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Perspectives on Clexit

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Introduction

The Paris Agreement of December 12, 2015, details a comprehensive and ambitious strategy to reduce CO_2 emissions, while ensuring a redistribution of resources from developed nations to lesser developed nations. While the Paris Agreement is non-binding, it calls for a drastic restructuring of the U.S. economy.

On June 1, in accordance with his Presidential campaign promise, President Donald Trump withdrew the U.S. from the agreement, a maneuver referred to as Climate Exit, or Clexit for short. The U.S. withdrawal was based on three critical issues: questionable confidence in the science of global warming, the inability to accurately predict future climate phenomena and the prospect of high expense yielding questionable returns on investment.

With regards to the science, the United Nations Framework Convention on Climate Change (UNFCCC) states that 1) the concentration of the earth's greenhouse gases is directly linked to the average global temperature, 2) the concentration of these gases has been rising steadily since the Industrial Revolution, and 3) the most abundant gas is carbon dioxide, which is the result of burning fossil fuels [1]. In the end, they conclude that "climate change is real and human activities are the main cause".

One of the "architects" of this paradigm, Dr. James Hansen, has taken the position that the planet is in grave danger from CO_2 toxicity. Additionally, his dogmatic opinions have caused many to say that the "science is settled" and that there is no need to research further. However, a brief perusal of Dr. Hansen's research shows that he has wavered significantly on the issue. For example, in a 1981 article titled "Climate Impact of Increasing Atmospheric Carbon Dioxide", Hansen says:

> *The global temperature rose by 0.2°C between the middle 1960's and 1980, yielding a warming of 0.4°C in the past century. This temperature increase is consistent with the calculated greenhouse effect due to measured increases of atmospheric carbon dioxide…It is shown that the anthropogenic carbon dioxide warming should emerge from the noise level of natural climate variability by the end of the century, and there is a high probability of warming in the 1980's [2].*

In 1992, he presents a radically different argument. In "Climate Forcing by Anthropogenic Aerosols", Hansen concludes:

> *Although long considered to be of marginal importance to global climate change, tropospheric aerosol contributes substantially to radiative forcing, and anthropogenic sulfate aerosol in particular has imposed a major perturbation to this forcing. Both the direct scattering of short-wavelength solar radiation and the modification of the shortwave reflective properties of clouds by sulfate aerosol particles increase planetary albedo, thereby exerting a cooling influence on the planet. Current climate forcing due to anthropogenic sulfate is estimated to be -1 to -2 W/m², globally averaged. This perturbation is comparable in magnitude to current anthropogenic greenhouse gas forcing but opposite in sign. Thus, the aerosol forcing has likely offset global greenhouse warming to a substantial degree [3].*

In 1998, the argument from Dr. Hansen shifts again. In "Climate Forcings in the Industrial Era" he unabashedly declares:

> *The forcings that drive long-term climate change are not known with accuracy sufficient to define future climate change. Anthropogenic greenhouse gases (GHGs), which are well measured, cause a strong positive (warming) forcing. But other, poorly measured, anthropogenic forcings, especially changes of atmospheric aerosols, clouds, and land-use patterns, cause a negative forcing that tends to offset greenhouse warming. One consequence of this partial balance is that the natural forcing due to solar irradiance changes may play a larger role in long-term climate change than inferred from comparison with GHGs alone [4].*

In 2000, he takes a position that is, again, novel and somewhat contrarian. He says in "Global Warming in the Twenty-First Century: An Alternative Scenario":

> *A common view is that the current global warming rate will continue or accelerate. But we argue that rapid warming in recent decades has been driven mainly by non-CO_2 greenhouse gases (GHGs), such as chlorofluorocarbons, CH_4, and N_2O, not by the products of fossil fuel burning, CO_2 and aerosols, the positive and negative climate forcings of which are partially offsetting [5].*

Coming full circle, he states in his 2008 article "Target Atmospheric CO_2: Where Should Humanity Aim?"

> *Decreasing CO_2 was the main cause of a cooling trend that began 50 million years ago, the planet being nearly ice-free until CO_2 fell to 450 ± 100 ppm; barring prompt policy changes that critical level will be passed, in the opposite direction, within decades. If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO_2 will need to be reduced from its current 385 ppm to at most 350 ppm, but likely less that [6].*

This sort of equivocation does little to instill confidence in the climate community's ability to predict future climate, much less properly weight and identify the drivers of the climate system (Table 1).

Even if we accept anthropogenic CO_2 as a significant forcing agent, a number of studies have concluded that the effects of CO_2 are exaggerated and will have a minimal impact on future temperatures [7]. Equally important, there can be little confidence in the predicted impacts that higher temperatures may (or may not) bring about. Although an

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exhaustive accounting of this is beyond the scope of this paper, it is illustrative to look at two climate phenomena that have not played out as predicted; hurricane intensity and drought severity. According to the most recent report of the Intergovernmental Panel on Climate Change (IPCC), a warmer world should experience intensified hurricanes and more severe droughts [8]. However, as Figures 1 through 3 illustrate, none of that has proven to be true.

Figures 1 and 2 show that ACE or Accumulated Cyclone Energy, has been virtually flat for both the Atlantic and Eastern Pacific sectors [9]. In other words, the total energy expended by tropical cyclones has neither increased nor decreased in the Atlantic Basin from 1950 through 2015, nor

Year	Dominant Driver(s)
1981	CO_2
1992	Aerosols – offsetting CO_2
1998	Sun
2000	CFCs, CH_4, N_2O
2008	CO_2

Table 1: Dominant global warming drivers cited by James Hansen.

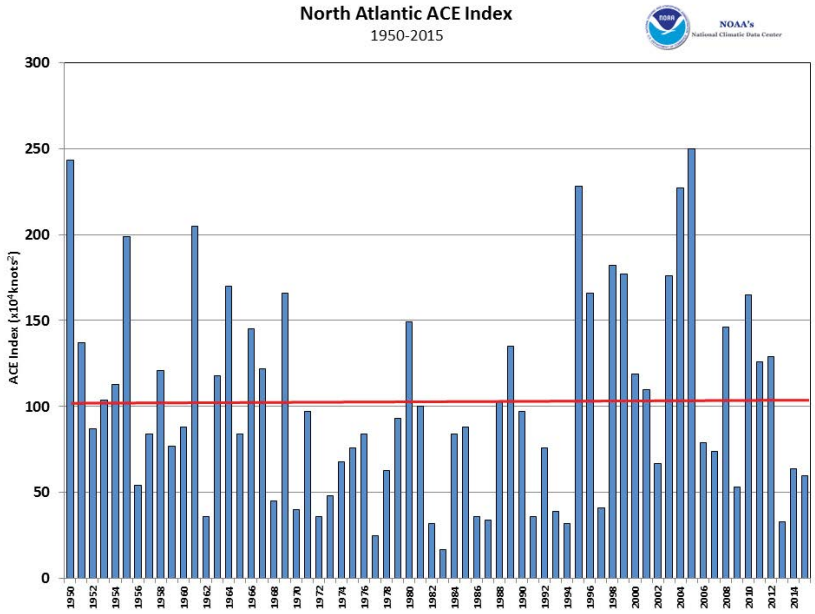

Figure 1: Tropical Cyclone ACE, North Atlantic, 1950-2015. Trend is in red.

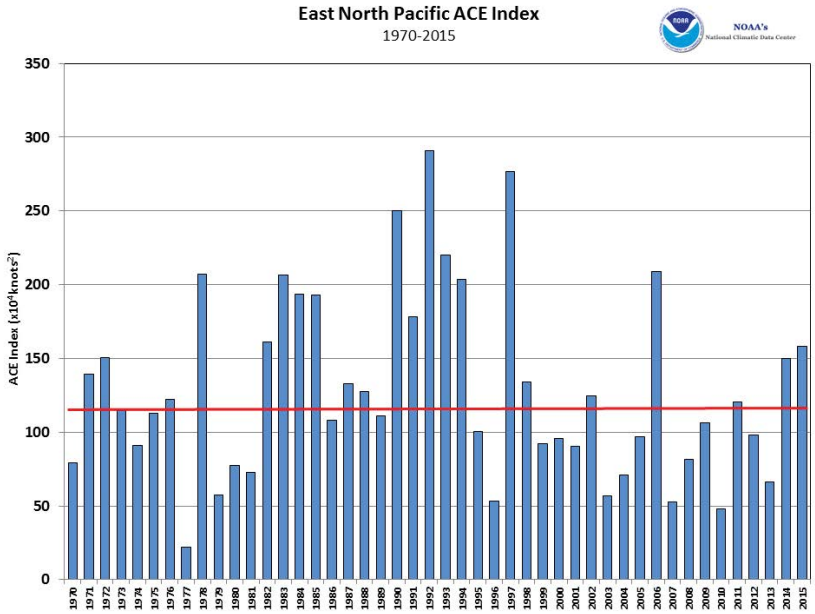

Figure 2: Tropical cyclone ACE, East North Pacific, 1970-2015. Trend is in red.

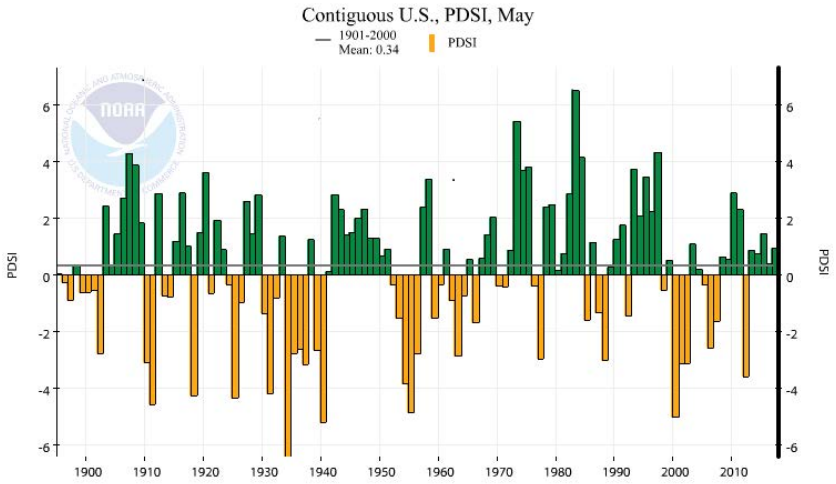

Figure 3: Palmer drought severity index, US, 1901 – 2000. Trend is in grey.

in the Eastern Pacific from 1970 to 2015. Figure 3 shows that the severity of droughts in the U.S., as measured by the Palmer Drought Severity Index (PDSA), has also remained flat since 1901 [10]. In light of the dire predictions that have been foisted on the public in recent years, it's truly remarkable to see how stable these critical parameters have been.

Finally, the costs associated with complying with the agreement are truly staggering. According to a report by NERA Environmental Consulting [11], the U.S. was set to "decarbonize" by the year 2050 in the hopes of capping global temperature rise. The target was a whopping 80% reduction in carbon emissions, a cut that would entail great expense in the process. Completely overhauling the U.S. energy infrastructure would reduce GDP by about $250 billion in 2025, and result in a cumulative loss of nearly $4 trillion between 2022 and 2031. Those losses would become larger going out, and the U.S. economy could lose 6% of its GDP, totaling $14 trillion by the year 2040. Parsed by household, the report concludes that between 2034 and 2040, the average household would lose roughly $5,000 per year.

In toto, the Paris Agreement would severely limit U.S. economic growth, crippling the country's ability to pay down its debt, expand economic opportunity, and compete in the global economy. Poorly conceived policies, based on questionable scientific methods and conclusions, should be avoided at all costs. We must collectively come up with better science, better predictions and better courses of action on these critically important issues. Until then, the U.S. should steer clear of any commitments to alter economic activity for the sake of remedying dubious environmental concerns.

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