OUR CLIMATE FUTURE:
WHAT WORLD WILL OUR GRANDKIDS INHERIT?

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Envision a world we are proud to leave to future generations. A world where our grandchildren, and great-grandchildren will be able to say that we, the present generation, did our part to make it a better place for all of Creation. If that is the goal, our generation has a lot of work to do. Some say It is too late for our generation, and our children, to change the current trajectory. except through education and advocacy. It will be up to our grandchildren and great-grandchildren's generation, to "bend the curve".

Our news is filled with the threats of World War III, current and future pandemics, and global threats to the environment. These threats and others are taking a heavy toll on our mental health, especially on the mental stability of youth. In this paper, I will drill down on one of these threats, the climate apocalypse.

Often, I hear people say, "How can it be climate warming when we are having such terribly cold weather". Few people seem to understand the difference between weather and climate. Weather is best understood as the day-to-day changes that we experience as we go about our daily lives. Climate refers to the patterns of such changes in temperature, rain, snow, evaporation, etc., over long periods of time. An analogy that might resonate for Cincinnatians would be the fortunes of the Bengals over last year's record in comparison with their performance since Paul Brown died. I will leave the analogy related to the Cincinnati Reds to your imagination.

Over our lifetime, we have been experiencing the gradual warming of the planet. This has introduced more energy into our weather systems which has in turn brought about more weather extremes. Droughts, wildfires, deluges, tornados, hurricanes, melting glaciers, and sea-level rise now threaten to upend our lives and those of the generations to come.

We are now surrounded by clear evidence of a warming climate that until recently seems to have gone unrecognized by many in the mid-west. As scientists have warned us for years, the life we have enjoyed is now threatened. Recent information revealed that oil companies knew of this possibility, years ago, but failed to warn us. The devastation will be even more destructive unless massive changes are implemented.

The goal of ***The Paris Agreement on Climate Change*** is to **limit global** warming to well below 2 degrees Celsius, (3.6 degrees Fahrenheit) preferably to 1.5 degrees Celsius, compared to pre-industrial levels. According to the ***United Nation's Intergovernmental Panel on Climate Change***, the world needs to cut global emissions 45 percent below 2010 level by 2030 to keep temperatures from exceeding 1.5 degrees Celsius.

Last week the forecast centers of the ***World Meteorological Organization*** reported that there is a 50 percent chance that we will hit the 1.5 degrees Celsius target level at least once between now and 2026. There are places around the globe that have already reached and exceeded this threshold.

Climate change is nothing new to the planet. The difference for us is the world we now inhabit. The population in the United States alone is approaching 332 million. We live in a significantly built environment. We use technologies that require vast amounts of the Earth's resources. And we desire more than just a subsistence life.

We have gone through a long period of denial and lost the opportunity for modest changes that could have ameliorated the threats. Now we are faced with the need for drastic mitigation if we are to retain some semblance of a lifestyle, we have enjoyed for a number of generations.

Climate Change Over the Earth's History

Our planet is estimated to be over 4.5 billion years old. Geologists, based on evidence in the rocks of the Earth's crust have parsed out these years into eons, eras, epochs, and ages. (When I tried to be more poetic, I used rocky evidence, but that had other connotations.)

Rather than boring you with the millions of years of cycles of extreme heat, cooling, glaciation, and plate tectonics, I will jump ahead to something all school children relate to, the age of dinosaurs. The climate that these creatures experienced was very warm and humid and supported lush jungle-like flora over much of the globe. Fortunately for us, a 124-mile-wide asteroid decided to call earth its home and disrupted the global climate causing their mass extinction, some 66 million years ago.

After that, the Earth experienced 50 million years of volcanic activity spewing extreme amounts of CO_2, and other toxins into the air. The thick blanket of soot and gasses blocked the sun's rays, which resulted in the onset of the Ice Age. Scientists have recorded five significant ice ages during this period, separated by periods of warming when glaciers temporarily receded, and woodlands supplanted the grasslands. It must have been a long time to wait for better weather.

The Holocene Epoch, the present period, began at the close of the Ice Age. Environmental scientists assert that a more appropriate designation for the later years of this period is the Anthropocene; *anthropo* for "man", and *cene*, for "new, to reflect the significant changes to the planet and its inhabitants caused by Homo-sapiens. Geologists have the upper hand and insist on seeing the evidence in the rocks. They will have a long time to wait.

Challenges of the Present Climate Change

The United States and the world face two fundamental challenges: ensuring energy security and combatting climate change. Last month, the ***United Nations Intergovernmental Panel on Climate Change Panel***, cited earlier, warned,

> *"The world must make an immediate transition away from fossil fuels and toward renewable energy like solar and wind. Otherwise, we are destined for more heat and drought, the oceans will continue to inundate coastal communities and extreme weather will become more deadly than it already is".*

The main culprits in climate change are greenhouse gasses that are building up in our atmosphere. Of them, the increasing amount of methane and carbon dioxide is the most significant. Carbon Dioxide forms a layer of gasses that trap the heat from the sun's rays and stays in the atmosphere for decades.

When people say there has always been climate change or that CO_2 was way higher in the past. They are right. But it was not a planet we would have wanted to live on and probably could not have survived.

Homo sapiens arose in a period of extremely low CO_2 emissions following the end of the Ice Ages. The CO_2 emissions held reasonably constant over the last 1000 years until the onset of the Industrial Revolution. By the time of the founding of the Literary Club, the Industrial Revolution had been in full swing. Factories in England, Europe, and the United States were belching CO_2 and soot from burning fossil fuels.

The United States began taking CO_2 measurements in 1958 at the ***Mauna Loa Global Monitoring Observatory*** on the big island of Hawaii. By that time, the planet was already into the warming period that extends to the present day. Atmospheric carbon dioxide measured at the Mauna Loa site last peaked in May of 2021, at a monthly average of 400 plus parts per million (ppm), the highest level since accurate measurements began 63 years ago.

Some people erroneously claim that volcanic activity is to blame for our problem. According to the ***United States Geological Survey***, volcanic activity around the globe generates in the range of 130 to 490 million tons of CO_2, depending on the year. Human activity generates about 35 billion tons per year. It takes approximately three days of human activity to equal an average year of global volcanic emissions of CO_2.

Response to Threats

Climate change and rising sea levels are threatening seaside communities around the world. Storms, hurricanes, and tidal surges result in utility failures, and the loss of property and lives. Residents in these communities and those threatened by wildfires are preparing for worst-case scenarios, collecting reserve supplies of food, water, prescriptions, and other necessities in case they are stranded or need to evacuate. Dislocations will depend on the availability of

government and community support, infrastructure viability, insurance, and individual resilience.

Municipalities, counties, and state governments in the US are developing plans to mitigate the potential and existing threats. The bipartisan ***Infrastructure Investment and Jobs Act*** that was passed in 2021, allocates significant resources to communities for climate resilience, adaptation, and even community relocation.

Here in our region, 100s of miles from a coastline, a lot of people do not feel threatened by the rising sea levels and ocean temperatures. They do not connect the rainfalls, flooding, and mudslides in the Midwest with what is happening on our seaboards. The hurricanes coming up through the Gulf are more frequent, more severe, and spawning storms, high winds and tornados. These extremes are being felt closer and closer to the Queen City. For the last two years in a row, the United States documented the most tornadoes ever recorded in the month of March.

Our city's ***Green Cincinnati Plan*** lays out how it is addressing climate change. The city has committed to powering all its facilities using 100% Green Energy by 2035. It will purchase enough solar energy from the ***New Market Solar Project*** in Highland County, Ohio to cover 25 percent of its annual usage. In addition to shifting to renewable energy, the city is also working to decrease the amount of energy that it uses, which will also decrease operating costs.

The ***National Oceanic and Atmospheric Administration*** reported that in 2021 temperature increases and associated weather disasters cost more than 145 billion dollars. Insurance companies are now basing their loss estimates on an assumption of an average global temperature increase of 2 degrees Celsius.

Shareholders of public companies are increasingly demanding more information about the risks that climate change could pose to their investments. The ***Securities and Exchange Commission*** plans to require all publicly traded companies to disclose their greenhouse gas emissions and the risks that climate change poses to their businesses.

Consequences of Our Climate Change.

Some of the consequences of climate change are already quite visible.

Water Supply: In countries dependent on glaciers and reservoirs for their water supply, temperature increases and altered weather patterns are rapidly diminishing the source. It also threatens their future reliance on hydroelectric power. Back yard swimming pools and golf courses are competing with homeowners and farmers for the precious resource. Landscaping and gardens need to change. As reservoirs dry up, the boating world will need to keep moving their docks until there is not enough water to float. Where will all the houseboats go? Maybe a new type of trailer park?

We will need to assess water use and risks with the same urgency that we address carbon.

Habitat Loss: Habitat depletion and changes acerbate the devastation of plants, the animals that consume them, and the whole terrestrial food chain. The acidification of our oceans is having a similar effect. The bleaching of coral reefs is rapidly affecting the food chain of aquatic life. The rapidly warming of the Arctic not only affects the habitat of the polar bears and other wildlife but is also releasing more CO_2 into the atmosphere. The melting of the permafrost already has affected key pipelines and roads.

Food Production: Rising temperatures and evaporation imperil the production of the food we need to survive. The ancient practice of watering individual plants is being reinvented through drip irrigation on a large scale. Open water courses and flooding of croplands will not be possible as water sources dwindle and evaporation increases. The flatulence of cows is a major emitter of methane, that eventually breaks down into CO_2. If we can't give up beef, perhaps some wonder-kid will figure out how we could capture and bottle it for our backyard grills or fuel for golf carts.

Sports Changes: Hunting and fishing for sport or survival will be further regulated to maintain species and deal with the loss of desirable habitats for the favored game. Seventy percent of the snow for the 2022 Olympic Winter Games was artificial. The Swiss expect up to 50% of their resorts to close by 2050. Locally, skiing on man-made powder at Perfect North has been going on for some time. Will this become common throughout ski country? As temperatures rise, current sports venues will probably relocate or move to indoor facilities. Maybe a Superbowl will come to Cincinnati.

Health Effects: For the many who suffer from seasonal allergies the future looks bleak. A March 2022 report, published, in ***Nature Communications*** projected that under high greenhouse emissions, the pollen season could start as much as 40 days earlier in the spring and last up to 19 days longer. In the most affected parts of the nation, pollen levels could triple. Seasonal shifting will be felt more in the North than in the South because of larger rises in temperature. Perhaps we should advise our grandkids to become allergists.

Location of populations and migration: Increased flooding, hurricanes, tornados, wildfires, and other calamities are having serious effects on where people live, their livelihood, industry, and culture. Population migration from these areas can be expected to increase and create tension in other areas for land, housing, jobs, and other life needs. Where will all the people go when large parts of Florida, Louisiana, and Texas are underwater? Do they sell now or wait for the flood?

Global and Local Action

The ***UN Panel on Climate Change*** report, which was released in April of this year offers hope for limiting global warming. But there is no time to waste. Unfortunately, debates about future

decisions and future uncertainties are distracting policymakers, CEOs, and the public from the goal of ensuring a decent future for our grandkids.

The ***Paris Agreement****'s* goal of preventing the average global temperature from rising more than 2 degrees Celsius over preindustrial levels means reducing global greenhouse gas emissions by roughly half by 2030. The United States signed on to an economy-wide target of reducing its net greenhouse gas emissions by 50 percent below 2005 levels, by 2030.

The path forward will not be smooth. Last year CO_2 emissions surged by almost seven percent. The budget bill, currently stalled in the Senate, includes over $500 billion in clean energy investments to put our emissions back on track to meet the 2030 target.

According to a new analysis released by the climate think tank ***InfluenceMap***, almost half of the 25 largest investor-owned utilities in the United States are actively pushing back against climate policy aligned with the *Paris Agree*ment. The report concludes that while some utilities have rallied around climate action, others have emerged as obstacles to curbing planet-warming emissions from the power sector.

The main trade association of utilities in the United States questioned the report's methodology and findings, calling it a "laughable" analysis that failed to mention utilities' progress in reducing their emissions. That sounds like the well-known strategic maneuvering and mantra of tobacco, pharmaceuticals, and chemical trade groups. The problem is, their lobbying and influence on our politicians, handicaps the foresight and movement needed to overcome significant threats to our health and the environment.

Larry Fink, Chairman, and CEO at ***BlackRock***, the largest money manager in the world, take the alternative position. In a letter to shareholders, he identified the challenges and responsibilities of decarbonization that CEOs and all of us must embrace if we are to secure a sustainable future for ourselves and the generations that follow. Here are a few quotes from his letter.

"*Most stakeholders – from shareholders to employees, to customers, to communities, and regulators – now expect companies to play a role in decarbonizing the global economy. Few things will impact capital allocation decisions – and thereby the long-term value of your company – more than how effectively you navigate the global energy transition in the years ahead.*

He goes on to state, "*It's been two years since I wrote that climate risk is investment risk. And in that short period, we have seen a tectonic shift of capital. Sustainable investments have now reached $4 trillion. Actions and ambitions towards decarbonization have also increased. This is just the beginning - the tectonic shift towards sustainable investing is still accelerating….*

He concludes, *"Our question…. is: what are you doing to disrupt your business? How are you preparing for and participating in the net-zero transition? As your industry gets transformed by the energy transition, will you go the way of the dodo, or will you be a phoenix?"*

Over 314 companies have signed up on ***The Climate Pledge*** to reach net-zero by 2040. These companies are turning the climate crises into climate action to reach the Paris Agreement 10 years early. Proctor and Gamble, Coca Cola, Pepsico, Unilever, IBM, Microsoft, and Amazon are just a few of the names we all recognize.

Where Do We Go from Here?

How do we create sustainable change to deal with the climate apocalypse that threatens the beautiful blue planet we call home? Some think the damage is already irreparable. For them the question is how do we adapt and help the planet recover?

We must encourage and inspire instead of censure and frighten. We need to identify opportunities amid crisis, invest in innovative solutions to accelerate the transition, and support those who suffer most from the calamity of climate change.

The auto industry is leading a host of other industries away from fossil fuels. I would like to mention a few climate change efforts, of which I have personal knowledge through family and friends.

Fuel Production from Waste: In 2000, my eldest son John, a Ph.D. Chemist, worked on a bio catalysis project funded by the Shell Oil Company to produce ethanol and another sustainable fuel molecule. The goal was to develop enzymes and microbes to efficiently break down switchgrass, corn stalks, and other non-food source waste material to get at the sugars. And then, develop other organisms to efficiently convert the sugars into a biofuel that could be utilized for vehicles. The technology for ethanol from cellulose moved from the laboratory to a scalable demonstration plant in Canada. The project was mothballed when fracking made oil and natural gas production so abundant in about 2010. That technology is still available for cleaner fuel production.

Micro-nuclear Power Plants: My grandson, George Luebkeman, a CalPoly graduate, has joined ***OKLO***, a California startup that builds advanced fission micro-nuclear reactor power plants. They are designed to power college campuses, industrial sites, large companies, and remote locations. These micro-reactors run on spent fuel from large-scale reactors and are inherently safe, due to their negative reactivity feedback response to increased temperature. The hotter the reactor gets, the less reactive it becomes, resulting in a system that shuts itself down in the event of any unplanned power increase.

Nuclear is not considered a "renewable" energy source, but rather a "clean" energy source. However, it is estimated that ***OKLO***'s power plants, could power the entire United States for over 100 years with nuclear energy, using only nuclear fuel that has already been mined, or

spent and currently sits in storage. The conservative estimate for the construction of a micro-reactor is less than a year, because of the small size. Other companies are working on mini and microreactors that in combination with renewable resources offer hope for meeting emission targets, sooner rather than later.

Solar Drip Irrigation: Our fellow Literary Club Member and former President Joe Dehner leads an international group that is bringing a *Solar Drip Irrigation Project* to provide rural farmers the needed energy and technology to reinvent their farms at an affordable cost. ***Soler Solutions Ltd***., an Ohio LLC was formed to mass-produce a solar-powered water pump system.

Joe Dehner can fill in the details for you, but here is a short overview. The system includes of a solar panel, control box, stand, and a submersible pump. It is designed to be connected to an available water source through piping or hoses. The system can deploy water directly or from an elevated tank through drip irrigation, with minimal evaporation or other loss.

Joe and his group are in the early stages of a partnership to deploy similar equipment and techniques at two Missions of the Episcopal Church of Navajoland, one in Utah and one in Arizona. The Missions are working with the Navajo Nation Chapter Houses and agricultural extensions in their states to develop models for increasing food security and raising farm yields and local income.

Y[our] 2040: My stepson, Chris Luebkeman, a Ph.D. architect and engineer is currently serving as Advisor to the President of the *ETH University* in Zurich, Switzerland. He is also a co-founder of ***[Y]our 2040*** dedicated to bringing together scientists, futurists, explorers, musicians, artists designers, authors, and entrepreneurs from all over the globe to discuss their vision for the year 2040. It was formed in response to the knowledge that climate change is fundamentally altering the relationship between the planet and its inhabitants, and the belief that it is up to people from all walks of life to influence the path forward; to anticipate, identify and interpret strategies to create a future that is more equitable and environmentally stable.

Green Umbrella is a local organization bringing people together from all walks of life who are concerned with a more sustainable future for our planet.

According to the ***Yale Program on Climate Change Communication***, 72 percent of Americans believe the planet is warming. Hamilton County is slightly above the national average with 74 percent. Seventy-seven percent of Americans support research into renewable energy. The same percentage believes that children should be taught about climate change in school. At the same time, I am sure there are some denying self-serving politicians contemplating legislation to ban teaching about climate change.

On a positive note, the United States set a major renewable energy milestone in April 2022. Wind Power became the second-highest source of electricity for the first time since the *Energy Information Administration* began gathering the data. It has surpassed electricity generated by coal and nuclear but still lags behind natural gas.

I am not sure where solar stands in the mix but as technology improves and the scale of production increases, we can expect green energy sources to reduce in cost and become more extant. One thing we all know is that energy demands will not decrease. More reliance on electricity for heating and cooling, vehicles, technology, and manufacturing will all increase demand.

Final Thoughts

What can we do to find hope and create lasting change as stewards and not destroyers of this world? I believe that despite the naysayers there will be continuing and increasing evidence of the climate change that will influence our response. Amidst all of this noise, we will drive forward to change attitudes and act to provide a sustainable future for those who come after us.

I don't believe in exceptionalism, but I believe that our country will make use of all the technology and policy tools at our disposal. We will increase our investment in research and development and systematically spread available technologies to scale up removal and sequestration of CO_2. We will support states and communities dealing with the threats to their life and property and help developing nations in their transition to renewable energy.

I was taught early and often, that it was my responsibility to leave the place in which I lived, worked, camped, or traveled better than when I found it. If we are to leave this planet better than we find it now, it will require more than words and proclamations, more than technology and ingenuity, more than money and goodwill. It will take trust. As Stephen Covey said, "*Change happens at the speed of trust*".

It will take trust in science, trust in our institutions, and trust in global collaboration. A communal trust that we are all in this together and we must work together to leave a healthy planet for our children, their children, and generations to come.

In closing, I would like to quote Joy Harjo, author and Poet Lauriat of the United States for the past three years. Perhaps, some of you heard her speak at NKU earlier this month. In a talk to a High School Poet Club, she spoke about the importance of writing. A process to which our club is dedicated.

> Writing is *" important just to keep track of yourself, because in the end, how do you come into this world? You come in, and you carry a story already, and then you come in and take on a story of your family and nation, community, and generation. And what are you going to leave with? You're going to leave with all of your acts…. You're going to leave with all of that knowledge and the truth of your journey".*

I would ask, what actions and stories will our grandkids learn about our generation? What is the story that they will carry about the truth of our role in climate change? What was the truth

of our role in the restoration of the planet - denial and omission, or acceptance and care? What will be our grandkids' stories of their climate future?

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