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PULLING OUT OF PARIS:

WHY THE UNITED STATES' WITHDRAWAL WILL NOT MUCH MATTER

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The Article reviews the United States' recent decision to withdraw from the Paris Accord and recounts some of the most prominent policy discussions surrounding this decision. The Article goes on to explain, that these policy discussions reject science in favor of short-term political gains.

The Article reviews new scientific reports which indicates that sea level rise may be far worse than expected, due in large part to the fact that previous computer models never looked beyond the year 2100. As this Article highlights, our policy discussions have become so heavily focused on the near future that we have created a distorted perception of time that doesn't mesh with reality. This Article urges policy-makers to take real action on climate now, before it is too late.

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INTRODUCTION[1]

On June 1, 2017, President Trump announced in a widely anticipated press conference watched worldwide, that the United States would pull out of the Paris Climate Accord.

Prospects now are that the United States will continue to strip away tougher policies and regulations on CO_2 and pollutants, as it pursues more lax thinking on greenhouse gases. That path, anyway, had already started very shortly after President Trump took office. The President's flouting of CO_2 rules of the previous administration is now causing celebration among conservatives and hand-wringing by liberals. It's an early "America First" thrust.

Trump's decision also brings to partial conclusion high-level discussions concerning the potential political consequences of leaving, that had gone on for months in the White House and places of global leadership. Yet remarkably, that attention in law and policy had revolved around—and post-withdrawal it still greatly does revolve around—near-term politics only.

These policy discussions have been pointedly blind to what science is telling us about climate and sea levels. Additionally, these discussions are so heavily focused on the near future, that we've created a distorted perception of time that doesn't mesh with reality and which downplays science. There are clear impacts recognized by scientists and their leading Academies around the world; to willingly overlook these impacts is leading us astray. What warming Earth's encroaching shorelines may mean well beyond 2100—a terminal year in projections and debate—needs to be considered.

Ironically, despite the recent furor over the United States staying in versus pulling out of the Paris Accord, it all probably won't much matter. Sea rise is likely to be much more catastrophic than now understood.

I. POLITICAL AND POLICY CALCULATIONS MISS THE POINT

Up until this point, politically-based calculations of the consequences of staying in versus pulling out of the Paris Accord have dominated and framed discussions.

Proponents of the Accord have argued that while the Paris Accord may be weak, it is but a first step in moving participants toward tighter targets and toward strengthening domestic action. Proponents view the political implications of withdrawal as potentially including:

- lasting harm for U.S.-European ties
- disgrace and embarrassment for the United States in foreign affairs
- destabilization in the Accord
- fewer efforts to tighten domestic regulations in the United States

1. An earlier, shorter version of this piece appeared in Scientific American. Robert Wilder & Daniel M. Kammen, *Exposed: The Climate Fallacy of 2100*, SCIENTIFIC AMERICAN (Oct. 19, 2016), https://blogs.scientificamerican.com/guest-blog/exposed-the-climate-fallacy-of-2100.

- coverage for other laggards to leave (a chilling domino effect)
- trade barriers such as new CO_2 taxes on American imports
- lost job growth in green energy, clean technology, and electric cars (which may now go other places like China)
- an opportunity for China to take on the mantle of leadership on climate

Meanwhile, opponents of the Paris Accord (often skeptics of climate change) assert that climate forecasting models denoting carbon dioxide (CO_2) as a problem are dubious at best, and that goals outlined in the Paris Accord would anyway not fix it.[2] They assert that acting on CO_2 would be costly and provide few benefits. Opponents argue that the Accord:

- shifts jobs in coal overseas where nations like India and China can mine coal and burn it, while not binding China's or India's industries to their competitive advantage
- erodes sovereignty
- creates job loss across energy sectors and elsewhere
- slows U.S. GDP growth because countries like China and India won't reach their peak emission levels for over a decade so they can go on polluting while the United States is handcuffed
- encourages spending capital on pointless renewables instead of spending capital on adapting to possible sea changes

Opponents also argue that there is no scientific consensus[3] about warming or its causes, that science does not even infer warming is due to CO_2, that glaciers aren't retreating, that computer models don't show rising sea levels or CO_2 levels as acute threats, and that natural warming is being counted against an arbitrary two degree ceiling.[4]

Still, others favored U.S. withdrawal for a different reason: some asserted that pulling out would actually help the rest of the world take stronger action on climate change. A United States that had only reluctantly stayed in, could use its seat at the table to press its position that climate change is a "hoax," and the United States could obstruct or impede firmer actions. Additionally, remaining might have also stymied a robust Europe-China alliance from forming on greenhouse gases; not to mention that a reluctant United States that stayed in, but refused to cut its own emissions, could convince others to peel off and ignore their own obligations to the agreement as well. Arguably, the United States withdrawing from the Accord might be better for all, because a renegade

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2. Ross McKitrick, *The Case for Pulling the U.S. Out of the Paris Climate Accord*, CATO AT LIBERTY (Apr. 26, 2017), https://www.cato.org/blog/case-pulling-us-out-paris-climate-accord.

3. *See, e.g.*, James Delingpole, *'Global Warming' is a Myth, Say 58 Scientific Papers in 2017*, BREITBART (June 6, 2017), http://www.breitbart.com/big-government/2017/06/06/delingpole-global-warming-is-myth-58-scientific-papers-2017/.

4. It must be said that a vast majority of scientists do not concur with these latter points; nor does any mainstream science, or national Academies. *See, e.g.*, *Breitbart Misrepresents Research from 58 Scientific Papers to Falsely Claim That They Disprove Human-Caused Global Warming*, CLIMATE FEEDBACK (June 8, 2017), https://climatefeedback.org/evaluation/breitbart-misrepresents-research-58-scientific-papers-falsely-claim-disprove-human-caused-global-warming-james-delingpole/.

United States cannot show that "Paris is an empty show-and-tell regime."[5] That the United States has withdrawn, might not be so vexing after all.

In sum, science hasn't been well-served, given that larger issues remain so ill-considered in policy, and data and concerns of scientists remain so disregarded. But that's still about short-term thinking and near-term politics. When it comes to a matter so complex as planetary processes and climate, the discussion must focus on long-term change, and that's where matters are still so misunderstood.

II. THE NATURE OF THE PROBLEM

We have made a grave error in our thinking about time. Again and again, politicians opine on climate in the near-term. Talk concerns 'possible 1 foot versus at most 3 feet' of rise, assumedly always to year 2100. In the political sphere, it is assumed that our cities and countries will always exist. Yet post-2100 sea level rises may engulf parts of California, Florida, New York City, Boston, Washington D.C., London, Shanghai, Amsterdam, and Mumbai. Though the destruction will be longer lasting than any sort of fallout from a nuclear weapon, post-2100 sea level rises are discounted away.

Our misconception of time stems in part from a basic distortion in early computer models about warming—early computers were only able to forecast to the year 2100. As a result, public discussions have been mostly about 'x degrees warming' or 'y feet sea level rise' by the end of this century, or at most by 2100. That's but a couple generations out, yet a post-2200 era is literally something that soon our (hoped-for) grandchildren could experience. Rejecting ruinous outcomes simply because they are beyond a few centuries out is not just factually wrong, it's immoral too.

It is just as wrong to assume that we can cut CO_2 levels later, and that post-2100 seas can be slowed, or even halted.

Both those beliefs are incorrect, because a crucial fraction of the airborne carbon released through next century, may persist for thousands of years. Think about it: some CO_2 from the Industrial Revolution almost 200 years ago is mixing with our current emissions. We're creating a kind of forever legacy, one that potentially can't be forgotten or fixed, no matter how far ahead we conceive of humanity. Perhaps even monumental impacts that can't be readily unwound in a timeframe meaningful to our species. We're only thinking decades out, while our foot is pressing hard on a warming accelerator, adding increasing rates of CO_2 that will last hundreds of years and create changes lasting forever.

Discussions about the Paris decision most always miss this science, as do assumptions about where the climate and seas may be heading in coming centuries. Rates of emissions have in the recent past risen from 1% per year in 1990 to sometimes nearer to 2%, which is at a higher end of what was anticipated in the 1990s.

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5. Luke Kemp, *Better Out Than In*, NATURE CLIMATE CHANGE (May 22, 2017), https://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate3309.html.

An admirable recent paper in *Nature Climate Change*, illuminates the importance of time and science for twenty-first century policy makers by analyzing sea level changes form a much longer time frame than previously considered.[6] Starting farther back than usual (twenty millennia ago), the paper focuses first on natural changes relating to orbital forcing, CO_2, and temperatures. Pointing to a major rise in CO_2 and warming around twenty millennia ago, the authors show how rising CO_2 levels likely brought Earth out of the last ice age. With those large natural increases in CO_2, air temperatures increased over a very long period from the Ice Age up to a near-modern climate reached some eleven millennia ago.

At that time, CO_2 and air temperatures sharply leveled off. Importantly a halt in atmospheric warming gifted all humanity with an interglacial temperature stability that was crucial to our species. That sliver of geologic time (going ten or so millennia), helped humanity take root on land, and allowed our societies and cultures to flourish.

Crucially, however, sea levels didn't stop rising. Sea levels continued rising long past when air temperatures had reached a plateau; sea levels rose for another 8,000 years. This multi-millennial lag is significant both in its length of time and its scope. Seas continued rising another 150 feet before reaching today's height, roughly three millennia ago.

Sea levels are acutely sensitive to CO_2 and temperature changes, demonstrating a sort of inertia by lagging behind carbon and climate cycles. Thus although addressing greenhouse gases now will help temperatures have plateau, sea levels could potentially go on rising long after any policies we implement, even if we take action to slow CO_2 growth worldwide.

Another key point highlighted in this paper is that one-fifth to one-half of airborne CO_2 released by the human industry thus far and in the next 100 years, will still be present in the year 3000. Combine the persistence of airborne CO_2 with the inertia of sea levels, and it means oceans could continue rising for ten or more millennia. Since it may be then that "ultimate return to pre-industrial CO_2 concentrations will not occur for hundreds of thousands of years," there's no easy off-switch to halt rising seas, no matter how much future societies might wish for it.

It's not just rising sea that's troubling in an absolute sense, but the rates of change too. Over the past ten or so millennia of unusually stable benign climate, airborne CO_2 moved quite little between 260 and 280 parts per million (ppm). But to first get up to that stable 280 ppm took from twelve to twenty-millennia. In those thousands of years CO_2 jumped by 80 ppm, from 190 to 270 ppm; temperatures rose by an average of seven degrees Fahrenheit. Now CO_2 is once again rising, but in a far more compressed rate.

Keep in mind too the scale of change: a difference of seven degrees is what separates today's ideal climate from the dramatic conditions of an Ice Age. Huge impacts therefore can be wrought by seven degrees Fahrenheit; in the last Ice Age, ice stood two miles tall over some parts of North America.

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6. Peter U. Clark et al., *Consequences of Twenty-First-Century Policy for Multi-Millennial Climate and Sea-Level Change*, 6 NATURE CLIMATE CHANGE 360-69 (2016).

For a possible idea of what future sea levels will look like, consider Earth's distant past when it was about five degrees Fahrenheit warmer than now. Sea levels then stood roughly fifteen to sixty-five feet higher than today; such levels without a doubt would drown most cities today. Fifty feet of sea rise would render Florida, New York City, much of the Eastern seaboard, the Gulf Coast and parts of the West coast but a distant memory.

Mechanisms of this happening are easy to fathom. Greenland's ice sheet stores twenty-two feet of potential sea rise which is melting and releasing over the course of the next ten millennia. In the last dozen years, Greenland averaged 600 trillion pounds of ice lost yearly. Greenland however isn't alone. Far greater is the Antarctic ice sheet which stores around 150 feet of potential sea rise that may be released over millennia to come. In the last roughly dozen years, the West Antarctic lost roughly 275 trillion pounds of ice annually.

We might be heading fast outside of the conditions humans have always known. Earth might even begin to exhibit heretofore unimaginable changed states. A new study, for instance, indicates that net melting is causing the Earth to slightly change how it moves on its polar axis. Days are getting very slightly longer because ice is melting at the poles is flowing toward the equator, redistributing Earth's mass.

Disturbing possibilities, and enormous time scales? Certainly. Still, basic scientific research into such possibilities needs to start seeping into policy discussions.

III. WHERE DO WE GO FROM HERE?: POTENTIAL SOLUTIONS IN LAW AND POLICY

In a start some leaders are listening; they see researchers giving ample warnings and mainstream scientific consensus as overwhelming. Facts on the ground too undeniably help incentivize. It's jarring for instance to see heat records are lately falling at what feels like a remarkable clip. Take 2016, which followed after 2015 broke records as the hottest year ever. Starting out, February 2016 was next our planet's warmest month on record; the hottest in 137 years of record keeping. This happened alongside a biggest ever-recorded jump in CO_2, over 400 ppm and rising.

However, even if the U.S. had kept its strong CO_2 commitments under the Obama executive orders, the world probably would still blow past the two degrees Celsius threshold. But as those orders are now being jettisoned and far more relaxed national rules are taking their place, it's a new ballgame.

Under the Trump Administration, three billion more tons of CO_2 may be put in air annually by 2030, now that the U.S. is out of the Paris Accord.[7] About one-fifth (21%) of pledged emission avoidance expected from the Accord was supposed to come from the United States.; it will now be much less.

7. Ellie Johnston, et al., *Analysis: U.S. Role in the Paris Agreement*, CLIMATE INTERACTIVE (Apr. 27, 2017), https://www.climateinteractive.org/analysis/us-role-in-paris.

Computer models indicate that due to the United States' withdrawal, warming in 2100 may be about 3.7 degrees Fahrenheit to 8.4 degrees Fahrenheit.

The United States may still have somewhat of an impact. Variables include state and local government action on climate change, along with free markets which may push for clean energy in the meantime, and future leaders in the White House who may re-engage or disengage on climate four to eight years from now.

Of course waiting to act on CO_2 levels is far from ideal; science indicates that action needs to be taken now. Recent studies are changing our previous assumptions that sea level rise will be linear and slow. Marine Ice Sheet Instability (MISI) was previously considered to be only a minor contributor to sea level rise and was kept out of projections, because the Antarctic was considered too stable and vast to react much within this century.

Thus when an international panel in 2013 gave scenarios for sea level rise in this century, they drew from this misconception. Their major Report offered a range of possibilities to 2100. An optimistic lower-end scenario (assuming strong actions on emissions) estimated roughly one foot of sea rise by 2100. While a higher-end scenario (assuming little action on climate) estimated seas could rise about three feet by 2100. Such a rate is nearly ten times the twentieth century average rise.[8]

However, a few years since that report, new papers on ice sheet dynamics have shown that our prior understanding may be incomplete, as MISI mechanisms could be more impactful than previously assumed. For example, one paper describes the thinning and retreating of Pine Island Glacier sooner than was heretofore expected.[9] Additionally, early collapse may be starting at Thwaites Glacier. Pine Island Glacier itself could raise seas about 1.7 feet, while the Thwaites Glacier could raise sea levels another two feet.[10] A 2016 paper by DeConto and Pollard further lists marine ice cliff instability (MICI) as a possible new mechanism for rapid glacial retreat due to vertical collapse of keystone marine-terminating ice cliffs.[11] It might occur quite some time after 2100 as well, but it can happen nonetheless. Again timescales are uncertain, but these collapses may be occurring in the next two to nine centuries as opposed to previously assumed millennia.

Put bluntly, these sorts of possibilities ought to be part of a calculus in policy decisions. Spending trillions of dollars guarding our coasts will prove futile if CO_2 levels continue to rise. Expensive walls built ten feet high to keep the rising sea out will be topped in a century or two. And one can't even imagine

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[8] Note that these projections are for "likely" ranges (meaning a less than 66% probability of this range occurring), so these ranges do not exclude the possibility of sea levels rising slightly higher than three feet, or staying lower. Policymakers surely want more certainty, but scientific knowledge at this point can't offer precision.

9. Lionel Favier et al., *Retreat of Pine Island Glacier Controlled by Marine Ice-Sheet Instability*, 4 NATURE CLIMATE CHANGE 117 (2014).

10. Ian Joughin et al., *Marine Ice Sheet Collapse Potentially Under Way for the Thwaites Glacier Basin, West Antarctica*, 344 SCIENCE 735 (2014).

11. Robert M. DeConto & David Pollard, *Contribution of Antarctica to Past and Future Sea Level Rise*, 531 NATURE 591 (2016).

seawalls able to hold back oceans forty feet higher than today. Rather than spend enormous capital on hardening our shores, it would be better to put resources into reducing CO_2 and greenhouse gas emissions by investing in renewables, clean electric cars, and climate-safe refrigerants. We should be focusing on prevention, not finding a cure.

IV. CONCLUSION

Blame of course is global. Everyone talks about the weather, but nobody does anything about it. We have for too long focused on the political consequences of our actions, sacrificing negative long-term global impacts on the environment for short-term political gains. The United States' withdrawal from the Paris Accord doesn't matter much, what does is whether we will continue down the path we're on. Will we continue disregarding science in favor of politics? Will we continue on a higher-carbon path that potentially commits us to higher seas for millennia, acidifying oceans, amplifying disease, erasing past climate stability, and making weather havoc? What will we tell the future, knowing we knew of the risks?

The point is such changes aren't burdens, but opportunities. Focusing on science, prevention, and renewable energy makes nations stronger, more resilient, and promotes job growth. In places like California, China, Denmark, Germany, and Morocco, renewables are progressing faster. In San Diego County (the fifth most populous county in the United States), the Public Utility Commission 2015 contracted for 35% of its power from clean energy in 2015 and 45% by 2020.[12] Similarly, California (the world's sixth largest economy) already gets 27% of its electricity from clean renewables and has set a current target of 50% clean energy by 2030. Additionally, a new piece of legislation (SB100) moving through the state legislature would require the state to derive 100% of its energy from renewables by 2045.[13]

But even that's not fast enough. We (Rob Wilder and Daniel Kammen) have spent most of our careers advancing renewable energy and sustainability, addressing climate in theory and practice around the world within academia, the public sector and non-profits, the private sector, and as entrepreneurs. Yet nothing currently gives us great hope that harsh scenarios for sea level rise can be avoided. Looking at rates of CO_2 emissions and at leaders who still only offer lofty words about future cuts instead of real action now, optimism does not spring to mind. In mere centuries, it seems possible we humans may commit the Earth to new climate regimes and higher sea levels never seen before in recorded history, and that potentially last millennia.

And we will have done it all, knowing the consequences.

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12. Rob Nikolewski, *Can California Really Hit a 100% Renewable Energy Target?*, SAN DIEGO UNION-TRIBUNE (June 11, 2017), http://www.sandiegouniontribune.com/business/energy-green/sd-fi-california-100percent-20170601-story.html.

13. *Id.*