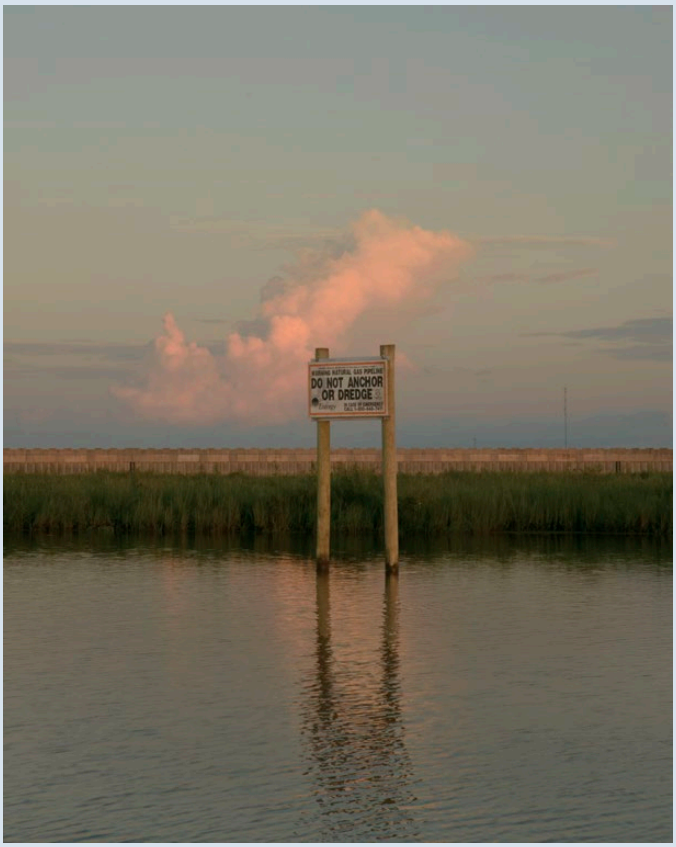
LAUREN ALEXANDER AUGUSTINE

Ten Years Into the Gulf Research Program



VIRGINIA HANUSIK, *Sunrise over the Lake Borgne Surge Barrier #2,* 2022.

On April 20, 2010, an explosion ripped through the Deepwater Horizon, an oil rig operating in the Gulf of Mexico, and triggered the worst oil spill to occur in US waters and one of the worst environmental disasters in US history. Eleven workers lost their lives, and 134 million gallons of oil flowed from the wellhead before it was finally capped 87 days later. The tragedy put a national spotlight on the risks associated with offshore drilling and exploration as well as on the Gulf, a unique American landscape rich in economic, natural, ecological, and cultural resources.

In the aftermath of Deepwater Horizon, a criminal settlement agreement led to the creation of the Gulf Research Program (GRP) at the National Academies of Sciences, Engineering, and Medicine in 2013. The agreement set aside $500 million in penalties for an endowment at the National Academy of Sciences to "carry out studies, projects, and other activities" focused on offshore energy production, human health, and environmental protection in the Gulf of Mexico and along the US Outer Continental Shelf. The endowment and its interest must be spent over a 30-year timeline for the benefit of the people of the Gulf region.

The GRP has just marked its tenth anniversary. Looking forward, our work remains focused on supporting this dynamic region as it navigates three far-reaching transitions related to its energy sector, coastline, and communities.

Offshore safety and the energy transition

The offshore oil and gas industry remains an important part of the regional and national economy, and current Gulf of Mexico federal offshore oil production surpasses levels recorded at the time of the disaster. This production now predominantly occurs in deep water as shallow-water production has continued to decline.

Assessing the current safety of offshore operations is a complex task. Vigilance is important because a major lesson of the BP oil spill is that the underlying risks of offshore operations are not static and shift over time. Although there hasn't been a subsequent blowout similar to Deepwater Horizon, there have been spills associated with aging infrastructure. "Legacy" offshore oil and gas infrastructure—such as decommissioned or retired pipelines, platforms, and other structures that remain in place after abandonment or the end of use—poses a particularly complex challenge. Eighteen thousand miles of pipelines have been decommissioned in place, for example, since the start of oil and gas production in the Gulf. And whole new categories of threats could emerge in the future, such as terrorism through cyberattacks.

A 2023 National Academies consensus study commissioned by the GRP determined that the offshore industry in the Gulf of Mexico has shown considerable improvement in systemic risk management, thanks to reforms implemented in response to the Deepwater Horizon spill. The study also found, however, that there is still work to be done: there is not yet a visible, industry-wide, industry-led commitment to a culture that supports safety.

Offshore oil and gas operations are only one part of the energy complex in the Gulf region, which is a world-leading dynamic enterprise. It is very possible the offshore industry will contract during the GRP's existence, which is slated to end by 2043. Leaving aside that Gulf offshore oil and gas is a nonrenewable resource and that technically recoverable resources (admittedly a moving target) may be exhausted over the next few decades, the dramatic increase in US onshore production spurred by advances in hydraulic fracturing has dampened investment in relatively expensive deepwater exploration.

The issue that looms over the future of the energy sector in the Gulf is climate change. Compared with 2013, there is greater agreement in the United States about the need to transition away from carbon-intensive energy sources if we are to meet the climate challenge. The growing consensus is apparent in not just official pronouncements but also major investment decisions by government and industry. Although the magnitude and speed of the transformation are uncertain and depend on several factors, including political and policy developments, the long-term direction is clear.

But this growing acceptance of the need for an "energy transition" masks important disagreements about how it should unfold, and even what the term means. The potential for natural gas to serve as a lower-polluting "bridge" fuel on the way to a clean energy future is one source of contention, as is the economic feasibility of emerging technologies such as carbon capture, utilization, and storage (CCUS). Tristan Baurick's article in the Fall 2023 edition of *Issues* highlighted the complexities of initiating CCUS projects in the region, as well as the excitement and skepticism about their potential from different quarters. Stories like this show how the energy transition, whatever its form, is far more than a technical issue.

The changing coastline

Oil and gas production is just one part of what makes the Gulf region a working coast. In the energy sector, production and exploration are complemented by refining, and the Gulf is home to over 45% of US refining capacity. In addition, more than 90% of US primary petrochemicals capacity is located in just two Gulf Coast states—Texas and Louisiana. Other key pillars of the region's economy—fisheries, navigation, and tourism—depend on or occur in the coastal zone.

The Gulf Coast is constantly changing and transforming as sea level rise affects low-lying communities and coastal ecosystems. Recent scientific findings provide cause for alarm. Over the past 10 years, the Gulf has experienced some of the fastest rates of sea level rise in the world, posing dire threats to coastal ecosystems. Long-range planning in the region depends on better understanding the future trajectory of this phenomenon.

This challenge is acute in the Mississippi River Delta as it undergoes rapid deterioration, abetted by levees and the scars of hydrocarbon extraction and navigation channels. Stemming the sea level rise is out of reach for policymakers in the short term, but strategic management and design approaches could help maintain a productive and sustainable delta. How these options are chosen and implemented will have massive implications for the economy, environment, and local communities, and raise complex and often controversial questions. To help decisionmakers chart a path forward, the GRP has made a $20 million-plus investment in a research consortium in partnership with Tulane University and Louisiana State University to develop an integrated modeling program to look at the future sustainability of the lowermost Mississippi River Delta, known as the Birdfoot Delta.

More of these kinds of collaborative and integrated efforts will be needed. But they are not simple. Virginia Gewin's article in the Winter 2024 *Issues* on the Gulf of Mexico's Loop Current demonstrates just how challenging it can be to put together the diverse teams required to produce and deliver the kind of information that policymakers need.

Resilient communities

A better understanding of the Loop Current can potentially improve researchers' ability to predict storm intensity and pathways, providing coastal communities with greater advance warning of catastrophic weather events. This capability is important, as recent studies suggest that stronger and rapidly intensifying storms could be increasing in frequency due to climate change.

The Gulf is on the front lines. Massive disruptions brought by climate change, the need to transition to a new energy economy, and the potential collapse of vital ecosystems are on the horizon for the nation as a whole, not just the Gulf region.

The science is not yet at the point where we can definitively say that the experience of the last few years represents a "new normal" of extreme weather in the Gulf region—but it is possible that we are looking at a future of compounding and sequential disasters similar to the 2020 hurricane season, which was the most active Atlantic hurricane season ever experienced in the United States. In that season, a record 11 hurricanes made landfall; a record 5 named storms made landfall in the Gulf of Mexico states; and 10 storms underwent rapid intensification, a process that requires extremely warm water (near or above 30°C/86°F).

There has been a rise in billion-dollar disasters as well as an increase in modest or even smaller events occurring in rapid sequence, the aggregate of which can create more damage, costs, and trauma than a single large event. The increased threat of compounding disasters (which can result from hurricanes, heat waves, wind events, and other hazards) requires greater adaptive capacity within communities to understand hazards and reduce exposure and vulnerabilities. This effort brings us face to face with an uncomfortable reality: "resilience" is not distributed evenly among communities, and this inequality is correlated with other long-standing inequalities centered around wealth, education, and access to housing and health care. On these dimensions, the Gulf region lags behind the nation, exhibiting even higher levels of inequality.

The way forward involves moving beyond a backward-looking "disaster" mindset and engaging in proactive efforts to shore up the key components that support the ability of communities to absorb, recover from, and adapt to adverse events and disasters. This will require transcending traditional silos and taking a systems approach that looks across multiple and intersecting community "capitals."

Partnering is essential to the GRP's health and resilience work, which inherently plays out locally. The GRP is currently collaborating with the National Academy of Medicine's Climate Communities Network, a nationwide endeavor to elevate community expertise, experience, and efforts to address the structural drivers of climate-related health inequities at the community level. We're also working with the Robert Wood Johnson Foundation to support community-engaged research on the role that data on the social determinants of health could play in improving public health data systems and better addressing health disparities.

As Samantha Montano outlines in her article in this edition of *Issues*, the long, tangled history of national disaster response is inextricably tied to the Gulf.

A focus on the future

The challenges sketched out here are daunting, but within the Gulf region there is a palpable desire and energy to meet them head-on. The research community is mobilizing and coming together via new and exciting partnerships and collaborations to develop integrated solutions for the future. Growing networks are facilitating the sharing of knowledge, data, and information beyond academia to decisionmakers and the communities impacted by their decisions. The region's young people, many of whom are supported through the GRP's educational programming, provide a particular source of inspiration, demonstrating a remarkable passion for shaping the region's future.

The GRP's programming is designed to capitalize on these emerging strengths. It supports the complex collaborations needed to expand the set of solutions that address the region's intersecting and integrated challenges, builds and sustains the networks needed for information to empower the people of the Gulf, and invests in the next generation of engaged leaders and the future workforce.

In many respects, the Gulf is on the front lines. Massive disruptions brought by climate change, the need to transition to a new energy economy, and the potential collapse of vital ecosystems are on the horizon for the nation as a whole, not just the Gulf region. The smart application of scientific, engineering, and medical knowledge is vitally necessary and provides the best hope for the future. If we can get it right in this unique and challenging setting, we can use that experience to inform the path forward for the nation and the world.

Lauren Alexander Augustine *is the executive director of the Gulf Research Program at the National Academies of Sciences, Engineering, and Medicine.*

To mark the tenth anniversary of its founding, the Gulf Research Program supported the publication of three reported articles on energy, environment, and society in the Gulf of Mexico.