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Leadership in the Sixth Mass Extinction

-Elizabeth F. R. Gingerich

Introduction

The “6th Mass Extinction” was once described by the late U.S. Representative from Arizona, Mo Udall, as follows: “The more we exploit nature, the more our options are reduced, until we only have one: to fight for survival” (Federal Impediments, 2014). Unfortunately, humanity has already arrived at the tipping point where such action is now vital. The only path forward is to fight for the future of the human species – by salvaging and restoring ecosystems and the environment upon which the human race is reliant and intertwined. Scientific data supporting the onset of a sixth mass extinction continues to build. The root causes may be multifaceted but all share the common link: human or anthropogenic activity. Human extinction will be the inevitable outcome of decimated ecosystems and of unchecked population growth and consumption. Where is the leadership to guide humanity from this seemingly ineluctable abyss?

Anthropogenic Forces Driving the Sixth Extinction

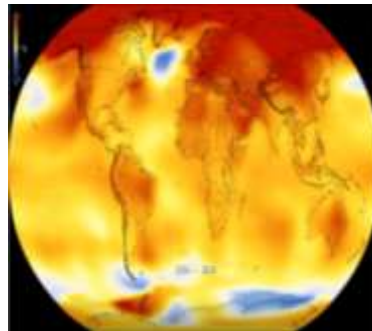
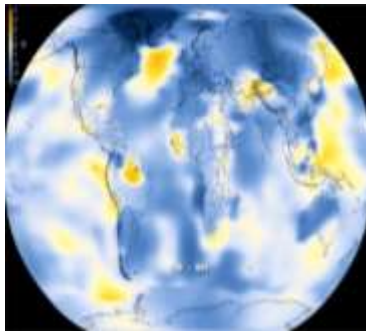
An “extinction event” is scientifically defined as a widespread and rapid decrease in Earth’s biodiversity. Over the last 500 million years, life has had to recover from five distinct catastrophic extinctions when more than 75% of species was extinguished. But unlike the causes for the first four which were primarily attributed to shifting levels of the Earth’s carbon cycle largely caused by volcanic eruptions – the fifth mass extinction, known as the Cretaceous-Paleogene extinction, is regarded as an anomaly. This extinction – occurring over 66 million years ago – has been famously classified as the one obliteration caused by an asteroid collision, decimating the dinosaur population in the process (*Cosmos*, 2019).

For millions of years, life on earth has been altered as a result of these five distinct mass extinction periods. Currently, the planet is entering the sixth mass extinction, leaving the Quaternary Period of the Cenozoic Era (which began at the fifth mass extinction) while unofficially shifting from the Holocene to the Anthropocene epoch (Zimmerman, 2016). This is an era of ongoing change – all fueled by human activity – and broadly characterized with the extinction of plants and animals and the degradation of biodiverse habitats such as rainforests and coral reefs as previously described – all driven by manmade climate change and the overhunting of species. There is no land mass today nor ocean immune from serious loss of biodiversity. Such widespread loss of habitat is also threatening human existence as agricultural practices continue to strip aquifers of their normal flow and inject pesticide

residues into the soil compromising otherwise potable water. “Food production accounts for one-third of greenhouse gas emissions and roughly for 70% of worldwide water use” (Razis, 2010). Although extreme conservation efforts are required to curb this decline in resources, the window of time within which to act has substantially narrowed and future palliative efforts may prove ineffectual (Ceballos et al., 2019).

Other human activities negatively impacting the environment include human population growth, rising per capita consumption rates (the U.S. still leads the world in per person consumption levels and associated carbon emissions although China is the top carbon emitter) meat intake, deforestation, decline in amphibian populations, overfishing, and ocean acidification. The 2019 ISPBS (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) *Global Assessment Report on Biodiversity and Ecosystem Services*, posits that approximately one million species of plants and animals face extinction as a result of human interference.

The alterations Earth has been enduring are unprecedented. Human activity is both a direct cause seen from deforestation and resource consumption, as well as indirect due to human’s impact on climate change (Karlis, 2019). In addition to the exploitation and decimation of biodiversity and the environment, an accelerated rate of human population it is also observed that does not equate with available resources to support it. “Our biologically reproductive success and Western consumer societies led to environmental disruption. We are almost seven billion on earth and continue to increase by around 80 million a year (we were 3.7 billion in 1970)” (Razis, 2010).



1880-2018: https://climate.nasa.gov/climate_resources/139/graphic-global-warming-from-1880-to-2018/. Since 1912, the Earth has experienced a 1 degree rise. Climate scientists predict another 3-5 degree hike before the end of the century.

According to the International Union for Conservation of Nature (IUCN), a non-governmental organization which maintains a list of threatened and extinct species, this current era of mass extinction is unparalleled since the dinosaurs were eliminated over 66 million years ago. Today, extinction affects about 41 percent of all amphibian species and 26 percent of all mammals and is demarcated by habitat loss,

exploitative agricultural practices, the overwhelming insertion of invasive organisms, pollution, desertification of forested areas, acidification of ocean waters, and climate change (IUCN - 2019). The IUCN has predicted that 99.9% of critically endangered species and 67% of endangered species will be lost – as early as within the next 100 years.

Presently, all indicators point to the presence of a sixth mass extinction. Several human impact factors underscore this conclusion:

- Every year, more than 18 million acres of forest disappear worldwide – the equivalent of 27 soccer fields every minute – mostly through manmade clearing activities. In addition to putting animals at risk, deforestation eliminates tree cover that helps absorb atmospheric carbon dioxide. In 2018 alone, nearly thirty million acres of tropical forest were lost – an area the size of Pennsylvania (*Phys.org.*, 2019).

- Human’s burning of fossil fuels to satisfy energy needs have increased the trapping of greenhouse gases in the atmosphere. For land dwellers, the planet’s dangerously hotter future has already occurred. Earth’s land masses have already warmed more than 1.5 degrees Celsius (2.7 degrees Fahrenheit) since the Industrial Revolution. And as land warms twice as quickly, devastating agricultural impacts are abundant, especially as the world’s population increases. Farms filling the void formerly occupied by forests are emitting approximately a quarter of global greenhouse gases annually, “including 13 percent of carbon dioxide and 44 percent of the super-warming but short-lived pollutant methane” (IPCC, 2019).
- Humans have accelerated the introduction and eventual permeation – both intentionally and inadvertently - alien species (a term used to denote any kind of animal, plant, fungus, or bacteria incongruous to an ecosystem. Alien species are recognized as a primary driver of present-day animal and plant extinctions (Blackburn, et al., 2019).

For the last quarter of a century, nation-states have been meeting at various places in the world to discuss the role that climate change has wrecked upon the planet and formed allegiances to counteract the destructive forces. Currently, the Conference of Parties (COP) 25 has just wrapped up in its host city of Madrid. Each year the COP offers a global platform whereby the latest scientific findings on climate change and national strategies on greenhouse gas control are shared and critiqued. Although participating nation-states – with the glaring exception of the United States – have done well to define the problem, in terms of performance, 2019 regrettably experienced an increase of 1% in CO₂ emissions worldwide. The proceedings featured several notable reports on climate change including a comprehensive analysis on planetary survival in the face of global warming released earlier in 2019 by the IPBES. Sir Robert Watson, IPBES Chair, warned:

The overwhelming evidence of the IPBES Global Assessment, from a wide range of different fields of knowledge, presents an ominous picture. The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide ... Through ‘transformative change,’ nature can still be conserved, restored, and used sustainably – this is also key to meeting most other global goals. By transformative change, we mean a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values (Karlis, 2019).

Further, these events have initiated “a mass extinction episode unparalleled for 65 million years” (Ceballos et al., 2019). Half a million land species “have insufficient habitat for long-term survival, are committed to extinction, many within decades, unless their habitats are restored” and one million are currently facing extinction (Karlis, 2019). At the current rate, the benefits humans cultivate from the world biodiversity could be permanently lost in as little as three human lifetimes, as such effects have seen to take thousands, even millions, of years restore as studied from past extinctions (Ceballos et al., 2019).

Telltale Indicators of Earth’s Decline

On December 11, 2019, the *New York Times* reported that temperatures in the Arctic region remained near historic highs as examined by the National Oceanic and Atmospheric Administration (NOAA). And on Greenland, the largest island in the world, spanning from the

northern Atlantic into the Arctic, the erosion of its ice masses has major implications for future flooding which may, in turn, alter coastlines and force whole communities to move inland. The



July, 2018. New fjords forming from ice melt on Eastern Coast of Greenland. Aerial photo provided by author

rainforest has been destroyed in the past five decades, mostly because humans have removed vegetation to open land for cattle ranching and new soybean fields – an extinction event (WWF Climate Report, 2019).

The burning of fossil fuels like coal and oil has increased the concentration of atmospheric carbon dioxide (CO₂), trapping heat and raising ground and water temperatures. As oceans absorb 93% of the extra heat that these greenhouse gases trap within the Earth's

atmosphere, marine species are killed and coral reefs bleached. This atmospheric annihilation has extended to land-based life forms as well. In fact, the immediate situation is impacting global fauna and driving animal populations to drop in unprecedented numbers (Kluger, 2014). Of the warming planet, the ISP BES classifies the rapid decline in biodiversity overall as “grim,” stating that currently about a million species are now facing extinction ... “many within decades. ...What’s at stake is a livable world.” The findings include the conclusion that habitat destruction and overfishing are, for now, the main causes of biodiversity declines, according to the ISP BES, but climate change is emerging as a “direct driver” and is “increasingly exacerbating the impact of other drivers” (ISP BES, 2019). The ISP BES and other noted scientists have put forth several primary indicators of planetary decline:

IPCC reported in 2019 that since 2003, 3.5 trillion tons of ice has melted, carving new fjords to channel runoff. The IPCC further indicated that the melting of the Greenland ice sheet during 2019 was the seventh-highest since 1978, with the remaining record years all occurring after 2000. In 2019 alone, the ice sheet experienced a seasonal melt of 10.9 million square miles. The rapid melting of Greenland’s ice sheet demonstrates some of the irreversible impacts of the climate change and could likely portend a threat of annual flooding to over 400 million people (IPCC, 2019).

In September 2019, the world was horrified to witness mass logging, intentional fires, and the further encroachment into the Amazon rainforest – the “Lungs of the World” – live-streamed via satellite and ground camera. The rate of deforestation has increased exponentially since the installment of Brazilian ultra-Conservative, Jair Bolsinaro. According to the World Wildlife Fund (WWF), approximately 80% of the world’s plant species is ensconced here yet roughly 17% of the



Amazon Rainforest burning and clearing, 2019. Courtesy, Deutsche Welle

- Ninety percent of flowering plants and seventy-five percent of all types of food crops rely on pollination by animals, including insects, birds, and bats – and all are currently threatened with extinction. The forecast is that these critical pollinators may be entirely killed off within the century (ISPBES, 2019).
- In 2018, carbon dioxide emissions from the energy sector rose to a new high of thirty-six billion tons (Kolbert, 2019).
- During the past fifty years, the planet’s human population has doubled and the size of the global economy has quadrupled – threatening further exploitation of natural resources and accentuating the deleterious effects of greenhouse gas production (Kolbert, 2019).

Climate scientists warn that “if all species currently designated as critically endangered, endangered, or vulnerable go extinct in the next century, and if that rate of extinction continues without slowing down, we could approach the level of a mass extinction in as soon as 240 to 540 years” (Greshko, 2019).

In addition to scientific community and government reporting administrations, businesses worldwide are noting the rapid rise of environmental impact, threatening both livelihoods and economies. *Business Insider*, relying upon a recent United Nations report, has succinctly identified its own primary human-driven indicators defining the present era of environmental degradation carbon-dioxide emissions, deforestation, and mining. As a result of these activities, the business consensus is that:

- global fauna has experienced a major collapse in numbers.
- Insects – many pollinators and food for other species - are perishing at record rates.
- Invasive aliens – often introduced by human inadvertent or intentional placement – are driving native species from their usual environments.
- Animal species are undergoing a biological annihilation.
- Up to 1 million species are currently threatened with total extinction (Woodward, 2019).

Ostensibly, the elimination of even one species could additionally precipitate a domino effect of extinction throughout an entire ecosystem. Elizabeth Kolbert, in *The Sixth Extinction*, opines that approximately 75% of animal species could be extinct within just a few human lifetimes. And in roughly 50 years, 1,700 species of amphibians, birds, and mammals will inevitably face a higher risk of extinction as a result of steadily disappearing natural habitats.

Query

According to US intellectual, political activist, linguist, and author Noam Chomsky, what took millions of years to rebuild and replenish on Earth from prior mass extinctions has only taken mankind several hundred years to destroy (Chomsky, *Democracy Now!*, 2019). And as he has repeated throughout the decades – true today more than ever - it remains the obligation of intellectuals to speak the truth and to expose lies, especially in western democracies where access to research is so readily available. Invariably, then, as non-fossil fuel company retained scientists agree, the planet is in the throes of a manmade extinction species which not only warrants immediate attention, but demands a call to decisive action.

With so much at stake, then, humanity needs to address species extirpation and global decimation without delay. This will invariably require competent and targeted leadership from

regional governments, nation-states, and perhaps most importantly, from ordinary persons. Identification of these persons may not be so difficult.

The “Eve” Factor: Female Leadership in the Time of Climate Crisis ***A Sampling of Countries, Regions, and Organizations – and Their Leaders***

Tackling climate change commands the interest of all and the leadership of a few who have the means to reconfigure energy policy. The disproportionate impact of climate change on vulnerable populations and women throughout the world, the disparate health and wellbeing consequences of traditional fossil fuel-based energy, environmental racism, and general inequities in access to renewable energy are all factors considered under a global energy justice framework. In the face of the existential threat of a mass extinction driven by global warming, a number of leaders have emerged worldwide, all sharing the goal of reducing reliance on fossil fuels to effectively address many of these energy justice concerns (Allen et al., 2019). And many of these leaders are women.



Kristalina Georgieva World Bank/Grant Ellis

As women assume an increasing number of leadership roles throughout the world, an analysis of women’s contributions to the energy sector is critically vital, especially in light of the fact that the renewable energy sector has more female representation (32%) than the traditional field of oil and gas (22%) (Garcia, 2019). Several examples of new world leaders include newly-installed Managing Director (MD) and Chairwoman of the International Monetary Fund (IMF), Bulgarian Economist Kristalina Georgieva and her predecessor and newly-appointed President of the European Central Bank (ECB), Christine Lagarde. Both women have expressed their individual commitments in playing a major role in fighting climate change by adjusting monetary policy frameworks accordingly. Speaking at the COP25, Georgieva admonished: “Now is the time to concentrate on action.... Climate change is an existential threat. It is a risk that we all have to take very seriously because from the perspective of an institution that deals with economic matters, it can push back development. We have seen that repeatedly over recent years” (COP25 Proceedings, <https://unfccc.int/event/cop-25>, 2019).



Christine Lagarde, Courtesy, IMF.org



Ursula von der Leyen, Courtesy, European Parliament

Although the environmental movement has been historically grassroots in nature, leaders are frequently extracted from government and business sectors – many of whom are females. *Fortune* reports that already in 2019, the number of female CEOs had risen to a record 33 in the Fortune 500 (still only 6%) (Zillman, 2019), but that recently a female was appointed to head the European Commission (EC) who shares the urgency of addressing the worldwide ravages of global warming. Although the EC, as a collective entity, appears to be on track to meet the Paris Agreement goals and the 2030 carbon-reduction targets, reaching climate neutrality in 2050 requires that innovating countries and regions must step up. To this end, Ursula von der Leyen, newly-installed EC president, has pledged to put forth a “European Green Deal” to

achieve the full transition away from a fossil fuels-based economy and attain the goal of making the EU a climate-neutral economy by 2050. Under her tutelage, a sustainable plan has been announced that would ensure 1 trillion euros of investments over the next decade through a European “Climate Bank” part of the plan to help finance these targets.



*Prime Minister Sanna Marin
Photo: Jari Niemelä*

And in the political world, the number of female government heads has multiplied, with a new leader elected to the office of Prime Minister of Finland in just these last few days: Social Democrat Sanna Marin, the youngest prime minister ever in the world, elected at 34 years of age. In her Brussels address on December 13, 2019, the new PM said that she was glad “to make a common decision that Europe would become carbon neutral by 2050”... but while “it is a major step forward it is not the end” [as] “our children, the new generation are expecting us to move on the climate issue faster” (Marin Address, 2019).

And then there was Greta.



*Greta Thunberg, 28 May 2019
Courtesy, Austrian World Summit Climate*

Greta Thunberg, the Swedish 16-year-old leader of the modern-day environmental movement, who has mobilized millions to fight climate change while condemning leaders’ inaction, was chosen on December 11, 2019 as *Time’s* Person of the Year — the magazine’s youngest recipient. While she attained the status of international icon, the fact remains that not much has changed to counteract the forces of global warming as the trajectory of global emissions is still heading in a wayward direction. As Thunberg doggedly

reminds us all: “The changes required are still nowhere in sight. The politics needed does not exist today, despite what you hear from world leaders ... I still believe the biggest danger is not inaction. The real danger is when politicians and CEOs make it look like real action is happening, when in fact, almost nothing is being done, apart from clever accounting and creative PR.” (Dennis, 2019) Greta doggedly called out world leaders at the recently concluded COP 25 in Madrid with respect to climate activism which falls short of being effectual in any meaningful way. And the world appears to be paying attention to this teenage phenomenon.

There are, however, global leaders whose governments and energy-related policies stand out for broader examination and possibly paths to be emulated. Several – all with female leaders – will next be examined.

Iceland

Iceland is a case on point. Historically, the country has been known for three distinctive features: centuries of female governance, ample renewable energy resources (primarily in the geothermal and hydroelectricity sectors – largely due to tectonic plate activity), and its maritime produce.

In July, 2018, the author had the occasion to conduct interviews in various government offices, including the Deputy Ambassador of Iceland to the U.S. Hreinn Pálsson in Washington, D.C., various Ministers' offices in the capital city of Reykjavik, business operators, cab drivers, wharf workers, foreign tourists, university students, and business operators throughout the island.



Author-supplied photographs, July 18, 2018. (Top, left clockwise: Gullfoss Falls, Haukadalur Geysir, Hellisheiði Geothermal Power Station)

Boasting a population of 350,000 (adding 3 sheep per resident as per Reykjavik airport brochure levity), the country generates the majority of its energy needs without fossil fuels – with the exception of the transportation sector. The government is attempting to emphasize the importance of electric vehicles by supplying, usually in back of many government and commercial buildings, renewable-energy generated charging stations. And nearby foreign entities crave this clean-energy capacity, desiring the installation of an underground cables to link foreign plants, diverting its flow and/or erecting its business operations on the island to directly partake of this advantage. Yet the local citizenry is skeptical – even anathema to undertake foreign ventures that could possibly undermine the country's energy independence.

Iceland is currently experiencing record tourism levels – despite the abrupt end to WOW discount airlines in the fall of 2019 – and the construction industry is booming – despite the absence of widespread forests on the island. Under the leadership of Prime Minister Katrín Jakobsdóttir, member of the Left-Green Movement, the country remains entirely dependent on renewable energy sources – with the exception of the Transport sector. It is the tapping into these resources that allows warm water to supply all of the country's heating needs as its underground piping provides insulation to buildings and residences and automatically melts the snow



Katrín Jakobsdóttir, Icelandic Prime Minister, Courtesy, Johannes Jansson/norden.org

and ice accumulating on the roadways, without the need for frequent snowplowing and saltings.

But Jakobsdóttir and her administration are under fire, however, for the rising amount of CO₂ emissions spawned by the rising rate of tourism and intrusion of foreign capital.



From top: Building cranes in downtown Reykjavik; renewable-energy electric vehicle charging stations; Offices of the Icelandic Prime Minister. All photos supplied by author, July 16, 2018.

Of over 72 interviews conducted in late July of 2018, there was a mixed view of foreign activity within the country, with several residents often blaming the Prime Minister for accepting too much foreign capital too quickly, the resultant crowded streets, and rising amount of pollution. However, confidence in female leadership appeared indomitable, with several echoing the conclusion that “This is a normal trend to have females in power – beginning with the Viking days when women took the mantle of leadership as men fought sea battles.” Female leadership is more of coincidence than calculation,” others opined. And Deputy Ambassador Pálsson echoed the common understanding that “As to female leadership throughout history – it prevailed during times when Vikings were at sea and it simply does not make sense to exclude half the potential workforce in any way.”

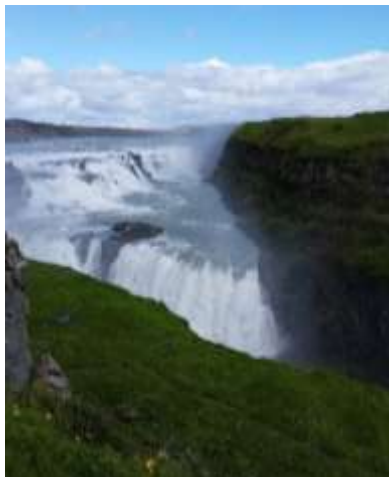
With respect to climate change, students at both Reykjavik University and the University of Iceland, appear to be embracing the trend of veganism and vegetarianism as a means to help reduce greenhouse gas emissions. And the national government has also moved to acknowledge changes in agricultural methods to better address the exigencies of the climate crisis. Geothermally-powered greenhouses are sprouting up all over the lava rock-strewn landscape, producing new strains of fruits and vegetables, including tomatoes, bananas, potatoes, and even strawberries - all occurring under Prime Minister Jakobsdóttir’s governance. Using natural resources in

this way makes sense with the country’s continual tectonic plate activity and an advantageous proximity to magma. As one foreign office staffer noted: “If we were Texas with oil deposits, we probably would be heading in that direction instead. But we are fortunate to have these cleaner natural gifts.”

Under the Jakobsdóttir government, climate-change fighting strategies have been fully supported, especially as the island witnesses the disappearance of its glaciers (even though tourist activity – aided by carbon-burning sightseeing planes and vehicles – remain largely unchecked). Regional scientists have recently discovered a new carbon sequestration method. Dubbed a potential solution to the global climate crisis, scientists are implementing new technologies designed to capture carbon emissions from the atmosphere and inject them into basalt deposits for permanent storage.

Natural beauty and renewable energy resources remain a double-edged sword for the island as they continue to invite tourists and more foreign capital. Several government representatives stated with respect to this situation that while many citizens welcome the additional business, there was a growing public consensus to protect what they have. On the topic of a steadily increasing foreign presence partaking of the island’s clean energy resources Deputy Ambassador Pálsson adds: “They want what we have and there is a growing movement to prevent this.” More foreign capital and more tourists generate more ground litter (and only paper is currently being recycled on the island) and produce more carbon emissions resulting in environmental degradation. But when tourism accounts for more than 8% of the nation’s GDP and foreign presence generates steady economic growth, perhaps this government leader may prove to be susceptible to endangering long-term sustainable growth (Young et al, 2019). Oftentimes flourishing economies and the promise of greater wealth tend to compromise an otherwise dedicated vision of clean energy policies.

It is important to mention another female Icelander known for championing the protection of natural resources. In this instance, the scope of that protection extended to even beyond the use of renewable power.



Bronze bust of Sigríður Tómasdóttir at Gullfoss Falls. Photo supplied by author, July 2018.

Sigríður Tómasdóttir (1874 - 1957) was one of the first native environmentalists whose activism helped preserve the oft-visited Gullfoss Falls, protecting it from the designs of the Industrial Revolution. Specifically, in 1907, her father entered into an agreement to allow for the construction of a hydroelectric dam close to the base. Tómasdóttir took legal action against this proposed development. While unsuccessful within the legal system, the cause gained widespread public support, securing the original objection of permanent preservation (Sittig, 2012).

British Columbia

British Columbia, the westernmost province of Canada, has been touted as a global model for promoting economic development while safeguarding natural capital in part through carbon pricing. It boasts 100% clean electricity generation, primarily through hydropower. It is satisfying provincial energy needs – with the exception of the transportation sector – through clean renewables while backing technological innovation to further reduce the emission of greenhouse gases (World Bank Group, 2019). The provincial carbon tax has remained in place through the terms of several provincial premiers. In 2011, Christy Clark, a member of British Columbia’s Liberal Party, was elected to the office of provincial leader. Five years later, the author had the opportunity to interview a member of her executive cabinet, Minister of Environment, Mary Polack, now serving in the Legislative Assembly of British Columbia. It was at the time in May of 2016 that “The Beast”



Photo: Glacier Media. Mary Polak (left), with former premier Christy Clark, 2013

member of her executive cabinet, Minister of Environment, Mary Polack, now serving in the Legislative Assembly of British Columbia. It was at the time in May of 2016 that “The Beast”

(the largest fire in Canadian history) was burning out of control throughout Alberta, an area that had been previously devastated by drought and high temperatures (*full interview at JVBL Summer/Fall 2016*).

Like Iceland, this territory is heavily reliant on its natural resources which have, in turn, sustained a steady stream of foreign tourism and provided for the bulk of its energy needs. British Columbia is also heavily reliant upon its fisheries and exports of seafood, electricity, and entertainment. With its mountainous topography and coastal and inner waterway systems, more than 97% of British Columbia's residential and commercial energy needs are met with hydroelectricity. This inexpensive and largely clean source of energy is supplemented by solar, wind, geothermal, and most recently, marine shore power.



Part of BC's vast interconnected waterways. Photo: author supplied, 2016.

The World Bank continues to identify British Columbia as an example of a region which uses its political leadership and ecological capital to fashion a state characterized by innovation and conservation. In effect, it has become a global leader in combatting climate change and was propelled to this position during the consecutive terms of Clark and her ministers (World Bank Group. 2019). The province's revenue-neutral, carbon tax was first introduced in 2008 and is seen as a formidable response to climate change drivers which include specific identifiable factors directly impacting the province's physical and biological systems:

- Average annual temperatures have warmed by between 0.5-1.7 degrees Celsius in different regions of the province during the 20th century. In fact, parts of British Columbia have been warming at a rate more than twice the global average.
- Over the last 50 - 100 years, B.C. has lost up to 50 % of its snow pack, and total annual precipitation has increased by about 20 %.
- Warmer winters have resulted in the mountain pine beetle, which has destroyed an area of pine forest equivalent to four times the size of Vancouver Island.
- Communities have been experiencing longer summer droughts as weather patterns grow increasingly erratic.
- Sea levels are expected to rise up to 30 cm on the north coast of British Columbia and up to 50 cm on the north Yukon coast by 2050, threatening coastal port infrastructure.
- Glacier reduction could affect the flow of rivers, impacting tourism, hydroelectric power, and fish habitat.



Port of Vancouver, British Columbia. Photo: author supplied, May 2016

With respect to the impact of rising sea levels and the threat posed to the province, Minister Polak stated in her 2016 interview that:

One of the biggest challenges we have in British Columbia with respect to adaptation is that with so many heavily populated, low-lying areas, we have lots of infrastructure at risk with rising sea levels. We don't have that. If you compare what is available for British Columbia and our coastline – if we were a nation – we would have the 8th longest coastline in the world. Last year our electricity was 97.9% produced hydro. Well it's a mix. It's mainly large hydro. Right now, our mix is about 25% of that is small hydro, in other words, run-of-river, wind, and to a lesser extent, solar. ... We trade in electricity, yes. ... But we also have to think of the things we haven't solved yet. Right? There are question marks or things that we haven't yet resolved and some of that is how people think of oil as simply powering our cars, powering the industry. But the petro-chemical industry and the petroleum industry [are also involved]... .The largest single driver of emissions is Transportation. Second to that is the Built Environment. (JVBL 2016).

In an effort to boost its economy while combatting climate change, the provincial government officially launched its carbon tax – now 11 years old – on July 1, 2008. This graduated tax has allowed both homeowners and commercial enterprises to reduce emissions while incentivizing the adoption of cleaner energy use and development. As a revenue-neutral tax, all monies generated by the tax are returned to the citizens of the province through credits and/or a proportionate reduction in other taxes.

But despite the government's many environmentally-friendly programs and taxing policies, there are – both in existence and still under consideration – pipeline projects, designed generally to transport high-carbon materials including tar sands from Alberta through British Columbia for further shipment abroad. The inability to curtail the continued trade in fossil fuels has generated selected condemnation of Canada overall for failing to lead in the battle against climate change. And as the former Environment Minister attempted to regulate oil pipelines and landfills during her term, now there has been somewhat of a backlash, leading to formal litigation. In early 2019, a British Columbia Supreme Court judge ruled that a lawsuit alleging wrongful exercise of lawful authority involving the contentious cancellation of a permit allowing a particular quarry to accept contaminated materials could proceed (Hainsworth, 2019). How determinative carbon regulation fares as an endeavor to be emulated by other regions is still being determined today.

Scotland

In April 2019, First Minister Nicola Sturgeon, first female leader of the Scottish National Party (SNP), publicly pledged to step up regional efforts to combat accelerated carbon emissions and worsening global warming, proclaiming that “Scotland will lead by example. ... I am making this public promise to the young people I met, and to their entire generation ... If that advice says we can go further or go faster, we will do so” (Carrell 2019).

As a noted pro-Scottish independence and anti-Brexit advocate, Sturgeon recognizes that the “climate emergency” warrants decisive and immediate action. Presently, Scotland's own carbon dioxide emissions are irrevocably causing sea levels to rise, which could have a negative impact on Scotland's prospects for ultimately achieving independence. Under her charge, a wide range of announcements have been disseminated to the citizens of Scotland, promising a cash and policy boost for green transport, heating, finance, aviation, and carbon-

reducing technological skills works to “consolidate Scotland’s reputation” (Dickie, 2019). That reputation of climate change leadership has been continuously honed over the last several decades, especially since the mid-2000s with the passage of the *Climate Change Act* which was amended and strengthened in target and reach in 2019 with the introduction of *Emissions Reduction Targets (ERT) Act*. The ERT was unanimously passed by the Parliament



First Minister of Scotland, Nicola Sturgeon. Courtesy, Kenneth Halley, https://commons.wikimedia.org/wiki/File:Nicola_Sturgeon_SNP_leader.jpg

on September 25, 2019, and received royal assent by the next month. Scotland now has a legally binding target to reach net-zero greenhouse gas emissions by 2045 and commits Scotland to interim emission reduction targets of 75% by 2030 and 90% by 2040 – the most ambitious statutory targets in the world for these target dates (Dickie, 2019).

Additionally, under the Sturgeon government, the region’s current Climate Change Plan (2018-2032) sets forth specific goals to continue to reduce emissions – in addition to its recent complete ban on fracking:

- Scotland’s electricity system, already largely decarbonized, will be increasingly important as a power source for heat and transport as well.
- Scotland’s buildings will be better insulated and will increasingly be heated and cooled by low-carbon technologies.
- Scotland will have phased out the need to purchase combustion-based cars and vans and will implement low-emission zones in Scotland’s largest cities.
- Landfilling of biodegradable municipal waste will terminate as a greater amount of Scotland’s food waste will be recycled.
- Scotland’s woodland cover will be intentionally broadened and its agriculture sector will be among the lowest carbon and most efficient food production systems in the world (*Keep Scotland Beautiful*, 2019).

The production of renewable energy in Scotland is deemed as extraordinary by EU and even global standards. Its panoply of resources includes wind, wave, and tidal power. In 2018, Scotland’s renewables comprised 74% of gross electricity consumption and by the beginning of 2019, the region produced 11.0 gigawatts (GW) of installed renewable electricity capacity. Its excess production has led to an export commodity (*Independent*, 2019).



Photo: Scotrenewables Tidal Power. This SR2000 turbine is said to have generated more green energy than Scotland’s entire tidal power facilities.

Although Scotland is not known for its sunny skies, the amount of energy harnessed through solar power is set to increase. Scottish Power has recently announced that it planned to use “hybrid technology” by adding solar to the renewable resource array. Additionally, the Scottish Government has led the way in the prohibition of single-use plastics – including drinking straws – which will be banned by end of 2019. Scotland was also the first to charge for plastic bags in supermarkets, effectively

making their recycling rate among the highest in Europe. It has even used some of the recovered plastic to construct a full-functioning bridge (*BBC*, 2019).

Global leadership in battling climate change under the First Minister continues to draw acclaim. In early December 2019, the Scottish government officially made tackling climate change the “centrepiece” of its energy program for 2020, with plans to promote low-carbon aircraft, trains, ferries, and buses as well as communal heating systems. Establishing her Scottish National Party government’s priorities – which remain unchanged even after the Conservative Party victories throughout the U.K. on December 12, 2019 – Sturgeon has reiterated her demand to the British government to hold another referendum on independence (*BBC*, 2019).

The SNP leader in April of 2019 declared a “climate emergency” – with her government braced to secure a range of pledges to curb emissions of greenhouse gases. Official support for the oil and gas sector in the North Sea would now be considered “conditional” on a willingness to transition to sustainable energy. Sturgeon has fortified this mission by announcing that a new Scottish National investment bank, scheduled to begin operations in 2020, would spend at least £2bn over the next decade for the “primary mission [of] securing the transition to a net zero [CO₂] economy.” Furthermore, a “trial of low emission flights is due to begin in Scotland in 2021, with the aim that all flights between airports within the country will no longer use fossil fuels by 2040. To further reduce emissions from transport, all Scotland’s rail services are intended to be carbon neutral by 2035. From 2024, all new-build homes would have to be heated from renewable or low carbon sources” (*BBC*, 2019).

In an interview with the author in July of 2018, Policy Director Erin Wood of the Energy and Climate Change Directorate for the Sturgeon government, commented on the intersection of female leadership and the climate change crisis:

Since her [Sturgeon’s] election in the Scottish Parliament in 2014, for the past two terms our First Minister has supported renewables domestically through the 2020 Routemap for Renewable Energy in Scotland (updated in 2015), UN Sustainable Energy For All – Scotland’s Contribution (published in 2015), the Scottish Energy Strategy (championing Scotland’s renewable energy potential, published in 2017), the Programme for Government 2017-18 (emphasising the decarbonisation of Scotland’s economy), and the third Climate Change Plan (focusing on emissions reductions between 2018-2032, published in 2018).

Sturgeon also “supports the UK Government in shared renewables objectives and contributes to influencing the outcome of EU negotiations, legislation and implementation regarding energy and renewables issues.” And with respect to support of the Paris Climate change Accord, “Scotland is actively committed to the Paris Agreement, and reports on emissions data annually rather than the proposed 5-year period, and has outlined ambitious targets for curbing global temperature increases by 2050.”

Concerning the role of women in the face of this existential climate threat, the Sturgeon spokesperson pointed out that it is widely:

“...recognised that gender is a significant issue in relation to climate change which will disproportionately affect women, particularly in developing countries, and therefore increased gender equality and female participation in decision-making, policy and leadership is needed. The increased competitiveness of the clean energy sector provides

opportunity for female leadership, diversity and innovation, whilst the global development agenda provides momentum and a platform on which female climate leadership can be promoted. Increased discussions of women in STEM subjects (science, technology, engineering and mathematics) for instance has gained significant support over recent years and has gradually infiltrated into the clean energy sector. Similarly, placing focus on supporting developing countries to innovate and empower their workforces, women and young people can positively contribute to improvements in clean energy and the Sustainable Development Goals more broadly.

Furthermore, in terms of financial support, *...the Scottish Government contributed over £300,000 to the UNFCCC's Gender Action Plan in 2017 as part of our climate change and development agenda. We also support the Women Delegates Fund run by WEDO (Women's Environment & Development Organisation). The Scottish Government is committed to contributing to gender initiatives as part of its climate change work.*

Norway

On September 23, 2019, Norway's Prime Minister Erna Solberg addressed the UN General Assembly at its Climate Action Summit in New York, promising that Norway "intends to do its part" in cutting emissions, with a long-term target of 90-95 percent emission reduction by 2050, and a strengthening of its 40 percent target for 2030. She further explained:

We need to step up, speed up and scale up. This is the message from young people across the world. It is reinforced by images of devastating natural disasters – most recently from the Bahamas. Norway is responding with increased ambition and action. We will strengthen our nationally determined contribution under the Paris Agreement. We urge others to do the same. We will also submit a low emission strategy to the UN. I am pleased to confirm that we follow through on our Paris commitment to double contributions to the Green Climate Fund. In addition, we continue to provide substantial support to countries that reduce deforestation. ... Together, we are calling on the world to step up ocean-based climate action. The oceans are severely affected by climate change. But today we released a study showing how the oceans can also provide solutions. At scale. Ocean-based climate action can reduce the emissions gap by up to 21 % by 2050. A sustainable and healthy ocean economy will be crucial for fighting climate change. It will provide jobs and food security, and will help to protect biodiversity. We urge all of you to join us in accelerating key ocean-based climate actions. This will help us to achieve the Sustainable Development Goals and the Paris Agreement (UN General Assembly, 2019).

Heading the Conservative Party, Solberg assumed the office of Prime Minister in 2013. Prior to her ascension, Norway was establishing a world leadership role in delineating the consequences of climate change while propounding remedial actions. For example, the country unilaterally pledged to assume an emissions reduction target of 30% by 2020. An even greater auspicious undertaking was the government's adoption of an aggressive International Climate and Forest Initiative (NICFI), where billions of dollars were pledged to preserve forests in Brazil, Indonesia, and in other developing countries. This pledge helped it to gain a decisive role in global financing strategies (Government.no, 2019).

More recently, Solberg has managed to assemble a multi-party cabinet, incorporating members of both the Liberal and Christian Democratic parties, partly to address the ravages of global warming. Yet in practice, she has adopted a more holistic view of worldwide

development, incorporating many social and economic factors into an overall environmental policy (Government.no, 2019).

There is a paradox lurking, however, in what the Norwegian government opines is the best way forward for sustainable economic operations and its actual, implemented energy policies. While a major proponent of weaning the transportation sector off of fossil fuels and impressing on the public the need to expeditiously transition to electric vehicles and ferries while raising carbon taxes, the Norwegian leader still advocates new oil and gas exploration. In fact, the government remains committed to reimbursing a business's exploration costs where a profit from tapping into new deposits can be assured.

This mixed bag of priorities can possibly further be explained by Solberg's election into office. She campaigned strongly on a platform of curbing immigration, reasoning that such stance could best be perpetuated by checking the consequences of global warming. The atmospheric changes of climate change, she explained – which include the impact on vulnerable populations through drought, famine, food insecurities, contaminated water sources, lack of arable farmland, and flooding – are all forces which could spur a decision for a population to emigrate. This somewhat obfuscated reasoning does engender skepticism and critique regarding the authenticity of a workable climate management program.



On December 11, 2019, at the COP 25 meeting in Madrid, environmental activist Greta Thunberg called the Norwegian government out, stating that until all humanity believes that

Hildenbrand /MSC; Photo: <https://www.securityconference.de/mediathek/munich-security-conference-2017/image/erna-solberg-1/>



Off the coast of Bergen, Norway, Courtesy L. Nøttaasen [https://commons.wikimedia.org/wiki/File:Oil_Rigs_at_Coast_Center_Base_outside_Bergen_\(24172112301\).jpg](https://commons.wikimedia.org/wiki/File:Oil_Rigs_at_Coast_Center_Base_outside_Bergen_(24172112301).jpg)

economic decline must be accepted to save the planet, governments like that of Norway are simply only offering window dressing on the most significant crisis of our time. Thunberg emphatically pointed out that Norway was only exacerbating the climate crisis “by looking for and producing more oil.” While this allegation has not been denied, the Prime Minister continues to stress that the country's renewable projects are currently being scaled up and that her government continues to advance the “deployment of carbon capture and storage below the seabed” (Thunberg, 2019).

Recently, Solberg has also taken a notable position in charging NATO with combatting climate change as a collective entity. Addressing the attendees at the NATO Engages event on December 3, 2019, Solberg stressed that the Alliance must “give rise to a little bit more discussion on how important it is to stop [climate] change.” As a matter of international security, member nations must “make sure that we invest now instead of having to invest a lot in the future to work on the damages. It is much less costly to prevent climate change than it will be to adapt to it – on all levels of our society” (Atlantic Council, 2019).

Although controversial and at times perplexing, Norway's Prime Minister continues to attempt to strike a balance with sustainable maritime practices while commanding worldwide attention to the existential threat of climate change. Solberg is responding with an increased focus to the youth wing of her own Conservative (Høyre) party on the government's approach to the oil industry, including taxation, as it seeks to form a strategy heading towards the 2021 election. This sector of the party has called for a bias-free discussion of the current reimbursement system by which the government covers 78% of the cost of a company's oil exploration with proof of resultant company profit. In reply, Solberg has maintained that she will continue to support a stable, reimbursement framework for the oil industry and that the exploration subsidy is key to that policy. And so, oil continues to be drilled while it remains a profitable enterprise and while there is still an ongoing public demand – despite its acknowledged harm to the environment (*The Local*, 2019).



June 2019 assault on Norwegian tanker in Gulf of Oman. Courtesy, AFP from Iranian news agency ISNA. <https://www.thelocal.no/20190613/three-explosions-reported-on-norwegian-oil-tanker-struck-in-suspected-attack-gulf-of-oman>

Denmark

This Scandinavian country, also under current female leadership, leads the world in wind energy production and wind turbine manufacture. Already by 2014, Denmark had produced over 57% of its electricity needs from renewable resources, primarily wind. The Danish wind company, *Vestas Wind Systems A/S*, has expanded from its Danish home base to various foreign countries including India, China, and the US, employing more than 18,000 employees worldwide. Mette Frederiksen, representing the social democratic party *Socialdemokratiet*, assumed the office of Prime Minister in June of 2019. Under her helm, the Danish government is pursuing a target of producing 30% of all its energy needs from renewable energy sources by 2020, increasing its wind power to spur on production by nearly 80% by 2024; and relying upon renewable energy sources for 100% of its energy needs in all sectors including transport by 2050 (Denmark.dk, 2019).



PM Jacinda Ardern (2017); Courtesy, Governor-General of New Zealand

New Zealand

In early November 2019, New Zealand Prime Minister passed the country's first Zero Carbon Law and touted that the country was now moving "beyond statements of hope and deliver signs of action." This new law will require future governments to adhere to the requirements created to ensure the average temperature does not exceed 1.5 degrees (Celsius). While the country will have until 2050 to lower its carbon emissions to zero, the Prime Minister has expressed the objective of transitioning to an electrical grid that runs off renewable energy by 2035. Ardern has been praised around the world as this landmark legislation passed through parliament with

cross-party support. With the passage of this bill, Ardern has declared that the country will be “on the right side of history” (news.co.au, 2019).

The Zero Carbon law targets greenhouse gases like biogenic methane, a gas produced by living organisms like cows. It also requires future governments to adhere to process requirements, fashioned to ensure the average temperature does not exceed 1.5 degrees (Celsius) (news.co.au, 2019). But like Iceland, however, the island nation may fall victim to the wonders of its own topography – including earthquake activity like the recent tragedy occurring on White Island in early December, 2019, which killed at least 15 people – as well as the increased carbon emissions associated with a steadily growing influx of tourists and foreign capital.

Germany

Angela Merkel, now towards the end of her premiership in Germany, has shepherded the move towards a renewable energy future. In October 2018, Chancellor Merkel of Germany and national leader of the country’s Christian Democratic Union (CDU) party, announced that she would not stand for reelection when her term ends in 2021. Unofficially regarded as the de facto leader of the European Union and “Chancellor of the Free World,” Merkel’s achievements expand well beyond immigration and foreign policy to taking on the era-defining fight against climate change. Her energy and decarbonization policies are largely defined by the *Energiewende* (“energy transition”) plan shifts away from fossil fuels and nuclear generation in favor of a massive adoption of a portfolio of renewable energy sources, primarily wind power. The emissions reduction targets have not completely materialized yet, in part due to the decision to decertify nuclear energy plants which has delayed the transition process. What has successfully occurred in the country’s onshore wind capacity which doubled between 2010 and 2018, with solar increasing from a smaller base of 17.9GW to 45.3GW in 2018. However, until reliable large-scale energy storage can be delivered, intermittency will continue to threaten security of supply and extend the life of coal-fired plants (Casey, 2019).



Germany Chancellor Angela Merkel speaking at the Paris Climate Change Accords, December 2015, Courtesy, UNFCC

Merkel’s prior training as a physicist and her doctorate in quantum chemistry, has sustained her commitment. When she became leader of Europe’s largest economy, she immediately used her scientific knowledge and training to set various target dates, with the most consequential being a renewable-based energy market of at least 65% on or before 2030. This goal also warranted the cessation of all nuclear-based power by 2022 as the German government had been influenced by overwhelming public outcry over the Japanese Fukushima nuclear meltdown. This public sentiment translated into an immediate decommissioning process of its own nuclear power plants. Germany’s output of solar, wind (both onshore and offshore), biomass, and hydroelectric generation units increased by 4.3% in 2018 to produce 219 terawatt hours (TWh) of electricity overall for that year. Additionally, the total renewable energy share of Germany’s power production rose to 38.2% in 2017 up from 19.1% in 2010, and is currently predicted to remain above 40% through 2019. The only green energy casualty of global warming has been the compromise of the country’s

hydropower facilities as extreme summer heat – especially during the 2019 summer months – has dried out many of the rivers (Reuters, 2019).

In 2018, a milestone was achieved by the German government: renewable energy sources overtook coal as Germany’s main energy source, accounting for just over 40% of all the country’s energy production. Since taking power in 2005, Merkel’s stewardship has exponentially driven significant investments into renewable energy market, with the dual objective of reducing greenhouse gas emissions while decarbonizing energy systems throughout Germany and throughout other parts of the world. For example, under her leadership, the government has also targeted deforesting activities in the Amazon Rainforest by suspending aid to Brazil (D.W., 2019).

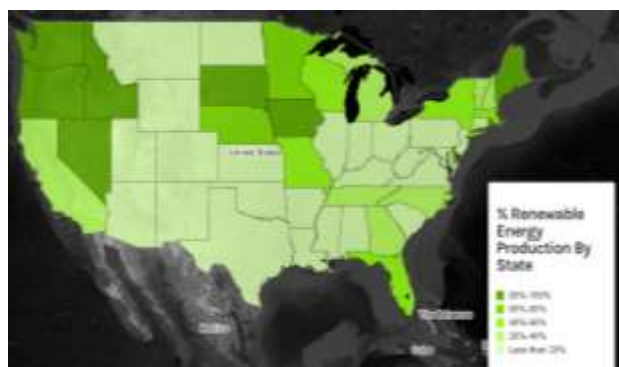
State Politics or Missed Opportunities?

Without question, the demand for energy in the U.S. has skyrocketed – and in the process of meeting those heightened needs, more CO₂ emissions are discharged into the air, exacerbating climate change. Thus, it is not surprising to discover that total electricity production has increased by over 700% since 1950 (DOE/EIA, 2019). And while over half of all electricity in the U.S. is generated from finite sources – primarily coal and natural gas – the environment continues to pay a price. Hence, more and more states are turning to cleaner, infinite energy resources including wind, hydro, and solar. In fact, renewable energy accounted for more than 17% of the national energy mix in 2017 – an increase from 8.5% a decade ago (DOE/EIA, 2019). Renewable energy production and usage is certainly not uniform among the states, however. The question is thus begged – what is the role of politics, if any, in a state-by-state energy assessment?

Red states versus blue states. Installed, potential, or distributed renewable energy capacity. Government-sponsored tax credits and financial investment incentives. A state-by-state clean energy report card is wholly dependent upon such variables of measurement which often vary substantially. And at a time of highly-partisan politics in America, one would naturally wonder whether the political landscape is stymying climate action plans in some states while buttressing those in others. One might attribute more progressive energy policies with historically Democratic-leaning states and climate stagnancy with more conservative states. Regardless of energy framing, *denying* a clean energy transition (to solar, wind, biomass, geothermal, biomass) requires deliberate actions advocating fossil fuel energy generation (inclusive of tar sands, oil, gas, coal, natural gas) and its associated political agenda. Alternatively, *implementing* a transition to renewables mandates the slowing, and eventually cessation of, the extraction of fossil fuels from the ground and



Total CO₂ Emissions – State by State.
Energy Information Administration, 2019



2017 EIA Mapping: Comparable Renewable Energy Production by State

water, halting the expansion and construction of fossil fuel energy infrastructure including natural gas pipelines as well as phasing out policies that favor fossil fuel energy development over cleaner alternatives. Stuck in a fossil-fuel-friendly position are many southern “red” states – including Alabama, Louisiana, Mississippi, West Virginia, Tennessee, and South Carolina.

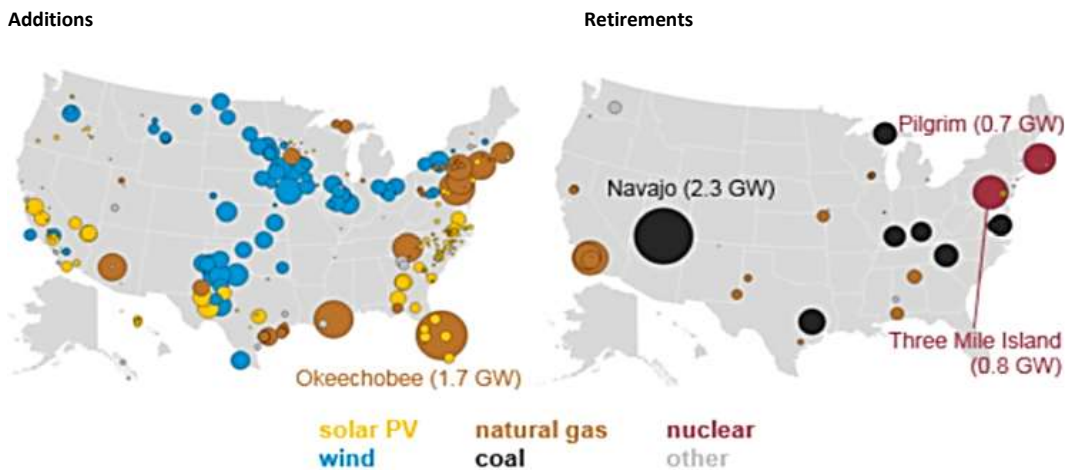
In early 2019, for the first time in U.S. history, renewable energy outpaced coal by furnishing 23% of the country’s power generation as compared to coal’s 20% output. Approximately 50% of U.S. renewable energy generation was primarily derived from wind and solar resources – displacing the former dominance of hydroelectric power (DOE/EIA, *2020 Renewable Energy Outlook*).

The author recently undertook a limited ground tour of several U.S. states to supplement particular U.S. Department of Energy (DOE) findings to uncover any information that might shed light on this issue. It was not surprising to discover that states with Democratic trifectas (governors plus both houses of the state’s legislature) are pushing forward with ambitious clean energy policies with California setting the most ambitious energy goal in the country: 100% renewable energy by 2045. Other Democratic-dominated states are defying the federal government’s rolling back on climate-change regulation – and some conservative Republican state legislatures are beginning to acknowledge the financial perks of such a transition irrespective of current federal policy, spurred on by consumer demand.

According to the EIA, those states pegged in 2019 as the highest emitters of carbon dioxide were California, Texas, Florida, Illinois, and Pennsylvania. While IEA findings indicate a correlation of progressive policies with a growing transition to renewables, the department has declared that even in the event no new clean energy bills are passed throughout the country, 31% of all U.S.-generated electricity will still emanate from renewable resources – albeit primarily from Democratic-run states. Examples of both the shifting and the target sharpening of renewable energy plans include the following state examples (DOE/EIA, 2019):

- With Republican Gov. Chris Christie out of the gubernatorial office and Democratic Governor Phil Murphy newly installed, the State of **NEW JERSEY** has recently adopted a goal of 50% renewable-generated electricity as part of its 2018 Energy Master Plan.

*U.S. Electric Capacity Additions and Retirements, 2019; Gigawatts (GW)
EIA, 2019*



- Perhaps influenced by its northern neighbor, the State of **WASHINGTON** is conducting a cost benefit analysis with taxing carbon. In 2019, under Democratic Governor Jay Inslee, the state did introduce a bill to eliminate coal within 6 years, to require 80% clean utilities 5 years after that, and to require all electricity to be carbon-free by mid-century. Washington is on its way to achieving these objectives as it is already the nation's top producer of hydroelectric power which annually accounts for two-thirds of all electricity generated throughout the state, satisfying the bulk – 78% – of its citizen's electricity demand. The state's Democratically-led government ushered in the state's "Clean Energy Economy Act" which requires all Washington electric utilities to remove coal-fired electricity from their rates by 2026 and to meet 100% of its annual electricity load from renewable energy and zero emissions generation.
- **PENNSYLVANIA**, the fourth-largest emitter of greenhouse gases in the country (after Texas, California, and Florida), has historically relied on coal to fuel its economy. However more recently, it has become a lead generator of natural gas – a coal replacement that still creates carbon emissions, yet less significantly.
- Whereas the **ILLINOIS** statehouse is more liberal-leaning than that of Pennsylvania, coal dependency remains evident and its state leadership has, until recently, been Republican-led. Newly-elected Democratic Governor J.B. Pritzker has indicated that substantial changes are coming to the 6th most populated state in the country, evidenced by his signing on to the U.S. Climate Alliance (a pact comprised of 18 states pledged to the objectives of the Paris climate agreement which was abandoned by the U.S. in 2017). Additionally, the new Governor has advocated a statewide objective of generating of 100% of its energy needs from clean sources. Illinois law currently requires that by year 2025, at least 25% of the state's energy be derived from renewable sources (Myers, 2019).

Helping to support this intended goal are the state's existing four wind farms. Not only do these installations help supply electricity, their home counties – all farming communities – have received more than \$9.9 million in tax revenue for the additional land use. These wind farms have helped to place the state as having the 4th highest decade-long renewable energy growth in the U.S., producing over 7% of its electricity energy needs from renewable sources in 2019 (Toledo, 2019).

- As the top wind-power producer in New England, **MAINE**'s new Democratic Governor, Janet Mills, replaces her Republican predecessor, Republican Governor Paul LePage, with a drastically redesigned energy policy, heavily reliant upon the development of new wind turbine capacity. Upon her inauguration, Governor Mills vowed to derive a minimum 80% of the state's electrical needs from a mix of renewable energy sources.
- **COLORADO**, under the helm of consecutive Democratic governorships, is moving quickly to generating the majority of its energy needs from clean sources. Newly-installed Democratic Governor Jared Polis has just effectively set the most ambitious target of any state: transitioning to 100% renewable energy by 2040 – a goal which if met would surpass the commitments of California and Hawaii. Wind is currently the state's primary renewable.

The path to cleaner sources of energy in Colorado has had an unorthodox journey, however. Under Republican Governor John Arthur Love, the state, in partnership with the DOE, launched a controversial method of extracting natural gas from subterranean depths

as a way to supplement reliance on more conventional sources of fossil fuel energy. In 1969, in a rural community, *Project Rulison* – as part of *Operation Plowshare* which explored peaceful uses of nuclear detonations – was contrived as an underground nuclear test with the primary objective to extricate natural gas deposits set in shale pockets. This novel attempt at fracking was accomplished using a 40-kiloton nuclear bomb. While largely successful in its primary objective, the radioactivity released in the blasting process contaminated much of the natural gas extracted, rendering it unsuitable to use in cooking and in heating homes. A buffer zone was erected around the affected area and general site clean-up, conducted under the auspices of the DOE, took close to 2 decades to complete (DOE/Los Alamos, 2019).



*Project Rulison, DOE Archives, circa 1969);
Los Alamos National Laboratory/Claude*

Since then, the development of new sources of energy has expanded, especially with respect to wind energy. Much of this growth has been actively supported by a combination of radically decreasing costs and steady federal incentives under three consecutive Democrat governorships since 2007. Further, the Colorado government has adopted a renewable portfolio standard, requiring that 30% of the state’s electricity be derived from renewable sources by 2020. Colorado was also the first state in the U.S. to enact a Renewable Energy Standard (RES) by public ballot initiative, whereby voters approved the Colorado Renewable Energy Requirement Initiative (Co.gov, 2019). The RES requires electricity providers to secure a minimum percentage of their power generated from renewable sources. This percentage has been increased 3 times up to the present day. State regulations embodying Colorado’s “Clean Energy Plan” also require large Colorado utility operations to achieve an 80% reduction in greenhouse gas emissions below 2005 levels by 2030 and 100% zero emission energy resources by 2050, creating both workforce retraining and a transition plan (Co.gov, 2019).

Former Democratic Governor John Hickenlooper was successful in bringing clean-energy-related manufacturing plants to the state. Denmark-based Vestas has already invested \$1 billion to establish four manufacturing facilities in Colorado with the investment objectives of expanding wind research and development activities. Vestas sustains statewide employment of more than 3,400 and manufactures turbine components blades for use – primarily in North America.

- The author’s home state of **INDIANA**, with a Republican trifecta, is home to the 8th largest wind farm in the world, Fowler Wind Farm, yet the power generated does not directly benefit its immediate residents. In the NE part of the state, however, utility provider NIPSCO has pledged to decommission its remaining coal-fired plants and adopt a broad clean-energy portfolio. With this shift towards clean-energy production – particularly in the wind sector – Indiana can still boast the 3rd highest, 10-year renewable energy growth rate in the country (DOE/EIA, 2019).
- **MISSOURI** only derives 4.0% of its electricity from renewables, but its 10-year renewable energy growth is the 16th highest in the nation. Transecting the state, however, very little

evidence of a clean-energy transition is evident – instead, more closed landfills are readily discernible.

- **ARIZONA** state politics have been largely controlled by the Republican Party, but are beginning to change – at least regionally. The state’s energy future remains truly an enigma and seemingly held captive to fierce politically-charged battles. In 2018, for instance, Arizona Proposition 127, the state’s Renewable Energy Standards Initiative, was on the ballot in Arizona as an initiated constitutional amendment and was soundly defeated. The proposed measure advanced a constitutional amendment to require all Arizona electric to acquire a certain percentage of electricity from renewable resources annually, with the percentage increasing annually from 12% in 2020 to 50% in 2030. In 2018, with Democratic billionaire Tom Steyer largely financing Proposition 127 to convert renewables into a constitutional mandate, the proposed measure failed with Republican-sponsored pacts and legislators solidly in defiance of the proposal.



(Above): Lake Mead, Arizona, November 25, 2019. (Left): Hoover Dam. Receding water levels indicated by white lines on side of hills. Photos provided by author.

The state finds itself in the 21st year of severe drought. Yet even with over 300 days of sunshine per year and few fossil-fuel deposits, its solar facilities remain *de minimis*. Also, the state’s co-reliance upon the hydro power (the state’s former top renewable energy source), generated by the Hoover Dam on the Nevada border, is in serious jeopardy due to a historically low reservoir water table. In fact, Lake Mead, the nearly 250-

square-mile reservoir that provides water to Arizona, California, and Nevada, and feeds the dam continues to drop due to the prolonged drought. This, in turn, reduces the power that the Hoover Dam’s electrical turbines generate – with climate change almost guaranteeing to make this area of the American West even hotter and drier (Schwartz, 2019).



Biospere II, Oracle, AZ. Photo: Provided by author November 2019). Oracle, AZ. November 30, 2019.

In Southern Arizona, regional utility provider Tucson Electric Power’s (TEP) planned generation mix for 2023 is comprised of 78% fossil fuels, largely demarcated by the conversion from coal to natural gas, but incorporating only 19% renewable energy sources. When transecting the state, one notices immediately the vast stretch of roofs devoid of solar panels. Even with Tucson-based, University of Arizona-operated Biosphere II, the operations of the enclosed experiment in sustainable living are tied to the electrical grid – with back-up natural gas and diesel generators on site and very little solar activity. Yet local utility

TEP has recently announced a 100-MW solar project paired with 30 MW of storage to be implemented within the next decade. And, in 2018, Arizona's electricity generation from solar energy exceeded generation from hydroelectric power for the first time in the state's recorded history. But the state's current renewable energy standard, completed over 10 years ago, is only 15% by 2025 – lower than the goals of several adjacent states (Storrow, 2019).

- **UTAH**, conservatively-governed, maintains a rather poor clean energy production record. Nationally, solar thermal and PV constitute the state's primary renewable energy source and the DOE indicates that in 2019 it reached over 13% in electricity derived from renewables. Over a decade, its progress has achieved a ranking of 6th highest energy growth in the country. Yet the majority of the state's renewable installations are in the north. Bisecting the state, the prevalence of fossil fuel rigs is prominent – together with expansive, methane-producing cattle ranches.

One of Utah's most prominent tourist attractions – Dead Horse Point State Park – is noticeably devoid of solar features, with the only indication of any solar activity being a potash-making facility, achieved from solar evaporation technologies.



Dead Horse Point, Moab, Utah. Photo: Supplied by author, November 24, 2019

Under the Trump Administration and the Republican-led state legislature and governorship, several areas of southern Utah have lost special protection and have been partially opened to mining for minerals, oil, and gas. The former protection given to Bears' Ears and Grand Staircase-Escalante national monuments' millions of acres of red rock formations, interconnected canyons, and pristine desert wilderness no longer exists. Since the beginning of 2017, Utah's crude oil and coal production have actually increased for the first time in 3 years, followed in 2018 by an even greater increase. In 2017 alone, 70% of the state's net electricity generation was attributable to coal, with one-fifth of product mined destined for export to other countries. And despite the presence of renewable facilities in the north, there remain five oil refineries sharing the same regional territory (DOE/EIA, 2019).

State politics have not been totally deaf to the call to develop renewables to address climate change, however. During a regional conference in May of 2019, Utah Republican Senator Mitt Romney stated:

“Addressing climate change is going to require significant private sector investments and a major global breakthrough in innovation and technology. To that end, Congress should explore ways to incentivize the research, development, and deployment of clean technologies. We also need to consider solutions that will sustain communities that may be impacted by changes in energy technology, and I will continue to meet with folks from our rural and coal mining communities in Utah to hear their perspectives.” – Republican Senator Mitt Romney

16 May 2019. Western States Move Forward with Clean Energy and Tools to Assist in a Just Transition for Coal Communities. *Utah Clean Energy.*

- **TEXAS**, a historically “red” state, has a worldwide reputation of fostering oil exploration. Houston remains the country’s “energy capital” while reports of refinery explosions continue to disseminate. Yet the state has exploded on the scene with its rapid installation of wind farms. The Greater Panhandle of Texas – part a region that has been referred to as “Tornado Alley” extending into Oklahoma – is certainly and uniquely qualified as one of America’s best places for generating wind energy.

In 2019, the DOE ranked Texas as having the 7th highest jump over the course of a decade in renewables with first-place honors in the category of total electricity generation from clean energy sources (primarily wind). In the present year, overall electricity generated from renewables approached 16% and is steadily climbing.



Photo: Author supplied, Dec. 1, 2019, Amarillo, Texas

- **OKLAHOMA**, a wholly landlocked state, unfortunately acquired the dubious distinction in 2017 as being the most earthquake-prone state – topping California. Over the last decade, research has proven that these seismic events are largely manmade due to natural-gas fracking methods (Maddow, 2019). The largely Republican-run state government has routinely given oil and gas companies state subsidies in the form of tax rebates – depleting state coffers and threatening the budgets of the entire Oklahoma public school system at times. Yet, currently – as is evident while simply entering the capital of Oklahoma City – wind farms are sprouting up quickly. With so much of the state’s climate subject to tornadic activity, capturing its potential makes sense. In fact, in 2019, Oklahoma’s electric needs were met by 35.2% renewable sources (DOE/EIA).
- **CALIFORNIA**, the fifth largest economy in the world, has, by far, the largest mix of renewables – including biomass, solar thermal, solar PV, hydro, and geothermal. Of course, no other state has been more impacted by climate-change driven disasters – wildfires, drought, and landslides – now resulting in planned utility blackouts. The state’s legislature and gubernatorial offices have long been occupied by Democrats. Several pieces of recent clean-energy friendly legislation include the state’s commitment to attaining a carbon-free economy by 2045 and already requiring all new residential structures to be solar-equipped constructed. The DOE has rated California as producing 47% of its electric needs from clean sources, with hydro in the forefront and solar not far behind. The state’s solar industry includes the Ivanpah Solar Electric Generating System (shown above) – a concentrated solar thermal plant located in the Californian Mojave Desert. Ivanpah, the world’s largest solar thermal facility, is jointly owned and operated by NRG Energy, BrightSource, and Google. The system is equipped with mirrors

the are programmed to follow the trajectory of the sun, heating up the water stored in the three towers to produce the steam which spins the turbines to produce electricity.



(Above): Ivanpah Solar Thermal Facility, Nipton, CA; (Right): Wind farm situate between San Bernardino and Riverside Counties. Photos: Author supplied, November 29, 2019



- **NEW MEXICO**, a relatively progressive state politically-speaking – is replete with private ranches and reservation properties. To the visitor, the state lacks any substantive quest to capture the renewable market. Yet the DOE has measured its growth over the last decade to exceed 258% - the 12th highest rate in the U.S. This statistic is aided by the fact that the state government recently enacted the New Mexico “Energy Transition Act,” which includes a requirement that all of the state’s investor-owned utilities must move to 100% zero carbon energy resources by 2045. This legislation also enables utility companies to use securitization through “energy transition bonds” to refinance investments in coal-fired power plants to retire operations early. A portion of the revenues derived from the bond sale are earmarked to be used to help fund economic development in coal communities in New Mexico, assisting displaced workers (DOE/EIA, 2019). Despite these recent political moves, New Mexico’s total electricity generation is in an unenviable position – the 12th lowest in the nation. Like Arizona, failure to fully tap into the solar market unnecessarily keeps this state’s energy portfolio stagnant.
- **KANSAS** is a stunning perplexity, having been governed by a blend of Democratic and Republican governors over the last two decades. The state demonstrates a wealth of both renewable and nonrenewable resources. Under



Wind Farms in between Salina and Hays, Kansas. Photo: author supplied, November 23, 2019).

Democratic governorships in 2006 and 2009 (Former Obama Secretary of Health and Human Services, Kathleen Sebelius, installed in 2003, followed by Democratic Governor Mark Parkinson in 2009), several windfarms – situated between the cities of Salina and Hays – were constructed making wind the state’s main source of clean energy. In 2019 alone, over 36% of Kansas’s electricity was generated from renewables. Approaching the border with Colorado, multiple semi loads of singular windmill blades can be readily seen as they are being transported into and through Kansas over the state’s main interstate – a sign that manufacturing in America has been revitalized – at least with respect to this energy sector.

Dr. Noam Chomsky: A Leader for the Ages

“What Matters” in this Climate Crisis is Simply Meaningful and Immediate “Action”

Since the 1960s, as he added political activism to linguistic accolades, Dr. Noam Chomsky reiterated a call to the educated, emphasizing that it was the ongoing responsibility of intellectuals to “to speak the truth and to expose lies.” This appeal to moral and social consciousness – especially directed to those with access to information sources – was, and is, to seek the truth hidden behind the distortion of lies that conceal a moral abyss as well as to disseminate facts through positive and direct action. Any failure to answer this call only signals “complicity.” Perpetuating ignorance is augmented through propaganda means; what is in existence today that was not present in prior decades are private media outlets like *Fox News* – calculated to spread misinformation and even underscore lies when convenient to ensure a narrative of continued concentrated wealth and power for the few. And one of the most impactful results of misinformation lies in the unchecked growth of the current climate catastrophe; the dismissal of factual information, the latent or even patent adoption of lies, and a general failure to act all subject life on earth to certain annihilation.



Noam Chomsky, Photo: Augusto Starita / Ministerio de Cultura de la Nación

Throughout the years, Chomsky has spoken of ebbs and flows in the human predicament: from fascism to the growth of democracies to current hyper-nationalism; from Brazil’s more promising leadership under the “people’s president” Luiz Inácio Lula da Silva to the rightist regime of Jair Bolsonaro; from democratic Barak Obama to far right Donald Trump; and from Nobel Peace Prize laureate Yitzhak Rabin to multiple terms of Israeli conservative extremist Benjamin Netanyahu.

On December 1, 2019, the author questioned Dr. Chomsky about the role of today’s youth in countering growing global corporate dominance, nuclear proliferation, and a quickly deteriorating environment due to accelerated global warming. Chomsky’s answers left open certain possibilities but he did definitively advocate an immediate call to action and unequivocally assessed blame on previous generations for the existential threat of planetary demise faced by today’s youth.

Asked to comment on Mahatma Gandhi’s oft-quoted, interminable message of hope, ***“When I despair, I remember that all through history the way of truth and love have always won. There have been tyrants and murderers, and for a time, they can seem invincible, but in the end, they always fall. Think of it—always,”*** Chomsky replied that while he hoped Gandhi’s message

were always true, it is neither reliable or consistent: *“I wish Gandhi’s message were true. Sometimes it is, sometimes not. As to whether today’s generation will be able to deal with the terrible problems that their elders have left to them, speculation is rather empty. What matters is action.”*

The author briefly reviewed the actions that have been taken or are underway to be adopted to combat climate change, spearheaded by grassroots movements and by government and business leaders, yet at a time when consumerism is at an all-time high worldwide. For instance, it was noted that there has been a remarkable advancement of solar panel installation on both new and preexisting construction in Germany, that TGV high-speed rails constitute the primary source of mass transportation in France, that certain automobile manufacturers and teenagers are conspicuously lowering their own carbon footprints (e.g., Volvo eliminating the combustion vehicle and Greta Thunberg sailing the Atlantic), and even that China is installing a football field of solar PV panels each hour of each day – all while the US – with the highest per capita GHG emission levels – continues to miss opportunities. In fact, between Black Friday and Cyber Monday – while much of the world was protesting consumerism – the US was on track for the highest consumer spending levels on record, inevitably exacerbating CO₂ emissions. With this dichotomy of action and practice, Chomsky was asked how this could be reversed in time to thwart irreversible environmental damage. He replied that the characterization of failed U.S. leadership is much more deplorable than simple missed opportunities: *Missing opportunities’ is too kind. ...The Trump administration is dedicated to destroying the prospects for organized human life. Fortunately, there is popular resistance, primarily among the young. Whether it will suffice in time – again, speculation is idle.*

“Missing opportunities’ is too kind. ...The Trump administration is dedicated to destroying the prospects for organized human life. Fortunately, there is popular resistance, primarily among the young. Whether it will suffice in time – again, speculation is idle.” – Dr. Noam Chomsky

With a scientific consensus regarding both the cause and consequences of climate change, Dr. Chomsky was asked about the stream of countervailing information, especially as the US government has been one of the primary disseminators of socio/political/economic misinformation. And with the advent of Fox News, deception has been given a formidable propaganda outlet, creating a firm and loyal cult of misinformed individuals throughout the country. Thus, the question was posed: “Although currently we have access to free, innumerable sources of information that if we chose to use to conduct our own research to discover facts which might lead to appropriate action and reaction, this does not appear to be happening – at least not *en masse*. Do you have a better recipe that could stimulate a more timely and proportional public response to the exigencies of today?” Dr. Chomsky’s response:

There are plenty of opportunities. What’s needed is the energy and dedication to pursue them. One possibility is to go back to the vision of the Founding Fathers, who interpreted the First Amendment quite different from today. They understood it to mean that the government had a responsibility to foster a lively, diverse, independent press. The US Post Office was set up primarily as a subsidy to independent media. That vision has been beaten back in our largely business-run society, now strikingly different from others in the marginality of public media. These have their problems no doubt but can be and often are

a force for independent thought and understanding. And there are many other possibilities.

And lastly, the author supplied the following analyses for comment: Greater individual wealth and rampant overt racism appear to have a chokehold throughout the US, keeping Donald Trump and his enabling GOP supporters from making any progress in effectuating a more comprehensive and immediate transition to clean, renewable energy. This has become evident to many – including the author – as I continue to travel the country, seeing missed opportunities for installations, especially in states primarily governed by conservative representatives. What do you believe is the best course of counteracting this reality, even in “red states”?

The usual: education, organization, activism. Beyond generalities everything depends on specific conditions.

And where declining birth rates are being documented in many developed parts of the world, population growth remains largely unchecked in least developed countries. *We* enjoy our families and in relative comfortable settings and would readily make the argument to Least Developed Countries’ (LDC) populations that a similar type of pleasure is simply not possible for them since we all face certain extinction unless we all change course now, i.e., consume less and restrict the size of our families. How is this hypocrisy remedied?

Lots of ways. We control our own lifestyles, at least the more privileged among us. Population growth can be checked by education of women – happens in poor countries as well as rich. And by raising living standards in equitable ways. And lots more that we can readily think of.

At 91, his leadership continues.

Conclusion

In decades past, the climate change debate began. In years past, the climate debate devolved into a climate crisis. Presently, the status of the problem is nothing short of a climate catastrophe. Rapid action must be taken to protect and restore threatened species and their habitats that are being exploited for financial benefit and degraded by human-caused climate change. Such factors are primarily a result of population size and growth as well as increased consumption rates and economic inequity. To end with the same query – where are our leaders in this era of mass extinction? Perhaps the answer lies with female, more youthful, and more democratically leaning-leaders, with experience and reflection continuing to guide their actions. Unquestionably, however, it is up to everyone – the world’s citizenry – to carve out a leadership role in the fight of our lives.

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