

Net Zero Revolution

Through a mix of aggressive policy and market-driven innovation, the world, along with the Nation, embarks a path to achieving net zero emissions by mid-century while also delivering on the Sustainable Development goals. As a result, the world is positioned to avoid most, but not all, of the most dangerous consequences of climate change. This success is enabled by a strong emphasis on inclusive and equitable policymaking which balances resources and opportunity with necessity. The U.S. population – larger, older, better educated, more diverse, and more affluent than at any time in decades – is enjoying the benefits of its sustainable society. Nevertheless, the shift toward a more sustainable Nation is achieved at significant public expense and redistribution of resources which hastens the demise of some industries and creates pockets of disgruntled citizens.

Current Events

01/2050

Los Angeles Times

Los Angeles Declares Victory in its 100-Year Battle with Air Pollution

FINANCIAL TIMES

Years of Environmental “Elitism” Blamed for Lackluster Economic Growth

The Times-Picayune
NEW ORLEANS ADVOCATE

President Calls New Orleans’ Urban Revitalization a “Model for the World”

THE WALL STREET JOURNAL

Weight of Stranded Assets Forces Break-Up of Exxon Mobil

2024



2050

340
MILLION



411
MILLION

\$26
TRILLION



\$47
TRILLION

Climate Indicators

Avg. Disaster Declarations (#/year)

120
A YEAR



130
A YEAR

Disaster Losses (\$B/year)

100
BILLION



125
BILLION

Exposure to Coastal Flooding (M ppl/year)

3.4
MILLION



3.8
MILLION

Average Heat Index >100 ° F (# days/year)

14
DAYS



28
DAYS

Avg. Annual Wildfire Area Burned (km2/year)

6,000



7,000

Climate

Thanks to a persistent global effort, global greenhouse gas emissions peaked in the early 2030s, before heading sharply downward, consistent with net-zero by 2050. Despite avoiding the worst impacts of climate change, many regions of the world fall victim to increasing frequency of short-term droughts. By mid-century, the spatial extent of severe droughts is more than double that observed at the start of the 21st century. Within the United States, the most severe drought events are concentrated in the Southwest, particularly during the summer months. The Colorado River, a system that has been in crisis since the 2020s, is no longer the water resource lifeline for the Southwest that it once was. Conflict between affected states has increased due to unstable water supply, especially for states located in the lower basin (e.g., California, Arizona, and New Mexico). The Supreme Court has heard cases related to the increasing conflict but has not provided clear guidance or resolution.

Despite such challenges, the broader social movement toward sustainability has helped prepare communities for these impacts, especially with respect to sustainable water management. Billions have been invested in the Southwest and approaches to accessing, storing, and equitably distributing water have evolved adequately to meet the challenges presented by severe droughts. Furthermore, individual households are contributing to water management solutions by investing in water-efficient appliances, reusing and recycling water where possible, and adhering to local regulations that reduce water usage during extreme drought. The success of community-level drought contingency plans depends on effective education and leadership, including from emergency managers.

Although urban areas are responding as well to severe drought, competition between urban and rural users have triggered growing tensions. Water allocation prioritizes urban use, leaving farmers grappling with the challenge of sustaining livestock and crops amidst increasing water scarcity. Despite farmers adopting less water-intensive irrigation methods and cultivating the latest generation of drought-resistant crops, these efforts fall short in maintaining normal yields. The federal government has intervened by bolstering subsidies and supporting crop insurance markets for farmers combating drought impacts, yet the consequence is an ongoing rise in food prices. In comparison to the 2000 to 2020 period, Americans now experience a 50% increase in food expenditure and are less likely to have ample supplies on hand, further intensifying concerns during disasters. Emergency managers' plans for stockpiling non-perishable food after a disaster has therefore become more important than ever, especially as states frequently supplement food bank distributions.

In addition to drought impacting many people's way of life across the Southwest, this region is faced with longer and more active wildfire seasons. The drier and warmer conditions in the summertime, coupled with increased fire fuel from drying forests and vegetation, have resulted in single wildfire events exceeding 50,000 acres in the Southwest. Wildfires burning farmland are exacerbating agricultural challenges already presented by drought. Increased attention also is being paid to

wildfire risk in the Southeast, where lightning-ignited wildfires are now more frequent. State and local leaders are carefully planning for a potentially conflicting compound event, in which concurrent evacuation measures are necessary for co-occurring wildfire and hurricane events. Meanwhile, billion-dollar disasters have risen steadily year by year, and now show signs of stabilizing, but not declining.

Society

Population growth driven by a healthy economy, longevity, and steady immigration drive the U.S. population to 411 million by 2050. The new era of civil rights that emerged in 2020s America is credited with embedding principles of social equity into decision-making in both public and private institutions. Rather than slow economic growth, as warned by skeptics of the social justice movement, this shift drives an urban renaissance that couples rigorous land use planning to enhance urban amenities and green space with an expansion of housing to increase accessibility making housing safe, healthy, and affordable, even for economically disadvantaged households. The modest rates of economic growth and reduced global inequality have resulted in some of the lowest rates of immigration of the 21st Century, while the emphasis on sustainability as a cultural norm has caused birth rates to fall below the replacement rate. Meanwhile, investments in healthcare systems and reducing health disparities associated with income and race/ethnicity have enabled more people to live longer, more productive lives.

The ongoing success of the 2015 Paris Agreement to drive down global greenhouse gas emissions is attributed to broader progress on climate resilient and sustainable development. Having reduced reliance on the use of fossil fuels and avoided the worst impacts of climate change, communities around the country commonly adopted nature-based solutions to manage the risk of climate change. Such actions were reinforced by Congressional reforms to the National Environmental Policy Act in the 2030s and subsequent litigation that resulted in a landmark Supreme Court decision which significantly increased the attention given to environmental protection in federal decision-making.

Despite the Nations' progress on sustainability, there is a growing counterculture, dubbed the Free Carbon Movement (FCM), that claims these gains have come at too high a cost to traditional American values of limited government and personal freedom. The FCM argues the Nation's environmental elitism has slowed global economic growth and thus undermined American prosperity. In short, the sustainability push has backfired. Echoes of these complaints can be heard in the global South, including America's southern neighbors, where the impacts of climate change continue to take a toll. Critics argue the federal government has been happy to export its technology, but its appetite for importing migrants on the run from climate change impacts is weak.

Economy

Americans in the mid-21st century are reaping the rewards of an economic model that integrates modest economic growth with clean and sustainable innovation that has transformed the economy.

While critics of prioritization of the environment and equity in economic policy yielded influence well into the late-2030s, years of economic data ultimately demonstrated that investments in innovation and climate-friendly technology are a major engine of job growth. Such market-driven progress was buoyed by the Climate Innovation Act of 2036 – effectively a national carbon tax that was used to incentivize clean tech transitions while raising revenue to support federal subsidies for clean energy technologies. This, coupled with strong support for trade liberalization and international partnerships, helped build international markets for U.S. innovation, thereby helping to maintain the Nation’s status as a global economic leader.

America’s success in an economy that prioritizes smart growth and sustainability is closely tied to its effective deployment of advanced technologies to accelerate productivity and add value to American industries. In particular, the ten-year 2030–2040 Carbon Moonshot, championed by multiple White House administrations, developed the technologies needed to transform the carbon intensity of steel and cement while also providing the research and development needed to scale-up industrial carbon capture technologies. America’s pioneering work on these technologies proved to be a windfall for American industries. With the world enjoying muted geopolitical tensions, particularly with respect to cooperation on climate action and sustainability, American innovation is able to be widely exported.

These advances in concrete and steel construction, piloted particularly by the Pacific Northwest National Laboratory, were enshrined in the National Building Code of 2038. After 15 years of study, the federal government developed risk-based standards that exceeded those of the International Building Code (IBC), and to facilitate the growth of American architecture and engineering firms abroad, the IBC 2041 revision incorporated these standards into its chapters 19 and 22. Unfortunately the specifications for making the materials were not precisely followed by local contractors and high-rises in an American-led development in the Istanbul Innovation Zone, which experienced a catastrophic structural failure after a magnitude 7.8 earthquake in 2049 along the North Anatolian fault. Subsequent forensic investigation revealed other faults in the National Building Code, and re-insurers have sued the federal government for damages.

The global movement toward low energy- and material-intensive commerce has led to the demise of a broad range of international and domestic enterprises. While efforts have been made to provide a soft landing, particularly for affected workers, these economic impacts are largely dismissed as unavoidable collateral damage. Pioneering local and state governments in Wyoming and West Virginia have encouraged investment in small modular reactors to offset the loss of jobs and revenue from the end of fossil fuel extraction and use. Although environmentalists cry “foul”, this strategy has proven effective at meeting national greenhouse gas emissions reduction targets while allowing local jurisdictions to chart their own path forward on sustainability. Meanwhile, the Nation’s liberal use of taxpayer dollars to subsidize the Nation’s green transition combined with its slow and steady vision for economic development has led to consistent growth of the federal deficit and persistently high interest rates pushing out investments in potential game-changing technologies.

Technology

High winds, hot temperatures, and dry conditions on the West Coast this summer prompted fears of a disastrous wildfire season. The Department of Energy's campaign for grid modernization has vastly improved the reliability and resilience of the grid, making the infrastructure failures that once triggered deadly wildfires a thing of the past. Cheap utility-scale battery storage and incentive-based programs have increased the numbers of homeowners willing to cede control of their internet enabled thermostats during emergencies so utilities can safely balance supply and demand without sporadic power disruptions.

The public has begun to question the wisdom of allowing utilities to unilaterally curtail power usage after the staggering death toll at a megachurch in Bakersfield. Elderly citizens had been evacuated from area retirement communities and assisted living centers over the Fourth of July weekend when daytime temperatures soared over 120° F each day (with the previous record of 118° F set in 1908). Unfortunately, the continuing influx of people exceeded the cooling capacity of the heat pumps, and facility managers were unable to activate their auxiliary air conditioners without the utility's authorization. Many of the victims suffered from heat stroke while first responders staged an evacuation and tried desperately to gain remote access to the utility's artificial intelligence-based grid operations center. In response to the public uproar and criminal investigation, California's governor signed an executive order creating new emergency management jobs focused solely on coordination between different public and private organizations with the ability to override automated systems.

Some emergency management offices in the West have commenced using drone-based sensors and satellite data for real-time surveillance, detection, and apprehension of arsonists and careless campers who start fires, as well as lightning triggered wildfires. Scientists and disaster managers can predict the spread of fires with the help of improved computational power and large amounts of data. As a result, the Nation has started to make progress in bringing down the death toll from wildfires. However, the growing use of these technologies has also triggered public backlash due to concerns about the presence of a surveillance state. Extremists have launched targeted cyberattacks against these drones and data centers that process satellite data, leading to many becoming inoperable.

Public pressure to lower carbon footprints combined with plentiful data on individuals came to a head as the travel patterns of multiple celebrities shirking carbon requirements when flying on private planes. Hacking into the database of the nation's largest charter operator, the journalists inadvertently uncovered a scheme to launder carbon credits for cargo and evacuation flights using Sustainable Aviation Fuel reimbursed by FEMA, which has caused internal organizational soul-searching about why the hack was so easy. Environmentalists have called for heavy fines and other corporations have shunned doing business with the carrier, putting the company out of business. For their part the celebrities are livid that their data was leaked and have started a movement with the slogan "My data, my choice," which is dividing the country. Not only has this caused chaos for

planning around the upcoming hurricane season, but emergency managers are also worried that the public backlash will mean they lose access to location data that is critical for getting everyone to safety during emergencies.

Geopolitics

Most nations have achieved substantial progress on all their Sustainable Development Goals through concerted international cooperation and investment. For example, malaria is nearly eradicated. By stabilizing the Amazon and other rainforests after the United Nations Decade on Ecosystem Restoration and efforts such as the One Trillion Tree Initiative, along with strategically located carbon-sink revegetation projects, engineers have architected a much more stable, higher rainfall regime. This has, however, led to a resurgence in some waterborne illnesses, requiring frequent, prompt multinational intervention to prevent backsliding. An emerging source of friction, however, at COP55, was whether the world should set ambitious targets to reduce the amount of greenhouse gas emissions back to 2020 levels by 2100 to avoid the ill effects of excess heat moving around in the oceans.

The relative lack of cross-border violence has meant that many nations have greatly reduced their spending on defense and piled these funds into social programs, disaster resilience, and improved domestic infrastructure. Indeed, alliances have allowed military capabilities to be freed up and repurposed for service organizations that project assistance into regions that are threatened by the occasional natural disaster. They also engage in fundamental research and development to pioneer the application of new technologies on installations that serve as bulwarks against the most sensitive habitats.

While there is ample international coordination between various homeland security and adjacent agencies, there are still some remnant transnational criminal organizations that supply illegal drugs and contribute to human trafficking. After several emergency response efforts in the past few decades to address surges in land and water crossings from natural disasters, components outside of FEMA have built the necessary emergency infrastructure and laid claim to that funding and those resources, contributing to turf battles when assets are activated in nearby domestic situations.

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Population data is derived from:

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GDP data is derived from:

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Climate Indicators:

- Disaster Declarations are extrapolated from historical data, excluding outlier years of 2011 and 2020, with adjustments to maintain consistency with underlying scenario. Data available at <https://www.fema.gov/openfema-data-page/fema-web-disaster-declarations-v1>.
- Disaster Losses are extrapolated from historical billion-dollar disaster time series, excluding outlier years of 2005 and 2017. Data available at <https://www.ncei.noaa.gov/access/billions/time-series>.
- Exposure to Coastal Flooding metrics are based on Hauer, M.E., Hardy, D., Kulp, S.A. et al. Assessing population exposure to coastal flooding due to sea level rise. *Nat Commun* 12, 6900 (2021). <https://doi.org/10.1038/s41467-021-27260-1>.
- Heat Index metrics are based on Dahl, K., Licker, R., Abatzoglou, J.T. and Declet-Barreto, J., 2019. Increased frequency of and population exposure to extreme heat index days in the United States during the 21st century. *Environmental Research Communications*, 1(7), p.075002. <https://iopscience.iop.org/article/10.1088/2515-7620/ab27cf>.

- Wildfire Acres Burned metrics are based on Abatzoglou, J.T., Battisti, D.S., Williams, A.P. et al. Projected increases in western US forest fire despite growing fuel constraints. *Commun Earth Environ* 2, 227 (2021). <https://doi.org/10.1038/s43247-021-00299-0>
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Scenario Narrative:

- For more information on projected drought conditions, see: Lu, Junyu et al. “Uncertainty and hotspots in 21st century projections of agricultural drought from CMIP5 models.” *Scientific reports* vol. 9,1 4922. 20 Mar. 2019, doi:10.1038/s41598-019-41196-z.
- For more information on historical food expenditure, see: <https://www.ers.usda.gov/amber-waves/2020/november/average-share-of-income-spent-on-food-in-the-united-states-remained-relatively-steady-from-2000-to-2019>.
- For more information on wildfire projections, see: <https://science2017.globalchange.gov/chapter/8/>.
- For more information on projected future migration, see: <https://www.whitehouse.gov/wp-content/uploads/2021/10/Report-on-the-Impact-of-Climate-Change-on-Migration.pdf>.
- For more information on projected earthquake impacts in Istanbul, see: <https://www.cnn.com/2023/03/17/middleeast/turkey-earthquake-istanbul-mime-intl/index.html>.