

A MAXIMUM SPEED GLOBAL CLIMATE RESCUE PLAN

January 19, 2024

*We are
unwilling “to
be plunged
into the abyss
of despair.”*

Martin Luther King Jr.
“Letter from Birmingham Jail”
(paraphrase)



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EXECUTIVE SUMMARY

As the nation and world experience climate impacts of increasing frequency and ferocity one question has become central and urgent. How quickly can we execute a maximum speed global climate rescue plan? And what would be the impact on global temperature and other key metrics of such a maximum speed transformation? Climate North Star is a proposal that answers these questions in a scientifically grounded way.

Climate North Star demonstrates what a global cessation of fossil fuel burning and transformed forest and agricultural practices, all pursued at maximum speed, could yield in terms of reduced:



Carbon emissions



Global average temperature



Atmospheric CO₂ levels



Sea level rise

The 1.5 degrees Celsius Paris Agreement temperature target is the most pervasive metric in the public climate conversation. Therefore, we think that global average temperature, currently at 1.2 degrees Celsius above pre-industrial levels, should be the primary metric to track progress in that conversation.

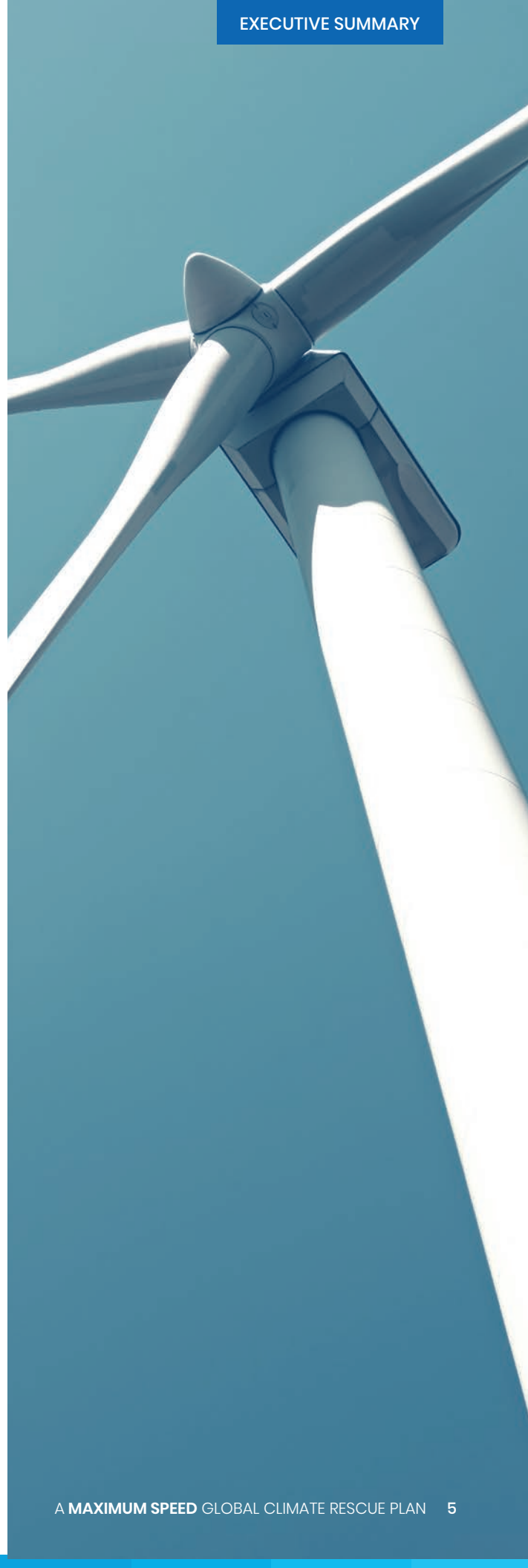
The Climate North Star goal is to reduce global temperature to as close to 0.5 degrees Celsius above pre-industrial levels as rapidly as possible and no later than 2100.

Climate North Star was inspired by a landmark paper published by Dr. James Hansen and colleagues in 2017, entitled “Young People’s Burden: Requirement of Negative CO₂ Emissions.” That paper’s finding was that the safe long-term global warming temperature is 0.5 degrees Celsius above pre-industrial levels, last observed on Earth in 1985. This temperature, called the Holocene Maximum, is what allowed cities to be built on coastlines around the world. A “safe” temperature in this report is one that would prevent multi-meter sea level rise, which would flood coastal cities, and could lead to the collapse of society, an impact aptly referred to by some as the “world-killer.”

Isn’t 1.5 degrees Celsius a safe long-term temperature? No, it is not. The 1.5 C target is the product of political—not scientific—deliberation. Some have defended a 1.5 degrees C warming goal because a 1.5 C rise would yield less devastating impacts than a 2 C rise. This is hardly a momentous revelation. And it is critical to understand that a long-term temperature of 1.5 degrees C global warming would be catastrophic. After the summer of 2023 that should surprise no one. Even our current 1.2 degrees C above pre-industrial levels is clearly too high as a long-term global average temperature.

KEY FINDINGS

- The 1.5 Celsius above pre-industrial temperature target of the Paris climate agreement is not based on science, but was the result of political calculations. It is not a safe long-term temperature. A safe long-term temperature is 0.5 Celsius, last experienced on earth in 1985. That is the temperature limit that allowed humanity to build cities on coastlines around the world.
- Climate North Star is designed to prevent the collapse of the ice sheets on Antarctica and Greenland. If they did collapse, coastal cities worldwide would be flooded, likely causing in turn the collapse of the global economy and society.
- Implementing the maximum Climate North Star recommendations would cause further warming of the planet to stop no later than 2035. Cooling will then be necessary as the last time Earth was this warm sea levels were 20-30 feet higher than today. The Climate North Star plan would yield a 0.8 Celsius global average temperature by 2100.
- Implementing the Climate North Star plan would yield 2100 sea levels 5 inches below the most aggressive IPCC scenario, returning in a few centuries to pre-industrial conditions.
- It is essential that the well-being of fossil fuel workers be centered in the energy transition proposed in Climate North Star.



Reaching the Climate North Star temperature goal entails the following:

- Achieving global all-sector 100% renewable energy by 2035.
- Transforming global forestry practices at maximum speed to reduce the release of, and sequester, carbon in Earth's forests and store it long term. (*Unless indicated otherwise, we use carbon as the unit of measurement, not CO₂. To convert the carbon figures to CO₂ multiply the carbon figure by 3.67. To convert the CO₂ figures to carbon divide by 3.67*)
- Transforming global agricultural practices at maximum speed to reduce the release of, and sequester, carbon in agricultural soils around the planet.
- Although not quantified in this paper, Climate North Star advocates reductions in personal consumption and waste generation by wealthy countries and individuals. This would function as a carbon reduction accelerator, especially in the years before reaching the 2035 target of global 100% renewable energy.

WHY THE 'ALMOST IMPOSSIBLE' CLIMATE NORTH STAR GOAL IS NEEDED

Undoubtedly achieving a global 100% renewable energy system by 2035 will appear almost impossible to many. 'Almost impossible' we believe is the sweet spot of ambition and feasibility. If it doesn't seem almost impossible then clearly we need to increase ambition. Any plan to effectively address global warming at this late hour would, of course, seem almost impossible. The most distressing thought is not how daunting the task we face is; a far worse thought would be not reaching the 2035 goal and realizing the climate emergency has moved beyond human capacity to impact. Therefore, the scientifically-informed moral commitment must be to execute the global climate rescue as rapidly as possible.

CLIMATE NORTH STAR IS AN EMERGENCY-LEVEL RESPONSE TO THE CLIMATE THREAT

Passage of the Inflation Reduction Act, despite many strong provisions, in no way represents a maximum speed climate rescue in the United States, much less the entire planet, especially as the U.S. continues to approve new fossil fuel projects.

The recommendations in Climate North Star make sense only if we are executing a comprehensive climate emergency response. There are things one would do in an emergency that would never be considered under normal circumstances. Certainly threatening the livability of Earth qualifies as an emergency.

It is a situation that cries out for federal government leadership not only to achieve a maximum speed carbon transition here but around the world as well. The most obvious historical parallel is the U.S. World War II industrial mobilization, supported by both business interests and labor. This maximum speed transformation was carefully planned and executed under federal leadership in order to achieve maximal industrial production while supporting workers and preventing an economic collapse. It was wildly successful.

CLIMATE NORTH STAR THROUGH A CLIMATE JUSTICE LENS

This report, and many being released at this critical time, are stuck in an awkward position. They seek to address the climate crisis at a scale necessary to avoid immense human suffering and other dire consequences of continued inaction for all living beings. All the while, it hopes to achieve these ends in a way consistent with the recent influx of calls for Climate Justice.

It is important to note that the concept of Climate Justice isn't some new tagline we can just apply to a more people-centric approach to mainstream environmentalism. It's the result of decades of organizing within environmental justice communities – continuing centuries of resistance to slavery, genocide, and colonization – that have already endured immense amounts of suffering at the hands of globalized, extractive economies.

The terminology of that movement, including Climate Justice and Just Transition, has increasingly been co-opted by mainstream environmentalists, politicians, and corporations to make their work appear more aligned with the needs and desires of the social movements that demand we do better as a society. Their actions, however, continue to show they're committed to maintaining a status quo that picks and chooses communities as collateral damage.

As objective, scientifically-based approaches to addressing the climate crisis, the ideas laid out in this report have not thoroughly considered the real-time impacts of implementing this plan on people, and in particular, the communities most impacted by the societal and industrial practices of extraction that got us here in the first place.

To be clear, there are contradictions between what is being proposed in this report and what the Climate Justice movement is advocating for and fighting against. To name a couple of main points to consider:

- Since the Climate Justice movement is about systemic change, any proposal that does not actively extricate power, capital, and resources from the dominant extractive system in the pursuit of building entirely new (or reinforcing old) ways of being that ensure the needs of people and the planet are put before the economy, it likely isn't aligned with the movement.
- Climate Justice also demands leadership of and accountability to the communities most impacted by the climate crisis and the world-view of extraction (of fossil fuels, but also labor and wealth) that brought us to this precipice; and also regarding proposed plans to solve the problems we face. As mere messengers – since we are not the only ones who will put this proposal into practice – we can't guarantee how this work will manifest after it's put out into the world.

For all these reasons, we hope this is the beginning of a conversation with the Climate Justice movement to see if there is any way that we can ensure what is being proposed here can be in alignment with the work you are doing.



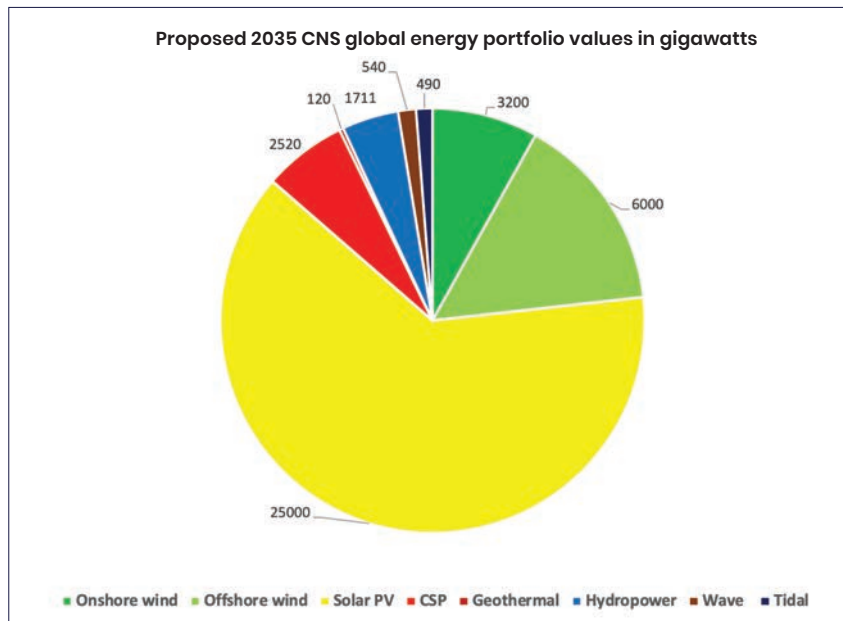
I am inserting this section into the paper you're reading so that every single person working to advance the Climate North Star (CNS) proposal cannot look back and say "I didn't know any better." A section on the importance of Climate Justice is included to give those less familiar with the concept an opportunity to deepen their understanding and because we believe at this point that incorporating a Climate Justice approach in everything we do is the best way to reduce harm – not just in the future – but for those already living through climate chaos and the extractive economy that needs to end.

The Climate North Star Vision Rests on Four Pillars

PILLAR 01

TRANSITION TO GLOBAL ALL-SECTOR 100% RENEWABLE ENERGY BY 2035

Proposed 2035 Climate North Star Global Energy Portfolio



Climate North Star is undergirded by a scientifically informed moral imperative to carry out a maximum speed global climate rescue plan.

The faster we decarbonize the less destruction, suffering, death and risk of triggering increasingly catastrophic impacts.

Mark Jacobson, director of Stanford University's Atmosphere/Energy program and some of the world's leading wholesale energy transition researchers have concluded that achieving global 100% renewable energy for all purposes by 2035 is technically and economically feasible. The estimated global capital investment would be US\$ 62 trillion. Over a 12 year period from 2023-2035 this would be approximately US\$ 5 trillion per year out of an approximately US\$ 100 trillion global GDP. The investment would be paid back in under six years from energy savings and under one year if social and environmental costs are included. (Energy&Environ. Sci., 2022, 15, 3343)

As climate impacts increase and intensify there is a growing sense that catastrophic global warming is everywhere now, perhaps captured most succinctly by July 2023 being the hottest month ever recorded on planet Earth.

Fortunately, our planet is blessed with an embarrassment of riches of renewable energy. The total annual solar radiation over the Earth's surface is greater than 5800 times the total global energy consumption by humans of 580 exajoules.

The fraction for 'solar PV' in our proposed 2035 portfolio is enormous; this would be a mixture of utility solar PV/non-agricultural, utility solar PV located on brownfields, floating utility solar PV, rooftop solar PV and parking lot solar PV.

High PV solar potential countries have a seasonality index below 2 and PV Output exceeds 3.5 kWh/kWpeak installed. Research shows that 86% of the global population lives in countries where these standards are met.

Additional resources proposed for the 2035 global energy portfolio are concentrated solar power, onshore and offshore wind, hydropower, geothermal power, and wave/tidal power.



PILLAR 02

IMPLEMENT GLOBAL CLIMATE-RESPONSIBLE FORESTRY PRACTICES AS RAPIDLY AS POSSIBLE

Forests are the most effective terrestrial carbon sinks on the planet and hold great promise for boosting the carbon transition but urgent steps must be taken now, the first of which is preserving unlogged forests, especially old growth and mature trees. Significantly, Climate North Star proposes natural carbon reservoirs and not the hugely problematic artificial carbon sinks that some IPCC scenarios rely upon for carbon reduction projections.

Climate North Star forestry recommendations



PROTECT THE STOCKS

In primary (unlogged) forests, especially mature-old growth forests and trees (most important) by ending deforestation and forest degradation. To maximize mitigation potential, deforestation and forest degradation would need to end now in the U.S., Canada and all other developed countries, and by 2030 globally, and forests protected for biodiversity and carbon at least tripled with half Earth protected by 2050.



PROFORESTATION

Allow degraded forests time to reacquire stocks by reaching maturity.



AFFORESTATION

Planting trees (preferably natives) on suitable fallowed fields.



REFORESTATION

(preferably natives) on cutover lands where needed.

The four pathways are all important in aggregate, however, protecting primary and older forests needs to be the top priority implemented in lock-step with getting off fossil fuels.

Protecting primary forests is the only effective carbon capture and storage approach that will work at scale immediately.

PILLAR 03

IMPLEMENT GLOBAL REGENERATIVE ORGANIC AGRICULTURE PRACTICES AS RAPIDLY AS POSSIBLE

Native Americans farmed in some parts of North America for 3,000–4,000 years prior to Euro-colonization. There is good evidence that many soils in the Midwest U.S. now, on average, store 46% of their carbon sequestration capacity compared to pre-European levels.

Global potential for sequestering carbon in agricultural soils is about 24 gigatons total, which is equivalent to approximately 2.5 years of energy related carbon emissions.

Climate change itself will have relatively minor effects on soil organic carbon in agricultural soils compared to changes in management practices, including the following:

5 PRINCIPLES OF SOIL HEALTH

Adapted from USDA Natural Resource Conservation Service

SOIL ARMOR	MINIMIZE DISTURBANCE	PLANT DIVERSITY	CONTINUAL PLANT/ROOT (PERENNIALITY)	LIVESTOCK INTEGRATION
Cover crops	Reduced tillage	Cover crop mixtures	Cover crops	Grazing cover crops
Residue	Lower compaction	Crop rotations	Perennial crops	Seed pastures in rotation
Reduced tillage	(controlled traffic)	Intercropping	Relay cropping	Adding manure
CRP (Conservation Reserve Program) or prairie strips	CRP or prairie Strips	CRP or prairie strips	CRP or prairie strips	



A “Regenerative Organic Agriculture” standard is possible, but will have to include scientific consensus and international government involvement. Standardization and third-party verification is also needed.

PILLAR 04

REDUCE PERSONAL CONSUMPTION & WASTE

Wealth is a key driver of climate change and reducing waste is a key climate solution. Due to the complexities of measuring personal consumption and waste management activities across the globe, this section is not quantified and therefore will not be part of the calculations to determine the Climate North Star impacts on carbon emissions, atmospheric CO₂ levels, global temperature and sea level rise described in the synthesis section of this paper.

But consider this: the Intergovernmental Panel on Climate Change (IPCC) has identified wealth as a key driver of energy demand¹. And this: the U.S. Environmental Protection Agency has suggested consumption accounts for 50% of U.S. greenhouse gas emissions². For those reasons, this section is designed to illuminate the connection between huge disparities in wealth, personal consumption, and waste generation in order to inspire a more frugal and consumption-conscious lifestyle.

A review of available global per capita energy use and waste data tracks with global wealth disparity largely on a nation-by-nation basis. On the one hand, Figure 1 shows the global average per capita amount of energy used in gigajoules per year (gj/a) for the residents of the world's wealthiest and poorest nations³. On the other hand, Figure 2 shows the same per capita breakdown for waste generation⁴. In both cases, the wealthy reign and American exceptionalism is on display: Per capita energy use in the U.S. is four times the global average and waste generation is three times the global average.

Figure 1. Comparing Per Capita Energy Use – 2017/2018

Average amount of energy used per capita in gigajoules per year (gj/a)

Per Capita Grouping	gj/a
United States	325
Wealthy Nations	210
Global average	80
Poor Nations	20

source: eia.gov

Figure 2. Comparing Per Capita Waste Generation

Per Capita Grouping	lbs/day
United States	4.9
Wealthy Nations	3.5
Global average	1.6
Poor Nations	0.9

source: worldbank.org

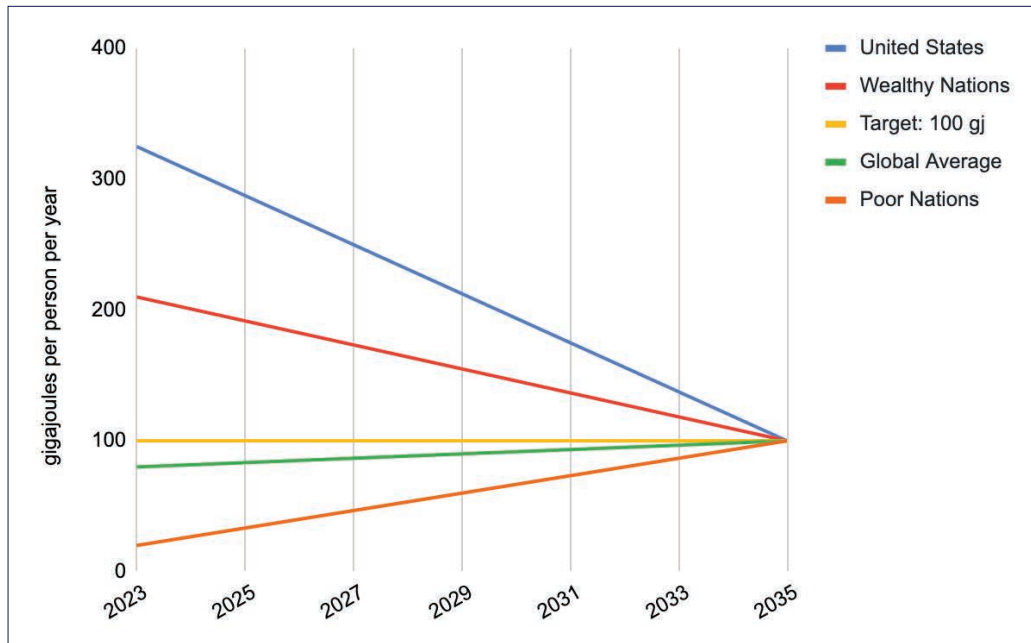
1. <https://www.ipcc.ch/sr15/>

2. U.S. EPA. (2009). Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices. https://archive.epa.gov/greenbuilding/web/pdf/ghg_land_and_materials_management.pdf

3. EIA data for energy consumption in wealthy countries (United States, Canada, United Kingdom, Italy, Germany, Japan, New Zealand, Australia, Luxembourg, Belgium, Austria, Switzerland, France, Denmark, the Netherlands, Finland, Sweden, Norway, Spain, Portugal, Israel, Ireland, and Iceland) and poor countries (Democratic Republic of Congo, Mozambique, Uganda, Tajikistan, Yemen, Haiti, Ethiopia, Tanzania, Kyrgyzstan, Uzbekistan, Zambia, Pakistan, Myanmar, Cambodia, Bangladesh, Cote d'Ivoire, Kenya, Nicaragua, India, Nigeria, Ghana, Vietnam, and Honduras) accessed via https://en.wikipedia.org/wiki/List_of_countries_by_energy_consumption_per_capita

4. World Bank. (2018). What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. <http://hdl.handle.net/10986/30317>

We propose a roughly fair global per capita energy use target would be 100 gj/a. While we do not suggest a global per capita waste generation target, waste generation data suggest that wealthy nations could curb consumption and adopt Zero Waste policies, programs, and practices that would reduce waste and cut related emissions.



Reducing personal levels of consumption and waste is not a substitute for engaging in political action to address system wide challenges, which we desperately need right now. However, while most elected officials would consider addressing wealth disparity to be politically unfeasible, Zero Waste policies, programs, and infrastructure have gained traction across the globe for their support of local economies, environmental justice, and resource conservation while helping reduce consumption-related emissions.

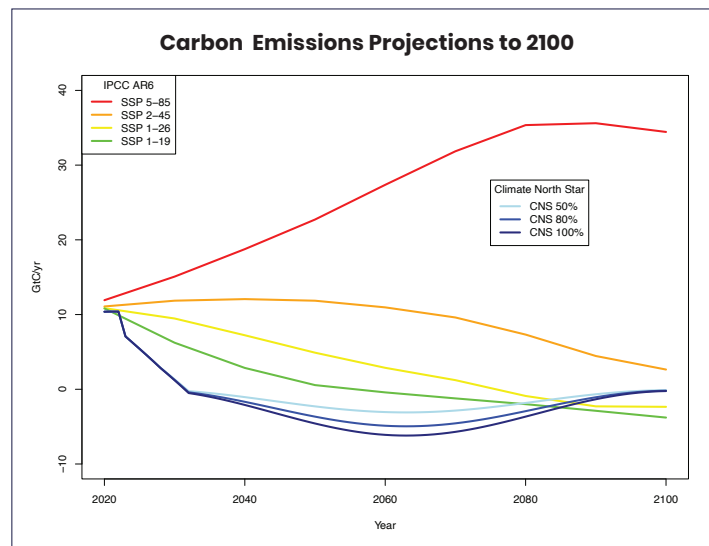
CLIMATE NORTH STAR

SYNTHESIS IMPACTS

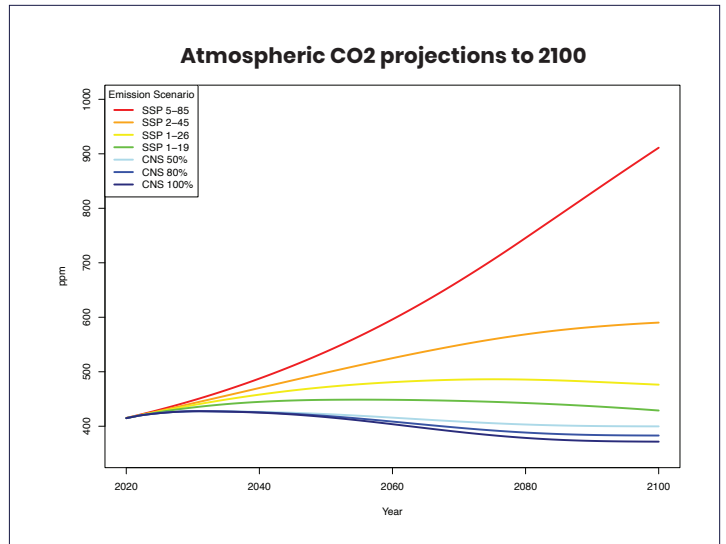
Climate North Star projects impacts on global carbon emissions, atmospheric CO² levels, global temperature and sea level rise from implementing the recommended fossil fuel emissions reductions and changes in forestry and agricultural practices.

There are three different Climate North Star scenarios projected for each of these metrics differentiated by percentage implementation of transformed forest and agricultural practices (50%/80%/100%). The fossil fuel phase-out schedule is the same for all three scenarios.

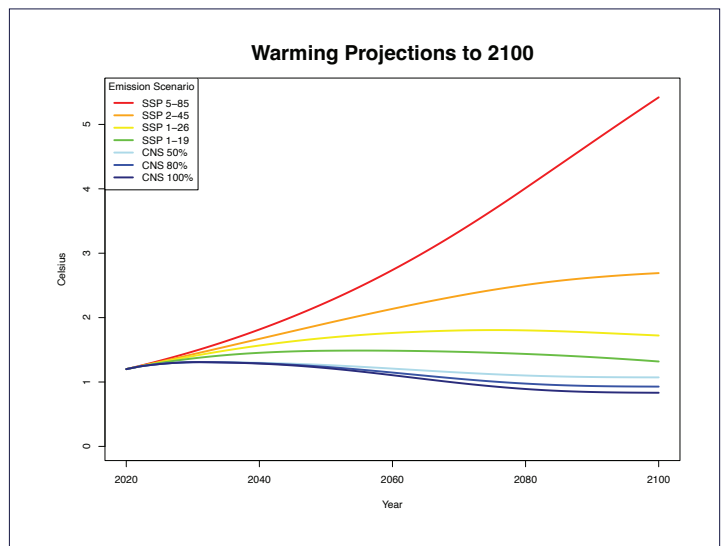
We call for emissions from fossil fuel combustion to fall to zero in 2035 in conjunction with land-use transformation. This impacts total carbon emissions at three different levels depending on the degree of land-use changes.



Atmospheric CO₂ levels peak at 428 ppm in 2030 in all three CNS scenarios and drops to as low as 372 ppm in 2100 under the CNS 100% scenario.



Global temperature in all three CNS scenarios peaks around 2031 at 1.3 Celsius and falls to 1.0, 0.9, or 0.8 C by 2100 depending on the degree of land use changes.



CNS 100% 2100 sea level rise is 5 inches less than the most aggressive IPCC scenario of 22 inches (here graphed in meters)

