THE CLIMATE MOBILIZATION

VICTORY PLAN

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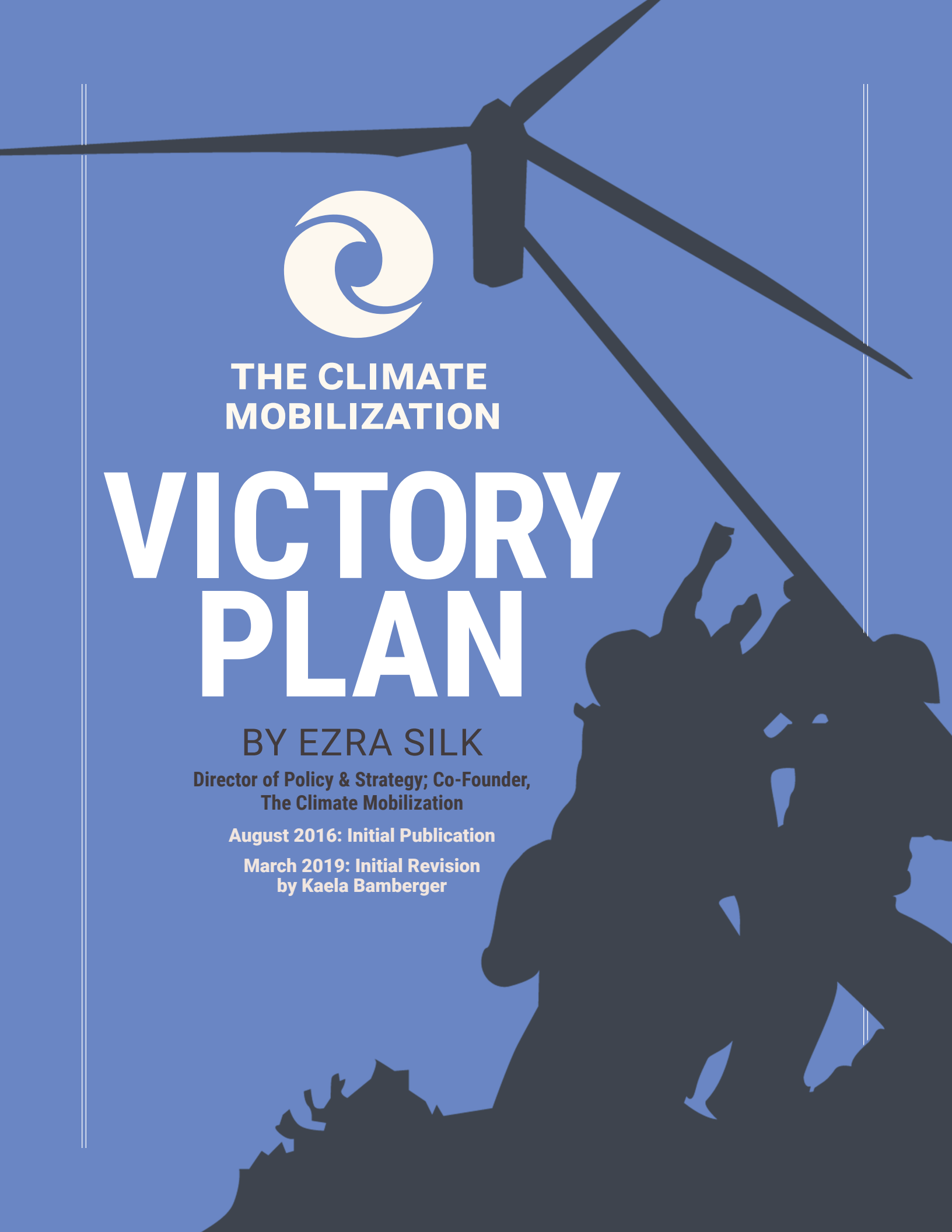

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FOREWORD

By Paul Gilding

For many years, a small number of scientists, scholars and activists have called for a WWII-scale mobilization to save civilization from climate catastrophe — an all-out effort far beyond anything proposed in today's polite debates. This year, the idea has started to build serious momentum, with new advocates like Bill McKibben and Bernie Sanders and the adoption by the Democratic Party in the U.S. of the call for an emergency climate mobilization.

As mobilization starts to break into the mainstream, it is imperative that we discuss the specifics of this effort. In 2009, I co-authored, with Professor Jorgen Randers, the **"One Degree War Plan"** — a global and less comprehensive overview of the concept described herein. The One Degree War Plan showed we can realistically slash global greenhouse gas emissions to net zero in 20 years and then restore a safe climate through a carbon dioxide drawdown effort.

While it's very positive that people are now signing on to the concept, it is critical that such a response be based on what the science demands. The hard truth is the climate has deteriorated significantly since 2009 and this appears to be now accelerating. There is no time left for multi-decade transition scenarios. At this late hour targets based around 2050, or calls for only zero emissions (without drawdown and cooling), are clearly not sufficient. They risk an unthinkable defeat by putting off the very concrete steps we need today. That is why I am so pleased that The Climate Mobilization has written this Victory Plan. It tangibly demonstrates how the U.S. could eliminate net greenhouse gas emissions by 2025, contribute to a global effort to restore a safe climate and reverse ecological overshoot through a massive WWII-scale mobilization.

It's important to understand what this means. WWII-scale climate mobilization is not just "a big effort." It is not a major project or a key policy initiative like the Apollo Program or even the New Deal. It is a comprehensive, economy-wide approach that, if done correctly, represents the only realistic way we can overcome the climate emergency. The mobilization called for in the "Victory Plan" is powerful and sweeping enough to provide effective protection in the face of civilization-threatening climate disruption. It is firmly based in the most advanced climate science, and offers an extensive overview of the poli-

cies necessary to be implemented in every sector. It may not have every measure right and it will further evolve as society researches and develops the plan, but it provides a clear and practical sense of what such an approach would really look and feel like. It shows us how we can win the war to save civilization.

When I published the "One Degree War Plan" in 2009, the very notion of action on this scale and in this style was dismissed. It was considered an interesting — almost entertaining — thought experiment. In the years since, people are slowly coming around to the idea. Whether motivated by the European refugee crisis, extreme weather events, global temperature records being smashed or just the mounting total weight of the evidence, they are coming to accept that not only is such a response necessary, it is also now conceivable.

Nevertheless, while you're reading this plan many thoughts will occur to you, as your mind tries to reconcile the huge gap between what you read is needed and today's reality. You will consider how "unrealistic" it is, how you "can't imagine" political leaders acting in this way or how the incumbent business community "will never accept" this level of economic transformation. Before that process begins, I'd like to establish one idea very clearly in your thinking:

A mobilization on this scale is the *only* rational response to the level of economic, security and social risks posed by climate change. Anyone who looks at the evidence objectively would conclude that — and historians will look back and wonder why it took us so long to accept it. So be clear — a mobilization on this scale is simply inevitable, with the only question being when we get started.

Hard to imagine? Yes, it is.

But before you go there, you have to imagine the alternative. Without this response, we will see a descent through cascading climate change induced crises with military conflict, accelerating costs, massive refugee flows, nations collapsing and global food crises as the world spirals down into economic and social collapse. This would inevitably require heavy government intervention and quite probably authoritarian rule to manage.

With that prospect unfolding, do you really think we will stand by and do nothing but observe and talk about the difficulty of acting? Now *that* is "unrealistic" and *that* I really "can't imagine."

As people come to accept this is the binary choice we face, we are getting closer to mobilization each day. I've seen the climate change response evolve steadily since the late 1980's — first from the vantage point of Executive Director of Greenpeace International and since then travelling the world as an author and speaker, alongside my work with the leaders of large global corporations on their strategic approach to sustainability. The response has never evolved faster than in the past few years.

Two recent developments illustrate the growing momentum:

In late July, the Democratic Party voted overwhelmingly to adopt mobilization language in its official platform. The platform declares a "global climate emergency," and commits to "a national mobilization, and to leading a global effort to mobilize nations to address

this threat on a scale not seen since World War II." This is an important moment — not because this guarantees that the next Democratic President will launch such a mobilization — but because it brings the idea into the mainstream debate and creates a foundation for future advocacy of the approach.

Then Bill McKibben, the leading voice of the American climate movement, published a **full-throated call for WWII-scale climate mobilization,** in which he states: "We're under attack from climate change—and our only hope is to mobilize like we did in WWII."

With the concept gaining acceptance, many ask, what will be the trigger for action? Some believe we must wait for a "Climate Pearl Harbour" moment to initiate a WWII-scale mobilization. My study of history challenges this. The lessons of issues like civil rights, emancipation of woman and the end of slavery remind us that shifts of this scale don't happen overnight. They evolve, unsteadily — pushed forward by a growing movement of dedicated supporters — before they achieve a symbolic moment that creates change. But those moments, like the bombing of Pearl Harbour or the march in Selma, Alabama — are just that, symbolic events creating political moments that allow society to shift. They are not the *cause* of the response but rather a spike in an ongoing and evolving process.

That's why I am a big supporter of the work of the Climate Mobilization (TCM) and was so pleased to contribute to this document. It is always on the edges of the mainstream that such big ideas begin. While people like me write papers and books putting ideas into society, it takes an active movement, like the one TCM is working to build, to bring ideas to reality. In its two short years of existence, The Climate Mobilization has achieved impressive progress in bringing the need for WWII-scale climate mobilization into the mainstream.

Of course we still have a huge amount to accomplish before we really get to work. So I'd like to close by discussing how The Climate Mobilization, and the broader climate emergency movement can build the support necessary to make this mobilization a reality.

Those deeply concerned about climate risk should naturally be supportive of the dramatic approach outlined in this paper. After all, if you believe as I do, that climate change poses an existential threat to civilization, then the potential for a response like that described here comes as a great relief. We can still fix this! And here is a roadmap for how. However, there is a different reason to support the approach, and a different audience for the argument. And this is the key idea I want to leave you with.

A full-scale economic transformation driven by the urgency of climate change is very different from WWII in a profound way — one that means we can build allies for this cause in new and important places.

The WWII mobilization was launched in the face of tragedy and required enormous sacrifices in human life, economic cost and quality of life to respond. It was a deliberate but necessary tragedy to avoid a far worse tragedy.

A climate mobilization, by contrast, could result in enormous reductions in the loss of life, huge economic benefits including innovation, technology and massive job creation

and all while leaving us with a much better quality of life. And it will do so with exciting new technologies like electric cars and batteries that engage and enthuse people. It will leave our energy costs lower and supplies more secure, our cities cleaner, more people employed, our health improved and our world more united by common purpose.

Common purpose is key. People who lived through WWII on the home front — so weren't at the front line facing the human tragedy — speak almost fondly of the time. The sense of unifying purpose, the community working together to face down and overcome a frightening external threat, the shift in culture from self-focus and consumerism to collective focus and purpose, left them feeling their lives were better, happier and more worthwhile.

This crucial difference can significantly impact the arguments used — and the potential allies for — a full-scale climate mobilization.

The global economy is in deep and serious trouble. Growth in the current model is grinding to a halt. Inequality and the lack of progress of the Western middle class has laid the foundation for political extremism, xenophobia and isolationism. It has thus brought us phenomena like Trump, Brexit and other political movements that further threaten the global economy. Policies to address this sluggish growth have led to both increased financial system risks and an enormous debt load — one there is no realistic way to pay back, just because growth is so sluggish. The resulting instability forms the shaky foundation on which the impacts of uncontrolled climate change will land — creating an economic and social crisis that will likely tip the system over the edge.

The elites and policy makers are wringing their hands in despair. They broadly agree on the problems but have no serious solutions to propose, except more of the same failed trickle-down economics. In this context, a climate mobilization along the lines outlined in this paper provides a far smarter way forward and the basis for building a serious alliance between those concerned about economic and political stability, those who are inspired by the technology and business opportunities and those concerned about climate change.

So as you read this paper, recognise that the scientific and economic evidence of the risks posed by climate change demands nothing less than what is proposed here. It is, by itself, well justified. But also recognise that the approach could quite reasonably be seen as a mobilization to save the economy — and frankly it's the best idea we have to do so.

I commend Ezra and The Climate Mobilization for their courage in taking up this cause and I hope all who read this will join us to help make that cause a reality.

Paul Gilding is the author of "The Great Disruption: How the Climate Crisis will Bring On the End of Shopping and the Birth of a New World" (2011), co-author of "The One Degree War Plan" (2009) with Jorgen Randers, and former executive director of Greenpeace International. Paul is a Fellow at the University of Cambridge's Institute for Sustainability Leadership. See Paul's recent writing at ***www.paulgilding.com.***

PREFACE

By Margaret Klein Salamon

The Climate Mobilization (TCM) is a rapidly growing grassroots movement that demands a WWII-scale climate mobilization to protect America, civilization and the natural world. Humanity is careening towards climate catastrophe, but there is hope in mobilization: The United States has the capacity to end net greenhouse gas emissions by 2025 and, by making global zero emissions our top foreign policy priority, to save billions of lives here and abroad, all while creating full employment and beginning to remove excess carbon dioxide from the atmosphere.

Many people in the climate movement, and many outside of it, recognize that these extremely ambitious targets are scientifically necessary. However, TCM is often challenged regarding whether our demands are feasible. The Climate Mobilization and the Climate Mobilization Project (our 501(c)(3) affiliate) commissioned this Victory Plan to address that challenge on the policy level, presenting a vision of how a mobilization, if implemented successfully and with care, could effectively protect humanity and all life on earth from the cataclysm we are hurtling towards.

There is also the formidable challenge of creating the political will for these changes. While the concept of climate mobilization has recently entered the mainstream political conversation — embraced by both the **Democratic Party** and by **Bill McKibben,** probably the most admired leader of the global climate movement — we as a movement are still far from achieving mobilization. There is still a huge amount of organizing, educating and evangelizing that needs to be done. Strategies for breaking through society's trance of denial and achieving climate mobilization are addressed in my papers, **Leading the Public into Emergency Mode: A New Strategy for the Climate Movement** and **The Transformative Power of Climate Truth.**

The Victory Plan takes its name and inspiration from the Victory Plan that the United States used to win World War II. It guided industrial production planning during the mobilization. According to historian Charles Kirkpatrick, "The Victory Plan predicted the future organization for an army that did not yet exist, outlined combat missions for a war not yet declared, and computed war production requirements for industries that were still

committed to peacetime manufacture."[1]

The Climate Mobilization Victory Plan was written by Ezra Silk, the co-founder and strategic director of TCM. Before Ezra started working full time to prevent the collapse of civilization, he was a newspaper reporter. Ezra applied his investigative powers to the task at hand, immersing himself in the relevant literature, consulting with experts across fields, gaining an incredibly detailed understanding of the various issues and policy proposals at hand. Appendix A lists the works cited. Ezra synthesized that understanding into this policy framework. This paper builds on climate mobilization plans created by others such as Paul Gilding, Lester Brown and Michael Hoexter, but it brings a level of specificity and comprehensiveness that is, to my knowledge, totally unique.

This Victory Plan relies heavily on lessons from World War II, when America successfully launched a rapid and extraordinary mobilization to fight a global war on two fronts and deployed an overwhelming supply of arms to its allies. We borrow not only our heroic imagery and can-do mobilization spirit from those years, but also look concretely to the governance structures and policy programs that worked so effectively for the United States. We also look carefully at where the WWII mobilization failed, in order to familiarize ourselves with the pitfalls of mobilization, to protect against them this time. Once again, we face an existential threat and must achieve total victory in the two-front "war" — overcoming the dual climate and ecological overshoot emergencies.

This is the first draft of the Victory Plan, intended for public and expert commentary, which will be reviewed for incorporation in a second draft. This draft is not entirely complete. Perhaps a document of this vast sweep can never be considered finished. It also is not intended to be exclusive. Indeed, we invite and challenge others to create alternate versions. With help from others, the final version of the Climate Mobilization Victory Plan will hopefully provide a roadmap to victory over the ecological crisis.

I am very proud of what Ezra has accomplished in this Victory Plan, and very excited at its potential to influence and stimulate public discussion, and move the climate movement, and all Americans, toward recognizing and advocating emergency climate mobilization.

Onward!
Margaret

Margaret Klein Salamon, Ph.D., is the Founder and Executive Director of The Climate Mobilization.

LEARNING FROM OUR LAST BATTLE FOR SURVIVAL

World War II Home Front Mobilization Overview

By Ezra Silk

At a 1943 press conference, a reporter asked President Franklin D. Roosevelt to address a rumor that he no longer liked the term "New Deal." He responded that a physician, Dr. New Deal, had remedied America's "grave internal disorder" during the '30s. But the attack on Pearl Harbor had "broke his hip, broke his leg in two or three places, broke a wrist and an arm, and some ribs; and they didn't think he would live, for a while." Dr. Win-the-War had since stepped in to conduct orthopedic surgery and Patient America was now on the road to recovery: "He has given up crutches. He isn't wholly well yet, and he won't be until he wins the war."[2]

Many have argued that a "Green New Deal" or "Green Marshall Plan" are needed today. This paper and The Climate Mobilization movement assert that it is not only the concept of a Green New Deal, but the spirit of "Dr. Win-the-War" that should animate America's response to the climate emergency. Just as FDR shifted his approach to defeat fascism, it is an absolute moral imperative that humanity pivots comprehensively from business-as-usual economics and politics to fight off the existential threat of civilizational collapse and biological holocaust.

We face a series of time-sensitive existential emergencies that can only be overcome successfully with a drastic transformation of the entire economy (or orthopedic surgery, in FDR's words) accomplished at wartime speed. All available social and economic resources and industrial capacity must be mobilized toward the primary objectives of restoring a safe climate and reversing ecological overshoot as rapidly as possible. In order to secure dignity and justice for all, to increase the odds of victory, and to preserve our highest ideals during this long emergency, Marshall Plan-like international aid efforts and equity-based New Deal-type social welfare programs should support this WWII-style emergency mobilization of our entire society and economy.

Context

Following World War I, the United States de-militarized extensively, while Germany rebuilt their economy around warfare. In the '30s, the Nazis engineered a devastating new form of warfare, *Blitzkrieg*, enabled by the mass-production of modern tanks and bombers and a total wartime mobilization of the German economy. The U.S. armaments industry was in a pitiable state, characterized by low output and old-fashioned production techniques. The U.S. Army was "the smallest, worst-equipped armed force of any major power," according to *Life*.[3] In 1939, the U.S. Army ranked 17th in the world, just between Portugal and Bulgaria.[4] During the '30s, as the Axis Powers invaded country after country, a powerful isolationist movement persuaded most Americans to ignore the gathering collapse of the international order. Though the general public and the business community were largely unprepared to face down the Axis powers, by the early '40s, it was clear to some high-level U.S. government officials that virtually the entire American economy would have to be geared toward war production as quickly as possible.

While the Axis powers mobilized for war, in factories across America, workers were transforming raw materials such as oil, rubber, and steel into consumer goods such as private automobiles. But the U.S. could not defeat the Axis with a fleet of Studebakers. The badly needed ramping up of war production would require a conversion of most of the economy from peacetime production to war industries. In spite of the isolationists, in the two years preceding the Pearl Harbor attacks, the federal government established several wartime boards and commissions and appropriated billions of dollars toward rearmament. And in July 1941, President Roosevelt asked for a plan to create forces that could defeat all of the United States' potential enemies. Two months later, he received the Victory Program.

Mobilization!

After the Dec. 7, 1941 attack on Pearl Harbor, the mood of the country very suddenly flipped from isolationism to mobilization. Once it became clear that war was inevitable, most Americans enthusiastically participated in a rapid transformation of the national economy and society. Thanks to FDR's foresight, the plans for a full-scale economic mobilization were on hand.[5]

Conservative business titans joined labor leaders and "New Dealer" government officials to redirect and refocus America's industrial might against the Nazis. Factories rapidly converted from producing consumer goods to producing tanks, guns, bombs, and planes — shattering all historical records for war production.

Young men sacrificed their lives fighting for their country. Women surged into factories and families planted 50 million "Victory Gardens" that supplied 40% of America's vegetables during the war. Scientists and universities pumped out research on behalf of the war effort — leading to huge technological and intellectual breakthroughs. More than 10% of the popula-

tion relocated, often across state lines, in order to find a "war job."

This transition from consumer production to war production was both demanded and supported by the federal government. In early February 1942, the government banned private automobile production in order to utilize the auto industry's tremendous capacity to produce war materiel. This conversion process occurred throughout the entire economy. The government banned or restricted activities that did not contribute to the war effort, such as the production of civilian refrigerators, vacuum cleaners, phonographs, and washing machines. It distributed abundant contracts to corporations, enabling them to produce armaments instead of consumer commodities in either new or existing factories. It also created new economic sectors in response to wartime requirements. In response to a cutoff of critical rubber supplies in Southeast Asia, the federal government launched a crash program that scaled up synthetic rubber production from under 1% to about 70% of total U.S. production — a *100-fold* increase — in about four years.[6]

Mobilization Policies and their Impacts

The federal government poured money into the war effort. By the end of the war, it employed more than 12 million Americans directly (or about 9% of the 131 million strong population), through the vastly expanded military. The government also distributed copious war production contracts, accruing huge budget deficits in the process. In 1939, defense spending made up about 1.4 percent of the Gross National Product (the contemporary indicator of national economic activity). At the peak of the war effort in 1944, defense spending constituted about 45 percent of GNP.

The enormous increase in federal government spending caused the greatest industrial building boom in human history. After more than a decade of depression, unemployment was quickly wiped out, dropping from 14.6 percent to 1.2 percent in five years time. Some 17 million jobs were created, wages grew 55 percent, and corporate profits boomed.

Unlike WWI, inflation was successfully contained. The federal government's Office of Price Administration controlled prices in order to minimize inflation and prevent price-gouging. During the war, the American business community overwhelmingly supported price controls. The National War Labor Board set wages, in order to minimize inflation.

In order to maximize the amount of real resources channeled toward the war effort, the federal government encouraged saving and discouraged wasteful resource consumption. Citizens were called on to invest in war bonds. These bonds both helped to finance the war effort and created a secure savings instrument for regular Americans, while also causing a significant drop in demand for consumer goods.

The federal government instituted a rationing program in order to ensure an equitable distribution of scarce resources on the home front. Gasoline, coffee, butter, tires, fuel oil, shoes, meat, cheese, and sugar were rationed, and every American received a fair share. Equal access to jobs and scarce resources was a major component of the mobilization.

The government also called on Americans, and mobilized local communities, to hold scrap drives to recycle tin, used tires, silk stockings, cooking fats, and newspapers. In 1943, reclaimed rubber from citizen scrap drives provided about 50% of domestic rubber production. A national speed limit — or "Victory Speed" — of 35 miles per hour was imposed, and pleasure driving and automobile racing (including the Indy 500) were banned, in order to conserve fuel, and primarily, rubber.

Taxes were also increased significantly, particularly on high earners, who were required to pay the most progressive tax rates in American history. A tax on excess corporate profits provided 25% of revenues during the war.

The combination of full employment and progressive taxation caused income inequality to plummet. Gains were made in social equality, as well, with women and African-Americans making particularly notable gains.

The government also partnered with universities and scientists to conduct incredible research and advance scientific knowledge in many areas, including the developments of radar and sonar technologies, code breaking, computing, and the blood transfusion procedures. The Manhattan Project, which developed the nuclear bomb and nuclear technology, was the most notable and ambitious research and development effort in history.

However, during WWII, the U.S. also placed more than 100,000 Japanese-Americans into internment camps. The government was worried that these individuals were spies for the Japanese, when in fact they were loyal Americans, many of whom longed to fight for the United States. This was a terrible, inhumane mistake, and an illustration of the need to be vigilant about abuses of power during a mobilization. During the Climate Mobilization, we must not curtail civil liberties for any ethnic or class group. On the contrary — the government must zealously protect civil liberties throughout the mobilization.

Lessons Learned

Mobilization is an economic approach that directs the collective force of industry away from consumerism and toward a singular national purpose. Profit-seeking behavior is either subordinated to or channeled toward the national mission.

It is characterized by large-scale deficit spending (spending more than taxes collected), sweeping command-and-control regulations, increased taxation in order to control inflation and re-direct private sector activity, and strong government controls over the distribution of raw materials and basic goods. Although corporations can play a constructive role in mobilization, they do not drive the change process. The government does.

Done well, economic mobilization has many benefits, including increased equality, full employment, and increased attention to the importance of cultivating every person. If you accept the need to rapidly — not gradually — convert an entire modern economy to a new purpose, mobilization is clearly the most effective, egalitarian, and sensible approach.

CLIMATE MOBILIZATION OBJECTIVES FOR VICTORY

Protect Civilization & the Natural World

The objective of America's fight in World War II, championed by FDR at the Casablanca Conference of 1943, was "unconditional surrender of the Axis powers," as well as a world based on the Four Freedoms.

The broad objectives of the Climate Mobilization should be to:

- ***Restore a Safe and Stable Climate*** that supports the continued existence of organized human society.
- ***Reverse Ecological Overshoot*** by shrinking the ecological footprint of the global economy to approximately half a planet per year.
- ***Halt the Sixth Mass Extinction*** by returning species (both vertebrate and invertebrate) extinction rates from the current highly elevated levels of 10-100 extinctions per million species per year to the previously normal baseline background rates of approximately 1 extinction per million species per year.
- ***De-acidify the Oceans*** by eliminating net carbon dioxide emissions and drawing down (or removing) excess carbon dioxide.
- ***Realize the Four Freedoms of the 21st Century*** (see below)

Principles

Motivating this project are the following values, emotions, and ideals:

- Profound alarm about the future
- Desire to protect ourselves, our families, civilization, and the natural world
- Commitment to the dignity and innate rights of every person on earth
- Feelings of profound moral responsibility
- Belief that humanity is capable of changing from a destructive force to a generative, life-protecting force
- Belief in the power of democracy
- Belief that America is capable of leading the world in this mobilization

- Love for humanity, animals, and the natural world
- Desire to protect all life
- Awe at the miracle of creation
- Faith in the power of truth and forgiveness
- Conviction that collective sacrifice, cooperation and hard work for the common good, combined with a measure of luck, can sustain humanity long into the future

Contemporary Threat Assessment

A growing body of scientific evidence demonstrates that humanity has created an extreme and intensifying ecological crisis that poses a series of fundamental risks to civilization and the natural world upon which it depends.

It is clear that time is of the absolute essence. There is only a small window in which the nations of the world *will possibly be able* to mobilize before their basic social and economic systems start collapsing.

Recent data conclusively demonstrates that decades of delay have led us into a global climate and sustainability emergency. Humanity has already heated the planet too much and expanded the physical scale of the economy beyond the limits that the biosphere can support in the long run. If business-as-usual scenarios are realized in the coming decades, the effects of humanity's collective resource consumption, waste, and greenhouse gas emissions could lead to the premature deaths of billions of people, cause a mass extinction of species or "biological holocaust," raise sea levels by dozens to over a hundred feet, and send the earth into a "hothouse" state for millennia or longer.[8 9]

The core, overlapping dynamics driving the ecological crisis are:

- Global Warming
- Ecological Overshoot

A third dynamic, largely unrecognized outside the scientific community, is presently masking the intensity of the global climate emergency:

- Global Aerosol Cooling

Global Warming

Human-caused emissions of greenhouse gases are trapping heat in the atmosphere and warming the planet. Since 1750, the earth has warmed an average of ~1.2° Celsius, effectively ending the Holocene, the 11,700-year period of climate stability during which agriculture and civilization developed (It should be noted that humans began altering atmospheric greenhouse gas concentrations through deforestation some 8,000 years ago

and rice irrigation 5,000 years ago).[10] Present atmospheric greenhouse gas concentrations are likely high enough to eventually warm the earth an average of at least 1.7°C above pre-industrial (1750) levels, taking the earth far outside the temperature range experienced during the development of agriculture and civilization. According to one estimate, humanity is on track to warm our planet an average of 2°C by 2036.[11] The global warming-intensified El Niño of 2015-2016 caused temperature anomalies to spike to 1.95°C above pre-industrial levels in the Northern hemisphere in February 2016.[12]

Human-caused global warming is in turn causing an increasingly severe set of changes to the climate, known collectively as climate change. These climatic changes include:

- Mega-droughts
- Heat waves
- Super-storms
- Intensified flooding
- Migration of vector-borne diseases
- Glacier melt
- Polar ice sheet collapse
- Mass coral bleaching
- Ocean oxygen loss and suffocation
- Accelerating sea level rise
- The slowing of the Atlantic Ocean conveyer belt (Atlantic Meridional Overturning Circulation)

Global warming can also trigger positive feedback loops that trigger further global warming, such as the dieback of the Amazon rainforest, the retreat and disappearance of Arctic summer sea-ice, a "continuous thaw" of the Arctic permafrost, and the release of subsea methane hydrates. One major study projected a catastrophic, long-term "continuous thaw" of the Arctic permafrost (which contains twice as much carbon as the entire atmosphere currently contains) at 1.5°C above pre-industrial levels, a level surpassed temporarily in recent months.[13]

A substantial portion of global carbon dioxide emissions are dissolving in the oceans, causing ocean acidification. Carbonic acid is formed, causing a drop in pH (or an increase in "acidity"), damaging the shell growth of critical marine organisms. Ocean acidification kills key components of the ocean food chain — specifically shelled organisms — and therefore poses a threat to the entire marine food web. Some one billion people rely on marine species as their primary protein source. Ocean acidity has increased 30% in the past two centuries, a rate of ocean acidification potentially unparalleled in at least the past 300 million years, as far as scientists can tell.

If carbon dioxide concentrations increase to 450 parts per million, the earth's coldest oceans — the Arctic and Southern Oceans — are projected to acidify to an extent that

could prevent marine organisms from forming calcareous shells, causing cascading ecological impacts on the marine food chain.[14] If emissions continue on a business-as-usual trajectory, the atmosphere's carbon dioxide concentration will reach 450 ppm by around 2030.

The scientific basis of this paper derives primarily from David Spratt's reviews of the most recent climate science literature, **Recount: It's Time to 'Do the Math' Again** (2015) and **Climate Reality Check: After Paris, Counting the Cost** (2016). Based on the latest climate science literature, we draw the following conclusions:

- The earth is *already* too hot.
- Global greenhouse gas concentrations are already far too high.
- Humanity has no safe "carbon budget" left to burn.
- The planet must be cooled from present average temperatures in order to restore climate stability and prevent considerable Arctic and Antarctic melting in the coming centuries, as well as associated sea level rise and weather changes.
- If "all" humanity does is rapidly eliminate net carbon dioxide emissions, natural carbon dioxide removal processes, namely the weathering of rocks, will not return atmospheric carbon dioxide concentrations to the safe, pre-industrial level for approximately 150,000 years.[15]

Overshoot

Humanity's ecological footprint has grown so large that our collective consumption and waste annually exceeds the earth's regenerative capacity. Since the problem grows more severe every year, humanity is accumulating a growing "ecological debt." If our ecological debt grows too large for too long, ecologists project a crash of the human enterprise.

A 2002 paper found that civilization has been in a state of ecological overshoot since the 1980s while a more recent study suggests overshoot began in the late '60s.[17]

The activities that have led to overshoot include:

- Growing crops for food, animal feed, fiber, oil, and rubber
- Grazing animals for meat, hides, wool, and milk
- Harvesting timber for wood, fiber, and fuel
- Marine and freshwater fishing
- Accommodating infrastructure for housing, transportation, industrial production, and hydro-electric power
- Burning fossil fuels

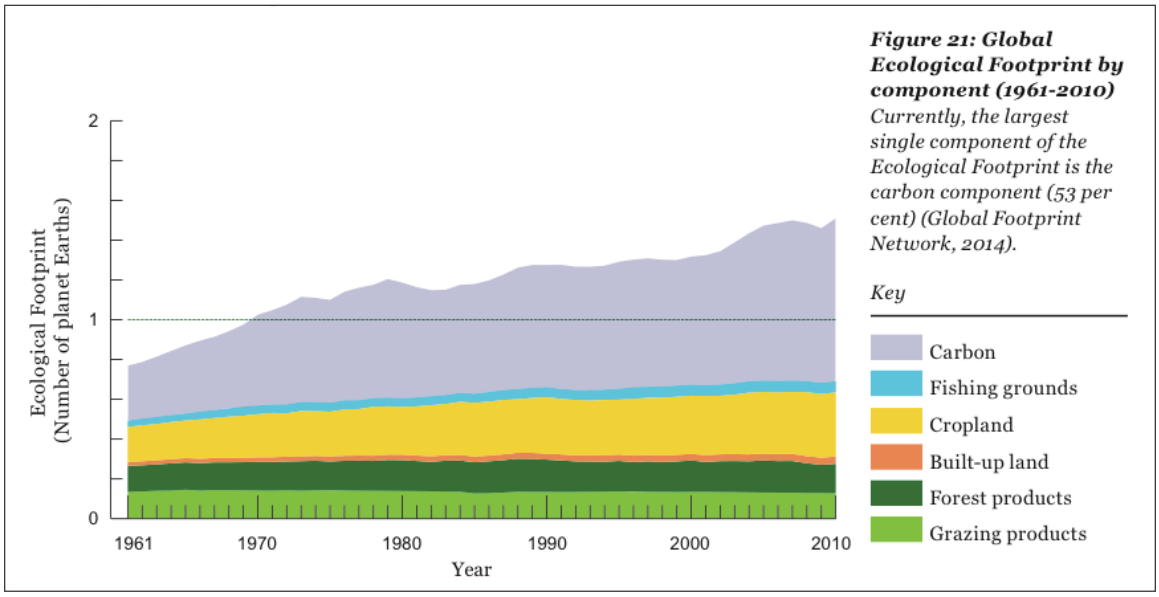


Figure 21: Global Ecological Footprint by component (1961-2010) *Currently, the largest single component of the Ecological Footprint is the carbon component (53 per cent) (Global Footprint Network, 2014).*

Source: WWF Living Planet Report (2014)

According to the Global Footprint Network, humanity now uses the equivalent of 1.6 planets to provide our resources and absorb our wastes: "This means it now takes the Earth one year and six months to regenerate what we use in a year. Moderate UN scenarios suggest that if current population and consumption trends continue, by the 2030s, we will need the equivalent of two Earths to support us" every year.[18]

In "Tipping Point for Planet Earth: How Close Are We to the Edge?" (2016), scientists Anthony Barnosky and Elizabeth Hadly warn that we have a rapidly diminishing window of time left before ecological overshoot and global warming abruptly push the biosphere into an impoverished and overheated state hostile to humanity.

They point to a number of startling facts, including:

- A forest area the size of Greece is clear-cut every year
- Nearly half of the Earth's land surface has been "paved, bulldozed, dammed or turned into agricultural fields and pasture lands"
- Almost all of the arable land available for agriculture has already been used
- "We've fished nearly 90% of the big fish out of the sea"

Overshoot is also a primary driver of the global groundwater depletion crisis, which has been caused substantially by an aquifer over-pumping "free-for-all" in the world's great agricultural regions and is increasingly exacerbated by climate change-intensified droughts. Groundwater depletion may "trigger more civil uprising and international violent conflict in the already water-stressed regions of the world, and new conflict in others," according to Jay Famiglietti, a NASA water specialist. "Vanishing groundwater will translate into major declines in agricultural productivity and energy production, with the potential for skyrocketing food prices and profound economic and political ramifications," Famiglietti warns.[19]

Overshoot threatens all life on earth. Humanity has initiated a mass species extinction episode "unparalleled for 65 million years." The accelerating rate of extinctions caused by our global society now constitutes the sixth mass extinction in Earth's 4.5 billion year history, and if allowed to fully unfold over the course of this century, will devastate life on our planet for millions of years. From 1970 to 2010, populations of vertebrate species — mammals, birds, reptiles, amphibians, and fish — declined by 52 percent.[21]

The fate of the world's remaining non-renewable resources will be determined by our response to the overlapping overshoot and global warming crises. Resource depletion, such as the massively accelerated erosion of soil critical to global agriculture, is likely to present mounting challenges in the coming decades and centuries. Long-term planning is needed to avert further shortages and price shocks.

Global Aerosol Cooling

The earth's overheating has been partially counteracted by the effect of short-lived atmospheric aerosol particles, tiny particles suspended in the atmosphere that are released through industrial, agricultural, construction, and transportation processes (including aviation). Aerosols are also released in natural processes such as volcanoes and forest fires.

Some aerosols, such as black carbon soot, have a short-term warming effect, while others, such as sulfates, have a short-term cooling effect. Other aerosols include organic carbon, nitrates, and dust from smoke, manufacturing and windstorms. Overall, aerosols are directly and indirectly cooling the earth by an unknown amount (due to insufficient monitoring). Estimates range from approximately 0.5°C – 1.2°C.

Fossil fuel burning is the source of about 72% of sulfate aerosol emissions, the primary cause of the global net aerosol cooling. The aerosol effect is known as "global dimming" or "solar dimming," since cumulative aerosol emissions collectively reflect an increasing amount of sunlight back into space and increase cloud cover. The aerosols are generally washed out of the atmosphere by rain after about 10 days, but are continually replenished due to human activities.

If global fossil fuel combustion is rapidly eliminated, as it must be in order to counteract the global warming emergency and extreme ocean acidification, the earth will experience a surge of global warming. It seems theoretically possible to counteract the heating surge with either one or a combination of the following approaches, which vary dramatically in risk levels and feasibility:

- Simultaneous, drastic cuts in short-lived warming agents (methane, black carbon, hydrofluorocarbons, and ground level-ozone)
- The simultaneous sequestration (removal) of globally significant quantities of greenhouse gases at an extreme speed far beyond any rate currently considered feasible by leading experts

- A combination of drastic cuts in short-lived warming agents supplemented by tremendously fast global greenhouse gas sequestration
- The use of solar radiation management cooling interventions (such as shooting aerosols into the stratosphere) to cool the planet or limit the warming surge

(**Note:** This plan ***does NOT*** call for the use of any solar radiation management technologies or methods)
[See a comparison of the relative contribution of all of the warming and cooling agents in the linked **IPCC AR5 chart**]

Former NASA climate scientist James Hansen has described the aerosol cooling predicament as humanity's "Faustian bargain."

The aerosol cooling dilemma is a sub-set of the larger global air pollution emergency. Sulfate aerosols are one type of a series of air pollutants that collectively kill some 6.5 – 7 million people prematurely every year through heart disease, stroke, chronic obstructive pulmonary disease (COPD), lung cancer, and acute lower respiratory infections in children, according to the World Health Organization. The Climate Mobilization should aim to end this ongoing humanitarian catastrophe, as well.

FRONT ONE

Restore a Safe & Stable Climate

Overview

In order to restore a climate that is safe, stable, and supportive of human civilization, humanity must:

- Drive the economy to net zero greenhouse gas emissions as rapidly as possible using emergency economic measures. The U.S. must reach net zero greenhouse gas emissions by no later than 2025, and the entire world community must reach net zero greenhouse gas emissions by no later than 2030.
- Drastically slash annual global greenhouse gas emissions immediately. Indeed, global emissions must "drop off a cliff."[22] This should be accomplished with explicitly non-violent strategies, including international financial and technology transfers, and possibly economic sanctions.
- Mount a large-scale carbon dioxide or greenhouse gas drawdown (or sequestration) effort immediately to restore pre-industrial greenhouse gas concentrations and cool the planet back to safe levels. Such an effort could take decades or even multiple centuries, depending on its scale and scope.
- Calmly consider whether a near-term cooling of the planet is required to combat positive feedbacks such as thawing permafrost and dying tropical rainforest that could take global warming out of humanity's control. If needed, figure out if and how such a near-term cooling can be safely and humanely accomplished.

FRONT TWO

Reverse Overshoot

Overview

In order to reverse overshoot and stop the 6th mass extinction of species, humanity must:

- Phase out consumerism and planned obsolescence.
- Considerably shrink the physical resource consumption levels of the global economy, and drastically increase efficiencies of production.
- Set aside at least half the Earth's land surface and oceans for preservation.
- Halt the further expansion of agricultural land and restore degraded lands.

FRONT ONE

RESTORE A SAFE & STABLE CLIMATE

TARGETS, DEFINITIONS & CONTEXT

Net Zero Greenhouse Gas Emissions

"Net zero" greenhouse gas emissions is achieved when a nation, entity, or process strikes an equal balance between greenhouse gas emissions and greenhouse gas removals (or sinks). In this paper, the demand for net zero emissions (often referred to as "zero emissions") means that an entity should:

- Eliminate greenhouse gas emission to the greatest physical extent possible
- Remove or sequester greenhouse gases to balance any physically unavoidable greenhouse gas emissions from a process

In this paper, "net zero greenhouse gas emissions" or "zero emissions" (shorthand) does *not* mean:

- Avoiding physically achievable greenhouse gas emissions reductions by paying others to reduce greenhouse gas emissions or sequester greenhouse gases ("carbon offsets")

The use of the term "net zero" to refer to national and global greenhouse gas emissions targets does not preclude efforts to achieve *true* zero greenhouse gas emissions, in which literally zero greenhouse gases are emitted throughout a product or processes' entire lifecycle. On the contrary — production processes, supply chains, or sectors physically able to convert to true zero emissions should be switched to true zero emissions as rapidly as possible.

Further, given that The Climate Mobilization calls for a large-scale greenhouse gas drawdown effort, net zero greenhouse gas emissions is only a marker on the way to our true goal: sequestering more greenhouse gases than emitted, thereby decreasing atmospheric greenhouse gas concentrations and ultimately restoring a climate regime as similar as possible to the one that fostered the development of civilization.

Safe Climate Restoration Targets

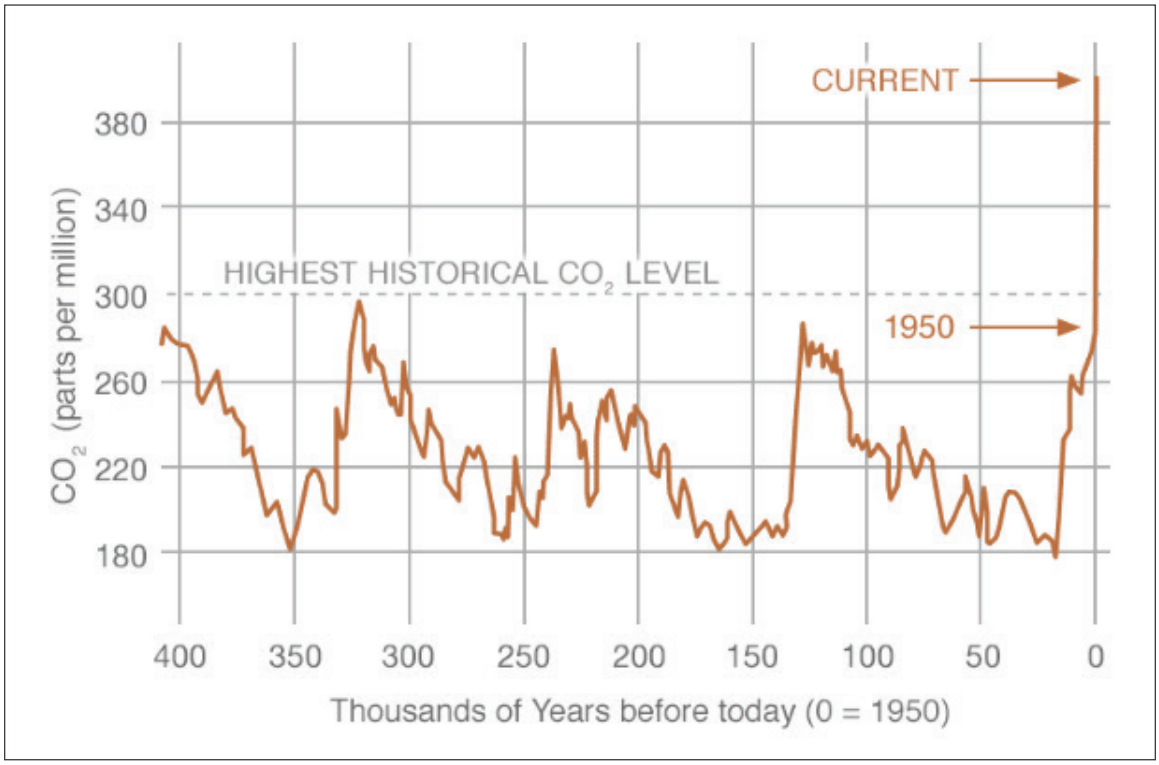
While most independent observers now agree that atmospheric carbon dioxide concentrations are far too high, there is less agreement on what target humanity should aim for in its quest to restore a safe and stable climate.

A recent study compiled by some of the world's top climate scientists found that "only a new 'Little Ice Age' could re-establish some of today's mountain glaciers and their reliable water resources for millions of people; or halt melting polar ice sheets that, once started, irrevocably set the world on course to an ultimate sea-level rise of between 4-10 meters or more."[23] The report argues that only a new global cooling to temperatures "at or below pre-industrial levels" could save small glaciers across the planet.

Carbon dioxide concentrations during the Little Ice Age, which lasted from about 1300 to 1870, peaked around 280 parts per million. This would suggest that humanity should aim to restore approximately pre-industrial atmospheric greenhouse gas concentrations, as suggested by the climate scientist Hans Joachim Schellnhuber when he called for a return to 280 ppm atmospheric carbon dioxide concentration several years ago.[24]

The 280 ppm carbon dioxide goal is considerably lower than the 350 ppm goal proposed by climate scientist James Hansen and others as an "initial target" that was subsequently embraced by much of the climate movement. A goal of 280 ppm implies an approximate doubling in scale of the global carbon dioxide drawdown effort.

If possible, it would be prudent to return *all* atmospheric greenhouse gas concentrations — not just carbon dioxide — to pre-industrial levels. A comparison of pre-industrial and contemporary greenhouse gas concentrations can be found **here**.



Source: "**Global Climate Change: Vital Signs of the Planet**," NASA

Overview of Greenhouse Gases

"One of the greatest challenges relating to global warming is that greenhouse gases result — directly or indirectly — from almost every major human industry and activity."

– World Resources Institute

Temperature-regulating greenhouse gases include:

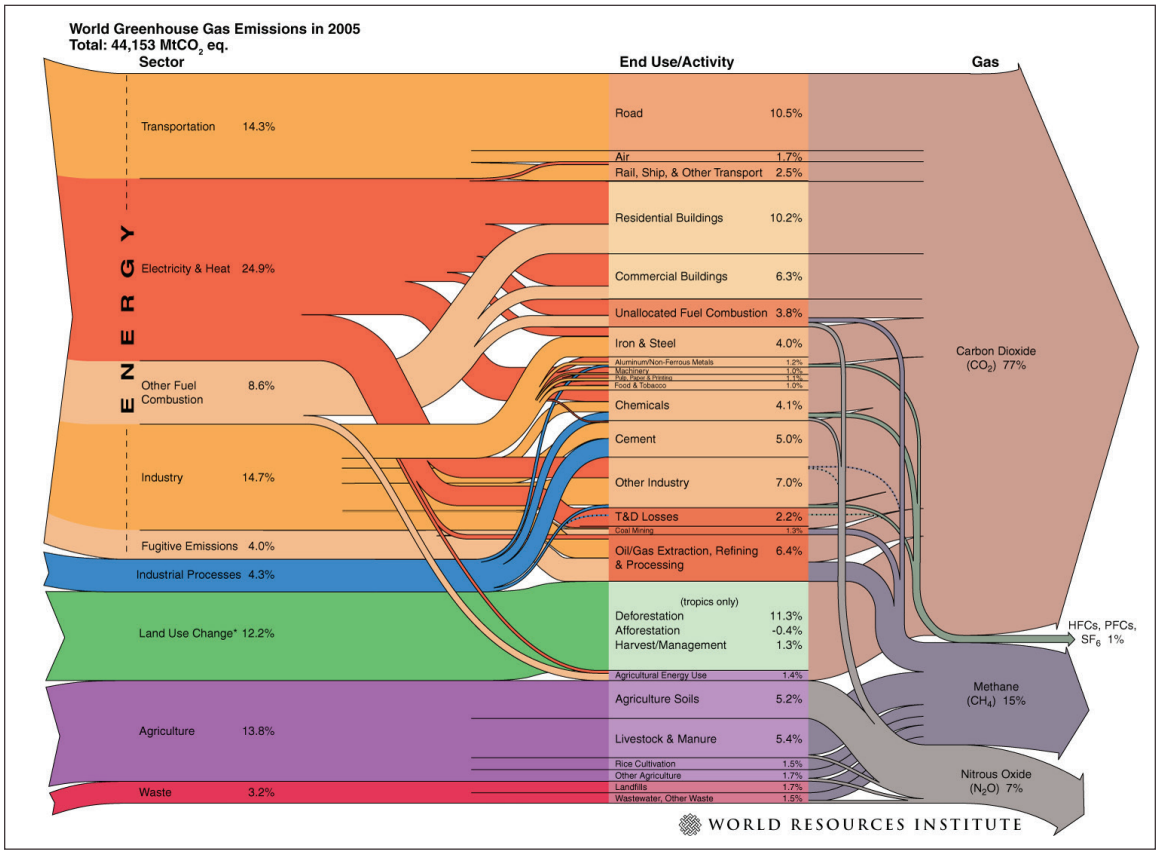
- Carbon dioxide
- Methane
- Nitrous oxide
- Water vapor
- Ozone
- Sulfur Hexafluoride
- Chloroflourocarbons
- Perflourocarbons
- Hydroflourocarbons

The primary sources of human-caused global greenhouse gas emissions include:

- The burning and combustion of fossil fuels
- Deforestation
- Enteric fermentation from livestock
- Cement production
- Paddy rice farming
- Fertilizers
- Soil degradation
- Land use and wetland changes
- Pipeline and hydraulic fracturing pad leaks
- Covered vented landfill emissions

Breakdown of Global Greenhouse Gas Emissions (2005)

The chart on the next page, which is outdated and potentially misleading but gives a general sense of the extent of global emissions sources, estimates total greenhouse gas equivalents based on a 100-year Global Warming Potential (GWP). This has major implications since it weighs longer-lived global warming agents more heavily than shorter-lived agents such as methane, which warms the planet 86 times as much as carbon dioxide for 20 years after it is emitted before decaying to carbon dioxide (over 20% of which then lasts for over a millennia). The 100-year GWP measurement



Source: **World Resources Institute**, July 2009

(that methane is 34 times as powerful a warming agent a carbon dioxide) understates methane's impact by about as 2.5 times.[25]

The differing emphases of 100-year GWP and 20-year GWP have massive implications for U.S. and global climate policy, since natural gas, which has been promoted as a "bridge fuel" in the transition to zero emissions energy sources, as well as ruminant animals such as cows, produce large quantities of methane.

Greenhouse Contribution of Animal Agriculture

Most studies have pegged annual global greenhouse gas emissions from animal agriculture between 14.5% and 18%, both of which imply that animal agriculture is a larger greenhouse gas contributor than the entire global transportation sector.

The documentary "Cowspiracy: The Sustainability Secret" (2014) has popularized the idea — with good reason, it seems — that many environmental groups and policymakers have downplayed or ignored the contribution of animal agriculture to the disruption of the climate system and the destruction of the global environment. The movie relies on a 2009 *World Watch* magazine article by World Bank analysts Robert Goodland and Jeff Anhang that argues that if the entire life cycle and supply chain of domesticated animals raised for food is accounted for — including domesticated ani-

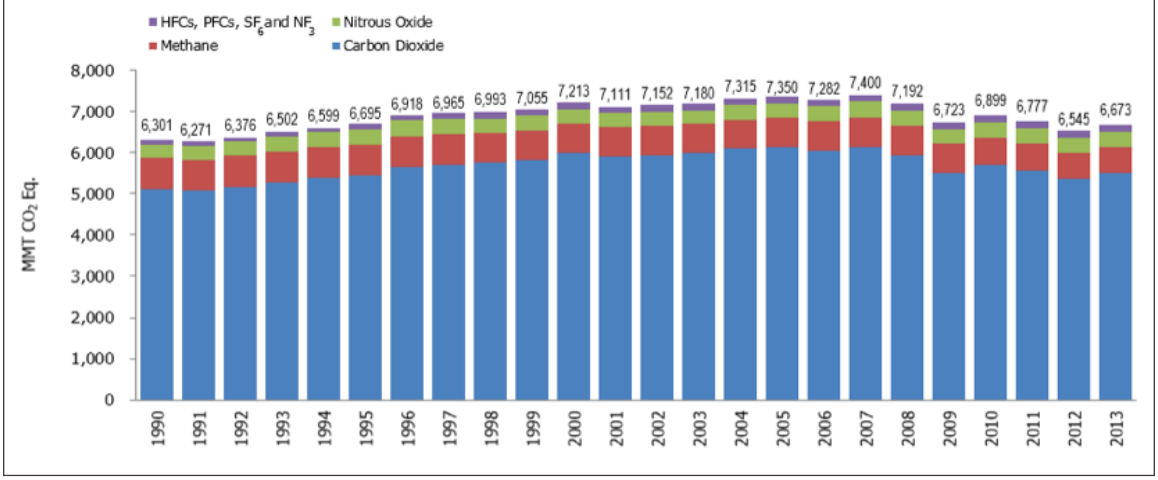
mal respiration and livestock-linked deforestation — animal agriculture was responsible for 51% of annual worldwide greenhouse gas emissions on a 20-year GWP in 2009, though some scientists have criticized this reasoning.[27]

This paper treats animal agriculture as a major contributor to planetary climatic and environmental destruction — even 14.5% of global emissions is enormous — but does not attempt to sort out these competing claims.

U.S. Greenhouse Gas Emissions Trends & Sources

In 2014, the United States domestically produced 6.87 billion tons of greenhouse gases (measured as carbon dioxide-equivalents), down from a peak of 7.4 billions tons of greenhouse gases in 2007, according to the EPA.
(Note: U.S. Federal Government GHG accounts, such as the chart below, use a 100-year Global Warming Potential, which substantially underestimates the short-term global warming impact of methane emissions.)

Figure 2-1: U.S. Greenhouse Gas Emissions by Gas
Note: Emissions values are presented in CO_2 equivalent mass units using IPCC AR4 GWP values.



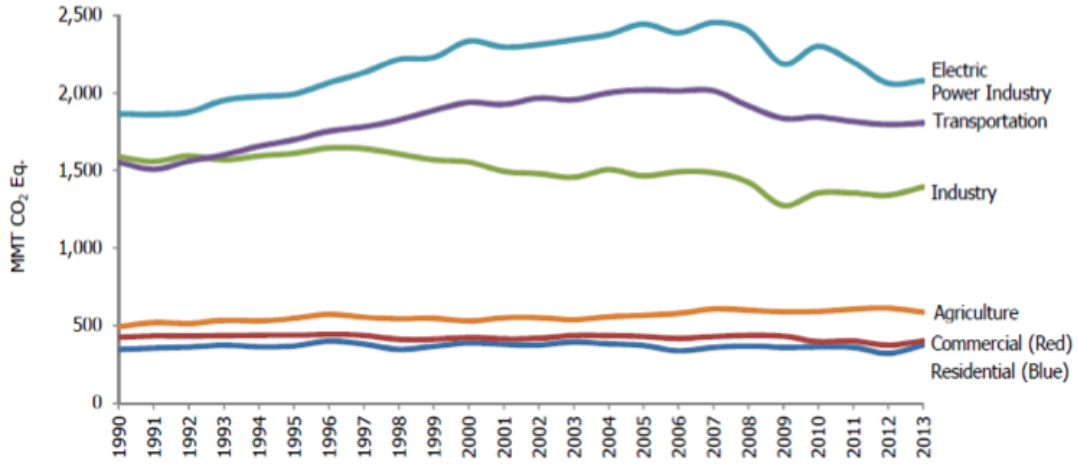
Source: EPA, U.S. Greenhouse Gas Inventory (2015)

According to the EPA, the breakdown of production-based greenhouse gas emissions by economic sector in 2014 was:

- **Electricity Production (30%):** *Fossil fuel combustion*
- **Transportation (26%):** *Fossil fuel burning for cars, trucks, ships, trains and planes*
- **Industry (21%):** *Fossil fuel burning for energy, greenhouse gas emissions from chemical reactions required to produce goods from raw materials*
- **Commercial and Residential (12%):** *Fossil fuel burning for heating, consumption of products that contain greenhouse gases, and waste handling*
- **Agriculture (9%):** *Livestock fermentation, soil degradation, rice production*
- **Land Use and Forestry (-11%):** *Managed forests and other lands absorbed more carbon dioxide from the atmosphere than emitted*

Figure ES-13: Emissions Allocated to Economic Sectors

Note: Emissions values are presented in CO_2 equivalent mass units using IPCC AR4 GWP values.



Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Decision-Making Criteria

Policy makers and government planners should take a number of factors into consideration when making difficult decisions during the climate mobilization. In particular, all decisions should weigh the following goals:

- Reduce greenhouse gas emissions to zero in all possible sectors, as rapidly as possible
- Shift toward 100% use of renewable resources to ensure long-term sustainability
- Cut energy, materials and land use to reduce America's "ecological footprint"
- Close the loop of systems in all possible sectors

KICK-START THE MOBILIZATION

1. Declare a National Climate Change & Ecological Overshoot Emergency

On September 8th, 1939, one week after the German invasion of Poland, FDR declared a limited national emergency "for the purpose of strengthening our national defense within the limits of peacetime authorizations."

In May and June 1940, the fall of France, Holland and Belgium and the threatened German invasion of Britain placed the United States in imminent danger of. At this point, the President initiated a major partial industrial mobilization of the economy, establishing an Office of Emergency Management and Advisory Commission to the Council of National Defense, requesting a doubling of the Navy and the implementation of a draft, and launching the largest armaments production program in American history. A year later, on May 27, 1941, the President, warning forcefully of the threat of a Nazi invasion of America in a Fireside Chat, proclaimed an unlimited declaration of national emergency, calling upon "all loyal citizens to place the nation's needs first in mind and in action to the end that we may mobilize and have ready for instant defensive use all of the physical powers, all of the moral strength and all of the material resources of this nation," with the goal of "strengthening … our defense to the extreme limit of our national power and authority."

And on December 8, 1941, in an address to a joint session of Congress at 12:30 pm the day after the attacks on Pearl Harbor, FDR requested that Congress pass a joint resolution declaring war against Japan. That afternoon, the declaration passed 88-0 in the Senate and 388-1 in the House. It authorized and directed the President "to employ the entire naval and military forces of the United States and the resources of the Government to carry on war against the Imperial Government of Japan" and pledged "all the resources of the country" toward the end of victory. Roosevelt signed the declaration at 4:10 pm.

It is in a similar spirit that the President should make plain to the American people and Congress that we face an unprecedented national emergency that will only intensify until we overcome the existential threats of runaway global warming and ecological overshoot. The President should request that Congress pass a joint resolution declaring a national climate change and ecological overshoot emergency in order to signal to the American public and the sitting Congress the urgency of ending business-as-usual and commencing

the most rapid possible transformation of the American and global economy toward the end of restoring a safe climate and reversing ecological overshoot.

Given the lack of emergency laws relating to the long climate and ecological overshoot emergencies, the President should also request an act of Congress establishing a legal and administrative structure that provides for the formal declaration of national climate emergencies and the activation of relevant special powers required to rapidly transform the economy in an equitable, safe, and democratic way, such as reduced compensation for the closure of climate-damaging plant and equipment. The Act should also empower the executive branch to rapidly create new mobilization agencies and systems fit to coordinate a national emergency mobilization to reverse global warming and ecological overshoot.

In the absence of Congressional cooperation, efforts may be required to change Senate rules in order to limit the power of the filibuster to block legislation. If that too fails, a presidential declaration of climate emergency under the National Emergencies Act may be considered as an option of last resort to deliver many components of a climate mobilization effort, although the NEA will very likely not provide a durable foundation for a mobilization of the scale and scope required, and could pose major risks to our system of government and the rule of law.

The National Emergencies Act is limited in its legal potential for the President to take the necessary action to implement a full zero emissions and carbon drawdown regime. The emergency declaration admittedly has certain statutes that could be interpreted to be of use in acting on the climate crisis; for example, it could empower the Federal Power Commission to "order changes in the generation, delivery, interchange, or transmission of electric energy" (16 U.S. Code § 824a) without an act of Congress. However, this statute and the myriad of others associated with the National Emergencies Act are historically specific, and their application to the slow-onset nature of the climate emergency could face legal resistance.

Furthermore, attempting to act over the heads of Congress would have serious repercussions for what's left of the sanctity of US democracy. It is with these factors in mind that the President's use of the National Emergencies Act would be primarily symbolic.

Whatever form it takes, the climate emergency response must explicitly disavow unnecessary, inhumane uses of emergency powers, such as the unconstitutional and immoral detainment or execution of American citizens or the repeal of *habeas corpus*. Congress and the Mobilization Oversight Agency (discussed below) should conduct bi-monthly reviews, exercise subpoena powers, and release public reports to an oversight committee as well as media to ensure the federal government is strictly adhering to the express intention of the emergency declaration(s).

2. Set Pre-Industrial Greenhouse Gas Air Quality Standards

The Environmental Protection Agency (EPA) should immediately add all 15 greenhouse gases to the National Ambient Air Quality Standards established under authority of the Clean Air Act. The standards should target safe, **pre-industrial** (1750) tropospheric concentrations for all greenhouse gases.[28]

Once established, every state in the country must submit zero emissions plans covering all greenhouse gas-emitting sectors to the EPA showing how the state plans to move to a net zero greenhouse gas emissions economy by 2025. Additionally, every state should submit greenhouse gas removal plans showing how it will contribute its fair share toward a global greenhouse gas removal effort.

3. Order Zero Emissions Plans from Large & Middle-Market Firms

The CMB will request mandatory plans from businesses and organizations with total annual revenue greater than $10 million showing how each entity will end the growth of their firm's lifecycle greenhouse gas emissions within one year, and cut them to net zero by 2025. This will be a monumental task, as there are more than 200,000 U.S. firms that generate over $10 million in revenue.[29]

In sectors where individual firms cannot develop zero emissions plans — such as aviation and steel — the CMB should work with all relevant firms to develop whole-of-sector zero emissions plans.

4. State of the Union Championing the Four Freedoms of the 21st Century

The President should give a State of the Union address invoking FDR's Four Freedoms speech of 1941,[30] to reaffirm the validity and unfulfilled promise of the Four Freedoms of the 20th Century and to champion the Four Freedoms of the 21st:

I. Right to a healthy and stable global environment
II. Right to healthy food, clean air and clean drinking water
III. Right to life-affirming work at a living wage
IV. Right to full democratic participation in government and at the workplace

MOBILIZE THE FED

The Federal Reserve System played an important role in WWII. After U.S. entry into the war, the Board of Governors formally declared that the Fed was "prepared to use its powers to assure at all times an ample supply of funds for financing the war effort."[31]

Its various contributions to the war effort included:

- Creating and executing war finance plans in coordination with the U.S. Treasury.
- Buying government securities in order to maintain interest rates at low levels (.375% on short-term Treasury bonds and 2.5% on long-term Treasury bonds). This effort helped limit the long-term costs of the war.
- Money creation: The low-interest rate policy resulted in the injection of large quantities of new money into the economy. According to economic historian Hugh Rockoff, 26% of the war effort was financed through the "printing press."
- To combat the inflationary potential of monetary expansion, the government imposed comprehensive wage, price, and salary controls. The Fed aided price control efforts by regulating consumer credit.
- Acting as the fiscal agent for various government agencies in order to expedite the delivery of loan guarantees to munitions producers.
- Marketing war bonds in cooperation with commercial banks, businesses, and volunteers

As in WWII, the Fed, in cooperation with the U.S. Department of the Treasury, should mobilize its considerable financing powers to make ample funds available for all aspects of the Climate Mobilization effort. Along with maximizing employment, stabilizing prices, and moderating long-term interest rates, the Fed should add another high-level mandate to guide its operations: Stabilizing the global environment, without which there will be no employment, prices or interest rates to govern.

ESTABLISH NEW FEDERAL GOVERNMENT AGENCIES

During World War II, FDR established 158 wartime agencies to coordinate the war effort. These agencies were vested with broad powers to plan and set priorities for the entire economy. FDR often selected business and community leaders — often referred to as "dollar-a-year men" — to head these agencies, balancing the needs and concerns of many constituencies.

The President will need to establish through statutes a number of new federal government agencies and institutions designed to coordinate the rapid restructuring of the American economy. The agencies must operate on a transparent, inclusive, and fair basis. The public servants who staff these agencies will be called on to exercise careful judgments and deliver independent decisions on behalf of the common good.

- **Presidential Task Force on Economic Conversion (TFEC):** This high-level task force will survey America's entire domestic industrial capacity and assess the capability and requirements for economic conversion. TFEC will conduct a comprehensive assessment of the production goals required to deliver a safe climate and sustainability, and examine the capacity of America's industries to convert production to meet those goals.

  TFEC will deliver its report to the Climate Mobilization Board, which will decide whether to impose stop-production orders, managed shutdowns, and other production controls in order to convert existing capacity to mission-critical production. The task force will also deliver recommendations for the scaling up of new capacity to the Mobilization Finance Corporation.

- **Climate Mobilization Board (CMB):** Staffed by America's leading environmental analysts, engineers, scientists, economists, environmental justice leaders, labor leaders and CEOs, (all from a diverse array of ethnic and socioeconomic backgrounds), the CMB will coordinate all agency-level mobilization activities, conduct technical assessments, oversee production goals, issue stop-production and scheduled production phase-out orders, institute efficient contracting procedures, and cut through red tape. The CMB and its state and local affiliates will review, and either deny or approve the mandatory zero emissions

and sustainability plans submitted by all private firms. The board will oversee and administer all caps (both stable and declining) on energy and materials use across sectors.

- **Transition Compensation & Adjustment Authority (TCAA):** During the mobilization, a wide range of capital assets, such as fossil fuel-based steam-electric power stations, internal combustion engine vehicles, jet aircraft, pipelines, and concentrated animal feeding operations, will be retired or decommissioned well before their scheduled expiration date as a result of new government policies. The owners of these scrapped capital assets will be given the opportunity to file compensation claims with the TCAA. The TCAA will also field applications for transition financial assistance from individuals and firms who have not lost capital assets as a result of early retirement but need assistance for other reasons related to the mobilization. The Mobilization Labor Board (see below) will guarantee re-employment of all workers who lose jobs as a result of the mobilization.

- **Mobilization Oversight Agency (MOA):** Staffed by investigative journalists, constitutional law experts, leading intellectuals and other high-level researchers and analysts, this independent agency will release monthly reports to the public on the state of the Climate Mobilization and its compliance with the law, human rights, and environmental safety standards.

  The presidential statute establishing the MOA should grant the agency administrative subpoena powers, in order to strengthen its investigatory capabilities. Heads of all other Mobilization agencies will be required to rapidly and transparently respond to any requests for information from this ombudsman-like institution.

- **Mobilization Labor Board (MLB):** This tri-partite board composed equally of labor, capital and federal government representatives will monitor and manage industrial labor relations and America's federal job guarantee program for the duration of the emergency transition. It will vigorously combat the inherently regressive quality of most environmental regulation (whether direct or flexible) in order to ensure that *all* Americans are deeply invested in overcoming the ecological crisis.[32]

  The MLB will aim to ensure as much of America's workforce as possible is contributing productively to the Climate Mobilization effort. The board will aim to ensure workers' health and welfare, maximize output of mission-critical production, and avoid Mobilization-disrupting labor strikes by guaranteeing:

- World class labor safety standards
- Robust wages ($15 an hour and over), paid family & medical leave, childcare, healthcare benefits, and retirement benefits
- Scaled up collective bargaining through a government-backed guarantee of the "card check" union formation method (as stipulated in the proposed Employee Free Choice Act, which allows automatic union formation if over 50% of the workers in a bargaining

unit sign an authorization card requesting a union)

- The establishment of joint labor-capital management boards (with a mandatory 50:50 split between labor & capital representatives) to oversee production decisions in government-subsidized private production operations
- Federally financed employment in the Climate Mobilization effort with a living hourly wage ($15-$21) and full benefits

The board will target true full employment — only allowing for unavoidable frictional (or search) unemployment — as opposed to the standard, considerably more flexible metric of a non-accelerating inflation rate of unemployment (NAIRU), which targets and results in unemployment for millions of Americans in the name of price control.

- **Mobilization Finance Corporation (MFC):** A wide variety of new technologies, sectors and infrastructure will be developed during the Climate Mobilization. This independent government corporation will provide loan guarantees, grants, and low-interest loans to firms working toward rapid safe climate restoration and sustainability. It will also create numerous subsidiary corporations to finance the emergency scaling up of new industries. The Mobilization Oversight Agency will frequently audit the MFC to ensure a zero corruption environment.

- **Office of Price Administration (OPA):** This office, led by economic experts in demand management and price stability, will monitor economic conditions during the Mobilization and establish fair and equitable controls on wages, prices, and consumption as needed to ensure price stability and a fair sharing of resources across society. The OPA will head the federal bureaucracy and coordinate local citizen-volunteer efforts that will jointly administer the downstream consumer greenhouse gas emissions rationing campaign (described below).

The OPA, a WWII-era agency reestablished for the Climate Mobilization, will also manage the allocation of fossil fuel supply among sectors in coordination with the CMB in order to ensure that mission-critical production, such as the rapid build-out of renewable energy generation, is prioritized, especially in the early years of the Mobilization.

Environmental Impact Accounting Service (EIAS)

The greenhouse gas emissions rationing and ecological footprint labeling schemes adopted during the Climate Mobilization will require complex calculations involving the lifecycle greenhouse gas emissions and environmental impact of American products, supply chains, and services. The EIAS will work together with the OPA at federal, state and local levels to administer the greenhouse gas rationing system. The EIAS, staffed by America's brightest climate scientists, economists and ecologists, will prioritize *consumption-based* lifecycle GHG emissions and lifecycle ecological footprint accounting instead of production-based analysis. This approach takes into account the massive greenhouse gas emissions and environmental damage embedded into American consumption of imports, particularly Chinese imports.

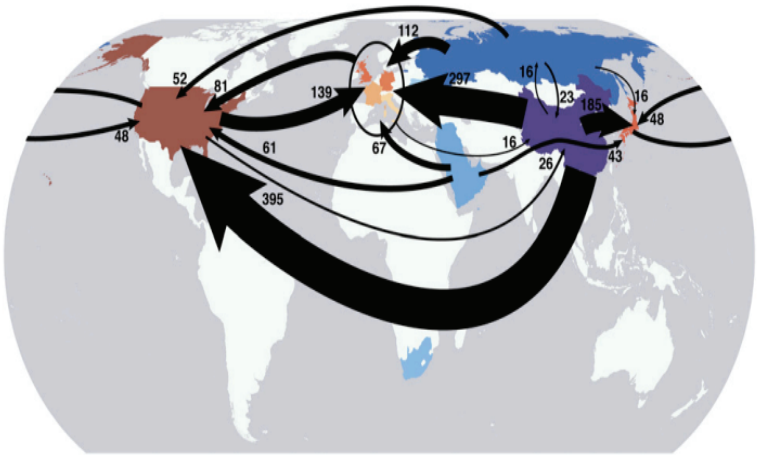


Fig. 1. Largest interregional fluxes of emissions embodied in trade (Mt CO_2 y^{-1}) from dominant net exporting countries (blue) to the dominant net importing countries (red). Fluxes to and from Western Europe are aggregated to include the United Kingdom, France, Germany, Switzerland, Italy, Spain, Luxembourg, The Netherlands, and Sweden.

Source: Steven J. Davis & Ken Caldeira, "Consumption-based accounting of CO2 emissions" (2009)

Material & Technology Substitution Board (MTSB): The MTSB will be staffed by independent engineers and chemists who will assess the validity of zero emissions substitution postponement requests, on account of unavailable zero emissions product or technology substitutes. The MTSB will rule on whether zero emissions substitutes are available, and if not, whether the product, raw material, or feedstock (a raw material used as an input into a machine or process) in question is critically necessary to American economic stability and the Climate Mobilization. If the production is ruled non-mission critical, the MTSB will refer the ruling to the CMB, which will decide whether to issue a stop-production order or a scheduled production phase-out. The MTSB will encourage the replacement of fossil fuel-based materials with non-destructively harvested, carbon-sequestering perennial industrial crops where possible.

Industrial Transformation Agency (ITA): The ITA will oversee, facilitate, and mandate the redesign and electrification of high-temperature industrial processes that use fossil fuels to heat blast furnaces and kilns. The ITA will have a dual mandate, in that its other

major task is to oversee the rapid abolition of highly wasteful planned obsolescence methods in all sectors as well as the proliferation of utility production practices that guarantee high-quality, long lasting products.

- **Climate & Environmental Science Information Bureau (CESIB):** Staffed by America's top climate and environmental scientists, in partnership with a large staff of artists, writers, and designers, this bureau will engage in a massive public information campaign to spread compelling, peer-reviewed scientific information that accessibly conveys the gravity of the climate and sustainability emergency and the consequences of defeat. CESIB will coordinate with the OPA to explain why various rationing and demand reduction measures are required to restore a safe climate and build a sustainable society.

- **Mobilization Research & Development Agency (MRDA):** Although most of the technologies and methods needed to save civilization are commercially available today, some are not. Over half of the $150 billion in annual federal research & development dollars are allocated to defense R&D, while less than $2 billion are annually allocated to renewable energy, energy efficiency, and electric grid improvements. The MRDA will reorient the $473 billion (2013), world-leading U.S. research & development effort, both private and public, toward the superordinate goal of stabilizing the climate and saving human civilization. In particular it will channel research & development investments toward:

  - Energy storage
  - Energy transmission
  - Vehicle-to-grid systems
  - Zero emissions airplanes and large ships
  - Non-carbon dioxide greenhouse gas drawdown methods
  - Non-destructively harvested perennial industrial crops
  - Substitutes for animal products
  - Perennial grains
  - Sustainable substitutes for rare earth minerals
  - Sustainable substitutes for fossil fuel-derived feedstocks
  - Electrification of high-temperature heat industrial processes
  - Adaptation measures that increase the resiliency of cities and agricultural systems to flooding and drought

FAIR SHARES GREENHOUSE GAS EMISSIONS RATIONING

Historical Background and Economic Theory

On the World War II home front, the Office of Price Administration coordinated and enforced a rationing program in order to ensure an equitable distribution of scarce resources at affordable, controlled prices. Gasoline, coffee, butter, tires, fuel oil, shoes, meat, cheese, canned goods, and sugar were rationed to ensure that Americans received fair shares of basic necessities. Goods were rationed either by quantity or points, and basic necessities were rationed by quantity and price controlled. Americans generally accepted the changes. Unlike in the U.K. and Canada, where professional civil servants staffed ration boards, citizen volunteers ran the local boards in America that distributed ration stickers and coupons. According to Milton Derber, "The board of neighbors idea facilitated the recruitment of many prominent and highly capable citizens who would otherwise have been unobtainable. This resulted in both securing community acceptance for rationing and in providing a very capable rationing board."

In "Any Way You Slice It: The Past, Present, and Future of Rationing" (2013), Stan Cox argues compellingly that once government officials respond in earnest to the ecological crisis, they will have much to learn from the WWII experience. In particular, he draws on historic and contemporary examples to convey that democratic, "fair shares," non-price rationing is the most politically viable and attractive way to manage demand in times of scarcity, however radical it may seem in times of abundance (or burdensome it may be in practice).

Price-based rationing (carbon taxes) and tradable rationing (upstream cap-and-trade schemes and downstream tradable energy quotas), the two main approaches offered so far in response to the climate crisis, will largely maintain existing economic inequalities, which will make it exceedingly difficult for citizens at all levels of society to accept sacrifices and pull together for the duration of the emergency. Carbon taxes may have trouble rapidly curbing demand in sectors such as transportation, where demand for oil products is relatively inelastic (non-responsive to price changes) in the short-term, unless the tax is raised to politically unacceptable or economically catastrophic levels. Effective cap-and-trade schemes may cause substantial price swings and political backlash due to speculation-driven price volatility.

One key difference between World War II and the ecological crisis, Cox notes, is the source of shortages. In WWII, the shortages of fuel and rubber that triggered rationing were caused by the growing world war, which cut off or endangered supplies. While some analysts have projected significant emerging shortages of fossil fuels and other resources as a result of overshoot-driven depletion, major shortages have not emerged soon enough to stave off climate chaos. Instead, government policy will be required to induce orderly upstream shortages through bans, rationing and decommissioning schemes. Along with the intentional creation of upstream shortages, offensive rationing downstream and comprehensive price controls will be required as well to manage demand, if we are to avoid shortages and inflation.

Furthermore, the rationing and price control regime will need to be quite extensive, due to what Cox describes as the "Whack-a-Mole" problem. Efforts at selective rationing and price control regimes during the initial months of the WWII mobilization led to inflation and shortages as pent-up demand — repressed for certain goods — surged into non-controlled areas of the economy.

Policy Proposal

The United States should institute a Rating All Products and Services (RAPS) rationing system, in which all products and services that emit greenhouse gases are rationed using electronic cards (similar to credit or debit cards) and regular, equal greenhouse gas emissions allowances freely issued to all citizens. Citizens would be able to sell their unused rations back to the government for cash. The government would then permanently retire the unused rations.

In effect, a parallel currency is established to rapidly and fairly ratchet down demand for greenhouse gas-emitting products and services in concert with upstream controls. Firms up and down supply chains will exchange the received points and quantities (along with cash payments) as they purchase and sell goods. Simultaneously, a zero emissions economy is scaled up to provide alternative to greenhouse gas-emitting products.

Local WWII-style volunteer rationing boards in all American communities, staffed by

elected community volunteers, should give citizens a forum to appeal for extra points or quantity rations and voice complaints to a responsive body.

Creating a functional greenhouse gas point system poses a significant logistical challenge. However, the point ratings for products and services would not need to be immediately perfect in order to have the intended effect. Furthermore, basic necessities would be quantity-rationed in order to ensure equal shares for all, which is not guaranteed in more flexible points rationing regimes.

Once established, the Office of Price Administration and the Environmental Impact Assessment Service should design and deliver a comprehensive upstream and downstream demand reduction regime with the following features:

- A rapidly declining national greenhouse gas emissions budget declining to net zero greenhouse gas emissions by 2025
- Across-the-board price controls to combat inflation
- Wage and salary controls, as needed
- Non-tradable rationing
- Government buyback and retirement of unused rations
- Eventual coverage of all core greenhouse-gas-emitting sectors: the food, energy, transportation, manufacturing, and industrial sectors (It may be politically and administratively easier to progressively phase in the regime and start with the most easily rated sectors, such as energy)
- Consumption-based greenhouse gas points scheme
- Quantity rationing of basic necessities
- Weekly free allowance issuances to citizens
- Sharing of rations among family members
- Appropriately smaller rations for young children
- Strict enforcement
- No loopholes for the rich
- Local citizen rationing boards

The OPA and EIAS should also mandate consumption-based ecological footprint impact labeling on all products and services.

ENERGY & ELECTRICITY

Fossil Fuel Phase-Out & Rapid Rollout of Renewable Energy

A global transition off of fossil fuels is possible, necessary, and inevitable, according to David Fridley, staff scientist at the Energy Analysis Program at Lawrence Berkeley National Laboratory, and Richard Heinberg, Senior Fellow-in-Residence at the Post Carbon Institute (and advisor to The Climate Mobilization).

In their book, "Our Renewable Future: Laying Out the Path for One Hundred Percent Clean Energy," (2016), Fridley and Heinberg argue that a transition to an entirely renewable energy system is feasible and very much worth pursuing — even though it won't be cheap or easy. Indeed, they argue a full transition to renewable energy will require a WWII-like mobilization, costing on the order of $200 trillion globally:

> *The energy transition needs to become the organizing context within which we see and understand everything else that is happening in the world. It needs to be the next great global project, akin to mobilization efforts in the United States for World War II—when Americans were asked to conserve, recycle, and grow their own food. We all must come to share the common understanding that climate change and our response to it constitute a wartime level of emergency, and that we all must cooperate toward a common goal.*

Fridley and Heinberg present a future U.S. energy portfolio dominated by solar and wind energy, and backed up primarily by biomass, hydropower, and geothermal energy sources for base load (or continuous) power. To provide reliable power, the electricity grid is redesigned, managed differently in order to shift and reduce demand, and supplemented with additional energy storage systems. In their transition scenario, there is a gigantic build-out of solar and wind energy (since these technologies have the most immediate capacity for growth), all fossil fuel energy uses are electrified, substituted or eliminated, and total energy use is slashed dramatically (70-90%).

Due to nuclear energy's enormous investment costs, long lead times in plant construction, post-Fukushima safety requirements, growing challenges of waste storage and dis-

posal, and risks of catastrophic accidents and weapons proliferation, Fridley and Heinberg argue that nuclear energy cannot provide much near-term relief from the climate crisis, in spite of hopes that thorium energy or the development of a commercial fusion reactors could lead to a large-scale deployment of new nuclear plants. They project an overall shrinkage of the global nuclear energy industry by 2100: "Fossil fuels are on their way out one way or another, and nuclear energy is a dead end."

Fridley and Heinberg present a number of reasons why a move toward an economy powered primarily by renewable electricity will require an all-out mobilization as well as permanent changes to the American economy that go far beyond a switch in energy sources. The reasons include the intermittency of wind and solar energy, the liquid fuels problem, other uses of fossil fuels that are difficult to substitute, the larger area density requirements of renewable energy collection activities, geographical limitations, and energy quantity limitations:

1. Intermittency

While the current electricity grid relies on controllable inputs such as hydropower, coal, natural gas, and nuclear, solar and wind power are inherently uncontrollable. For instance, wind often blows with the greatest intensity at night, when electricity demand is lowest, and sunshine is limited in the winter.

However, there are ways to make intermittent solar or wind energy act more like controllable fossil fuels. Options include:

- Storing some of the electricity generated for later use
- Building extra capacity
- Redesigning and further connecting electricity grids to balance loads
- Shifting electricity demand from times of convenience to times of abundant supply
- Reducing overall demand

2. The Liquid Fuels Problem

- "Electricity doesn't supply all of our energy use, and very likely cannot in a renewable future. Oil fuels nearly all transportation and many industrial processes, and oil substitutes generally have substantial drawbacks and limitations: "Few automobiles, trucks, ships, or airplanes can burn a pure biofuel without costly engine retrofitting.""

3. Other Uses of Fossil Fuels

Fossil fuel energy is used to generate high temperatures to produce:

- Steel and other metals
- Cement
- Rubber
- Ceramics

- Glass
- Other manufactured goods

Fossil fuels also serve as feedstocks for materials, including:

- Plastics
- Chemicals
- Pharmaceuticals
- Others

4. Area Density of Energy Collection Activities

Renewable energy collection technologies, such as large wind and solar farms, have large geographical footprints compared to fossil fuel collection technologies, such as a natural gas well: "Capturing renewable energy at the scale required to offset all gas and coal energy would nevertheless entail environmental impacts that are far from trivial."

5. Location

Renewable energy sources are more available in some places than others. The best solar energy resources are in the Southwest, while three of the most scarcely populated American states — Montana, North Dakota, and South Dakota — have substantial potential for wind energy development. Fully exploiting these renewable resources will likely require the construction of long-distance, high-capacity transmission lines from energy collection sites to more populated areas.

6. Energy Quantity

Humanity currently uses over 500 exajoules (EJ) of energy per year from all sources. The earth absorbs an enormous 3,850,000 EJ annually from sunlight. But estimates of the practically realizable amount of energy that can be harnessed globally from sunlight range from 42 - 2,592 EJ, due to limiting factors such as the material and land requirements for the building and siting of solar collectors.

According to one analysis of the global potential of renewable energy, business-as-usual growth scenarios show global energy use doubling to 1,000 EJ by 2050.

But according to the study, renewable energy cannot provide "anywhere near a 1000 EJ by 2050." The analysis concludes that a global shift to renewable energy is both necessary due to the limitations of nuclear energy and "will have to be accompanied by large reductions in overall energy use for environmental sustainability."

Heinberg and Fridley concur: "Even assuming a massive build-out of solar and wind capacity…renewables will probably be unable to fully replace the quantity of energy currently provided by fossil fuels, let alone meet projected energy demand growth."

Despite these challenges, Heinberg and Fridley argue that a massive mobilization can deliver 100% renewable energy. But it will take an immediate shift in government policies.

A Note on Timelines

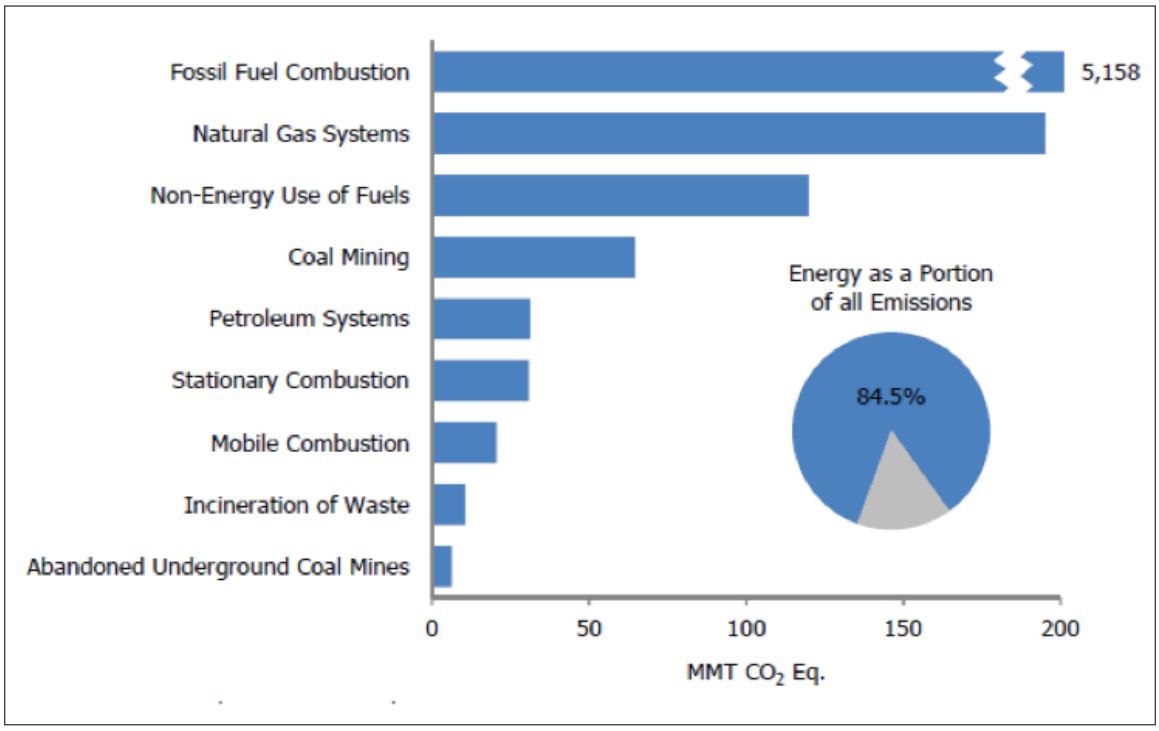
In their book, Heinberg and Fridley seem to embrace energy analyst Vaclav Smil's widely disseminated conclusion that "energy transitions on a national or global scale are inherently protracted affairs. The unfolding shift from fossil fuels to renewable energy sources will be no exception. It will require generations of perseverance." Yet they also note that "without a massive mandatory program, the transition will take decades."

In a new study analyzing recent empirical data, Benjamin Sovacool, director of the Danish Center for Energy Technology, strongly challenges this proposition, suggesting that a vigorous government program backed by a major social movement could accelerate the transition considerably:

> *The ten examples above — five covering prime movers, five covering changes in supply — do cast some doubt on mainstream conceptions that transitions must invariably take decades to occur. Indeed, although previous, historical transitions may have taken a great deal of time, the argument runs that we have learned a sufficient amount from them so that contemporary, or future, energy transitions can be expedited. Future transitions may also become a social or political priority in ways that previous transitions have not been—that is, previous transitions may have been accidental or circumstantial, whereas future transitions could become more planned and coordinated, or backed by aggressive social movements or progressive government targets.*[34]

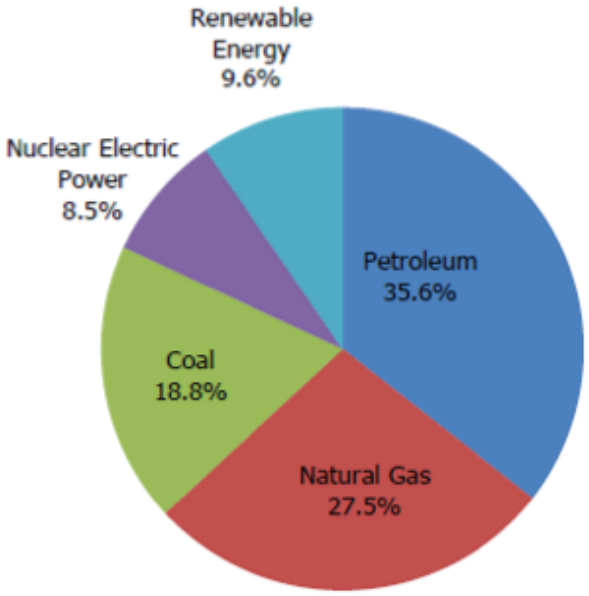
This paper assumes that if the government commits to an emergency mobilization and a maximum commitment of resources toward that end, the abandonment of fossil fuels can be accomplished in years, not decades, which is what science and ethics now clearly demands. Energy planners need to examine the fastest possible technical scenarios for abolishing fossil fuels.

Energy-Related U.S. Greenhouse Gas Emissions



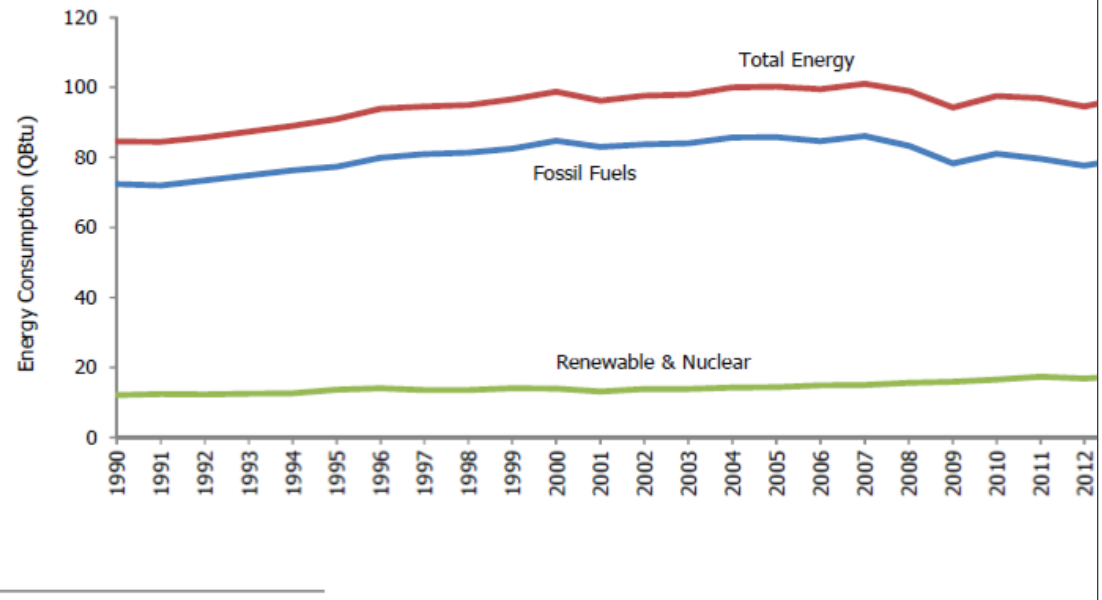
Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Figure 3-3: 2013 U.S. Energy Consumption by Energy Source (percent)



Source: EPA, U.S. Greenhouse Gas Inventory (2015)

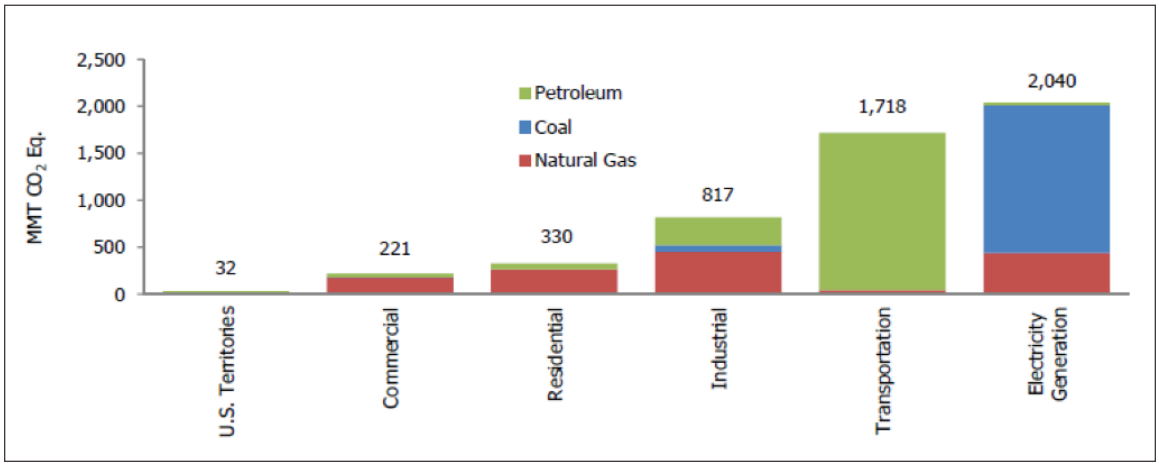
Figure 3-4: U.S. Energy Consumption (Quadrillion Btu)



[7] Renewable energy, as defined in EIA's energy statistics, includes the following energy sources: hydroelectric power, geothermal energy, biofuels, solar energy, and wind energy.

Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Breakdown of U.S. Fossil Fuel Energy Use by Sector (2013)



Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Phase Out Fossil Fuels by 2025 & Slash Total Energy Use

The President should direct the entire federal government apparatus, and in particular the Department of the Interior (DOI), Transportation Redesign Administration (TRA), the Department of Energy (DOE) and the Environmental Protection Agency (EPA), to abandon the "All-of-the-Above" energy policy championed by President Obama and move to phase out fossil fuels entirely by 2025. It should also aim for an ~80% cut in

economy-wide total energy use, much of which can be accomplished through widespread electrification (conversion of energy to electricity entails enormous energy losses). More specifically, a U.S. fossil fuel phase-out policy should immediately:

1. End New Fossil Fuel Exploration

Halt permits for exploration for any type of fossil fuel (coal, oil or gas, conventional or unconventional)

2. Ban New Investment in Fossil Fuel Infrastructure, Use & Production

Ban investments in the production and use of fossil fuels for:

- Pipelines
- Power stations
- Energy supply
- Use in buildings
- Industry
- Transport
- Agriculture

3. Ban New Fossil Fuel Export Infrastructure

Halt the expansion of infrastructure for fossil fuel export (coal, oil or gas)

4. Ban New Fossil Fuel Export Projects

Halt the approval of new fossil fuel export projects (coal, oil and gas)

5. Decommission all Fossil Fuel uses by 2025

Establish a program to decommission all infrastructure, plant and equipment using fossil fuels by 2025.

6. Abolish Fossil Fuel Subsidies

End all subsidies to the fossil fuel industry (except for restructuring out of the fossil fuel industry)

Deliver a Rapid Rollout of Renewable Electricity

1. Build a Continental Renewable Energy SuperSmart Grid

According to Antonella Battaglini, a senior scientist at the Potsdam Institute for Climate Impact Research (PIK), a “SuperSmart Grid” combines two of the most discussed options for renewable power systems — the Super Grid and the Smart Grid. The Super Grid is based upon centralized, utility-scale power generation, and requires the movement of electricity over long distances with high voltage direct current transmission technologies

(HDVC). The Smart Grid approach manages numerous, decentralized renewable generation sources through "smart" technologies and demand side management measures.

A SuperSmart Grid combines these approaches, using "a large share of decentralized and distributed renewables generation, linked into a highly flexible grid capable of transporting electricity over vast distances and in all directions." According to Battaglini, this approach can "speed up the decarbonization process." Heinberg & Fridley also endorse the idea of a "mix of both centralized and decentralized grid systems, combining long-distance transmission infrastructure (high-voltage lines) with local distribution."

The federal government should design and deliver a continental renewable energy SuperSmart Grid by 2025 to enable renewable power generation to be synchronized with power demand day and night, facilitating the creation of a modernized, national zero emissions electricity system that facilitates local, decentralized smart grids. The government should fund the construction of high-voltage transmission lines and work with utilities to deliver significant smart grid upgrades in order to gain a better understanding of what is happening on the grid, reduce power consumption during peak hours, incorporate grid energy storage, and integrate solar and wind on a massive scale.

The main elements of the smart grid approach include:

- Integrated communications, sensing & measurement devices (smart meters and high-speed sensors deployed through the transmission networks)
- Devices to signal the current state of the grid
- Better management and forecasting software
- Energy storage systems
- Additional transmission capacity

2. National Feed-in-Tariff (FIT)

Congress should pass a feed-in-tariff policy to promote the rapid deployment of renewable energy sources. Feed-in-tariffs are subsidy programs that offer long-term contracts to buy electricity from renewable energy producers. The tariff should be based on the cost of generation (as opposed to market prices), and differentiated by technology, installation type, and strength of renewable resource. It should be adjusted as these factors evolve.

3. Maintain Existing Nuclear Generation Until Renewables are Fully Scaled Up

Federal energy policy should encourage states to shut down extremely dangerous nuclear reactors, but should generally aim to maintain nuclear power generation until there is enough renewable energy capacity to replace current coal, gas, and nuclear power generation. If retiring nuclear power plants means adding additional greenhouse gases into the atmosphere, it should not be done.

4. Scale Up Vehicle-to-Grid Systems

Vehicle-to-Grid (V2G) systems use electric cars as "smart appliances" to balance grid elec-

tricity demand with supply. The goal of V2G systems is to use electric vehicle (EV) batteries to provide decentralized storage of electrical energy as intermittent energy sources such as wind and solar come online. According to Fridley & Heinberg, "Since automobiles are parked an average of 95 percent of the time, if EVs were left plugged in during that time electricity could flow to power lines and back."

When a zero emissions standard is put in place for new vehicles (see below), sales of electric vehicles will likely increase considerably. The Department of Energy should incentivize utilities to guarantee repair and replacement of electric vehicle batteries used for V2G storage. Such a policy could help scale up V2G systems and reduce the need to build redundant generation capacity in the fight against intermittency.

TRANSPORT MOBILIZATION

Mass Electrification & Shift Toward Rail and Public Transit

During World War II, an extraordinary revolution in transportation occurred on the American home front. In their book, "Transport Revolutions: Moving People and Freight Without Oil" (2010), transportation planners Richard Gilbert and Anthony Perl describe America's "great wartime pause in motorization" as the "most ambitious effort in American history to restrain personal mobility."

In 1941, Americans owned 30 million cars, about 75 percent of the world's total. A massive consumer of raw materials, the auto industry was equal in size to the total industry of most countries of the world. Spread across 44 states and 1,375 cities, it employed 500,000 workers directly and 7 million indirectly.

It was already clear to government planners in 1941 that the U.S. could not supply the labor and raw materials required to accommodate a full-scale war mobilization and a booming civilian auto industry. But with industry profits running high that summer, government planners ordered a gradually phased-in 43.3% reduction in car output that would be accomplished by the summer of 1942. The attack on Pearl Harbor rendered such gradualism irrelevant and dangerous to national security.

In January 1942, the first official act of the newly established War Production Board (WPB) was to order a cessation of all passenger vehicle production and light-duty trucks by February 10th. Automobile manufacturing facilities were converted extraordinarily quickly to the production of anti-aircraft guns and heavy bombers, disproving the industry's claim that its production lines could not be converted to war production. About 75% of existing auto manufacturing equipment was retrofitted to produce war materiel, while the rest was hauled off and scrapped. By 1943, the government's stop-production order had slashed the car industry's annual personal vehicle production output from 3.8 million cars to 143!

Meanwhile, due to a cutoff of rubber supplies in Southeast Asia, the government introduced tire rationing, which one journalist described as inducing a "slow paralysis" of America's car fleet. When oil tankers came under attack by enemy submarines, mandatory gasoline rationing, administered by local boards of citizen volunteers, was introduced, covering the entire nation by December of 1942.

In 1943, a national ban on "pleasure driving" was put in place for most of the year. According to Gilbert & Perl, "Those caught by vigilant police officers were summoned before local ration boards and could be stripped of their gasoline coupons as punishment. The hearings were open to the public and covered by the press to drive the message home."

A national 35 miles per hour wartime speed limit — or "Victory Speed" — was established, as well. From 1942 to 1945, all automobile racing — including the Indianapolis 500 — was banned.

The government encouraged neighborhood and co-worker car sharing clubs, and industry cooperated in the national transportation demand management effort. People who joined car-sharing clubs received extra rations, while major war production plants charged workers a 10¢ fee for each empty seat in their car as they entered work parking lots.

The wartime pause in mass motorization stimulated a brief "golden age" of public transit in America. Public transport ridership rose from close to 13 billion trips in 1940 to some 23 billion trips in 1946. Per capita travel by passenger vehicle declined 41% from 1941-1943, and buses, streetcars, and local, regional, and intercity trains successfully met the subsequent surge in demand.

Passenger trains' share of intercity travel increased fourfold from 8% to 32% from 1941-1944, while intercity bus travel more than doubled from 4% to 9%. Rail's share of freight movement increased from 61% to 72% from 1940-1943.

In the second half of 1945, the WPB authorized the resumption of civilian vehicle production. The following year, annual private automobile output increased to 2 million, and America's unprecedented pause in mass motorization came to a sudden end.

Contemporary Context

Products of the fossil fuel petroleum oil — particularly gasoline, diesel fuel, and jet kerosene — power the vast majority of global transportation today. In the U.S., transport was responsible for 26% of domestic greenhouse gas emissions in 2014:

- Almost all transport now is propelled by environmentally destructive internal combustion (ICE) engines
- Almost all land transport is accomplished by vehicles that carry fuel on board – either gasoline or diesel fuel

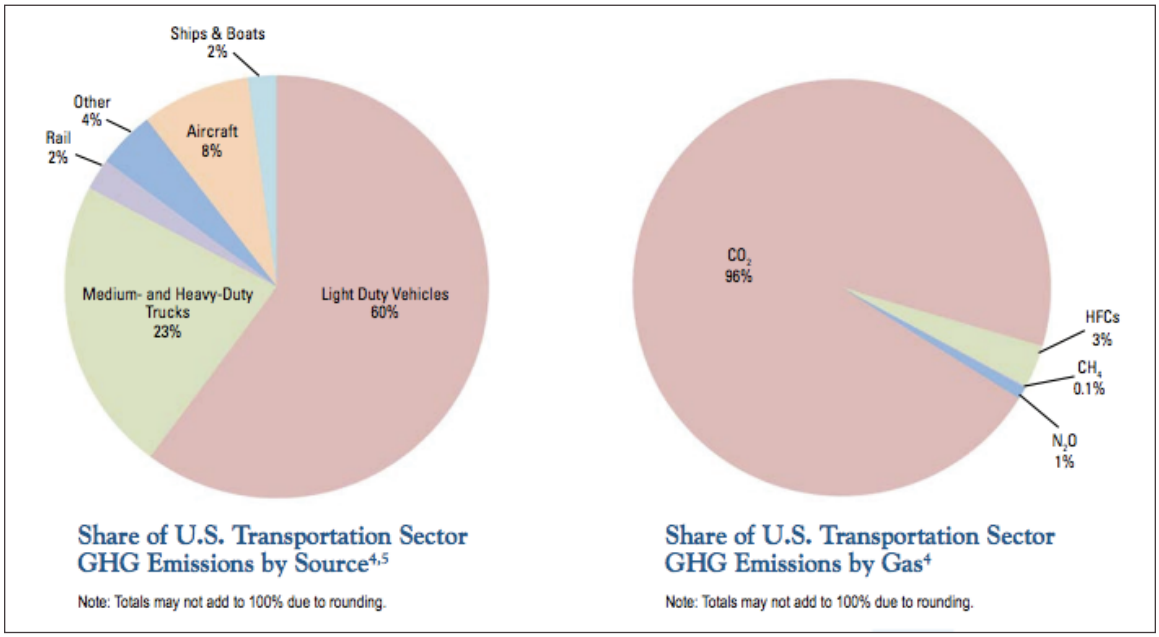
- Almost all marine transport is propelled by diesel engines
- Climate-warming air travel and air freight movement have been the fastest growing freight activities
- Electricity-storing batteries have low energy densities and even with considerable improvements would probably be too massive to power large airplanes or ships

Goal: Sustainable, Zero Emissions Transportation

Major systemic changes that should occur to achieve a sustainable, zero emissions American transportation system:

- Rapid phasing out of the internal combustion engine in all transport modes where a drop-in, sustainable, zero emissions substitute is not available to replace fossil fuels
- A ban on new fossil fuel-powered transport mode production
- A substantial reduction in the ratio of cars to people, which can be accomplished with shared vehicles and direct home-to-destination small vehicle transit service
- A massive motor vehicle scrappage program
- Shift away from suburban sprawl mode of development and "fly-and-drive" status quo
- A comprehensive shift to electric motors in all possible transportation modes
- A massive development of electric transportation infrastructure
- A boom in efficient and high-quality electrified public transport
- Shift to walkable, pedestrian and bicycle-friendly towns and cities
- A rapid expansion of high-speed interurban passenger rail capacity to replace domestic aviation and reduce long-distance driving
- A boom in electrified intercity bus travel
- A shift away from long-haul trucking and an increase in rail freight movement
- A possible increase in domestic marine freight movement (barges)
- The development of environmentally sustainable, zero emissions substitutes (namely non-destructively harvested biobased feedstocks) for long-distance marine and air transport
- Shift to water-based modes of international travel, powered by a mix of sails, kites, renewable electricity and possibly non-destructively harvested biobased feedstocks

Overview of U.S. Transport Sector Greenhouse Gas Emissions



Source: "Fast Facts: U.S. Transportation Sector Greenhouse Gas Emissions 1990-2013," EPA, Oct. 2015.

Greenhouse Gases Emitted from Transport Sources:

- Carbon dioxide (from fuel combustion)
- Methane (from fuel combustion)
- Nitrous oxide (from fuel combustion)
- Hydrofluorocarbons (from air conditioners used to cool people and/or freight)

GHG-emitting Transport Fuels:

- Motor gasoline
- Distillate fuel
- Residual fuel oil
- Jet fuel
- Aviation gasoline
- Natural gas
- Liquefied petroleum gas
- Lubricants

Transportation GHG Sources:

- On-road vehicles
- Aircraft (commercial, military & general)
- Ships and boats
- Rail
- Pipelines
- Lubricants

Mobile Equipment GHG Sources:

- Agricultural equipment
- Construction & mining equipment
- Lawn & garden equipment
- Logging equipment
- Recreational equipment

On-Road Vehicle Definitions:

- **Passenger Cars:** Automobiles used primarily to transport 12 people or less.
- **Light-Duty Trucks:** Trucks with a gross vehicle weight rating typically around 8,500 pounds or less, such as Sport Utility Vehicles (SUVs) and minivans.
- **Medium- and Heavy-Duty Trucks:** Vehicles with a gross vehicle weight rating of more than around 8,500 pounds, such as tractor-trailers, box trucks for freight transportation, service trucks and utility trucks.

Size of the American Motor Vehicle Fleet, Private & Public (2014)[36]

Automobiles:	113,898,845
Buses:	872,027
Trucks:	137,162,349
Motorcycles:	8,417,718
Total:	260,350,938

Key Policies

The policies outlined below are non-comprehensive, but, if implemented, will launch a dramatically new course in U.S. transportation policy and place America on a rapid course toward a transformed transportation system.

First, the President and Congress should establish the **Transportation Redesign Administration** (**TRA**) to substantially replace the U.S. Department of Transportation, which is too invested in the "fly and drive" status quo to manage a full-scale transformation of American transportation.

A forum for consultation with industry, organized labor, environmental groups, and interested citizens on major changes, TRA will finance deployment of the technology and infrastructure needed to create a sustainable, zero emissions transportation system. The DOT could transfer a substantial portion of its 58,622-person staff and $77.2-billion budget to the new agency, but TRA will shift American transportation planning away from the airport and highway expansion the DOT specializes in and toward massive rail development, car-free zoning, and rapid electrification of all possible transport modes.

1. Ban Production of Fossil Fueled Transport Modes (Land, Air & Sea)

In 2010, President Obama requested that the Environmental Protection Agency (EPA) and National Highway Transportation Safety Administration (NHTSA) develop a coordinated national effort to reduce light-duty vehicles' fuel consumption and greenhouse gas emissions for model years 2017–2025 as part of the Corporate Average Fuel Economy (CAFE) regulatory program. The President should call an emergency re-evaluation of the program in order to deliver a zero greenhouse gas emissions standard as quickly as feasible.

The program applies to passenger cars, sport utility vehicles, minivans, and pickup trucks. In total, these vehicles are responsible for about 60% of all U.S. transportation emissions.

The President should direct the EPA, in coordination with the Transportation Redesign Administration (TRA) and the California Air Resources Board (CARB), to conduct an emergency evaluation of the program to assess the closest possible date at which the standards can be set to 0 grams/mile of greenhouse gas emissions.

The existing standards are projected to result in an average industry fleet-wide level of 250 grams/mile of carbon dioxide or better by model year 2016 and 163 grams/mile of carbon dioxide or better by model year 2025.

We recommend a model year of 2020 to reach an average industry fleet-wide level of 0 grams/mile of all greenhouse gas emissions, including carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons. That means, starting in the summer of 2019, *all* new light-duty vehicles produced will be zero emissions.

In 2015, the U.S. produced 12,100,095 motor vehicles. Once a zero emissions standard is in place, America's electric motor vehicle manufacturing output should grow dramatically.

The EPA, CARB and TRA should also establish and implement zero greenhouse gas emissions standards by the summer of 2017 for production of the following modes:

- Medium-duty and heavy-duty vehicles
- Motorcycles
- Buses
- Mobile equipment
- Locomotives
- Aircraft
- Ships
- Boats

In addition, the President must direct the EPA, CARB, and TRA to update America's relaxed air quality standard guidelines for the five criteria pollutants — carbon monoxide, nitrogen oxides, volatile organic compounds and particulate matter (PM10) — to the stricter World Health Organization guidelines.

2. Cash for Clunkers, Take Two: This Time, Scrap 'Em All

The Car Allowance Rebate System ("Cash for Clunkers"), in effect for 32 days in the summer of 2009, was a modest passenger vehicle scrappage program intended to stimulate the economy and encourage a shift toward more fuel-efficient vehicles. The $3 billion program distributed vouchers of either $3,500 or $4,500 (depending on the difference in fuel economy) toward the purchase of new vehicles. The program mandated that participating dealers disable the traded-in vehicles and scrap them. The most traded-in vehicle was the Ford Explorer 4WD, while the top seller was the Toyota Corolla. In total, 690,114 vehicles were scrapped and 690,114 new vehicles were purchased.

Congress should immediately authorize a program to retire or retrofit the entirety of America's approximately 260 million strong fossil fuel-powered motor vehicle fleet by 2025. A $2 trillion appropriation would likely be sufficient to fund an average $5,000 - $10,000 payment for every retired or retrofitted motor vehicle. Additional funds may be required if the initial appropriation is insufficient to drive the switch.

Such a program would not rely on dealers, since it would not make use of an inflexible voucher system that mandates new car purchases. Instead, it will allow participants to choose their new primary mode of transportation, whether public transit, electric vehicles, walking or biking. Eligible vehicle recycling firms will handle the transactions directly, in order to ensure that cars are not re-sold intact.

Program participants will receive either:

- Cash payments (average $4,000)
- Decade-long, free public transportation passes

A ban on fossil fuel-powered motor vehicle transport should be phased in no late than 2025, as well.

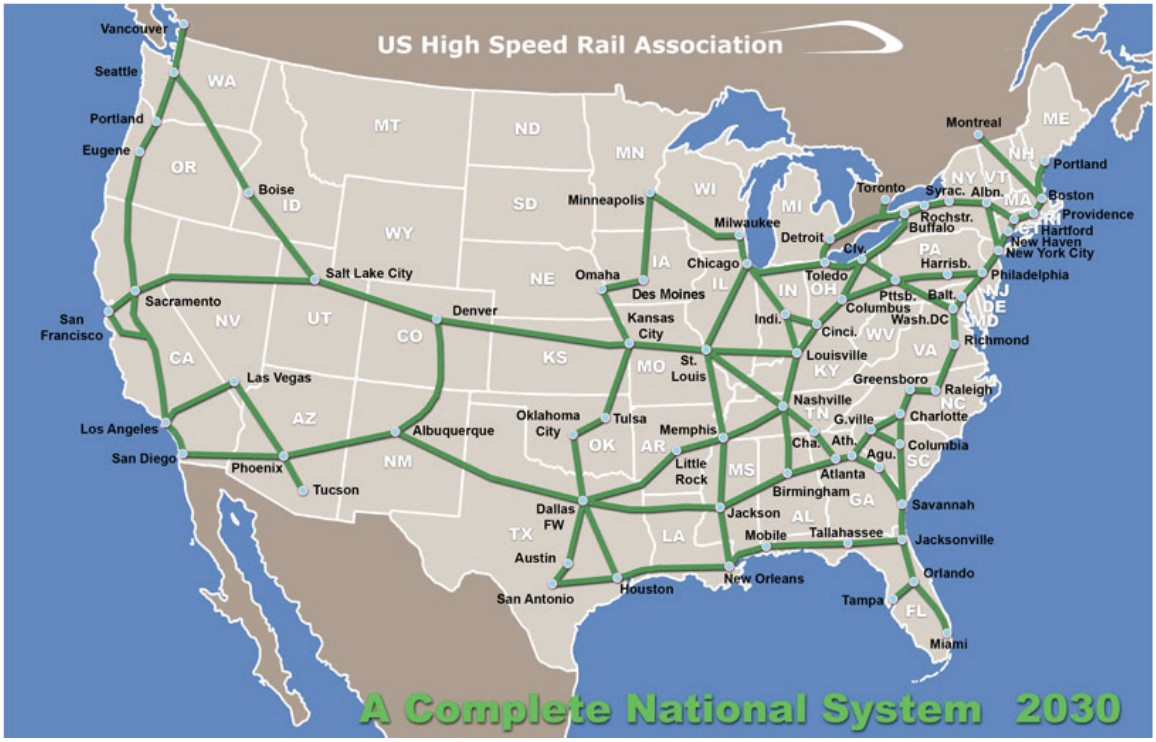
The program's success will depend on the rapid deployment of a massively improved public transportation system and passenger rail network. The prospect of an attractive electrified bus-and-rail transit system, plus a substantial direct payment or long-term public transport pass, may motivate some Americans to opt out of driving. A consumer carbon rationing system will diminish the appeal of investing in a new vehicle during the Mobilization. That being said, America's plug-in electric vehicle (PEV) fleet, now above 400,000, will likely increase dramatically.

3. Electrify America's Rail System & Develop a Continental High-Speed Rail Network

America has far and away the longest rail network in the world. Connecting 48 states and stretching 141,808 miles, our unified rail network contains enough track to encircle the Earth more than five times.

The U.S. rail system is predominantly used for the movement of bulk freight — such as coal, chemicals and grain — inside freight cars hauled by diesel locomotives.

With the exception of the six-fold increase in traffic during World War II, America's once



The national High Speed Rail system proposed by the U.S. High Speed Rail Association.[37]

hegemonic passenger rail service has been in decline since 1920. The length of electrified rail peaked in in the late '30s at 3,100 miles and has declined since.

The majority of America's rail system is privately owned. Many private railway owners earn income from carrying bulk freight and time-sensitive goods (auto parts, assembled vehicles and containerized shipments) in high volumes, and are resistant to the idea of introducing higher-speed passenger trains into the mix.

To achieve a sustainable, zero emissions rail sector, the entirety of America's active rail system will need to be electrified and powered by a zero emissions electricity grid.

Furthermore, high-speed passenger rail, as developed successfully in Japan, Europe, and China, is one of the most promising alternatives to fossil-fuelled aviation and long-distance motoring. A continental high-speed rail network could be the backbone of a sustainable, zero emissions American transportation system. This would require an unprecedented expansion of passenger rail in America.

Although it would be possible to build some high-speed passenger lines on new public rights-of-way or decommissioned or surplus highway infrastructure, the ideal location to develop new passenger rail is on the existing rail rights-of-way, many of which have excess capacity for tracks that could accommodate a vast rail infrastructure expansion.

One way to gain access to the existing rights-of-way is through nationalization. The TRA could buy out railway owners and operate the rail network as a publicly-owned utility. Where geographically and socially feasible, single-track routes could be converted to multi-track track routes to facilitate increased freight traffic as well as a mix of passenger and freight traffic.

Railroad industry nationalization has occurred before in the United States. On Dec. 26, 1917, President Woodrow Wilson ordered the nationalization of the railroads in order to end

severe wartime congestion in freight yards, terminals and ports, and to ensure cooperation among management, labor, investors and shippers. Congress affirmed the order several months later, and the newly formed United States Railroad Administration ran the rail industry until the end of World War I.[38]

Another option is the use of an infrastructure condominium, a legal device that could separate the ownership of land along a right-of-way from what is built upon it. Essentially a large-scale partnership between public and private rail developers, the use of this device would require legislation to recognize it as a new mode of transport asset ownership.

If approved, the infrastructure condominium could preserve private ownership of existing assets and rights-of-ways. Rights-of-ways would be owned separately from the tracks, communications, signaling systems, and electric power distribution equipment. An infrastructure condominium arrangement would enable a privately owned rail right-of-way to be shared by freight carriers, local transit operators, long distance passenger carriers and high-speed corridor operators. Electric power companies could partner with rail owners to use the corridors for power transmission, as well. However access to America's rail rights-of-ways is secured, the TRA should move ahead rapidly to develop a state-of-the-art, federally funded continental network of high-speed passenger rail. The government should directly fund the construction of a high-speed rail system targeting a maximum 15-hour cross-country rail journey. In conjunction with the Department of Energy, the TRA should conduct an assessment of conventional high-speed rail and **magnetic levitation** (maglev) technology to determine which propulsion and rail technology is most appropriate.

Developing a continental high-speed rail system could easily cost hundreds of billions of dollars, dwarfing the $8 billion allocated to states for high-speed rail in the American Recovery and Reinvestment Act (2009).

In 2015, this Japanese Maglev train set the world rail speed record, running 366 miles per hour on a test track.

Courtesy: **Digital Trends**

4. National Solar-Electric Bus Rapid Transit Deployment

Bus Rapid Transit (BRT) is a cheap, comfortable and efficient rapid transit system pioneered in South America that has succeeded in reducing travel times around the world. BRT systems, which are already in use in 36 U.S. cities, make use of dedicated bus-only

A Chinese Bus Rapid Transit system. Courtesy: Scania.com

lanes, separating participating buses from car traffic and providing priority signaling to buses at intersections. Separation from car traffic and low floors makes the buses considerably safer for pedestrians.

As the U.S. engages in a massive expansion of passenger rail, adopts a new greenhouse gas rationing system, and begins to shift away from car-dependency, a national deployment of solar-powered bus rapid transit systems could ease the transition to zero emissions and sustainability in the short- and long-term.

The Mobilization Finance Corporation will create a subsidiary, the Solar BRT Corporation (SBC), to finance a rapid scaling up solar BRT in America.

The SBC will provide capital funding and operational support for a frequent battery-electric BRT system with buses capable of accommodating passengers, light freight and bicycles.

The Transition Compensation & Adjustment Authority (TCAA) will buy out existing diesel bus fleets from private operators and public transit agencies by offering favorable financing on battery-electric buses that have a solar-photovoltaic “skin” capable of generating 5-10% of energy and emergency power, as well as a Wifi telecommunications system for passengers.

In exchange for funding, the federal government will mandate that bus operations companies source their power from new renewable energy generation, offering a facility for matching renewable power plant developers and public transit agencies/bus operations companies.

With the cooperation of local public transit agencies and private bus system operators, the Federal government will mandate high frequencies of service to encourage switching to renewably-powered electric public transit for routine trips along predictable routes, including a rural “post bus” system.

5. Car-Free Cities Act

In January 2014, Germany's second-largest city, Hamburg, announced a plan to create a **Green Network** that will enable anyone to travel the car-dependent city completely by bicycle or foot.[39]

The goal is to create a network of pedestrian and bike paths that connect all of the city's existing green spaces, as well as car-free commuter routes for all of the city's residents. Hamburg planners aim to complete the project, which will cover 40% of the city, within 15-20 years. Meanwhile, in 2012, Denmark completed the first of 26 **bicycle superhighways** that provide Danish suburbanites with a safe and attractive means of bicycling to work in city centers.[40] London is constructing bicycle superhighways as well.

Americans should have the right to travel to work and move around their cities and towns without being forced to use expensive, dangerous, stressful, and climate-heating combustion vehicles. During the 20th century, the car came to exercise a "radical monopoly" over the American transportation system, virtually extinguishing other transport modes such as the trolley and passenger rail. The Car-Free Cities Act will provide trillions of dollars over a 5-year period to facilitate the transformation of America's cities from car-centric concrete jungles into beautiful, human-scale, citizen-centered environments designed to guarantee the right to travel and enjoy life without car ownership.

- **Empower Bikers:** Finance municipalities and counties that build separated bike infrastructure, such as bicycle superhighways and dedicated bike lanes, convert traffic patterns to enable sharing of streets, or build new shared streets with traffic calming speed limits where all participants share a common right of way. Finance and scale up bike-sharing systems across the country.
- **Empower Pedestrians:** Finance municipalities and counties that build sidewalks and cyclist/pedestrian overpasses over intersections, highways and arterials that divide areas of settlement with a density greater than 800 inhabitants per square mile.
- **Empower Bus Riders:** Fund dedicated bus lanes on major thoroughfares and limited-access highways and arterials along with bus stops featuring access to bike, pedestrian, and local transportation.
- **Electrified Light Rail & Commuter Rail:** Provide funding for electrified light rail & commuter rail projects in metro areas across the country (Most of Boston's "T" rail system is commuter rail, except the Green Line, which is commuter rail).

State highway departments should only receive federal road improvement dollars from TRA if they are facilitating federal targets to transition off of fossil fuels and they prioritize and implement multi-modal roadways that are accessible to walking, cycling, automobile, public transit, and other modes. These roadways should facilitate abundant connections between all of the different modes, as well.

6. Terminate Highway and Airport Expansion

About $50 billion of the DOT budget is annually allocated toward the expansion of America's 19,299 airports (2014) and 4,177,073 miles of highway (2014). This funding should be terminated, and the public-sector highway engineers, planners, and project managers affected should switch to rail planning and the development of electric transportation infrastructure on America's rail and road network. A moratorium should be placed on highway and airport expansion, as well.

7. Curb Aviation

There is no zero emissions substitute currently available to power the entire global aviation fleet. Batteries, fuel cells, and biofuels are not presently capable of powering large planes while emitting zero greenhouse gases. Given that during the early years of the Mobilization, large quantities of fossil fuels will be required to build out a renewable energy system, the accelerated curtailment of fossil fuel use in non-mission critical sectors, including aviation, will be required.

Coordinating with the Climate Mobilization Board, the TRA should ration jet fuel and aviation gas on a fair and transparent basis — declining collectively by 15% every year from a baseline year of 2016 — among general aviation pilots and commercial airlines. In 2014, there were 204,408 registered general aviation aircraft in the U.S., while the American commercial airline fleet stood at 6,676 carriers. Assuming appropriate zero emissions substitutes are consequently developed and deployed, all fossil fuel-powered aircraft (that haven't been converted to zero emissions with a drop-in substitute, perhaps non-destructively harvested perennial biofuels) must be permanently grounded by 2025. If not, the absolute minimum level of fossil fuel-powered aircraft required to maintain the healthy functioning of the global economy should remain in transit.

In the early years of the Mobilization, a large number of America's nearly 20,000 airports could likely be decommissioned by the TRA or local authorities, as diminished aviation traffic is concentrated in a smaller number of routes at the remaining airports. Remaining airports in operation could be converted to travelports that connect aviation operations with electric road and rail feeders. TRA may need to allocate revenues to municipalities that convert or decommission airports to help pay down some of their debt accrued from borrowing to expand airport capacity.

In the medium term, the build-out of a zero emissions national passenger rail system can substitute for domestic passenger aviation. Air freight could potentially be replaced by electrified marine and rail-powered freight movement, solar-powered airships (dirigibles) for cargo hauling, teleconferencing and telecommuting, increasingly localized and regionalized supply chains, and international travel by trans-oceanic vessels (such as the Queen Mary 2) powered by a combination of wind (sails, rotors, or kites), solar power, and a very limited amount of non-destructively harvested perennial biofuels.

8. Conserve for Victory: Transport Demand Management

The government should institute a number of other measures to reduce fossil fuel and materials consumption for transportation. Apart from rationing, these should include:

- A reduced national speed limit for fossil fuel-powered vehicles
- Ban on unnecessary "pleasure" driving of fossil fueled-vehicles
- A government marketing campaign encouraging neighbor and co-worker car-sharing and a shift to public transit use
- An employer mandate designed to facilitate an increase in people working from home and teleconferencing when feasible

9. Scale Up Shared Vehicle Fleets

A wide-scale transition to shared vehicles, and in particular shared autonomous electric vehicles (such as electric taxis and taxi-buses) can eliminate congestion, slash emissions, and drastically reduce the size of car fleets.[41] The TRA should distribute grants to cities to dramatically scale up fleets of shared autonomous electric vehicles.

10. National Commission on Long-Haul Trucking, Aviation & Shipping

TRA and the Department of Energy should convene a national commission to explore a sustainable future for the long-haul trucking, aviation, and shipping industries. Due to the energy density limitations of batteries, all of these sectors are not easily electrified. Switching to biofuels en masse could cause immense environmental and social damage due to constraints on land and other factors.

In particular, the commission should consider scenarios in which:

- Long-haul trucking of freight is switched to electrified rail
- Aviation is permanently curtailed and maintained at a much-reduced level using a modest amount of non-destructively harvested perennial biofuels
- Trans-oceanic shipping is refashioned to incorporate sails, rotors, kites, renewable electricity, and a modest amount of non-destructively harvested perennial biofuels
- International travel is reduced and shifted toward rail and trans-oceanic vessels

After consultation with the public and affected industries, the TRA should release and implement comprehensive plans to drive these sectors to net zero greenhouse gas emissions by 2025. Appropriate compensation for scrapped capital assets should be arranged.

TRANSFORM THE FOOD SYSTEM

Shift Toward Plant-Based Diets, Perennialize Grains, and Embrace Agroecology & Carbon Farming

Contemporary Context

In "A National Food Policy for the 21st Century," Mark Bittman, Michael Pollan, Ricardo Salvador, and Olivier De Schutter trace the modern crisis of the American food system to the food price spike of the early '70s. In response to the shock, the Nixon Administration established a new "productivist paradigm" in agriculture, abandoning supply controls and embarking on a campaign to boost farm production by subsidizing and encouraging the industrialization and consolidation of commodity agriculture. The policy promoted a heavy dependence on fossil fuel inputs, such as nitrogen fertilizers and pesticides, and a small number of annual crops (particularly corn and soy) grown in monoculture — the cultivation of a single crop in a field or farming system at the same time. In recent decades, the agricultural sector and food system at large has undergone a "structural transformation" characterized by increasing monopolistic concentration and vertical integration.[42]

In the past decade, U.S. transportation policy has mandated the conversion of commodity corn crops to ethanol biofuel, linking increasingly volatile food and energy markets tightly together. Excess supplies of highly subsidized crops are often dumped in foreign markets, creating extreme hardships for small farmers abroad. American food production is geared toward producing cheap, unhealthy annual grains and oilseeds – much of which is used to fuel vehicles and feed animals headed for slaughter instead of people. According to one study, U.S. grain animal feed production could be diverted to feeding 800 million people.

Meanwhile in the past 50 years, animal agriculture has transformed from a traditional decentralized family farm system to industrial-scale farm animal production, or factory farms. The U.S. animal agriculture system is integrated into a global animal agriculture production and feed system that slaughters 60 billion farm animals every year, producing massive quantities of methane and nitrous oxide, leaching nutrients into watersheds and creating ocean dead zones, and converting large swathes of tropical rainforest into farmland for cattle ranching and animal feed production. Globally, approximately a third of all

farmable land is now used for growing livestock feed.

Across the earth, unsustainable use of insecticides, herbicides, fertilizers, annual crops, bare soils and plows are degrading topsoil, and causing large losses of 25-75% of soil carbon stocks, much of which converts into carbon dioxide and greatly intensifies global warming. By one estimate, the food system as a whole is responsible for about half of global greenhouse gas emissions, with agricultural production contributing 11-15% of global greenhouse gas emissions, processing, packaging, refrigeration, and retailing food contributing 15-20%, and food waste 2-4%. Some 70-90% of global deforestation is caused by agricultural land expansion, mostly for the production of industrial sugarcane, oil palm, soy, maize, rapeseed.

Restoration

While agriculture is massively accelerating the destruction of the global environment, a major reduction of meat and dairy production as well as a transformation toward a "carbon farming" system could help halt deforestation, reverse global warming through the mass sequestration of carbon dioxide, create a more sustainable economy, and produce yields sufficient to feed the global population. In, "The Carbon Farming Solution," (2016) permaculture (or "permanent agriculture") expert Eric Toensmeier explores a suite of agricultural practices and perennial crops that can be harvested non-destructively and sequester carbon dioxide while providing generally high yields of healthy foods as well materials, chemicals and energy (annuals are plants that perform their entire life cycle within one growing season, while perennials are plants such as trees, vines, and palms that last for many growing seasons).

Of the world's 12 billion acres of farmland, carbon farming practices, many of which are ancient, are already in use on hundreds of millions of acres globally (mostly in poor countries). Carbon farming may take many forms, from modifications to annual crop production, carbon-sequestering agroecological approaches to maize, bean, and soybean production, carbon farming livestock production systems (silvopasture), and the production of perennial crops. Toensmeier argues that many of the most-discussed carbon farming techniques — such as no-till, organic annual cropping, and managed grazing — actually have the lowest carbon sequestration potentials per acre (although if globally adopted they could have a significant impact). Other techniques, especially tropical multistrata agroforestry, have extremely high sequestration potential.

Agroecological techniques include:

- Integrated pest management
- Integrated nutrient management
- Conservation tillage
- Agroforestry

- Aquaculture
- Water harvesting
- Livestock integration
- Polycultures (The integration of multiple crops in the same area)

Agriculture will also need to adapt to climate change in order to preserve food production. Agricultural systems that both fight and adapt to climate change include diversified annual cropping systems that use soil conservation practices and incorporate trees, as well as perennial systems with diverse species and multiple layers of vegetation, sustainable soil management, and sustainable fertility management.

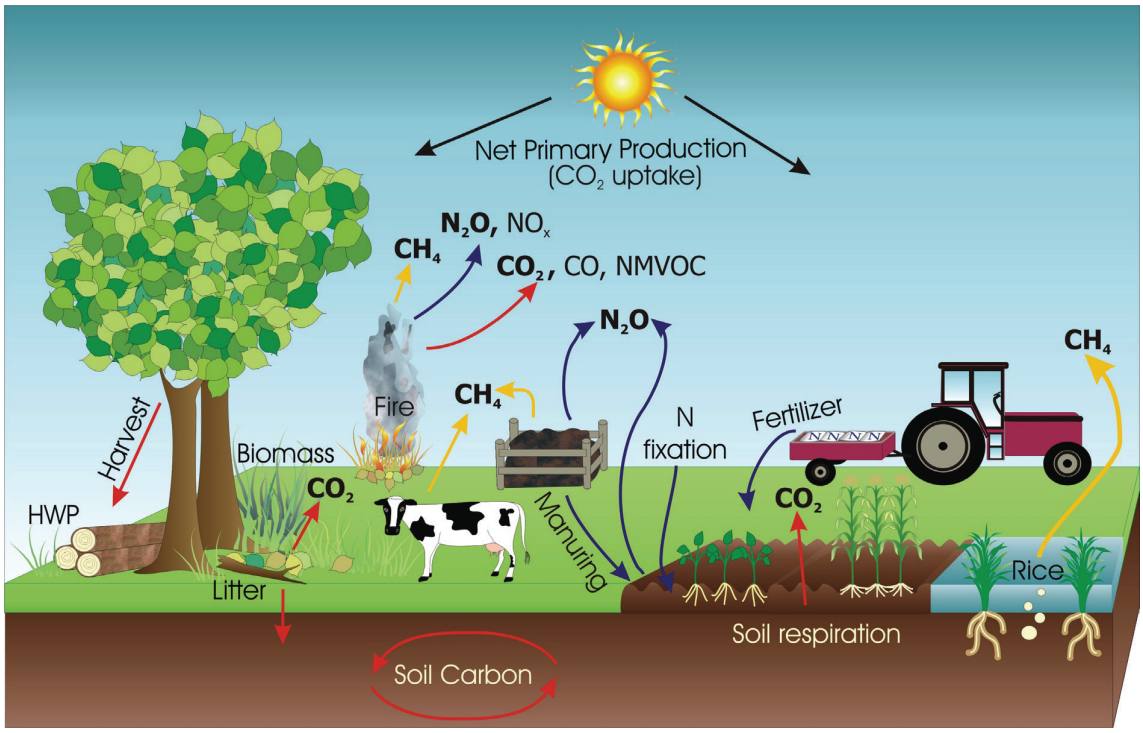
Greenhouse Gases Emitted from Agriculture:

- Methane
- Nitrous oxide
- Carbon dioxide

Agriculture GHG Sources:

- Enteric fermentation (methane)
- Manure management (methane, nitrous oxide)
- Rice cultivation (methane)
- Agricultural soil management (carbon dioxide, nitrous oxide)
- Field burning of agricultural residues (methane, nitrous Oxide)
- Agricultural equipment (carbon dioxide, nitrous oxide, methane)

Greenhouse Gas Emissions from Agriculture



IPCC Guidelines for National Greenhouse Gas Inventories (2006)

Methane Emissions from Enteric Fermentation

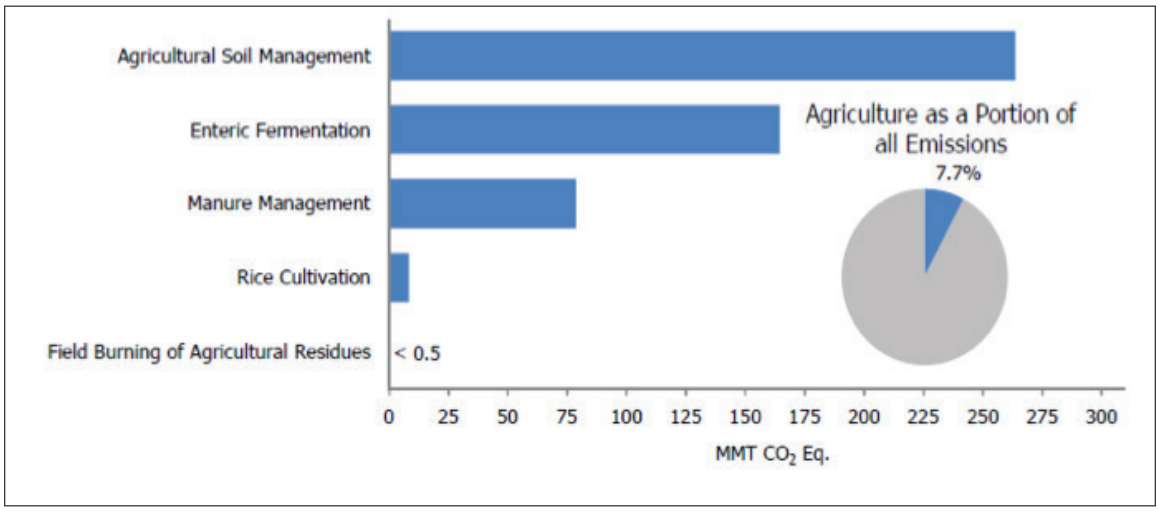
Table 5-3: CH_4 Emissions from Enteric Fermentation (MMT CO_2 Eq.)

Livestock Type	1990	2005	2009	2010	2011	2012	2013
Beef Cattle	119.1	125.2	125.5	124.4	121.7	118.7	117.1
Dairy Cattle	39.4	37.6	41.0	40.7	41.1	41.7	41.6
Swine	2.0	2.3	2.5	2.4	2.5	2.5	2.5
Horses	1.0	1.7	1.7	1.7	1.7	1.6	1.6
Sheep	2.3	1.2	1.1	1.1	1.1	1.1	1.1
Goats	0.3	0.4	0.4	0.4	0.3	0.3	0.3
American Bison	0.1	0.4	0.4	0.4	0.3	0.3	0.3
Mules and Asses	+	0.1	0.1	0.1	0.1	0.1	0.1
Total	**164.2**	**168.9**	**172.7**	**171.1**	**168.7**	**166.3**	**164.5**

Note: Emissions values are presented in CO_2 equivalent mass units using IPCC AR4 GWP values.
Note: Totals may not sum due to independent rounding.
+ Does not exceed 0.05 MMT CO_2 Eq.

Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Breakdown of Agricultural Methane & Nitrous Oxide GHG Emissions



Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Table 5-1: Emissions from Agriculture (MMT CO_2 Eq.)

Gas/Source	1990	2005	2009	2010	2011	2012	2013
CH_4	**210.8**	**234.4**	**242.1**	**243.4**	**238.9**	**239.6**	**234.5**
Enteric Fermentation	164.2	168.9	172.7	171.1	168.7	166.3	164.5
Manure Management	37.2	56.3	59.7	60.9	61.4	63.7	61.4
Rice Cultivation	9.2	8.9	9.4	11.1	8.5	9.3	8.3
Field Burning of Agricultural Residues	0.3	0.2	0.3	0.3	0.3	0.3	0.3
N_2O	**237.9**	**260.1**	**281.2**	**281.4**	**283.2**	**283.4**	**281.1**
Agricultural Soil Management	224.0	243.6	264.1	264.3	265.8	266.0	263.7
Manure Management	13.8	16.4	17.0	17.1	17.3	17.3	17.3
Field Burning of Agricultural Residues	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total	**448.7**	**494.5**	**523.3**	**524.8**	**522.1**	**523.0**	**515.7**

Note: Emissions values are presented in CO_2 equivalent mass units using IPCC AR4 GWP values.
Note: Totals may not sum due to independent rounding.

Source: EPA, U.S. Greenhouse Gas Inventory (2015)

Key Policies

1. Establish a U.S. Department of Food, Health, and Well-Being (DFHW)

This agency will replace the current agricultural planning system administered by the

USDA, FDA and EPA in order to end the revolving door between government and industry, overlap between industry trade promotion and government checkoff programs (such as the "Got Milk?" dairy promotion campaign), and dietary guidelines conflicts.

The new agency should create America's first national food policy, with an overarching goal of promoting the health of Americans and the environment, and more specifically:

- A healthier population
- A reduction in hunger
- Mitigation of (and adaptation to) climate change
- Decreases in energy consumption
- Improved environmental conservation
- Rural & inner city economic development
- Reduction in socioeconomic inequality
- A safer and more secure food system
- A shift toward perennial grains and non-destructively harvested perennial feedstocks
- A healthier relationship with animals and major reduction in meat and dairy consumption

2. Adopt the 50-Year Farm Bill

Written by Wes Jackson of The Land Institute in 2009, the **50-Year Farm Bill's** goal is to eventually "return the world's grain-producing landscapes to perennial plants in the rotation for grain production." Grains compose about 75% of U.S. crop acreage currently, and the policy sets a long-term goal of 80% deep-rooted, long-lived perennials and 20% annuals. About 80% of present U.S. grain production is annual-based.

In the first 8 years of the program, federal funding will sponsor 80 plant breeders and geneticists who will develop perennial grain, legume and oilseed crops and 30 agricultural and ecological scientists to develop agronomic systems, working on 6 to 8 major crop species.

Instead of focusing only on exports, commodities, subsidies, soil conservation measures and food programs, the Farm Bill will be expanded to protect soil from erosion, eliminate fossil fuel dependence on-farm, sequester carbon, reduce toxins in soil and water, carefully manage nitrogen, reduce dead zones, cut wasteful water use and preserve or rebuild farm communities.

3. Create a Soil Carbon Sequestration Payments System

To incentivize soil carbon sequestration on a large scale, the government should establish a system to pay landowners for soil carbon sequestration efforts at a rate of $150/ton/carbon sequestered/acre/year, or higher, if necessary. The payment system should include a mechanism to support polycultures on diversified, mid-size farms.

The new payments systems will require the establishment of a carbon sequestration accounting service and improved monitoring tools.

4. Shift U.S. Agriculture toward Carbon Farming & Agroecology

The DFHW should coordinate with other federal government agencies, Congress, and the cooperative extension services to encourage and subsidize a shift away from environmentally catastrophic conventional industrial agriculture and toward carbon farming and agroecology:

- The Department of Commerce should revive the WWII-era National Inventors Council and fund a Carbon Farming Challenge to reward the most successful carbon farming initiatives
- Reform the USDA Crop Insurance Program to phase out conventional agriculture mandates and to improve climate resiliency
- Establish a Farmers' Land Army (based on the Women's Land Army of WWI and WWII) to quickly train and deploy new carbon farmers. Recruits to the FLA should receive student loan forgiveness.
- Give special subsidies to farms to encourage a shift towards agroecological practices, such as diversifying operations, using cover crops and rotational systems. Support farmers with grants as they negotiate the costly "establishment hump" entailed in a transition to carbon farming.
- Remove subsidies for nitrogen fertilizers
- Increase funding for the cooperative extension services, earmarked specifically for agroecology education and assistance to accommodate the placement of the Farmers' Land Army.

5. "Less Meat, Less Heat, More Life": Cut American Meat & Dairy Consumption in Half by 2020

The Chinese government recently updated its national health guidelines to recommend a 50% cut in meat consumption per capita for its 1.3 billion citizens by 2030. If successful, the shift will slash China's annual greenhouse gas emissions by 6%, according to Climate Nexus.

James Cameron, Arnold Schwarzenegger, and Chinese actress Li Bingbing have partnered with the Chinese Nutrition Society in a PSA campaign called "**Less Meat, Less Heat, More Life**" to promote the effort to cut Chinese meat consumption in half. The PSAs will be featured on Chinese television and billboards.

The U.S. should aim to join China in adopting a climate-friendly diet. The DFHW should set a hard cap on livestock production, declining 10% annually, and U.S. dietary guidelines should be revised to reflect the need for a climate-friendly diet that shifts toward plant-based foods.

Working with the DFHW, Schwarzenegger and Cameron should join with other celebrities, leading physicians, athletes and top military brass to bring the "Less Meat, Less Heat, More Life" PSA campaign to the U.S. In addition, the department should scale up a "Vegan for Victory" PSA campaign to encourage citizens to go all the way in adopting a

climate-friendly diet (while ensuring that all Americans receive appropriate amounts of the vitamins needed for health and vitality, such as B12).

6. Phase Out All Factory Farms by 2020

To contribute to the goal of quickly cutting meat and dairy consumption in half, the EPA should limit supply by ordering that all factory farms be rapidly phased out by 2020 and require that all farmers feed their cattle seaweed, which could likely drastically reduce cattle methane emissions

7. Phase Out Corn Ethanol Mandate

Congress should also repeal the Renewable Fuels Standard, a program mandating the use of corn-based ethanol in transportation fuels sold in the U.S. Annual corn production should be switched toward perennial-based carbon farming systems as U.S. transport policy shifts toward electric motors and car-free cities.

8. Urban & Suburban Victory Gardens

The DFHW should provide education and financial support to citizen efforts to create biodiverse, carbon-sequestering gardens on public and private land, and on buildings (as green roofs). Additional funding should be provided to Cooperative Extension's Master Gardeners programs, for dissemination into communities at large.

9. Shift American Agriculture to All Organic by 2025

Organic food production does not use synthetic fertilizers, herbicides, and pesticides, and is considerably better for the environment than conventional agriculture. The DFHW should set a national goal of shifting all American agricultural operations to organic by 2025.

Other policies

- Shift American Agriculture to no-till, partial-till & strip-till as appropriate by 2025
- Establish a Carbon Sequestration Accounting Service
- Promote wind farms on degraded pasture and cropland
- Establish a federal grain reserve
- Phased-in ban on supermarket food waste
- Adopt EU's "Five Freedoms of Animal Welfare"
- Massively increase funding to the NRCS Conservation Innovation Grants program
- Anti-trust action to restore food system competition
- New Deal for farmworkers

OVERHAUL THE BUILT ENVIRONMENT

1. Climate Homefront Rescue Program

During the mobilization, low-income homeowners may be unable to afford new home insulation, double pane windows, solar hot water heaters, air-source heat pumps, and photovoltaic panels. And many landlords may be unwilling to invest in such critical energy efficiency upgrades.

For that reason, a set of government programs will need to drive a shift toward residential energy efficiency. The U.S. Department of Housing and Urban Development should offer assistance to homeowners to make the switch, as well as incentives and regulations that ensure landlords follow suit.

Furthermore, HUD should purchase and scrap gas stoves and propane grills in order to drive a faster shift toward zero emissions in the residential building sector.

2. Encourage Shift to Transit-Oriented Development

HUD should distribute abundant grants to municipalities to encourage a shift toward Transit-Oriented Development (TOD).

According to the **Transit Oriented Development Institute**, TOD components include:

- "Walkable design with pedestrian as the highest priority
- Train station as prominent feature of town center
- Public square fronting train station
- A regional node containing a mixture of uses in close proximity (office, residential, retail, civic)
- High density, walkable district within 10-minute walk circle surrounding train station
- Collector support transit systems including streetcar, light rail, and buses
- Designed to include the easy use of bicycles and scooters as daily support transport
- Large ride-in bicycle parking areas with stations
- Bikeshare rental system and bikeway network integrated into stations
- Reduced and managed parking inside 10-minute walk circle around town center / train station
- Specialized retail at stations serving commuters and locals including cafes, grocery, dry cleaners"

3. Mandate Passive House Standard (Passivhaus) for New Buildings

A Passive House standard is a proven strategy to slash demand for heating and cooling through highly efficient building design and construction. Passive house buildings (whether homes, commercial, or public) usually require only 5-10% of the energy needed for similarly sized, but conventionally designed, buildings. There are thousands of Passivhaus structures now built in Germany.

The 3 main features of passive solar heating design are:

- Glazing for capturing sunlight
- Trombe walls and other ways of storing heat
- Insulation to maintain relatively constant temperatures

Other important factors include:

- Orientation of the long side of the building toward the sun.
- Appropriate sizing of the mass required to retain and slowly release accumulated heat after the sun sets
- Need to seal the house envelope to reduce air leaks (increasing the risk pollutants will be trapped inside)
- Further spacing apart of buildings to allow for good solar exposure in the winter

One great benefit of passive solar buildings is that they provide better work environments than ones with artificial, fluorescent lighting. The Passive House standard should be mandated for all new buildings.

4. Mandate EnerPHit Standard for Renovations & Retrofits

It is more difficult to retrofit passive solar technologies into existing homes. EnerPHit is a certified approach similar to Passive House, but for renovations and retrofits. The EnerPHit standard should be mandated for renovations to maximize quality and efficiency of building shells.

Other Policies

- Electrify almost all building services to enable the transition away from natural gas distribution networks.
- Maximize insulation and air tightness where complete EnerPHit retrofit is infeasible.
- Improve efficiency of all heating, cooling, lighting and appliances

FULL EMPLOYMENT & WWII-STYLE TAX FAIRNESS

Historical Background

The tremendous arms build-up for World War II ended the Great Depression, with unemployment dropping precipitously to 1.2%. During the war, the federal government transformed America's miniscule antebellum Army of several hundred thousand soldiers into a modern Army of over 8 million men in the span of a few short years.

Since WWII, and especially since the '70s, unemployment and underemployment has been a chronic problem in the United States. Dr. Martin Luther King Jr. viewed unemployment as central to the plight of African-Americans, and in 1968 called on the U.S. federal Government to guarantee employment:

> ***With unemployment a scourge in Negro ghettoes, the government still tinkers with half-hearted measures, refuses still to become an employer of last resort. It asks the business community to solve the problems as though its past failures qualified it for success.***[43]

The United States and other governments have created job guarantee programs in the past. Examples include the Civilian Conservation Corps and Works Progress Administration of the 1930s, as well as the limited job guarantee program for heads of households that cut Argentina's unemployment rate from 23% to 10% following the severe financial crisis and economic meltdown of 2001-2002. The Indian government also established a rural job guarantee in 2005.

Current Context

The United States government's real unemployment rate, or underemployment rate (U6), includes workers who can only secure part-time employment due to poor economic condi-

tions, discouraged workers and other citizens who desire to work but have been unable to find employment.

In July of 2016, the real unemployment rate stood at 9.7% (**St. Louis Fed**), meaning approximately 15,450,839 people are unemployed or underemployed in America today. The seasonally adjusted U.S. civilian labor force for March was 159,287,000. Without remedial action from the federal government, the underemployment rate could oscillate wildly up and down during the Climate Mobilization, causing massive social strain and waste of human potential.

Proposed Policies

1. Job Guarantee

We can wipe out the long recession of the 21st century just as rapidly as America wiped out the Depression during WWII, if we have the courage and moral vision to mobilize the American people toward the immense project of saving civilization.

After declaring a climate emergency, the President must fulfill the obligations of the Humphrey-Hawkins Act (1978) and create a federally funded, locally organized job guarantee program to create true full employment in America, fulfilling at last one of the Four Freedoms championed by FDR in 1941.

Acting as the employer of last resort, the government must offer all American citizens who are ready, willing, and able to work the opportunity to work for a base pay of $15 an hour at a job that contributes to the success of the Climate Mobilization effort. Pay will operate on a sliding scale of up to $25 an hour. The jobs would guarantee benefits and vacation.

The Mobilization Labor Board will coordinate the federally-financed program, but the jobs will be distributed and organized locally by municipal governments and non-profit organizations. Federal funds for labor and materials will be distributed based on the following criteria:

- Does the work help move America rapidly towards a net zero greenhouse gas emissions economy?
- Does the work help remove greenhouse gases from the atmosphere?
- Does the work combat the 6th mass extinction of species?
- Does the work help transition America to an environmentally sustainable economy that is durable enough to last long into the future?

Once in place, the scale of the job guarantee program will grow as private sector employment declines, and vice versa.

The American job guarantee we envision would be comprehensive, employing up to 20 million people, depending on the availability of private sector employment, and only allowing for frictional unemployment (brief periods of unemployment as people switch jobs) for

those who are ready and willing to work.

There should also be a guaranteed 3-month severance package at the same salary for all people laid off as a result of the Mobilization as determined by the Department Of Labor (plus paid job re-training, job search assistance, or financial assistance to move). This guarantee should be extended to 2 years for laid-off worker who enter the job guarantee program. The Department of Labor's Unemployment Insurance program eligibility requirements must be amended to reflect the new guarantees.

The program should also provide for:

- Substantial student debt relief for all job guarantee enrollees (At least $10,000 of debt relief per year of service)
- Guaranteed re-employment in the green jobs sector for coal miners and other fossil fuel workers displaced by the mobilization

2. Wartime-level tax rates

Historical background

For a successful Mobilization, all Americans must embrace the principle of fair and shared sacrifice. A few months after the attack on Pearl Harbor, President Roosevelt unsuccessfully pushed for a 100% tax rate on incomes above $25,000 (about $350,000 in today's dollars) in the name of wartime equality. By 1944, top marginal tax rates were raised to 94% on incomes above $200,000 (about $2.7 million in 2016 dollars).

Current context

Income inequality in the United States is now at its highest point since 1928.[44] Inequality has been tied to a host of problems including crime, political corruption, and very high rates of total resource consumption.

Proposed Policies

A highly progressive income tax scheme should be re-established with a 91% marginal tax rate on incomes above $2 million. Capital gains taxes and other income/wealth taxes should be adjusted and adopted accordingly to ensure that the wealthiest Americans contribute their fair share to the mobilization effort.

MOBILIZE THE DEPARTMENT OF DEFENSE TO FIGHT CLIMATE CHANGE & ECOLOGICAL OVERSHOOT

The World War II-era Department of War played a central role in the fight to defeat fascism. Its descendant, The Department of Defense, can play just as critical a role in the mobilization to save civilization.

With a roughly $585 billion annual budget, the DOD receives over half of federal discretionary spending, and employs over 3.1 million people, including National Guardsmen and Reservists. With its enormous resources and institutional understanding of the logistics of war mobilization, the DOD can play an important role in the Climate Mobilization effort.

1. Aim for Zero Emissions by 2023

The DOD, a massive consumer of fossil fuels, has already been leading the way toward a renewable future. It should massively scale up its ambition—and America's—by pursuing a goal of eliminating net greenhouse gas emissions from all its operations and equipment by 2020.

Any non-mission critical infrastructure, equipment, or weaponry unable to convert to zero emissions should be decommissioned.

2. Shift R&D Dollars to Environmental Defense

Federal outlays on research & development are about $150 billion dollars per year, with $80 billion allocated to defense R&D. Meanwhile research & development allocations for renewable energy, energy efficiency, and electric grid improvements were less than $2 billion dollars in fiscal year 2015.

The DOD should work with the Mobilization Research & Development Agency to shift $70 billion in annual defense R&D spending toward environmental defense — renewable energy, energy efficiency, energy storage, and plant-based meat and dairy substitutes. R&D funds should also be devoted to technologies eliminating fossil fuel use in high-heat industrial processes, affordable and sustainable next-generation biofuels, and the elimination of fossil fuels from all feedstocks (raw materials).

3. Operation Climate Rescue: Transform America's Military Footprint

The U.S. Military possesses nearly 800 military bases in over 70 countries. Bases that are hindering international cooperation in the climate mobilization — such as the base in Okinawa that has incited local protests — should be decommissioned. The remainder should be either partially or fully converted to Climate Rescue bases that distribute emergency food and water supplies to impoverished people and environmental refugees with no strings attached.

By combatting the threat of mass starvation across the globe, Operation Climate Rescue can restore America's standing in the world to the pinnacle reached after World War II. Furthermore, in conjunction with the joint efforts of the International Climate Mobilization Alliance (see below), this global operation can greatly diminish the appeal of terrorism and extremism, empowering the President to phase out controversial measures likely to continue fueling tensions abroad, such as the CIA's global drone strike program.

4. Convert Defense Supply Manufacturers to Climate Mobilization Production

The DOD should work with the Renewables Plant Corporation, the Presidential Task Force on Economic Conversion, and the Climate Mobilization Board to deliver and execute a plan to switch existing manufacturing operations subsidized through the Federal defense budget to the production of wind and solar energy components, advanced batteries, non-fossil fuel feedstock substitutes, and other hardware and materials required for the renewable energy build-out and the broader Mobilization effort. The plan should aim to convert as much industrial capacity as feasible to the Climate Mobilization effort while also maintaining sufficient munitions production to protect America and our allies amid the ongoing and intensifying geopolitical turbulence.

5. Factor the Environmental, Humanitarian and Political Damage of Warfare into All Future Strategic Planning

Failed American military interventions abroad have killed millions of people and left massive legacies of environmental destruction in their wake. The inevitable ecological and human destruction involved in warfare should be factored into all future DOD strategic planning. Accounting for these factors will make it more difficult to engage in hasty, poorly planned, environmentally catastrophic, expensive and fatal interventions abroad.

During the Climate Mobilization and beyond, business leaders, workers, and citizens will need to shift toward a precautionary principle when interacting with the global environment. The armed forces must adopt this strategic shift, as well.

6. Scrap the Nuclear Weapons Modernization Program

To that end, the President should scrap America's 30-year, $1 trillion nuclear weapons modernization program, which, according to *The New York Times*, is contributing to a revived Cold War of nuclear one-upmanship with Russia and China.[45] [46] It is imperative that we immediately begin to work with Russia and China to save civilization, not compete over the size of our respective nuclear weapons stockpiles, which could destroy civilization, humanity, and virtually all life on earth in an instant.

LAUNCH AN EMERGENCY GLOBAL FOREST MANAGEMENT EFFORT

In a "A World to Live In: An Ecologist's Vision for a Plundered Planet" (2016), George Woodwell, Director Emeritus of the Woods Hole Research Center, argues that humanity can halt the annual growth of atmospheric carbon dioxide concentrations by the year 2020 or even earlier through a WWII-scale mobilization that initially cuts global fossil fuel emissions by 25% in conjunction with an emergency forest management effort.

Humanity emits ~10 billion tons of carbon annually, with ~8.5 billion tons emitted annually from fossil fuel burning, and ~1.5 billion tons from deforestation. The oceans absorb ~2 billion tons of excess global carbon emissions annually, while plants on land absorb another 2-3 billion tons of excess carbon every year. The atmosphere absorbs the remaining 4-5 billion tons of human-caused global carbon emissions.

Woodwell argues that a global forest management program to preserve all the remaining old-growth (or primary) forests could end carbon dioxide emissions from deforestation by 2020 (cutting ~1.5 billion tons from annual emissions). In addition, a global effort to grow new forests on previously forested lands totaling the size of Alaska (~663,300 square miles) could immediately sequester 1-2 billion tons of carbon every year as the new forests develop. If fossil fuel emissions are cut simultaneously by 1.5 – 2.5 billion tons by 2020 (or ~25%), the combined oceanic and land-based carbon sinks would — at least temporarily — equal carbon dioxide emissions, halting the growth of atmospheric carbon dioxide concentrations.

(Some argue that with a global shift to a vegan diet, a much greater land area — over 9 million square miles — can be reverted to native forest, which would require that 41% of global grasslands and pasturelands be converted back to forest.)[47]

Either way, Woodwell anticipates that such a program would face massive resistance from timber and agricultural interests:

> ***There will be endless arguments about profits from the sale of timber and more land in agriculture to meet the demands of an expanding human population. But the age of massive deforestation to feed greed or enable the expansion of industrial agriculture has passed as the climatic disruption generates continental droughts and equally distressing floods in marginal lands.***

With sufficient courage and political leadership, America can kick-start a global effort to halt and reverse the forest death spiral.

1. Reforest America's Public Lands (and Phase Out Extraction & Grazing)

The federal government owns a massive portion of the surface area of the United States – about 640 million acres, or 28% of America's total acreage. These holdings, most of which are in the West and Alaska, consist of all the national parks, forests, wildlife refuges and wilderness areas.

America's public lands are managed by three branches of the Department of the Interior – the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (FWS), and the National Park Service (NPS) – in conjunction with the USDA National Forest Service and the Department of Defense.

The Forest Service and the BLM, which collectively manage 456 million acres of public lands, are statutorily tasked with a "multiple use" mandate that calls for a balance of land uses among conservation, recreation and resource extraction activities. Large-scale cattle and sheep grazing, mining, logging, and energy development operations (both fossil fuel and renewable) are ongoing on U.S. public lands.

Federal agencies lease land for logging and fossil fuel extraction (both onshore and submerged offshore) and assess fees for grazing. In particular, U.S. agencies provide leases for crude oil, natural gas, coal and oil shale extraction on public lands. These activities are collectively contributing to the climate emergency and the 6th extinction by destroying habitats and releasing greenhouse gases, such as carbon dioxide and methane. One analysis found that federal fossil fuel production on federal land alone caused nearly 1.278 billion tons of greenhouse gas emissions in 2012, equivalent to 19.5% of U.S. greenhouse gas emissions.[48]

Large-scale, intact, interconnected ecosystems store large quantities of carbon dioxide and provide habitats for species to flourish. To combat the 6th extinction and the climate emergency, Congress and the President should act to remove the "multiple use" mandate and "all-of-the-above" energy policy governing the management of public lands. **Commercial logging, fossil fuel development, mineral extraction and livestock grazing must be rapidly phased out on federal lands.** (Some logging, such as selective cutting in wildlife-urban interface zones, will still be needed to protect communities from wildfires.) Existing leases must be cancelled and leaseholders appropriately compensated for the premature termination of agreements. Ecosystem-sensitive development of renewable energy should continue on public lands, in order to combat abrupt global warming, which would devastate America.

After the ban is imposed, the federal government should move immediately to:

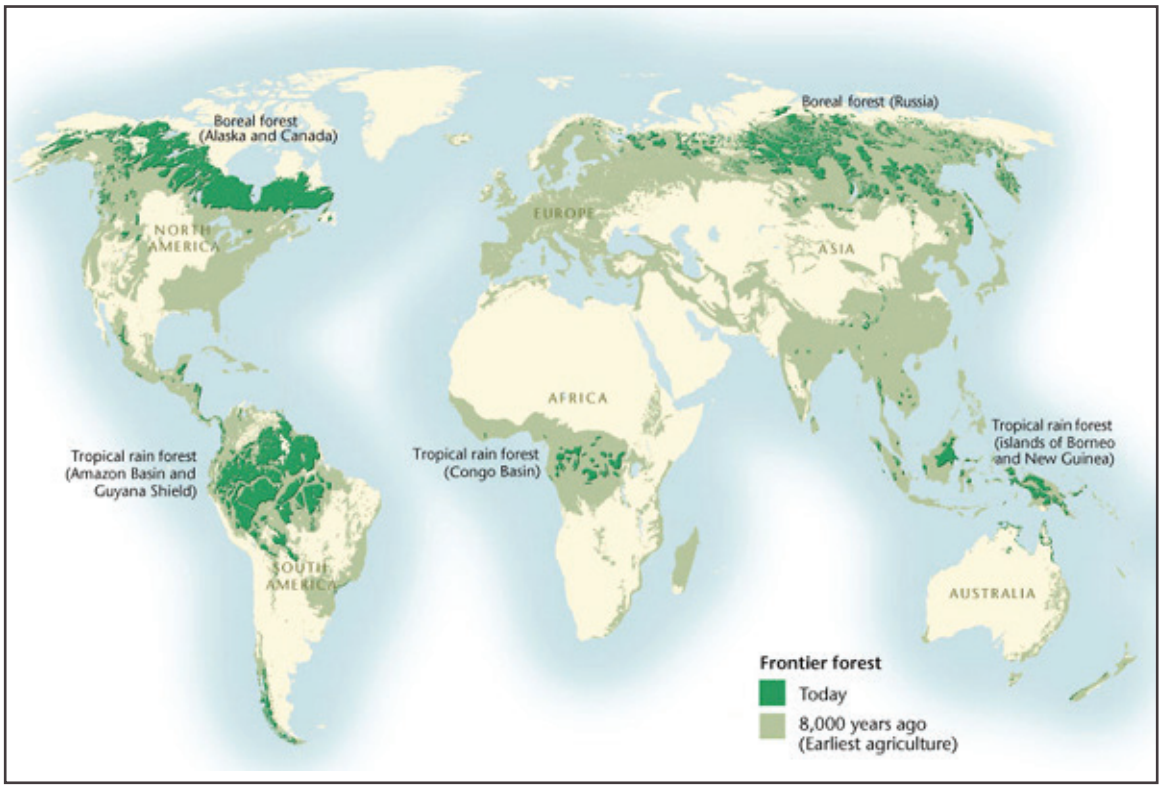
- Re-establish forests on previously forested public lands that have been logged
- Rebuild native vegetation on lands previously used for grazing
- Consult with First Nations/Native Americans, as well as current residents and managers on long-term and appropriate transition plans.

2. Pioneer a Non-Violent Global Effort to Halt & Reverse Deforestation

The destruction of forests, particularly the north-temperate, boreal, and moist tropical forests, accounts for ~15% of global carbon emissions. The U.S. must lead a non-violent global effort to permanently preserve all the remaining old-growth forests, including the entirety of large, intact natural forest ecosystems such as:

- The Tropical rain forests of the Amazon & the Congo
- The Tropical rain forests of the Pacific Islands (Borneo, Papua New Guinea, and Northern Australia)
- The circumpolar Boreal forests of Alaska, Canada, and Russia
- The Montane (mountain) forests of the world

Old-Growth Forests Today vs. 8,000 Years Ago



Due to logging and land-clearing, the planet has lost 75% of its original, old-growth forests.
Source: "Primary Forests: A Snapshot of What Remains," National Geographic, July 16, 2015

In addition, U.S. federal government agencies should lead an effort to re-establish forests on formerly forested lands that are abandoned, impoverished and otherwise unused. According to Woodwell, sufficient land is now available to reforest some 650,000 square miles (roughly the size of Alaska) in previously forested areas around the planet. The reforested areas and preserved old-growth forests should be integrated into the "Half-Earth" wildlife corridor network described below.

The U.S. should work with the international development community and members of

the International Climate Mobilization Alliance (see below) to subsidize the permanent protection of old-growth forests and re-establishment of forests through generous grants and other financial incentives. Reversion of grassland and pastureland to native forests should be incentivized, as well, in order to increase the sequestration from developing forests.

Woodwell suggests that such a crash forest management effort, in conjunction with a 25% cut in global fossil fuel emissions in the next several years, could potentially slow down or head off positive feedbacks that have the potential to destroy the biosphere:

> ***The climatic disruption under way now is moving rapidly into "feedback" systems that can destroy the biosphere. The forests and Arctic may respond in different ways, but the risks of devastating releases are high enough that the additional releases should be avoided at all costs...***
>
> ***Meanwhile if nations led by the United States can move rapidly, the potential exists in the next few years for slowing or possibly deflecting that tragedy through a combination of managing terrestrial ecosystems, especially forests and their soils, and reducing the use of fossil fuels. The opportunity is likely to be transitory, short-lived, and once lost to feedbacks, irrevocable.***

RESEARCH PROGRAM ON NEAR-TERM COOLING APPROACHES

By Ezra Silk and Margaret Klein Salamon

Given the very real prospect of a scenario in which global warming feeds upon itself and becomes effectively uncontrollable, it is *possible* that "merely" ending net global greenhouse gas emissions at wartime speed and instigating a massive greenhouse gas drawdown effort simultaneously will not cool the planet quickly enough to protect civilization and the natural world.

Given the gravity and immediacy of the climate threat, it is not clear to us that the examination of "least-worst" options to prevent uncontrollable warming should be ruled out. While the climate movement has tended to regard discussion of "solar radiation management" as a hazard in and of itself, we believe that public discussion and understanding is required for a democracy to function well. Such difficult decisions, with such extraordinarily high stakes, should be thoroughly researched and discussed in a highly public forum. The public — not just technical experts — must understand the choice at hand, and ultimately, decide with the international community at large whether a near-term cooling intervention is a risk worth taking to prevent uncontrollable overheating of the planet. The public must also be made aware of the potential risks of not attempting a near-term cooling.

In 2015, the National Academy of Sciences' National Research Council recommended researching "albedo modification," or solar radiation management methods meant to increase the earth's reflectivity and either cool the planet or slow down global warming (See the recommendations in Appendix B). And in April, the Senate appropriations committee followed the council's recommendation, inserting language into a proposed spending bill for fiscal year 2017 (which starts on October 1st) requesting that the Department of Energy's Office of Science conduct research into methods meant to reflect sunlight and cool the earth.[49]

This paper supports the proposed appropriation for research into "albedo modification" in the Department of Energy budget, and believes that the budget for such research must be sufficiently high for it to be conducted quickly and thoroughly. *However, we believe* ***only reversible methods should be researched***. The department should also expand its

inquiry to examine not just albedo modification and other "solar radiation management" proposals meant to reflect sunlight (such as a space shade), but other potential means of quickly cooling key regions or the planet at large, including:

- Extremely rapid sequestration of greenhouse gases through global ecosystem restoration
- A global switch to veganism combined with a gigantic reforestation and afforestation effort on former pastureland and grassland
- Extremely drastic cuts in emissions of short-lived warming agents (in conjunction with drastic cuts of medium- and long-lived warming agents)
- Restoring water cycles to cool the planet
- A combination of some or all of these proposals

The use, or planned use, of "solar radiation management" could provide governments with an excuse to further delay zero emissions and drawdown — both of which are unquestionable scientific and ethical imperatives that simply must be done. The Climate Mobilization absolutely would never advocate "solar radiation management" as a standalone climate intervention. Rather, it should *only* be considered as a part of an emergency climate mobilization that eliminates net greenhouse gas emissions as rapidly as possible and draws excess greenhouse gases out of the atmosphere on a massive scale. For an extended discussion of the potentially extreme risks of solar radiation management, particularly the proposed technique called aerosol sulfate injection, see Appendix B. The appendix also discusses why some leading scientists believe we must research solar radiation management methods.

To be clear: This paper advocates research into a broad spectrum of proposals intended to provide near-term cooling. **We are *not* advocating the use, today, of any of these methods or approaches.** That is a decision that the global community at large will have to make, following a transparent, comprehensive public research program.

DRAWDOWN RESEARCH & DEVELOPMENT PROGRAM

The National Academies' report on carbon dioxide drawdown methods, "Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration," examined the following approaches meant to remove carbon dioxide from the atmosphere:

- Afforestation & reforestation
- Carbon sequestration on agricultural lands
- Accelerated weathering methods
- Mineral carbonation
- Ocean iron fertilization
- Bioenergy with carbon capture and sequestration
- Direct air capture and sequestration
- Geological sequestration of carbon dioxide

The report found that a drawdown effort on a scale sufficient to cause atmospheric carbon dioxide concentrations to decrease would be "extraordinary difficult":

> *As discussed throughout this report, CO2 removal from the atmosphere can be enhanced using a range of approaches from biological to chemical. To remove enough CO2 from the atmosphere to offset a substantial fraction of today's CO2 emissions represents a major challenge given available technology and physical constraints (e.g., available land for growing bioenergy feed stocks, and disposing of sequestered CO2). To take enough CO2 out of the atmosphere to cause atmospheric concentrations to markedly decrease would be extraordinarily difficult. The challenge is to capture climatically important amounts of CO2 out of the atmosphere, to sequester it reliably and safely, and to do this in a way that is economically feasible, environmentally beneficial, and socially, legally, and politically acceptable.*

Many within the climate movement and the regenerative agriculture movement favor biological drawdown methods — carbon farming, agroforestry, reforestation and wetland restoration, among others — to remove massive quantities of carbon dioxide from the atmo-

sphere. There is considerable disagreement about the potential of carbon farming, reforestation, afforestation, and (more generally) ecosystem restoration to draw down excess carbon dioxide due to the amount of land required to support human civilization.

According to Eric Toensmeier, author of "The Carbon Farming Solution," (2016) carbon farming on its own is insufficient:

> *Can carbon farming alone solve our climate change problem? Not even close. Carbon farming doesn't work without dramatic emissions reductions (including clean energy and reduced consumption in wealthy countries), as even a small fraction of the remaining 5 to 10 trillion tons of carbon in the fossil pool would far overwhelm the theoretical maximum sequestration capacity of soils and biomass, estimated at 320 billion tons.*

Some argue the historic carbon loss from land clearing and degradation is much higher. Professor William Ruddiman of the Department of Environmental Sciences at the University of Virginia argues that deforestation has resulted in over 500 billion tons of carbon emissions since the dawn of agriculture.[50] If so, that would greatly increase the potential of biological sequestration.

As noted above, atmospheric carbon dioxide concentrations are now averaging 400 parts per million (ppm), and are increasing at about 2-3 ppm every year. If humanity rapidly eliminated net carbon dioxide emissions and peaks concentrations at 425 ppm, then it would take a drawdown effort removing over 308 billion metric tons of carbon to remove the excess atmospheric carbon burden in order to return to 280 ppm, the known safe level (2.125 billion tons of carbon = 1 ppm CO2).

Unfortunately, if the concentration of atmospheric carbon dioxide begins to decline below the concentration in the ocean surface waters, the oceans will begin to release the large amounts of carbon accumulated since the industrial revolution into the atmosphere. While the oceans currently absorb about 2 billion tons of carbon per year, that flow will reverse if humanity is successful in slashing carbon dioxide emissions and scaling up a global drawdown effort. According to Woodwell, the oceans will slowly release between 100 and 200 billion tons of carbon (or possibly more) if atmospheric carbon dioxide concentrations begin to decline.

How long would it take to remove 408 to 508 billion tons of excess atmospheric carbon?

An IPCC estimate of carbon sequestration potential through global adoption of carbon farming techniques found a theoretical maximum capacity of 1.5 - 1.6 billion tons per year, according to Toensmeier. Drawing down at the rate of 1.6 billion tons a year would take approximately 255 to 317 years to draw down the excess atmospheric and ocean carbon load and return from 425 ppm to 280 ppm.

A 2015 study published in the journal *Nature Climate Change* also found that immediately halting tropical deforestation and re-foresting non-productive areas that were previously tropical forest could draw down significant quantities of carbon – about 4 billion tons per

year for 50 years and then a linearly declining amount until 2095.[51]

Although Toensmeier believes the potential for drawdown through agroforestry methods has been underestimated by such analyses, he argues it would be impossible to draw down even 320 billion tons through biological drawdown methods alone.

> *Since the dawn of agriculture 10,000 years ago or more, land clearing and degradation have resulted in 320 billion tons of emissions, 155 billion tons of which were released between 1850 and 2010…If all of that land was restored to its original pre-agricultural state, we might be able to reabsorb it all. Our use of the land for farming, living, and working makes this effectively impossible.*

Others, such as Adam Sacks, executive director of the group Biodiversity for a Livable Climate, disagree, arguing that restoration of healthy ecosystems on billions of degraded acres across the planet could, in theory, draw down 10 billion tons of carbon annually (or more) and restore pre-industrial carbon dioxide concentrations in a matter of decades.[52]

There is significant potential in biological carbon drawdown methods such as reforestation; the proven and safe methods must be pursued with great haste on a global scale. But even at a very high human-managed biological drawdown rate of ~10 billion tons per year, it would still take some 41 to 51 years to draw down all the excess atmospheric and oceanic carbon and return from 425 ppm to 280 ppm. That's a long time to wait to return to safe and stable climate.

For that reason, the federal government should initiate a major research and development program into both biological and chemical carbon dioxide drawdown methods along the lines of the 2nd recommendation in the National Academies' report:

> ***Recommendation 2:*** *The committee recommends research and development investment to improve methods of carbon dioxide removal and disposal at scales that would have a global impact on reducing greenhouse warming, in particular to minimize energy and materials consumption, identify and quantify risks, lower costs, and develop reliable sequestration and monitoring.*

The program should *not* pursue research & development into ocean iron fertilization, which the National Academies' report determined had such large "environmental and sociopolitical risks" if deployed on a large scale that it "would likely outweigh the potential benefits."

The program *should* also pursue research & development of safe and effective methods to draw down all of the non-CO2 greenhouse gases. For example, nitrous oxide, a greenhouse gas 300 times as potent as carbon dioxide released from agricultural fertilizers, manure, crop residues, fossil fuels, forest fires and biomass cook stoves, has an atmospheric shelf life of nearly 120 years and should be drawn down to pre-industrial levels if possible.[53]

FRONT TWO

REVERSE ECOLOGICAL OVERSHOOT

HALF-EARTH CONSERVATION TO HALT THE 6TH MASS EXTINCTION

Since hard-shelled animals first evolved during the Cambrian Explosion 544 million years ago, the number of plants and animals on Earth has steadily increased, in spite of five catastrophic mass extinction events.

Humanity's overshoot of planetary limits has initiated another mass extinction of species, the 6th extinction, which threatens to wipe out much of life (50 - 75% or more of all species) on Earth by the end of this century if business as usual persists. If allowed to unfold, it could take roughly 10 million years for life to fully recover. Meanwhile, accelerating global warming is wreaking havoc on the natural world, causing wholesale migrations of species and ecosystems in a geological instant.

In "Half-Earth: Our Planet's Fight for Life" (2016), the biologist E.O. Wilson compares humanity's collective impact to the 9-mile wide asteroid that 66 million years ago slammed into the Chicxulub coast of Yucatan at a speed of 45,000 miles per hour, exterminating the non-avian dinosaurs and, in combination with volcanic eruptions, causing the 5th mass extinction of species. While humanity has become a force of destruction on the scale of the Chixculub asteroid, Wilson argues that there is a diminishing window of time left to prevent a full-blown "biological holocaust."

Prior to the emergence of anatomically modern humans 195,000 years ago, the rate of extinction was 1 species extinguished per million species per year. According to Wilson, extinction rates are 100 to 1,000 times higher today and accelerating upwards, and the exponential growth of human activity is the cause.

There are about 2 million specifies identified today, and 18,000 new species are discovered every year. Biologists estimate that about 2/3 of the Earth's species have not yet been discovered. Total species estimates range from 5 million to over 100 million.

In response to the gathering mass extinction, Wilson and other conservationist have proposed an "emergency solution" called Half-Earth. It consists of setting aside half the planet's surface as a chain of inviolable reserves and habitat corridors in order to protect 80% or more of the species surviving today and facilitate their South-North and West-East migration amid severe climate disruption.

Because humanity's ecological overshoot is the principle driver of contemporary extinc-

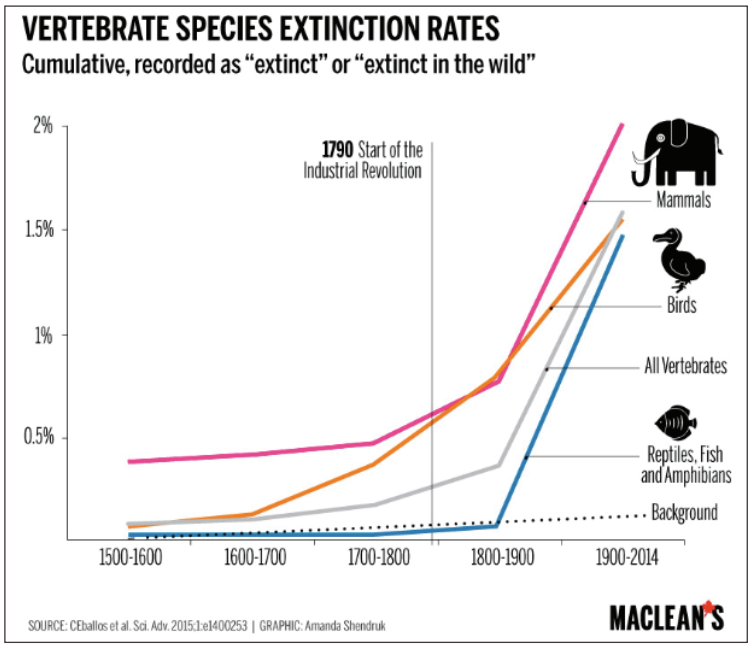
tion, the restoration of a pre-industrial (1750) climate is not enough to stop the 6th extinction in its tracks. A Half-Earth preservation campaign will be needed as well to provide safety for humanity and all of the life forms with which we share the planet. Furthermore, depending on the success of the campaign to reverse global warming, conservation-oriented management of the biosphere has the potential to maintain many local and regional ecosystems' functions as carbon sinks, preventing them from deteriorating, converting into carbon sources, and exacerbating global warming.

Definitions

Ecosystem: A large community of living organisms (Coral reefs, rivers, woodlands)

Species: The basic organisms that make up the living components of ecosystems (Corals, fishes, oak trees)

Vertebrates: Animals that have a backbone or spinal column (Fishes, amphibians, reptiles, birds and mammals)



Invertebrates: Animals that do not have a backbone or spinal column (Mollusks, butterflies, insects, marine organisms, crabs, crayfish, dragonflies and corals)

Biosphere: Collectivity of all the organisms on the planet (all the animals, algae, fungi, microbes alive)

Biodiversity: The variety of life on Earth or in a particular ecosystem; a contraction of "biological diversity"

Primary Causes of the 6th Extinction

The major drivers of extinction are known by the acronym HIPPO:

- Habitat destruction
- Invasive species
- Pollution
- Population growth
- Overhunting

Other drivers include:

- Heavy use of pesticides
- Shortages of natural insect & plant food
- Artificial light pollution
- Climate change
- Ocean acidification

Scale of Biodiversity

Total Known Species: **2 million**
Vertebrate Species: **62,839**
Invertebrate Species: **1.3 million**
Flowering Plant Species: **270,000**

Area of Earth Currently Protected

Land Surface Protected:
161,000 land reserves protect less than 15% of Earth's land area

Ocean Area Protected:
6,500 marine reserves protect 2.8% of Earth's ocean area

Goals

Stop the 6th Mass Extinction: Return extinction rates to one species extinguished per million species per year, the rate that existed before the spread of humanity.
Protect Half the Earth or More: Extend reserves to 50% or more of Earth land and ocean area

Key Policies

1. Scale Up Federal Conservation Spending

The percentage of federal spending devoted to environmental protection and natural resource management has declined from nearly 2.5% of federal spending in the late '70s to about 1% today. If we are to stop the 6th extinction, writes Wilson, "conservation cannot continue to be treated as a luxury item in national budgets."

The Function 300 (Natural Resources and Environment) budget section, the centerpiece of federal conservation and environmental funding, has ranged between $25 billion to $45 billion in recent years. **Function 300 funding levels should be increased to $250 billion.**

Function 300 provides funding for the following agencies and programs:

- Army Corps of Engineers
- Bureau of Reclamation
- Department of Interior
- Bureau of Land Management
- National Park Service
- Fish & Wildlife Service
- The Forest Service
- USDA Conservation Programs
- Environmental Protection Agency
- National Oceanic and Atmospheric Administration

2. Designate a Great Plains Buffalo Commons National Park

Congress must designate a **Buffalo Commons National Park**, with the goal of reintroducing American bison on a large scale into the depopulating Great Plains of America in order to sequester carbon and revive the rural economies of the High Plains. The park will extend across portions of Montana, Wyoming, Colorado, Oklahoma, New Mexico, Texas, North Dakota, South Dakota, Nebraska, and Kansas.

Originally proposed by Frank & Deborah Popper in 1987, the idea of a 139,000 square mile Buffalo Commons has gained increasing support in recent years as the region has depopulated and the Ogallala Aquifer, the region's major water source, has depleted.[54]

The Forest Service should use voluntary contracts and other payment schemes to acquire the ranch and farmland required to establish the Park. $1 billion in land acquisition costs may need to be appropriated, according to estimates.[55] Coordination with Original Nations and ranchers should occur, including debt forgiveness and transition planning for all persons and entities beneath a certain size. Options to avoid residential displacement would be heavily weighed in the National Park's implementation.

3. Establish Half Earth Administration (HEA)

The transformation required in the management of public and private lands is such an enormous departure from present practices that a new federal agency will be required to oversee the emergency ecosystem restoration project. The Half-Earth Administration will:

- Establish an inter-connected North American wildland reserve network as America's contribution to Half-Earth
- Coordinate with other countries to set aside half the Earth's land and ocean area for conservation
- Work with other agencies and the private sector to reorient America's land use and resource management practices toward the goals of stopping the 6th mass extinction and restoring a safe climate
- Help species and ecosystems adapt to climate disruption

In particular, the agency should focus on establishing habitat corridors, carefully moving species in response to climatic disruption of ecosystems (assisted colonization), and maintaining ecosystems' form and function (such as nutrient cycling and watershed integrity).[56]

The HEA should also work with Congress and the Office of the U.S. Trade Representative to overhaul America's trade policy and prioritize the need to halt the 6th extinction and reverse the global economy's ecological overshoot.

4. Develop a North American Wildland Reserve Network

The HEA's top domestic priority must be to acquire the land, using conservation easements and land purchases among other tools, to develop an interconnected wildland reserve network stretching across North America.

Surviving wildlands in the U.S. and around the world are generally fragmented into scattered pieces. Public and private preserves — national parks, wilderness reserves and restored landscapes — must be dramatically expanded and linked together into a series of interconnected Long Landscapes, including

- A Wilderness Appalachian corridor up and down the East Coast
- The unbroken Boreal forests across all of Northern Canada
- Western Wildway arc of land from Mexico along the Rockies to Alaska
- The longleaf pine forests of the Southeast
- White Mountains to the Whitecaps of Long Island
- Buffalo Commons National Park of the Great Plains

Beyond working with the Canadian and Mexican governments, the HEA should also coordinate with the Transportation Redesign Administration (TRA) to fund and manage the construction of wildlife overpasses and underpasses across the country.

Surveillance systems will also be needed, to protect the wildlife and to allow virtual access to the reserves. Physical access should be ensured as well.

5. Launch a Global Effort to Save the Best Places in the Biosphere

The HEA's top foreign policy priority should be to set aside at least half the earth's land surface and oceans in order to stop the 6th mass extinction.

While writing "Half-Earth," Wilson asked 18 of the world's senior naturalists to list the best places in the biosphere, on the basis of their uniqueness and need for protection.

Protected areas ***within*** the following places should form the core of the Half-Earth wildland network, which will be connected as much as possible by habitat corridors:

North America

- The Redwood Forests of California
- The Longleaf Pine Savanna of the American South
- The Madrean Pike-Oak Woodlands of Mexico

The West Indies

- Cuba & Hispaniola

South & Central America

- The Amazon River Basin
- The Guiana Shield
- The Tepuis in Venezuela & Western Guyana
- Greater Manu Region of Peru
- Cloud & Summit Forests of Central America & The Northern Andes
- Páramos of South America
- Atlantic Forests of South America
- The Cerrado
- The Pantanal
- The Galápagos Islands

Europe

- The Bialowieza Forest of Poland & Belarus
- Lake Baikal, Russian Siberia

Africa & Madagascar

- The Christian Orthodox Church Forests of Ethiopia
- Socotra (Indian Ocean)
- The Serengeti Grassland Ecosystem
- Gorongosa National Park, Mozambique
- South Africa
- Forests of the Congo Basin
- The Atewa Forest, Ghana
- Madagascar

Asia

- The Altai Mountains (Russia, China, Mongolia, Kazakhstan)
- Borneo
- The Whestern Ghats of India
- Bhutan
- Myanmar
- Scrubland of Southwestern Australia
- The Kimberley Region of Northwestern Australia
- The Gibber Plains
- New Guinea
- New Caledonia

Antarctica

- McMurdo Dry Valleys of Antarctica

Polynesia

- Hawaii

6. Fund Project to Map Earth's Biodiversity

> *"To discover every species of organism on Earth and to learn everything possible about it is of course one of the most daunting of all tasks. But we will do it, because humanity needs the information for many basic scientific and practical reasons, and more deeply and compellingly because exploration of the unknown is in our genes." – E.O. Wilson*

To save Earth's species, it is imperative that we know that they exist. Of the 2 million species known to science, only 1 in 1000 have been intensely researched. And millions of other species have not yet been identified.

There is a severe shortage of scientific natural historians, and many more expert researchers are needed on the ground to study the planet's species and understand what is happening to the biosphere.

The HEA should launch a global effort to classify every species on Earth by 2050 and train and enlist hundreds of thousands of expert researchers from across the world in the biodiversity mapping project.

RESTORE THE OCEANS

In a 2010 TED talk, "**How We Wrecked the Oceans**," Scripps Institution of Oceanography scientist Jeremy Jackson paints a bleak picture of the future of the oceans:

> What are the oceans going to be like in 20 or 50 years? Well, there won't be any fish except for minnows, and the water will be pretty dirty and all those kinds of things, and full of mercury, et cetera, et cetera, and dead zones will get bigger and bigger and they'll start to merge, and we can imagine something like the dead zone-ification of the global coastal ocean. Then you sure won't want to eat fish that were raised in it, because it would be a kind of gastronomic Russian Roulette.

Many of the drivers of ocean devastation have been addressed in other sections – such as nitrogen fertilizer runoff from agriculture, plastic pollution from industry, offshore oil and gas extraction in the energy sector, and carbon dioxide emissions in the electricity and transportation sector.

Some of the major threats to the oceans are:

- Waters are warming as a result of global warming
- The ocean is rapidly acidifying due to carbon dioxide emissions
- Coral reefs are bleaching
- Overfishing is causing the sudden collapse of entire fish populations
- Industrial bottom trawling fishing is converting the benthos, or "animal forests," of the oceans to barren mud
- Huge industrial fishing nets capture, kill and injure massive amounts of marine creatures, such as sea turtles, sharks, dolphins, seabirds, porpoises and whales (known as "bycatch"), that are not explicitly targeted for commercial fishing
- Polluted river deltas filled with agricultural nitrogen fertilizers are draining into the oceans and creating "dead zones" that kill fish and sea life (a problem intensified by the federal ethanol mandate)[57]

The devastation of the oceans, which are the primary protein source for 1 billion people, is not only a moral catastrophe — it is a threat to global security. To restore the health of the oceans, industrial-scale fishing will need to be substantially curbed, according to marine scientists at the University of British Columbia:

> Fishing is the catching of aquatic wildlife, the equivalent of hunting bison, deer and rabbits on land. Thus, it is not surprising that industrial-scale fishing should generally not be sustainable…If these trends are to be reversed, a huge reduction of fishing effort involving effective decommissioning of a large fraction of the world's fishing fleet will have to be implemented, along with fisheries regulations incorporating a strong form of the precautionary principle.[58]

1. Amend the Magnuson-Stevens Act

Congress must amend the Magnuson-Stevens Fishery Conservation and Management Act (1976) to accomplish the following policies and goals:

- Abolish the roughly $713 million in annual fishing subsidies (half of which encourage overfishing)[59]
- Allocate considerable funds to support the needs of traditional, fishery-dependent communities affected by the Act.
- Eliminate "bycatch" to the greatest extent possible through improvements in fishing net technology
- Ban bottom-trawling and mid-water (pelagic) trawling in all U.S. waters
- Drastically cut seafood waste (nearly half — 2.3 billion pounds — of the U.S. annual seafood supply is wasted)[60]
- Combat overcapacity and overproduction in the U.S. commercial fishing sector

2. Preserve Half of American-Controlled Waters

The American maritime exclusive economic zone (EEZ) is the largest in the world, covering over 3.4 million square nautical miles in the Atlantic and Pacific Oceans, the Caribbean Sea, and the Gulf of Mexico. Within the EEZ, the federal government manages a national system of marine protected areas (MPAs) covering 41% of marine waters that are meant to conserve marine ecosystems while often allowing for multiple uses, including fishing.

About 3 percent of waters in the EEZ are designated as marine reserves, known as "no-take MPAs" or "no-take zones," which totally prohibit fishing and other extractive activities.

The federal Marine Protection Center should immediately set a new target of covering 50% of the nautical miles under American possession with no-take marine reserves in order to contribute America's fair share toward a global Half-Earth ecosystem restoration campaign.

3. Scale Back the Commercial Fishing Fleet

The massive expansion of MPAs will not comprehensively protect migrating species. To that end, limits on fishing capacity will be required to restore ocean ecosystems under American control.

Empowered by the amendments to the Magnuson-Stevens Act, The National Marine Fisheries Service (known as NOAA Fisheries) should set a schedule to retire a substantial portion of American commercial fishing vessels by 2030, beginning with the largest (over 78 feet and 9 inches). The retirement process should prioritize a just transition for fishing communities and targets should be set to prevent any further fisheries collapses and to restore American-controlled ocean ecosystems to full health.

NOAA Fisheries should work closely with The Transition Compensation & Adjustment Authority and affected communities and businesses to provide just compensation for losses.

In addition, a moratorium should be placed on damming or mining projects that threaten salmon spawning habitats.

APPENDIX A

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APPENDIX B

Background on "Solar Radiation Management"

The most discussed solar radiation management strategy involves the injection of aerosols into the upper atmosphere in an effort to reflect sunlight and either quickly cool the earth or slow down the rate of warming. Aircraft, modified artillery, high-altitude balloons, or a giant hose would inject sulfuric acid, hydrogen sulfide, or sulfur dioxide into the upper atmosphere. This approach, known as stratospheric sulfate aerosol injection, would attempt to mimic the effect of volcanoes, which have demonstrably cooled the earth in the past by spewing sulfate aerosols into the atmosphere and reflecting sunlight back into space.

Such a "climate intervention" could theoretically begin to cool the planet approximately 6 months after its deployment and then constrain global heating for decades (or longer), assuming a continuously replenished stratospheric aerosol injection. It could also help counteract the "Faustian Bargain" surge of global warming that could occur if fossil fuels are rapidly phased out and aerosols substantially disappear from the lower atmosphere (troposphere).

Risks

Stratospheric sulfate aerosol injection could disrupt global rainfall patterns, causing floods and droughts that would adversely affect billions of people across the planet, and possibly killing huge amounts of people (in the absence of massive international assistance). If too much sulfate is injected into the stratosphere, the earth could be cooled excessively or too quickly, causing cataclysmic effects akin to either "minor" or "major" "nuclear winter" scenarios, depending on the extent of the overshoot. As a result of these potentially murderous side effects, the actual or planned use of this technology could potentially lead to warfare. There could also be other side effects that cannot be predicted before the technology is deployed.

If the process of aerosol sulfate injection was completely disrupted as a result of depression or war for several years, the cooling effect could wear off, leading to a sudden, disastrous

pulse of warming that could overwhelm the ability of ecosystems to adapt. If solar radiation management was deployed in order to mask the global warming from a business-as-usual emissions trajectory and was suddenly interrupted, it would result in an extremely disastrous warming pulse. Even if no interruption occurred, solar radiation management would need to somehow be deployed continuously for centuries or millennia on end if it was deployed as a substitute for net zero emissions and greenhouse gas removal.

There is no way to test these technologies at scale. The author Naomi Klein persuasively argues that using these techniques would make all humanity and the natural world guinea pigs in an extremely dangerous experiment.

However, it is also true that this extremely dangerous experiment has already begun, thanks to hundreds of years of planetary deforestation, greenhouse gas emissions and aerosol emissions that have completely transformed the earth system.

The best metaphor we can think of for global stratospheric sulfate aerosol injection is chemotherapy — something that no sane person would ever undergo voluntarily, *unless they were going to die without it*. It may be that humanity is out of "good" options, and *may* need to consider the least-damaging pathway back to safety.

Scientific Support for Research

Despite these enormous risks, world-renowned climate scientists have recommended a research program into solar radiation management in response to the existential threat of global warming and associated positive feedback effects, such as a continuous thaw of the Arctic permafrost. An uncontrollable global warming that feeds upon itself could easily kill billions of people and destroy much of the biosphere. Paul Crutzen, an atmospheric chemist and leading promoter of "nuclear winter" theory who won the Nobel Prize for his contribution to the protection of the ozone layer, recommended active scientific research into solar radiation management strategies in a watershed 2006 paper:

> *In conclusion: The first modeling results and the arguments presented in this paper call for active scientific research of the kind of geo-engineering, discussed in this paper. The issue has come to the forefront, because of the dilemma facing international policy makers, who are confronted with the task to clean up air pollution, while simultaneously keeping global climate warming under control. Scientific, legal, ethical, and societal issues, regarding the climate modification scheme are many (Jamieson, 1996; Bodansky, 1996). Building trust between scientists and the general public would be needed to make such a large-scale climate modification acceptable, even if it would be judged to be advantageous. Finally, I repeat: the very best would be if emissions of the greenhouse gases could be reduced so much that the stratospheric sulfur release experiment would not need to take place. Currently, this looks like a pious wish.*

The National Academy of Sciences' Recommendations

If the Senate passes the proposed bill and a research program into solar radiation management commences, it could be a major step toward humans consciously attempting to cool the planet with technological interventions. Opponents of an SRM research program fear that a research program could create a slippery slope toward inevitable deployment, while proponents say it is a necessary step to gain better technical understanding, whether SRM is used or not.

In 2015, the National Academy of Sciences released technical evaluations of both carbon dioxide drawdown methods, "Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration," and solar radiation management methods, "Climate Intervention: Reflecting Sunlight to Cool the Earth."[1]

The committee recommended that solar radiation management (or albedo modification) should be researched but not deployed globally "at scales sufficient to alter climate at this time." More specifically, the reports recommended:

> **Recommendation 1:** Efforts to address climate change should continue to focus most heavily on mitigating greenhouse gas emissions in combination with adapting to the impacts of climate change because these approaches do not present poorly defined and poorly quantified risks and are at a greater state of technological readiness.
>
> **Recommendation 2:** The committee recommends research and development investment to improve methods of carbon dioxide removal and disposal at scales that would have a global impact on reducing greenhouse warming, in particular to minimize energy and materials consumption, identify and quantify risks, lower costs, and develop reliable sequestration and monitoring.
>
> **Recommendation 3:** Albedo modification at scales sufficient to alter climate should not be deployed at this time.
>
> - Albedo modification strategies for offsetting climate impacts of high CO2 concentrations carry risks that are poorly identified in their nature and unquantified.
> - Deployment at climate-altering amplitudes should only be contemplated armed with a quantitative and accurate understanding of the processes that participate in albedo modification. This understanding should be demonstrated at smaller scales after intended and unintended impacts to the Earth system have been explicitly documented, both of which are lacking.
> - There is significant potential for unanticipated, unmanageable, and regrettable consequences in multiple human dimensions from albedo modification at climate-altering scales, including political, social, legal, economic, and ethical dimensions.

- Current observing systems are insufficient to quantify the effects of any intervention. If albedo modification at climate-altering scales were ever to occur, it should be accompanied by an observing system that is appropriate for assessing the impacts of the deployment and informing subsequent actions.
- If research and development on albedo modification were to be done at climate-altering scales, it should be carried out only as part of coordinated national or international planning, proceeding from smaller, less risky to larger, more risky projects; more risky projects should be undertaken only as information is collected to quantify the risks at each stage.

Recommendation 4: The committee recommends an albedo modification research program be developed and implemented that emphasizes multiple-benefit research that also furthers basic understanding of the climate system and its human dimensions.

Recommendation 5: The committee recommends that the United States improve its capacity to detect and measure changes in radiative forcing and associated changes in climate.

Recommendation 6: The committee recommends the initiation of a serious deliberative process to examine (a) what types of research governance, beyond those that already exist, may be needed for albedo modification research and (b) the types of research that would require such governance, potentially based on the magnitude of their expected impact on radiative forcing, their potential for detrimental direct and indirect effects, and other considerations.

REMAINING SECTIONS

(to be Drafted)

Note: The Climate Mobilization Victory Plan is nearly complete in its basic outline, but not entirely. There are a few remaining sections that will be added following the publication of the first draft.

- Industrial Processes
- Plastic Pollution
- 21st Century Water Conservation Policy
- International Climate Mobilization Alliance
- Mobilization Trade Policy (Repeal, Amend, or Reject all Trade Agreements that Would Expose the U.S. to Liability for Undertaking the Climate Mobilization Conclusion

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