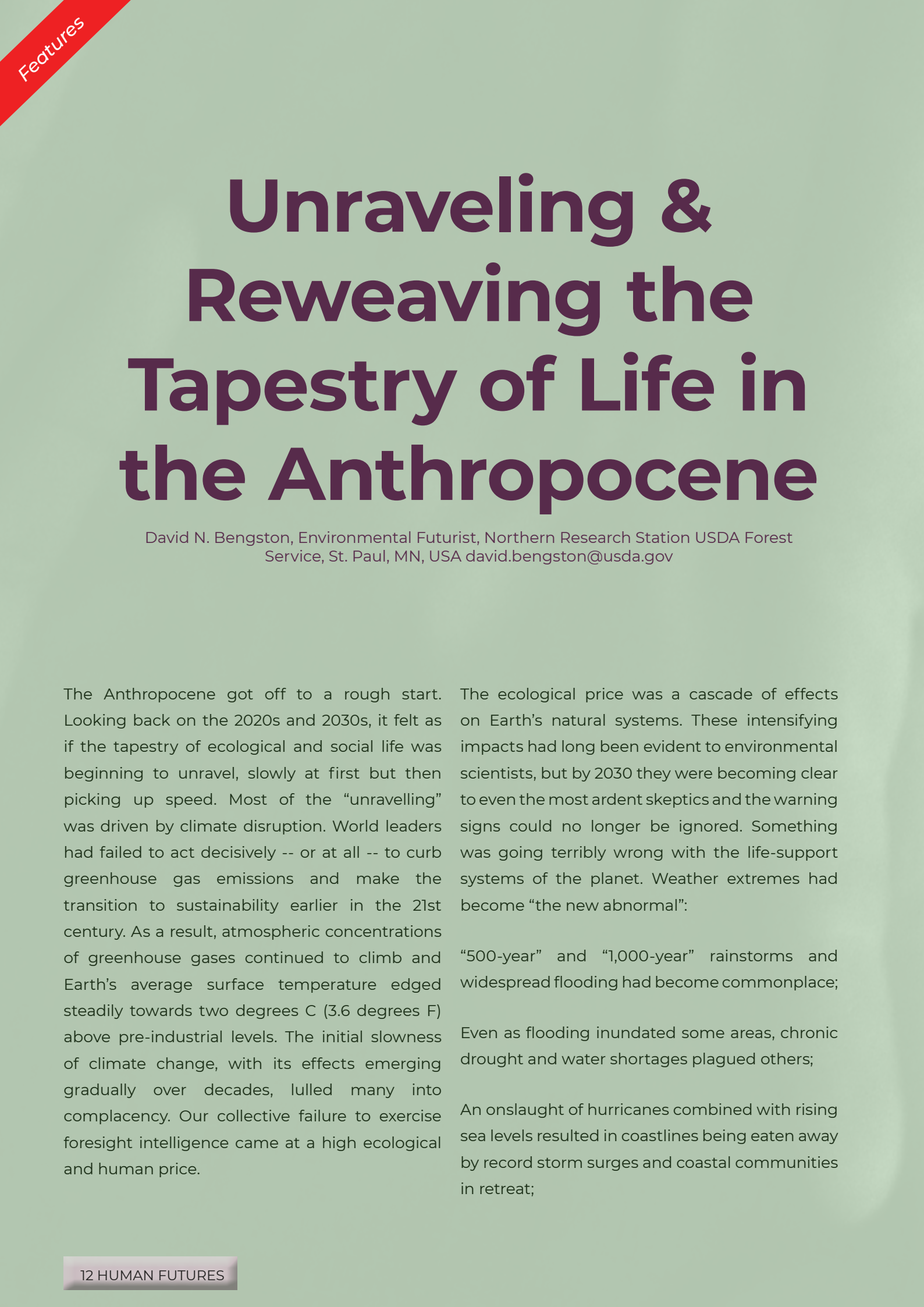




Unraveling & Reweaving the Tapestry of Life in the Anthropocene

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The Anthropocene got off to a rough start. Looking back on the 2020s and 2030s, it felt as if the tapestry of ecological and social life was beginning to unravel, slowly at first but then picking up speed. Most of the “unravelling” was driven by climate disruption. World leaders had failed to act decisively -- or at all -- to curb greenhouse gas emissions and make the transition to sustainability earlier in the 21st century. As a result, atmospheric concentrations of greenhouse gases continued to climb and Earth’s average surface temperature edged steadily towards two degrees C (3.6 degrees F) above pre-industrial levels. The initial slowness of climate change, with its effects emerging gradually over decades, lulled many into complacency. Our collective failure to exercise foresight intelligence came at a high ecological and human price.

The ecological price was a cascade of effects on Earth’s natural systems. These intensifying impacts had long been evident to environmental scientists, but by 2030 they were becoming clear to even the most ardent skeptics and the warning signs could no longer be ignored. Something was going terribly wrong with the life-support systems of the planet. Weather extremes had become “the new abnormal”:

“500-year” and “1,000-year” rainstorms and widespread flooding had become commonplace;

Even as flooding inundated some areas, chronic drought and water shortages plagued others;

An onslaught of hurricanes combined with rising sea levels resulted in coastlines being eaten away by record storm surges and coastal communities in retreat;

Frequent and intense ice storms disrupted lives and damaged infrastructure and trees.

The world's forests -- which used to be called the "lungs of the planet" and the "cradle of biodiversity" -- were particularly hard hit. Tropical deforestation continued to ravage the most biologically rich places on Earth. The vast Boreal forests of Canada, Scandinavia, and Siberia were in decline due to temperatures rising more rapidly in the north and growing insect and disease problems. Forests everywhere suffered a barrage of "mega-disturbances" -- multiple, interacting ecological disruptions like hotter droughts and more frequent and severe wildfires interacting with other stressors. Mega-disturbances grew in scale and pushed many forests beyond thresholds of sustainability. The least healthy and resilient forests began converting into non-forest ecosystems such as weedy shrublands and grasslands, full of non-native invasive species. Vital ecological services provided by forests, such as flood control, carbon storage, and provision of wildlife habitat, severely declined. By 2030, mega-fires had turned the world's beleaguered forests from being a carbon sink to a source, releasing more CO₂ into the atmosphere than they absorbed, despite scattered efforts at reforestation around the world.

On top of mounting environmental damage, a related set of human challenges was posed by population growth and high levels of consumption. Despite a slower pace of growth, world population grew from around 7 billion early in the 21st century to 8.5 billion in 2030 and almost 10 billion by 2050 -- a multitude of new mouths to feed, homes to build, and aspirations to meet. Rapidly growing demand for food, fresh water, energy, minerals, wood and other natural resources collided with ecosystem destruction and degradation.

The human price of climate disruption was devastating and escalating, measured in burgeoning climate refugees, conflict, economic stress and human suffering. Regional wars over scarce natural resources erupted regularly, often ignited by dwindling water resources. Hotter droughts on every continent resulted in frequent crop failures, food shortages and exorbitant food prices. For the masses who fell behind economically in developed countries, the insecurity was heightened by the large number of ecological and war refugees from the Middle East, Africa, Asia, Latin American and the Caribbean where the economic prospects of working in agriculture and manufacturing turned bleak. With a population beyond the carrying capacity of a stressed planet, the great majority struggled to find work and eke out a meager existence. Times were hard for all but the wealthiest, but the impacts were overwhelming for the poor.

In the early 2040s, a climate tipping point was reached. Some scientists attributed it to the release of massive amounts of methane from thawing Arctic "permafrost" in the previous decade. Whatever the cause, the pace of ecological unravelling quickened. The ongoing climate disruptions of the previous decades were accelerating and coming in rapid succession, with no time to recover from one disaster before the next one hit. A pervasive sense of dread settled in as everyone braced for the next catastrophe, knowing it was just around the corner.

Humanity faced a stark choice: We could continue to muddle through and hope for the best or take bold action. By the mid-2040s, a consensus emerged that "saving the Earth" wasn't the issue: This was about saving ourselves. The Earth would be fine and would adjust to a radically different climate. But the future of humans was

in jeopardy. The real possibility of ecological, economic and social collapse ignited multiple and massive efforts to turn things around, from the grassroots to a global scale. A sea change in environmental activism began in poorer nations that were bearing the brunt of unravelling ecological systems. But the transformation spread across the globe with surprising speed. Public environmental values and attitudes shifted seismically, resulting in solid support for change across the political spectrum. People from all walks of life and at every level of society joined together in an effort that was very much like mobilizing for a war. Visionaries, politicians, scientists, NGO leaders, indigenous communities, entrepreneurs, religious leaders, educators, journalists, corporate chiefs, civil servants, film producers, musicians and ordinary citizens united in a series of global and regional “Manhattan Projects” for sustainability, unleashing a tsunami of technological and cultural innovation.

The opening salvo in the war on climate disruption was a risky and what some considered crazy attempt to “hack the earth” using controversial geoengineering methods to manage the global climate. This approach had been strongly opposed by environmentalists and indigenous peoples for decades: Everyone knew that intentionally re-engineering the planet by altering core processes of the oceans, soils and atmosphere would likely have unexpected and possibly dire consequences. But there was no choice -- we had to buy time to find lasting solutions. After a long and contentious debate, a resolution was passed by the UN General Assembly to establish a new international body to closely monitor and regulate the geoengineering activities of member states. The two main geoengineering approaches allowed were a variety of large-scale techniques to reduce the amount of sunlight absorbed (e.g., brightening clouds with reflective

aerosols, deploying large arrays of space-based mirrors) and techniques to remove CO₂ from the atmosphere (e.g., fertilizing the oceans with iron, mechanically capturing and storing CO₂).

A non-controversial piece of the geoengineering blitzkrieg was the global reforestation and restoration effort, dubbed Bring Back Our Forests by the Forestry Division of the United Nation’s Food and Agriculture Organization. Deforestation and mega-fires had turned forests into net emitters of carbon dioxide. But tree planting on an unprecedented scale and sustainable forest management informed by both cutting-edge science and traditional indigenous forestry began to restore forests and turn the “lungs of the planet” back into a net carbon absorber. Bring Back Our Forests included an ambitious urban forestry effort aimed at cities around the world. Lush urban forests began to transform humanity’s main habitat, where a full 90 percent of people now live.

The gamble paid off. The effects of geoengineering gave both needed encouragement and a short breathing space to implement permanent solutions. Historians of today look back at the 2040s and 2050s as a time of remarkable creativity and innovation, in which the existential threat of climate disruption united humankind as never before and galvanized all-out efforts to deal with our planetary mess. The burst of technological and cultural change over the late 2040s and 2050s touched every aspect of our lives and our relationship with the planet. Like the “Great Acceleration” of industrial society following World War II, we witnessed the equivalent of several Industrial Revolutions rolled into one, except without all the carbon. Technologies that had been gestating for decades finally came to fruition and were quickly adopted:

Crops were genetically-engineered to be drought-resistant and self-fertilizing;

Various types of artificial photosynthesis produced fuels from sunlight to be stored and used when the sun is not shining;

Innovative industrial processes were developed that mimic nature's time-tested and efficient patterns and strategies;

Renewable and biodegradable wood-based nanomaterials replaced non-renewables in countless uses;

Synthetic biology -- long feared and tightly regulated -- helped restore healthy ecosystems by bringing back extinct keystone species, creating new bacteria able to clean up pollution, and generating trees with genes designed to keep them free of disease, climate resilient and absorbing carbon dioxide.

Historians are still sorting out the lessons of the 21st century, but this much is clear: Humanity learned that the future is open and we can choose and act to bring about a desirable and sustainable future. We are not locked in to gradual unravelling or sudden collapse. A new world is within our grasp. We learned the hard way, through an initial failure to exercise our collective foresight intelligence, that climate disruption can be rapid and that it posed a grave threat. But we also learned that human creativity and innovation can be swift.

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