the world in their ambition and sophistication. These include the Landfill Methane Regulation, SLCP Reduction Strategy, 2022 Scoping Plan, and SB 1383. The latter policy requires a 40% reduction of methane emissions across all sectors by 2030. The rest of the world is starting to catch up. The EU and US sponsored the Global Methane Pledge, which now has 150 signatories worldwide. The Inflation Reduction Act includes significant penalties for methane emissions in the US from large-scale oil and gas operations as well as funding for closing leaking oil wells. These are encouraging

developments, but in an emergency, they are not enough.

Emergency Actions

First, the Global Methane Pledge has no requirements and is not enforceable. There should be a concerted effort to reach an international agreement for methane reduction, akin to the Kigali Amendment, which phases out another important greenhouse gas – hydrofluorocarbons — with emission reduction dates, enforcement, and funding and technical assistance to help countries meet the targets. Right now, there is insufficient international will to do this.

Second, oil companies should be required to fund plugging and closure of the tens of thousands of abandoned oil wells in the US and around the world to stop leaks and emissions. The oil industry has managed to avoid billions of dollars of liability whereby the major oil companies sell their old oil wells to undercapitalized companies that then abandon the wells and declare bankruptcy or otherwise dissolve, leaving emitting wells and cleanup costs to taxpayers. This is a massive subsidy to oil companies and a significant source of methane emissions. Right now, oil companies have political power sufficient to preclude a change in liability that would result in oil industry obligation.

Third, we need to speed research and testing on feed additives for cattle (such as red seaweed) to reduce enteric emissions, a very significant source of methane worldwide. Results have been promising and efforts need to be sped up. The same holds for methane emissions from rice cultivation, which accounts for 8 to 12 percent of worldwide methane emissions. Research in China and elsewhere (including at UC Davis) shows that methane emissions can be reduced significantly based on the timing and extent of field flooding and other techniques that could be adopted rapidly. Right now, research is under resourced.

Fourth, landfills account for about 15 percent of methane emissions, although that may be an underestimate because measuring and monitoring is surprisingly limited. Virtually every jurisdiction in the world has landfills, and methane emissions can be reduced through multiple strategies, including some that result in minimal cost (such as biocovers). Action to reduce landfill emissions should be dramatically escalated. Right now, we lack some important measurement and monitoring data, but that could be changing.

Fifth, coal mine methane is a large source, particularly in China. It can also be

captured and used far more effectively than is currently the case. Methane escapes from closed mines as well as operating mines, so coal mine methane capture needs to be part of a no-coal future. A much greater level of capture from coal mines could be instituted quickly. Right now, there is insufficient will to institute the needed controls at coal mines.

With the launch of multiple methane detection satellites scheduled over the next few months, methane emissions data will expand rapidly. Now is the time to accelerate action and ambition with a sense of urgency. Actions reflecting a sense of emergency should include:

- Concerted effort towards an international agreement for specified methane emissions reductions, technical assistance, methane action plans, and institutional support
- Industry funding and contracting for plugging and closure of orphan wells
- 80% reduction of oil and gas emissions by 2030 worldwide (either as part of international agreement or independently)
- Capture high percentage of methane emissions from coal mines by 2028 (either as part of international agreement or independently)
- Acceleration of research on livestock feed additives and rice cultivation actions
- Worldwide focus on measuring, monitoring, and reducing landfill emissions
- Protocol for satellite leak detection data to be provided to leaking facility and for follow-up action by jurisdiction

These initiative require actions across multiple sectors and multiple actors. Some are more immediately viable than others. For example, the International Energy Agency identifies emissions from both coal mining and oil and gas operations as the most achievable in a short time period. But we need action across all methane sectors and an institutional commitment among jurisdictions around the world. The climate change emergency response need not be frantic, at least not until climate change impacts become even more acute.

Next time: ending deforestation.