RESOURCES
for the FUTURE

Annual Report 2022

70

70 Years of RFF

"Nothing in life is to be feared; it is only to be understood. Now is the time to understand more, so that we may fear less."

Attributed to Marie Curie
Two-time Nobel Prize–winning scientist

"The best solutions for today may nonetheless differ from the approaches we've successfully used in the past and from what we thought we would be relying on just a few years ago."

Richard G. Newell
President and CEO, Resources for the Future

A Milestone Year of Impact and Reflection

2022 was a year of both responsiveness and retrospection for Resources for the Future (RFF). As we worked to provide decisionmakers with the relevant research and policy analysis that they need in charting an effective, efficient, and equitable way forward, we also had a unique opportunity to reflect—to look back at our history and impact as we marked 70 years of work that has informed and shaped the solutions that can meet the greatest challenges of our time.

As the Bipartisan Infrastructure Law passed in late 2021 and moved toward implementation in 2022, work on another historic climate policy package already was underway. In August 2022, the most comprehensive climate bill in US history was signed into law: The Inflation Reduction Act was introduced this summer by Senators Chuck Schumer and Joe Manchin, ultimately passing as law during the budget reconciliation process. Unlike any other major US environmental legislation to date, the Inflation Reduction Act relies heavily on "carrots"—financial incentives such as tax breaks that encourage moves toward clean energy technologies—rather than "sticks" in the form of mandates or fees.

With more than $360 billion targeted at reducing emissions and boosting domestic manufacturing and jobs, the law has far-reaching effects on a range of important advancements such as clean energy, energy efficiency, and electric vehicles. RFF scholars responded immediately to help inform the design of particular strategies and measure the potential impact across sectors, in collaborations that involved a diverse range of specialties. In doing so, our experts demonstrated RFF's characteristic nimble nature and significant timely analysis that benefits both policymakers and the people those policies affect.

While Congress debated various provisions of the Inflation Reduction Act, and in the immediate wake of its passage, RFF released a wide-ranging set of analyses through timely events, reports, issue briefs, blog posts, and podcast episodes that explored the potential impacts of the new law's provisions. Our scholars outlined the implications of the legislation for power-sector emissions and household electricity

"The best traditions of RFF produce ideas that might seem unconventional or untested—ideas that might fly in the face of conventional wisdom, but just may hold the key to our future."

MEET OUR PRESIDENT

Richard G. Newell

2022 marked six years for Newell as RFF's president and CEO. He worked on projects such as the *Global Energy Outlook*, a new social cost of carbon estimate, and the Net-Zero Economy Summit.

IMAGE Above: RFDCphoto Previous page: Thomas Barwick / Getty Images

In 2022, RFF celebrated a landmark

70

years of advancing a healthy environment and thriving economy.

RFF is home to

139

staff and affiliated scholars.

RFF colleagues engaged in over

350

interactions with key policymakers and government officials.

RFF was ranked

#1

for energy economics globally.*

On Twitter, over

22,600

accounts follow RFF.

We released our

200th

episode of *Resources Radio.*

We're a 501(c)(3) nonprofit organization with a budget of

$17,500,000

to support our work, our people, and our mission.

Our expertise was cited in the news more than

1,600

times by US and international news outlets.

Financial supporters of RFF include

268

foundations, corporations, individuals, and nongovernmental organizations.

RFF colleagues published

113

editorial products on the blog and in *Resources* magazine.

RFF generated

110

publications and public comments.

Our Year in Numbers

RFF hosted more than 70 events, with over

12,700

attendees at our 28 public events alone.

Our podcast, *Resources Radio*, was played over

125,000

times across various podcast platforms.

Our website generated more than

1,200,000

page views over the last 12 months.

bills; electric vehicles in terms of subsidies, critical minerals, air quality, charging infrastructure, and the evolution of markets and the vehicle fleet; clean energy projects in "energy communities"; and a new approach to industrial-sector energy in the form of networks, or "hubs," of clean hydrogen producers and users.

Amid this major milestone of climate legislation, RFF also marked our own milestone: 70 years of research, analysis, and policy engagement in pursuit of solutions that support both a healthy environment and a thriving economy.

October 2022 marked the 70th anniversary of RFF, an anniversary that has lent opportunities for celebration and reflection—an inflection point that called for an examination of how we got here and an exploration of the challenges that remain before us. The history of our incredible institution reveals critical lessons for today: RFF's legacy demonstrates that drawing on ingenuity and innovation can help us surmount enormous problems, even on the magnitude of global climate change.

In the past seven decades, scholars at RFF have developed important techniques to evaluate the impacts of policy interventions for energy and the environment. We've also honed tools that can measure the benefits of environmental protection in economic terms, so those protections can be considered on equal footing alongside the costs of taking action. RFF scholars were the first to propose the unconventional idea that shaping market forces can help solve big environmental problems—and, in the process, created the fields of environmental economics and natural resource economics.

From its inception, RFF and its scholars have applied creative thinking, a willingness to set aside conventional wisdom, and an approach to policy that expands who and what can be part of the solution. Our organization has identified what motivates effective solutions, and our work has demonstrated how the very same economic forces that contributed to a problem also can be harnessed to fix it. We recognize that the best solutions for today may differ from the approaches that we've used with success in the past and from what we thought, just a few years ago, would be the strategies of choice. The best traditions of RFF produce ideas that might seem unconventional or untested—ideas that might fly in the face of

conventional wisdom, but just may hold the key to our future.

This past October, RFF hosted the Net-Zero Economy Summit, a daylong convening to discuss the best strategies for driving emissions down to net zero. Conversations at the event examined the opportunities and challenges of delivering a net-zero resilient economy, with a nuanced emphasis on the system-wide transformations that are needed to create effective, efficient, and equitable solutions.

Net zero has become an increasingly salient goal for both governments and the private sector, because pursuing net-zero emissions focuses on an outcome that is subject to direct control, consistent with stabilizing the climate, inclusive of technology, open to innovation, and ready to harness the power of incentives. Furthermore, progress can be measured by whether actions are increasingly on a path to net-zero emissions—and this metric can be tracked at the level of the whole world, a nation, a state, or an individual business.

How can we possibly summarize the year of high-impact ideas that RFF produced in 2022? Certainly not in this letter, and not even in the few dozen pages that follow. We would need much more space to cover all the work and impact that RFF has achieved this year, but we've distilled the year's accomplishments to some key moments. Please read on to share in RFF's inquiries and insights that relate to a year of historic legislative action, a new estimate of the social cost of carbon, international trade and competitiveness, air pollution and public health, environmental justice, comprehensive decarbonization strategies, and much more.

As always—but especially in these critical times that call for rigorous research to help decisionmakers address the climate crisis—we thank our dedicated staff, partners, supporters, and Board of Directors. The impact described in these pages has grown from your continued commitment to RFF.

With many thanks,

Richard G. Newell
President and CEO | Resources for the Future

*RePEc rankings of global institutions in energy economics, November 2022, out of 3,000 institutions.

Investing in Communities for a Just Energy Transition

Fossil fuels provide substantial revenue to the US federal government and many tribes, states, and localities. As the US economy transitions to low-carbon energy sources, government policies can help replace declining revenue and assist communities in adapting to their changing circumstances.

In early 2022, RFF scholars released two studies about the future of communities with substantial fossil fuel economies. **Daniel Raimi** and **Sophie Pesek**, working alongside RFF University Fellow **Gilbert E. Metcalf**, estimated in a working paper that fossil fuels generate approximately $138 billion per year in revenue for the federal government, tribes, states, and municipalities. The research, which has been accepted for publication in the journal *Review of Environmental Economics and Policy*, suggests that significant investments may need to be made into these communities as the energy transition progresses, as fossil fuel–based revenues are expected to fall as

other energy sources become more widely available. However, in their paper and related blog post, the authors also highlight that climate *inaction* could cost roughly $261 billion per year (assuming an older estimate of the social cost of carbon of $51 per metric ton, which RFF research recently estimated at 3.6 times higher).

This work saw significant media attention in the months following its publication. Outlets such as the *New York Times*, Associated Press, *Bloomberg*, Axios, and the *Financial Times* included the findings from the paper in their reporting about the energy transition.

MEET OUR TEAM

Daniel Raimi

Led research on county-level vulnerability to the energy transition, which was published by *Nature Scientific Reports*.

IN NUMBERS

Climate inaction could result in a yearly cost of

$261 billion

compared to a revenue of $138 billion.

MEET OUR TEAM
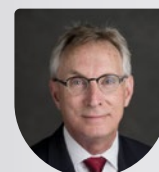
Gilbert E. Metcalf

The Massachusetts Institute of Technology welcomed University Fellow Gilbert Metcalf as a visiting professor.

MEET OUR TEAM

Sophie Pesek

After joining RFF in March 2021, Pesek was promoted to the position of senior research analyst in late 2022.

IMAGE RoschetzkyIstockPhoto / Getty Images

ILLUSTRATION Myriam Wares

Resources Magazine Issue 209

To commemorate its 70th anniversary, RFF released three special issues of *Resources* magazine in 2022, including an issue dedicated to landmark research that's been undertaken throughout the institution's history.

This magazine issue brought together reprints from the *Resources* archive alongside contemporary commentary from RFF scholars.

"What's Nature Worth?" *(2004)*
This article aimed to demystify the economic valuation of nature for decisionmakers—an ongoing task at RFF—by taking an early look at the value of changes in air and water quality, which is foundational to assessing the effectiveness of climate policies.

"Backwoods Economics" *(1967)*
How much weight should different voices carry when making land management decisions? This article discusses the different perspectives—from local communities to the federal government—and how their priorities may have similarities and differences.

"Air Quality and Electricity" *(1996)*
RFF researchers determined that the environmental consequences of electricity-generation markets in the years after restructuring would depend importantly on choices about environmental regulation, energy policy, and new sources of electricity supply—all of which were difficult to predict.

"Forty Years in an Emerging Field" *(1999)*
Economics was missing in action during the environmental revolution of the late 1960s, but eventually made its mark on policy. How the discipline became an agent of change in environmental law is a story that isn't over yet.

"In Pursuit of a Sustainable Space Environment" *(1993)*
Debris resulting from human activities in space is a major concern, as even small pieces of debris can cause substantial damage. This article about the seemingly arcane topic of space debris anticipated, by many years, a problem that now receives routine media attention.

"One Strategy for Pollution Control" *(1970)*
Could effluent charges control water pollution in the United States? This article raised novel insights about waste discharge into our nation's waterways and the need for economic incentives to address the problem.

"Resources in America's Future" *(1963)*
This article posed an important question: "Can the United States, over the balance of the twentieth century, count on enough natural resource supplies to sustain a rate of economic growth sufficient to fulfill all of [its] aspirations?"

> " [One] article aimed to demystify the economic valuation of nature for decisionmakers ... by taking an early look at the value of changes in air and water quality, which is foundational to assessing the effectiveness of climate policies.

READ THIS ISSUE

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Driving Research on Electric Vehicle Subsidies

T he Inflation Reduction Act became law this year with provisions attached that originally appeared in the Build Back Better Act. As the 117th Congress debated the Build Back Better Act, when that bill first was introduced, **Joshua Linn** published research on subsidies for medium- and heavy-duty vehicles (such as trucks and buses) at a point when his insights on the bill's related provisions could inform members of Congress. In an issue brief, Linn found that subsidies will be vital for increasing the number of electric vehicles on the road; however, the effectiveness of subsidies depends on the pace of declines in vehicle price.

Linn also established in a working paper published two weeks later that subsidies for light-duty passenger vehicles, when combined with other policies such as standards for greenhouse gases and zero-emission vehicles, are less cost-effective but more equitable than the subsidies on their own.

MEET OUR TEAM

Joshua Linn

Joined CBS News to discuss how California's new plan to phase out gas-powered vehicles will affect costs for consumers.

IN NUMBERS

Our research showed that the tax credits failed basic cost-benefit analysis, achieving less than

$200 million

in benefits to society, compared to costs of about

$1 billion

Ending the subsidy resulted in a huge decline in the use of refined coal at US power plants: "Last year, 31 percent of US coal-fired generation ran on refined coal," noted Prest. "This year? Close to zero."

Informing Decisionmaking on a $1-Billion Coal Subsidy

In recent years, US law has provided nearly $1 billion annually in tax credits for "refined coal"—coal that has been treated with chemicals with the goals of making it burn cleaner and reducing local air pollution.

To be eligible for the credit, companies were required to demonstrate certain levels of emissions reductions for three pollutants and had the option of doing so using laboratory tests. However, results from a lab can differ substantially from actual operations at power plants.

Using a nationally comprehensive dataset, **Alan Krupnick** and **Brian C. Prest** investigated the consequences of the tax credit for emissions reductions. They showed that emissions reductions in practice were only about half of the levels required and that the tax credits failed basic cost-benefit analysis, achieving less than $200 million in benefits to society compared to about $1 billion in costs.

Because the tax credit was up for reauthorization at the end of 2021, RFF's work had immediate relevance, helping inform members of Congress who were evaluating whether to reauthorize the tax credit. Ultimately, the credit was not reauthorized—and data from the Energy Information Administration that were released later in 2022 showed that ending the subsidy resulted in a huge decline in the use of refined coal at US power plants: "Last year, 31 percent of US coal-fired generation ran on refined coal," noted Prest. "This year? Close to zero."

MEET OUR TEAM

Alan Krupnick

Extensively researched US hydrogen fuel development, writing numerous blog posts and papers about the technology.

MEET OUR TEAM

Brian C. Prest

Was cited in a July op-ed by the *Washington Post* editorial board for his work on oil and gas leasing.

The Health Benefits of Meeting US Climate Goals

In April 2021, the Biden administration rejoined the Paris Agreement with a pledge to reduce economy-wide net greenhouse gas emissions in the United States by 50–52 percent in 2030, relative to 2005 levels. This goal, if achieved, would result in substantial emissions reductions and reductions to both air pollution and pollution-related deaths.

In January 2022, RFF researchers released the first comprehensive study analyzing these health outcomes. Working in tandem with scholars at Harvard University, our researchers found that meeting US climate goals would generate more than $33 billion in public health benefits in 2030 alone. This modeling showed that most health benefits would result from reductions in power-sector emissions of sulfur dioxide and nitrous oxide, both key components of the harmful air pollutant $PM_{2.5}$.

The study, coauthored by **Dallas Burtraw**, **Jhih-Shyang Shih**, **Maya Domeshek**, and **Seth Villanueva**, also showed that, while some regions will benefit more than others, all regions will experience health benefits that will accrue broadly across income levels, racial groups, and ethnic backgrounds.

MEET OUR TEAM

Jhih-Shyang Shih

The journal *Environmental Science & Technology* recognized Shih and several RFF coauthors with a best-paper award for policy analysis.

MEET OUR TEAM

Seth Villanueva

Started a PhD program at the University of California's prestigious Bren School of Environmental Science and Management.

Environmental Justice: Screening Tools, Indexes, and Justice40

Empirical research has helped to show that households of color, tribal communities, low-income neighborhoods, and other marginalized groups are disproportionately exposed to harmful pollution and other environmental problems.

To examine crucial topics in the field of environmental justice (EJ), RFF and the Urban Institute jointly hosted a six-part webinar series called Exposure. Each event brought together advocates and scholars to explore how research can better inform policy design and public investments to remedy inequities, past and present. **Margaret Walls** oversaw the design of the series and moderated several discussions, while **Leonard Shabman** and **Daniel Raimi** also participated in the programming.

"Lessons from History and a Look to the Future"
Panelists reflected on the foundation of EJ activism and its grounding in research, sharing examples of when and how scholars have provided the evidence necessary for legal remedy, policy change, or citizen awareness campaigns.

"Energy Equity and Transitions"
This webinar took a deep dive into issues of energy justice, energy poverty, green jobs, and communities that will face unique challenges due to the clean energy transition.

"Climate Impacts, Adaptation, and Resilience"
The impacts of temperature increases, sea level rise, and extreme weather events often hit low-income neighborhoods and communities of color particularly hard. The webinar homed in on research

in this area, grassroots advocacy, and policy challenges and solutions.

"Infrastructure Investments and Equitable Benefit-Cost Analysis"
Government agencies use tools like benefit-cost analysis to determine where, what, and who receives federal dollars for infrastructure investments. During this event, experts discussed the use of these tools as applied to investments in hazard mitigation, climate adaptation, and water infrastructure.

"Research and Community Partnerships"
Effective partnerships between researchers and community organizations can advance an understanding of environmental vulnerabilities that confront disadvantaged communities. At this event, a panel of experts shared their personal experiences and insights on how scholars and EJ advocates can work together successfully.

"Screening Tools, EJ Indexes, and Justice40"
EJ screening and mapping tools bring together environmental, socioeconomic, and demographic information to identify the communities that are most affected by pollution. This event examined these tools, including the beta version of the Climate and Economic Justice Screening Tool from the White House Council on Economic Quality.
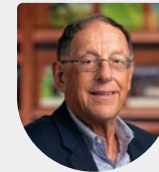

MEET OUR TEAM

Margaret Walls
Joined Daniel Raimi and Kristin Hayes as the third cohost of RFF's weekly podcast, *Resources Radio*.

MEET OUR TEAM

Leonard Shabman
Quoted by *Politico* and *E&E News* about systemic inequality in federally funded flood-adaptation measures.

> The impacts of temperature increases, sea level rise, and extreme weather events often hit low-income neighborhoods and communities of color particularly hard.

The Costs of California Wildfires

Wildfires are becoming increasingly common and damaging across the western United States. In 2021, California recorded 2.6 million acres—and more than 3,500 structures—burned. But what happens after these fires are extinguished?

MEET OUR TEAM

Matthew Wibbenmeyer
Research on wildfire management cited, quoted, and published widely.

MEET OUR TEAM

Ann M. Bartuska
Was selected as a member of the Biden administration's Wildland Fire Mitigation and Management Commission.

IN NUMBERS

In California, during 2021, over

3,500
structures burned due to wildfires.

> The California government has launched a new strategy to supplement wildfire mitigation efforts: prescribed burns and "managed wildfires."

MEET OUR TEAM
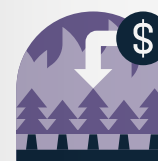
Molly Robertson
Contributed to two public comments on energy issues and wrote an explainer on electricity affordability.

MEET OUR TEAM

Carolyn Kousky
Published a book, *Understanding Disaster Insurance*, about the need to improve insurance related to natural disasters.

An article in the *Journal of the Association of Environmental and Resource Economists* by **Yanjun (Penny) Liao** and RFF Nonresident Fellow **Carolyn Kousky** examined the fiscal impacts of wildfires on California municipalities by combining financial data from 1990 to 2015 with data on historical wildfire perimeters. They found that affected communities were more likely to experience a budget deficit due to higher spending on public safety, community building, and resilience measures.

Meanwhile, the California government has launched a new strategy to supplement wildfire mitigation efforts: prescribed burns and "managed wildfires," intentional and unintentional fires that are allowed to burn under careful supervision. In a *Common Resources* blog post, **Ann M. Bartuska** and **Matthew Wibbenmeyer** delved into the benefits and risks related to such a policy.

And a study in the journal *Environmental Research Letters* by **Matthew Wibbenmeyer** and **Molly Robertson** used granular spatial data to examine how wildfire-related hazards affect different socioeconomic groups. The study, which was shared widely among western US public radio stations, revealed important equity implications for policymakers who are weighing options to distribute the costs of wildfire suppression and mitigation across households in low- and high-hazard areas.

"Wildfire mitigation policies that deliver financial assistance to high-hazard areas could be subsidizing wealthy households," noted Robertson. Instead, "addressing concerns associated with costs of increasing wildfire hazard may call for a geographically targeted approach focused on reducing the burden for the most vulnerable communities."

Global Energy Outlook 2022: Turning Points and Tension in the Energy Transition

The *Global Energy Outlook,* an annual report released by RFF, provides a unique "apples-to-apples" comparison of energy projections by top institutions around the world.

In their original forms, these outlooks appear very different—but the RFF report standardizes differing aspects to allow for a robust, harmonized analysis of global energy projections. This year's *Global Energy Outlook* spotlighted high levels of uncertainty in the world's energy future and the need for well-designed policy to enhance energy security and meet climate goals. The report also explored the upheaval in oil markets caused by the COVID-19 pandemic and, most recently, the Russian invasion of Ukraine.

All energy projections are bullish on solar and wind, projecting that these renewable sources will contribute increasingly to electricity generation by midcentury. But absent "exceptional" changes, RFF analysis found that emissions are unlikely to decline substantially enough to achieve long-term climate targets and limit global temperature rise to well below 2°C.

"We not only need lower-cost energy technologies—we need a lot of options," said RFF President and CEO **Richard G. Newell** at the RFF Live event launching the report. "Technological innovation and deployment of relatively low-cost clean energy is essential."

The *Global Energy Outlook* report and event were mentioned in outlets like Axios and *National Journal,* and RFF accompanied the release with an updated Global Energy Outlook Explorer data tool, which provides users with access to detailed, harmonized data from more than 60 recent energy outlooks and scenarios. Both the data tool and the 2022 report have been viewed thousands of times on the RFF website.

> The report also explored the upheaval in oil markets caused by the COVID-19 pandemic and, most recently, the Russian invasion of Ukraine.
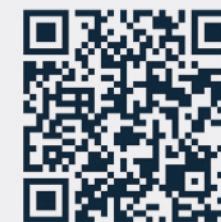
IN NUMBERS

The Global Energy Outlook Explorer data tool provides access to over
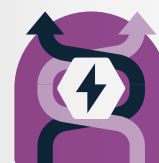
60

recent energy outlooks and scenarios.

USE THE TOOL

www.rff.org

IMAGE Thomas Barwick / Getty Images

Highlighting a Dual Strategy for Energy and Climate Policy

In 2022, the Biden administration responded to oil-market volatility in part by pledging to release one million barrels of oil per day from the Strategic Petroleum Reserve, for six months starting in May.

The short-term strategy focused on addressing immediate concerns about US and global energy prices, even as the administration developed plans for reducing fossil fuel emissions. A report by **Brian C. Prest** explored how policies that focus on fossil fuel supply, when paired with demand-side policies, can both minimize impacts on energy prices and reduce greenhouse gas emissions. In an accompanying blog post, Prest warned that short-term solutions focused solely on either supply or demand will not necessarily yield results that meet both political and climate needs. "It is vital to recognize the synergies created by pursuing supply- and demand-side policies in tandem," he wrote.

RFF President and CEO **Richard G. Newell** also wrote an op-ed in *Barron's* about these often competing priorities. "Just as they share a common root, today's energy crisis and the climate crisis share a common solution: a transition from unabated fossil fuels toward a diverse and reliable portfolio of clean energy sources," Newell wrote. "The good news is that the range of technological options available to enable a secure energy transition has expanded dramatically over the past decade."

Wetland Conservation Is Worth the Cost

MEET OUR TEAM

Hannah Druckenmiller

Reflected on the need to incorporate the ecosystem impacts of climate change into the social cost of carbon and climate policy in a comment for *Nature Climate Change* in June.

In a first-of-its kind article in the journal *American Economic Review*, **Hannah Druckenmiller** and her Columbia University coauthor found that the loss of a hectare of wetlands (roughly the size of two and a half football fields) costs society an average of $1,900 in flood damages per year. In developed areas, that figure jumps to more than $8,000.

This paper, which got picked up by outlets such as E&E News, *Scientific American*, and *Nature* magazine, is especially relevant as the Biden administration implements regulations to protect wetlands and other waterways, and as the Supreme Court ramps up to make a decision about what kinds of wetlands require protection. Druckenmiller elaborated on her findings in the context of this *Sackett v. US Environmental Protection Agency* Supreme Court case, and wetland protection as a whole, in an op-ed she penned for the *Hill*: "If we protect wetlands, they are sure to pay us back by protecting us."

jared lloyd / Getty Images

Encouraging Climate Ambition through Trade

The industrial sector accounts for roughly one-third of global greenhouse gas emissions and is on a path to become the largest source of US emissions, above power and transport.

Cutting emissions from this sector—particularly for steel, aluminum, cement, and chemicals—will be crucial to achieving net-zero goals. Because these products are exchanged in highly competitive international markets, some are concerned that domestic decarbonization policies could result in production shifting to nations that have weaker environmental policies. As the international community considers increasingly ambitious climate policies, carbon border adjustment mechanisms have been brought to the fore as a way to level the playing field for international trade and increase US competitiveness.

A recent RFF issue brief by **Ray Kopp**, **Billy Pizer**, and **Kevin Rennert** outlined a path forward: a decarbonization policy paired with a carbon border adjustment that would apply a fee to goods based on the carbon intensity of certain products. The fee would apply equally to both foreign and domestically produced goods. In a tweet, Senator Sheldon Whitehouse praised RFF's research and said he would be "putting this idea to use" in a new bill—which he discussed with RFF President and CEO **Richard G. Newell** at an RFF Live convening the following month.

"We have the opportunity to both lower carbon emissions and create a structure to lower emissions, while at the same time stepping into a field of contest that we are very much sure to prevail in," Whitehouse said during the event. "I thank RFF for the research work that you have done, not only on the carbon border adjustment bill, but also for many years on the carbon pricing bill … the trustworthiness of RFF has been extremely helpful."

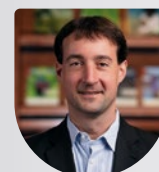## MEET OUR TEAM

Ray Kopp

In a spring episode of *Resources Radio*, Kopp sat down with RFF University Fellow V. Kerry Smith to discuss the legacy of RFF.

MEET OUR TEAM

Kevin Rennert

Amid conversations around the Inflation Reduction Act, Rennert discussed the future of US climate policy on Sky News.

FROM TWITTER

"A great overview here from @RFF on how to craft what's called a carbon border adjustment —a way to cut carbon pollution and boost cleaner American manufacturing. It's a clear win-win. I'll be putting this idea to use in a new bill —stay tuned."

Senator Sheldon Whitehouse

IMAGE Monty Rakusen / Getty Images

Risky Business: Climate Financial Risks

As climate change warms the planet and actions are taken to reduce emissions, financial institutions have been faced with new and changing risks to assets and the broader financial system.

In spring 2022, the US Securities and Exchange Commission released a proposal for rules on climate-related disclosures that would apply to publicly traded companies.

In a special five-part series of articles for the *Common Resources* blog and *Resources* magazine, spearheaded by **Billy Pizer** and **Marc Hafstead**, experts weighed in on the proposal and its implications, including the requirement that firms with climate pledges report the use of carbon offsets in achieving emissions reductions.

"Why Do Investors Need or Want the SEC Climate Disclosure Rule?"
Experts, including RFF Board Member **Robert Litterman**, outlined why investors need or would want the SEC climate disclosure rule.

"Indirect Emissions Disclosures Are Important but Tricky"
In the second installment in the series, a group of scholars assessed the main concerns with Scope 3 emissions disclosures—emissions that include indirect emissions associated with a company's activities.

"Even with Moves toward Transparency, Corporate Climate Pledges and Carbon Offsets Will Be Complicated"
In this article, a group of experts examined the main concerns about corporate climate pledges and carbon offsets.

"Will the SEC's Proposed Climate Disclosure Rule Come Up against Legal and Economic Challenges?"
Experts, including RFF University Fellow **Joseph E. Aldy**, addressed potential concerns about the legal basis for the SEC climate disclosure rule.

"International Context of the Proposed Climate Disclosure Rule from the US Securities and Exchange Commission"
A group of scholars addressed the question, "Are disclosures consistent across jurisdictions, and will we see an international climate disclosure standard?"

MEET OUR TEAM

Robert Litterman

Litterman and colleagues launched a hedge fund that focuses on climate change–related investments.

MEET OUR TEAM

Joseph E. Aldy

Published five journal articles in 2022, several with other RFF scholars, about carbon pricing and emissions reductions.

IMAGE Fabrice Cabaud / Getty Images

Designing Carbon Pricing Policy at the State Level

Various US states have adopted ambitious decarbonization goals for the decades to come. For example, Hawaii, New York, and Maine have set targets to reduce state-wide greenhouse gas emissions by 100 percent in the coming decades.

In most cases, states have yet to finalize the policies that can achieve their ambitious goals. As states look to do so, many may consider adopting some form of a carbon pricing policy, a tool typically recognized by economists as the most efficient for achieving emissions reductions, as part of a collection of policies to meet state goals.

Throughout 2022, **Karen Palmer** and **Dallas Burtraw** provided state policymakers with important insights about the potential levers that can be deployed to establish carbon pricing programs. In May, for example, they worked with **Molly Robertson** to brief the Economywide Strategies Subgroup of the New York Climate Action Council on a comprehensive overview of policy design for carbon pricing. Many of their insights came from a literature review that Palmer, Burtraw, and former RFF colleague Kathryne Cleary published earlier in the year—which synthesized information from existing carbon pricing programs, simulation modeling for proposed programs, theoretical concepts, and descriptive analyses. A larger team of researchers, including **Marc Hafstead**, **Lillian Anderson**, and former RFF colleague Luis Fernández-Intriago, conducted analysis for the New York State Energy Research and Development Authority as the agency helped to inform New York's climate policy development process.

MEET OUR TEAM

Marc Hafstead

The *Journal of Public Economics* acknowledged Hafstead and his coauthors with an award for best paper.

MEET OUR TEAM

Lillian Anderson

Joined RFF as a research associate after completing her master's degree in economic development programming.

Resources Magazine Issue 210

The articles in this issue covered the high-impact work that RFF is doing right now, tackling the tough problems for which the world is currently navigating solutions—especially climate change.

The spring issue of *Resources* celebrated the people of RFF, including some of the newest fellows on RFF's research team whose research focuses on climate risks and impacts—**Hannah Druckenmiller** and **Yanjun (Penny) Liao**. An article in the magazine featured interviews with the two scholars on *Resources Radio*, a weekly podcast produced by the *Resources* editorial team and RFF.

Druckenmiller, who studies the value of healthy ecosystems and the causes of long-run environmental changes, reflected on how her education in the Bahamas introduced her to "all sorts of environmental issues, especially regarding sustainability and how human and natural systems are interwoven" and ultimately influenced her

research interests. Druckenmiller also discussed her research on the economic value of a tree and other ongoing projects.

In her interview, Liao, a scholar of behavioral and market responses to environmental risk, identified an important question that motivates her research: "How do we build a robust system to reflect and diversify the risks [associated with natural disasters], and to protect vulnerable populations from the realization of those risks?" When asked what's next for her at RFF, Liao said, "[I'm] thinking more about how we handle risk—especially as climate change is increasing those risks. I'm already starting to think of collaborating with RFF colleagues, looking at climate impacts on businesses and how they're able to handle that risk."

Climate Change and the Supreme Court: *West Virginia v. EPA*

At the end of June, the US Supreme Court released its long-awaited decision on *West Virginia v. US Environmental Protection Agency (EPA)*.

While the court did not question EPA's authority to regulate greenhouse gas emissions, it did limit the agency's ability to set emissions standards for existing power plants under Section 111(d) of the Clean Air Act. In a *Resources* magazine article, *Common Resources* blog post, and RFF Live webinar that attracted over 1,200 attendees, experts unpacked the decision and what it could mean for the future of US environmental regulation and climate policy.

"Superficially, the case doesn't change much," argued RFF University Fellow **Nathan Richardson** in the blog post. "Nevertheless, I think the superficial reading is too rosy. The Supreme Court is clearly skeptical of EPA climate regulation. Since *Massachusetts v. EPA*, the authority of EPA to regulate climate has been curtailed in every case that the Supreme Court has considered. Any future attempts by EPA to innovate will be met with similar skepticism."

The decision raised questions about how future administrations might attempt to curtail power plant emissions under the Clean Air Act. "The options that come to mind are efficiency improvements, cofiring with natural gas or biomass, and carbon capture," wrote **Aaron Bergman** in the blog post. "EPA could determine what level of emissions is achievable at fossil fuel generators ... the states would then determine a plan as to how best to achieve those targets."

An RFF issue brief published last year by **Dallas Burtraw** and **Maya Domeshek** proposed such a strategy—a performance standard based on the opportunity to cofire coal with natural gas—and modeled the associated emissions reductions and costs. This 2021 paper was cited multiple times in the media in the context of the Supreme Court ruling, with mentions in *Bloomberg*, the *Hill*, and Inside Climate News.

MEET OUR TEAM

Nathan Richardson
Joined the faculty of Jacksonville University's new law school in August to teach environmental law.

MEET OUR TEAM

Aaron Bergman
After working for ten years on modeling analysis for the federal government, Bergman signed on as an RFF fellow.

IN NUMBERS

1,200
people attended an RFF Live webinar in which experts discussed the Supreme Court's decision.

NATHAN RICHARDSON

"The Supreme Court is clearly skeptical of EPA climate regulation. Since *Massachusetts v. EPA*, the authority of EPA to regulate climate has been curtailed in every case that the Supreme Court has considered."

Emissions Markets: Quantities *with* Prices

How can we design effective environmental policies that can respond to new information?

Typically, environmental policies use either "price" or "quantity" tools to determine the value of an environmental good or resource—whether setting a price directly through a tax or fee, or setting a physical emissions-quantity target and then letting the private sector figure out the cost of achieving it. A journal article and *Common Resources* blog post by **Dallas Burtraw**, **Karen Palmer**, and colleagues at the University of Virginia employed experiments and simulations to identify a more flexible, hybrid approach that they call "price-responsive allowance supply," which automatically adjusts the available allowances in a tradable credit market in response to new information about costs.

Recent innovations in market design, which involve auctions for emissions allowances, have opened up possibilities for improving carbon emissions markets and environmental regulations. In the context of regulating greenhouse gas emissions, price-responsive supply makes different quantities of allowances available at different prices to more accurately adjust the market in response to new information about costs and benefits. This approach already has been implemented in the Regional Greenhouse Gas Initiative, and it can have even broader applications.

"Adding flexibility to fixed policy instruments can improve outcomes," the coauthors wrote in the journal article. "The key advantage of price-responsive supply is that it automatically adjusts the supply of allowances contemporaneous with the formation of the market price and, hence, contemporaneous with the discovery of new information by market participants."

MEET OUR TEAM

Dallas Burtraw

Quoted in a *New York Times* article about the Inflation Reduction Act and the urgency of climate action.

MEET OUR TEAM

Karen Palmer

Published well over a dozen journal articles, reports, and blog posts in 2022 about decarbonizing the electric grid.

Resources Radio: Putting Equity in the Driver's Seat

During the summer of 2022, *Resources Radio* released two podcast episodes on equity issues in the transportation sector.

H ost **Daniel Raimi** sat down with Regan Patterson, a former Transportation Equity Research Fellow at the Congressional Black Caucus Foundation. In her episode, Patterson described the causes of and solutions to environmental injustice and inequitable access in the US transportation system.

Patterson noted that a history of highway construction in non-white and low-income communities has created disproportionate exposure to pollution and limited mobility access. Equitable solutions, Patterson said, would require significant funding and policy changes across the board. "Anything that helps encourage or fund more frequent, reliable, and accessible service to help reduce our automobile dependency and our reliance on cars, is a promising policy, in my opinion," she said.

In a later episode, **Beia Spiller** discussed her work on air pollution exposure and impacts in New York City and how these may be affected by proximity to highways. Spiller currently is working on a collaborative project with local community groups that will estimate the effects of traffic pollution and mitigation efforts on indoor air quality in New York City schools.

"If we really care about intergenerational equity and changing the tide of wealth and equities across race and ethnicity, then we need to be exploring these types of issues and interactions," she said.

Resources Radio celebrated its 200th episode during 2022, and the popular weekly series was listened to more than 125,000 times a year across various podcast platforms.

MEET OUR TEAM

Beia Spiller

Joined RFF after a decade with Environmental Defense Fund, where she worked on electricity and transportation issues.

IN NUMBERS

Resources Radio was listened to more than

125,000

times a year across various podcast platforms.

👤 MEET OUR TEAM

Todd Aagaard

Coauthored two explainers about the role of the Federal Energy Regulatory Commission in electricity regulation and grid decarbonization.

ALSO IN JULY

Getting to a State of Carbon Pricing

In 2021, Washington State adopted strong climate goals, including economy-wide carbon pricing, and state agencies sought public input for how regulations should be crafted to achieve that goal. In July, **Dallas Burtraw** coauthored formal guidance on how Washington could implement an emissions containment reserve, which is mandated under the state's legislation.

Reexamining Pricing Rules in Electricity Markets

US electricity capacity markets aim to enhance the reliability of the power grid by compensating generators that are available to supply power when needed to meet peak demand. In the mid-2010s, the Federal Energy Regulatory Commission (FERC) expanded minimum offer price rules (MOPRs) in capacity markets. Some, including former FERC Commissioner Richard Glick and various environmental and consumer groups, have argued that these price floors could prevent state-sponsored clean-energy resources from participating in the market and lead to high costs for consumers. In a *Common Resources* blog post, **Todd Aagaard**, **Karen Palmer**, and **Molly Robertson** identified three key lessons learned from the MOPR controversy that could improve electricity markets in the future.

A book coauthored by RFF University Fellow **Todd Aagaard** offered new insights into the design and regulation of capacity markets and their potential role in the clean energy transition. In May, RFF hosted an in-depth discussion on the role of capacity markets in the transition to a decarbonized electricity system and about Aagard's book, *Electricity Capacity Markets*, which provides key insights into the design and regulation of capacity markets in the past, present, and future.

Introducing the E4ST Model for Collaborative Power-Sector Research

The Engineering, Economic, and Environmental Electricity Simulation Tool (E4ST)—maintained by RFF, Cornell University, and Arizona State University—is the most realistic, detailed long-run model of the US power sector that's available.

The tool can predict the short- and long-run effects of virtually any policy on emissions, air quality, health, electric bills, supplier profits, and total estimated dollar value of net benefits.

Over the summer, RFF researchers led by **Daniel Shawhan** publicly released an open-source version of RFF's uniquely capable E4ST modeling software, opening a new channel to increase our beneficial impact on policymaking and infrastructure-investment decisions. RFF has used E4ST to inform policymakers about the likely benefits and costs of various proposed national and state policies, including standards for clean power generation, emissions pricing policies, nuclear and coal-fired power plant subsidies, and funding for research and development related to emerging clean energy technologies.

MEET OUR TEAM

Daniel Shawhan

Led an expansive project that examined potential policy pathways to decarbonize the US electric grid.

IN NUMBERS

The E4ST models of the US and Canada contain

19,000

existing generators with detailed characteristics.

> RFF has used E4ST to inform policymakers about the likely benefits and costs of various proposed national and state policies, including standards for clean power generation, emissions pricing policies, [and] nuclear and coal-fired power plant subsidies.

USE THE TOOL

www.rff.org

Informing and Demystifying the Inflation Reduction Act of 2022

In August, President Joe Biden signed into law the Inflation Reduction Act (IRA), a budget reconciliation package that authorized $369 billion on energy and climate spending over the next decade.

This legislation built upon elements of the Build Back Better Act, which RFF experts had informed through multiple analyses that were published as issue briefs. When the proposed IRA first came to light, RFF analysis of the new legislation offered key insights on a range of energy and climate provisions in the IRA via social media, news articles, and various RFF products and activities.

In-depth RFF modeling conducted by **Nicholas Roy**, **Dallas Burtraw**, and **Kevin Rennert** found that the law could save American electricity consumers more than $200 billion over ten years. They also observed reduced levels of electricity price volatility and a reduction in 2030 power-sector emissions by 70–75 percent compared to 2005 levels. These groundbreaking findings generated more than 60 news citations, including articles in the *Los Angeles Times*, CNBC, *Bloomberg*, and *Politico*.

Later in the year, the authors of RFF's highly cited IRA issue brief collaborated with **Maya Domeshek**, **Karen Palmer**, and **Jhih-Shyang Shih** to produce a new, in-depth report examining the IRA's likely effects on air pollution, household budgets, the energy generation mix, and more. This new round of modeling showed that carbon dioxide emissions reductions in the electricity sector under the IRA

will cost $43–$54 per metric ton on average—a cost that's much lower than updated estimates of the social cost of carbon. The scholars found that annual electricity-sector emissions will fall to 61–68 percent below 2005 levels in 2030, compared to a projected 51 percent reduction under a baseline scenario without the IRA. They projected that generation from clean electricity sources will rise to 69–75 percent of the United States' energy generation mix in 2030, relative to 56 percent in the baseline scenario. And the modeling suggested that the national average retail price of electricity would fall 5.7–7.8 percent over the next decade relative to the no-IRA baseline.

RFF's timely modeling of the legislation generated about 400 media citations, including mentions in the *New York Times*, *National Geographic*, and the Associated Press. RFF President and CEO **Richard G. Newell** explored the international implications of the IRA in an op-ed in *Foreign Affairs* and was interviewed by Sky News about the legislation.

Blog posts written by RFF scholars about the IRA also did well: *Bloomberg* cited analysis of the IRA undertaken by **Margaret Walls**, who examined how funding had been allocated to address historical environmental problems and climate impacts in frontline communities. And Axios covered **Beia Spiller**'s two popular blog posts about the act's effects on electric vehicle subsidies. The Associated Press and Axios cited **Brian Prest**'s work on the oil and gas provisions of the IRA. Together, these four blog posts attracted over 18,000 views on the RFF website.

RFF events also helped to demystify the legislation for a variety of audiences. An RFF Live webinar featured RFF's modeling team and experts from other leading institutions who examined key energy and climate provisions in the IRA. More than 1,000 attendees tuned in as panelists discussed their analyses, the bill's implications, and their work to inform the conversation surrounding this landmark legislation.

In addition, RFF President and CEO **Richard G. Newell** sat down with Deputy Secretary of Energy David Turk for an RFF Policy Leadership Series event focused on the legislation, along with topics pertaining to energy security and decarbonization. The passage of the IRA "is a historic achievement," Turk noted. "This bill will help us get to 40 percent reductions in our greenhouse emissions by 2030. That is an incredible achievement and was not inevitable."
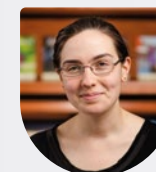
MEET OUR TEAM

Nicholas Roy

Quoted by Bloomberg Law about how tax credits in the Inflation Reduction Act will affect electricity rates.

MEET OUR TEAM

Maya Domeshek

Led efforts to model how federal climate policy and climate change affect different communities.

IN NUMBERS

Our modeling found that the law could save over

$200 billion

for American electricity consumers over ten years.

Learning from California Cap and Trade

More than a decade ago, an innovative emissions trading system was established in California. This cap-and-trade program limits carbon emissions, creates a market for tradable emissions credits, and funds decarbonization projects. The program's history, successes, and lessons learned can help similar programs succeed elsewhere.

To go deep on emissions trading in the United States, **Richard D. Morgenstern** sat down with Daniel M. Adler, the deputy director for climate finance in the California Infrastructure and Economic Development Bank (part of the Governor's Office of Business and Economic Development in California), to discuss how things are going with California's cap-and-trade program, its method of funding decarbonization projects across the state, its progress on reducing emissions and facilitating cost-effective strategies, reasons for its longevity, future directions, and more. The resulting blog post based on their conversation resonated with thousands of readers.

MEET OUR TEAM

Richard D. Morgenstern

Co-led a multi-day workshop in March to analyze the benefits and costs of federal environmental regulations—the event was attended by almost 400 people.

dowell / Getty Images

An Updated Social Cost of Carbon: Calculating the Cost of Climate Change

After years of robust modeling and analysis, the Social Cost of Carbon Initiative—a multi-institutional team led by researchers from RFF and the University of California, Berkeley—released an updated social cost of carbon (SCC) estimate that reflected new methodologies and key scientific advancements.

T he study, published in September in the journal *Nature*, found that each additional ton of carbon dioxide emitted into the atmosphere costs society $185 per ton—3.6 times the current US federal estimate of $51 per ton.

The SCC is a critical metric that measures the economic damages, in dollars, that result from the emission of one additional ton of carbon dioxide into the atmosphere. A high SCC can motivate more stringent climate policies, as it increases the estimated benefits of reducing greenhouse gases. The research, led by RFF University Fellow **David Anthoff** and **Kevin Rennert**, and coauthored by **Brian C. Prest**, **Billy Pizer**, **Richard G. Newell**, and **Jordan Wingenroth**, brought together leading researchers from institutions across the United States to develop important updates to SCC modeling.

Analytics firm Altmetric ranked the article in the top 1 percent of the most impactful *Nature* publications and in the top 5,000 for the most impactful academic publications of all time—out of more than 22 million publications. The publication generated more than 290 media citations, including articles in the Associated Press, *Washington Post*, Reuters, *Politico*, and an op-ed for *Barron's* by RFF researchers about the groundbreaking research. Senator Sheldon Whitehouse shared the findings on the Senate floor.

In November, the US Environmental Protection Agency (EPA) proposed a rule to regulate emissions of methane from the oil and gas sector, which in the process introduced a new approach to estimating the SCC for a sensitivity case in its regulatory analysis. As Rennert and Prest noted in an article on the *Common Resources* blog, "In its sensitivity analysis, EPA updates each of the four major steps of SCC estimation: socioeconomic projections, climate modeling, translation to economic damages, and economic discounting. In doing so, the agency draws heavily on peer-reviewed and published work from the SCC Initiative." The EPA analysis settled on an SCC of $190 per ton, compared to the *Nature* study's $185 per ton. RFF experts also have employed the same framework to estimate an updated social cost of methane of $1,900 per ton, which has direct relevance to EPA's rule and other policies that reduce methane emissions.

"Our estimate, which draws on recent advances in the scientific and economic literature, shows that we are vastly underestimating the harm of each additional ton of carbon dioxide that we release into the atmosphere," said RFF President and CEO **Richard G. Newell**, who coauthored the peer-reviewed paper, in a statement. "The implication is that the benefits of government policies and other actions that reduce global-warming pollution are greater than has been assumed."

The study produced two other major outputs: The Greenhouse Gas Impact Value Estimator (GIVE) model is an open-source software platform that allows users to replicate the team's methodology or compute their own SCC estimates. And the Social Cost of Carbon Explorer is a new data tool that demonstrates the working mechanics of the GIVE model on an interactive dashboard.

"Our hope is that the freely available, open-source GIVE model we're introducing … forms the foundation for continuous improvement of the estimates by an expanded community of scientists worldwide," Rennert said in a statement. "A completely transparent methodology has been a guiding principle for our work, which is also directly relevant to other greenhouse gases, such as methane and nitrous oxides."

EPA employed the GIVE model and other RFF work in its updated approach to estimating the SCC, such as the RFF Socioeconomic Projections of population; per capita economic growth; and emissions of carbon dioxide, methane, and nitrous oxide. The agency also used a central discount rate of 2 percent, which corresponds to the rate used in the *Nature* study. Discount rates weigh the costs of future impacts against impacts experienced today; the change to a 2 percent rate accounts for the largest share of the increase in the SCC estimate.

IN NUMBERS

The study, published in the journal *Nature*, was ranked in the

Top 1%

of the most impactful articles in the publication and in the top 5,000 for the most impactful academic publications of all time—out of more than 22 million.
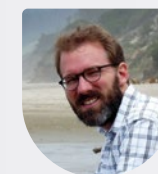

MEET OUR TEAM

Jordan Wingenroth

Lent his modeling expertise to this year's *Global Energy Outlook* report, alongside his work on the social cost of carbon.

MEET OUR TEAM

David Anthoff

Worked with RFF researchers to update the social cost of carbon and submit a public comment about the social cost of methane.

Sparking Solutions to Wildfires through an RFF Live Series

In the fall, RFF launched Sparking Solutions, a three-part RFF Live webinar series focused on finding equitable, effective, and workable policies to address the growing threat of wildfire in the United States.

N early 750 attendees across the three events learned from experts who identified and assessed policies that could help communities that are most at risk of wildfire.

"We're acknowledging that, with climate change, we're in an environment that is different than what we experienced 20 to 30 years ago," said panelist Brian Ferebee from the US Department of Agriculture during the first event, a conversation on the role of fuels management in mitigating the impacts and intensity of wildfires, which was moderated by **James Boyd**.

The second event featured a discussion about how people living in communities surrounded by forests and grasslands—areas known as the "wildland-urban interface"—can reduce wildfire risk and protect their homes and businesses. In a conversation moderated by **Margaret Walls**, Montana-based analyst Kimiko Barrett noted a crucial question being explored in ongoing research: "How do you reduce flammable surface area, so that when embers and other sources of exposure can threaten a home, you're mitigating opportunities for that home to burn down?"

The last event in this series was held in November, with panelists discussing the growing difficulty of insuring against wildfire risks. In conversation with **Yanjun (Penny) Liao**, RFF Nonresident Fellow **Carolyn Kousky** noted: "It would be much better not to suffer through disaster in the first place, and the question is, can insurance play a role in that? We're seeing new products and approaches that expand the benefits of insurance to encourage more climate adaptation and investments in risk reduction."

MEET OUR TEAM

Yanjun (Penny) Liao
Coauthored explainers to help stakeholders better understand the financial risks posed by climate change.

❝❝ CAROLYN KOUSKY

"It would be much better not to suffer through disaster in the first place, and the question is, can insurance play a role in that?"

IMAGE Justin Sullivan / Getty Images

Launching the Global Climate Policy Partnership

The Paris Agreement provides an international framework to move to net zero by requiring countries to set emissions-reduction goals. To help major economies and businesses achieve their goals and objectives efficiently and inclusively, RFF launched a major new project, the Global Climate Policy Partnership (GCPP), which brings together an international network of leading economic and policy research institutes.

The GCPP will facilitate a greater understanding of climate policies across national boundaries by quantifying and evaluating their economic, financial, and social impacts at all geographic scales.

At the GCPP launch event in September, which was part of Climate Week NYC 2022, **Ray Kopp** moderated a conversation on a crucial component of the climate challenge—the manufacturing sector. A panel of global experts deliberated about the implications of emissions-reduction policies for economic production and competitiveness, along with the technological solutions that countries are deploying in their manufacturing sectors. "Since this is a global problem, we need to turn our focus

outward and think about how we are going to transfer new clean technologies, disperse them throughout the world, and assist developing and emerging economies in reducing their climate footprint," noted event panelist and RFF Nonresident Senior Fellow **Carolyn Fischer**.

The implementation of border adjustments that tax greenhouse gas emissions, for example, was a policy option at the center of RFF's international research in 2022. Findings from **Brian Flannery**, **Jan Mares**, and others on potential strategies for border adjustment implementation, as well as potential benefits and costs of this internationally significant policy option, illustrate how global collaboration can drive research and policy at the large scale.

FIND OUT MORE

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CAROLYN FISCHER

"Since this is a global problem, we need to turn our focus outward and think about how we are going to transfer new clean technologies, disperse them throughout the world, and assist developing and emerging economies in reducing their climate footprint."

MEET OUR TEAM

Brian Flannery

Published extensively about border tax adjustments and standards for measuring greenhouse gas emissions.

MEET OUR TEAM

Jan Mares

During the summer, Mares and colleagues briefed German and UK government agencies on the nuances of border adjustments.

IN NUMBERS

The GCPP currently includes members from

11

countries, including Brazil, Germany, and Japan.

MEET OUR TEAM

Carolyn Fischer

Coauthored an article in *Nature Climate Change* about the potential impacts of imposing a carbon price on imported goods.

IMAGE HandmadePictures / Getty Images

IMAGE RFDCphoto

> Leading voices in government, business, academia, and the media explored the solutions that are needed to achieve net-zero emissions across all major sectors of the economy.

MEET OUR TEAM

Susan F. Tierney
Moderated a popular RFF Live event in July about the landmark Supreme Court case *West Virginia v. EPA*.

♥ THANKS!

RFF is grateful to the following supporters who helped make our Net-Zero Economy Summit possible:

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◆ Susan and John Tierney

Convening to Uncover Net-Zero Solutions

The Net-Zero Economy Summit, hosted by RFF as part of its 70th-anniversary celebrations, explored the transformative decisionmaking needed to deliver on two goals: net-zero greenhouse gas emissions and the advancement of our economic well-being.

On Thursday, October 20, leading voices in government, business, academia, and the media explored the solutions that are needed to achieve net-zero emissions across all major sectors of the economy—as well as the crucial decisions that are needed to confront climate risks, build resilience, and prioritize solutions that are just and equitable. The daylong event took place at the REACH at the Kennedy Center and attracted more than 300 in-person attendees from government, research institutions, media outlets, and the private sector.

The RFF Story
RFF President and CEO **Richard G. Newell** delivered opening remarks on RFF's history of scholarship and the lessons that can be applied to build a net-zero economy.

Keynote Addresses
Ali Zaidi, White House National Climate Advisor, delivered keynote remarks, which were followed by a conversation with former Treasury Secretary Hank Paulson, moderated by RFF Board of Directors Chair **Susan F. Tierney**.

International Climate Policy
Experts discussed policies to support industrial competitiveness, minimize emissions leakage, and encourage ambition as nations decarbonize.

Industry and Fuels
This session examined the tools that decisionmakers and industry leaders will need to meet the challenge of decarbonizing the industrial sector.

Transportation
Experts across policymaking, industry, and academia examined the future of the transportation sector, including electric vehicles and electrification, fuels, freight, and aviation.

Land Use, Forestry, and Agriculture
Panelists explored the role of land—cultivated, wild, and urban—in meeting climate targets, as well as the relationship between increasingly intense and frequent wildfires and greenhouse gas emissions.

Electric Power
Experts explored the opportunities and challenges in building an electricity market and policy structure that enables 100 percent clean, reliable, and affordable power around the clock.

Climate Risks and Resilience
Panelists examined the strategies and policies that are needed to build just and equitable resilience in the face of disproportionate climate impacts.

Resources Magazine Issue 211

Addressing the climate crisis—for society today and for future generations—requires systemic economic change at the global scale.

I ssue 211 of *Resources* magazine examined how RFF's team of economists and renowned policy experts is structuring its future work around getting to a net-zero resilient economy.

"Getting to a Net-Zero Resilient Economy"

What does "net-zero resilient economy" mean, exactly? **Billy Pizer** helped define the term in an episode of the *Resources Radio* podcast, transcribed for the magazine.

"Decarbonizing the Transportation Sector Equitably"

Beia Spiller wrote that net-zero goals will demand major strides to decarbonize the transportation sector.

"Getting Industry to Net Zero"

Alan Krupnick explored the tools that are needed to meet the challenge of getting to net zero in the industrial sector, including innovations that reduce the costs of cleaner fuels and processes, regulations and incentives for decarbonization, and models to identify such opportunities and help design policies.

"Decarbonizing the Power Sector While Maintaining Reliability and Affordability"

Karen Palmer and **Molly Robertson** explored the opportunities and implications of total decarbonization of the power sector.

"Nature-Based Forestry and Agriculture Solutions"

How can we harness US lands—cultivated, wild, and urban—to meet climate goals and sustain people and ecosystems? **James Boyd** investigated this increasingly crucial topic.

"Coping with Climate Change and Building Resilience"

Margaret Walls wrote about the actions that communities need to take to survive in a world where sea level rise, wildfires, and flooding are increasing in both frequency and intensity.

"State-Level Roles in the Transition to Net Zero"

Billy Pizer explored the increased levels of state action that will be important as decarbonization efforts ramp up federally and throughout the United States.

"International Climate Policy"

Ray Kopp examined efforts that are being taken to encourage decarbonization globally, while recognizing that countries need to maintain international competitiveness.

"Climate Change Risk in the Financial System"

Marc Hafstead and **Billy Pizer** wrote about the risks and opportunities for financial assets and the broader financial system that are associated with climate change and the clean energy transition.

❝ Alan Krupnick explored the tools that are needed to meet the challenge of getting to net zero in the industrial sector, including innovations that reduce the costs of cleaner fuels and processes, regulations, and incentives for decarbonization.

🔍 READ THIS ISSUE

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ILLUSTRATION Myriam Wares

MEET OUR TEAM

Billy Pizer

Led RFF's Solar Geoengineering Research Project, which funded research on the social science aspects of solar geoengineering.

> Countries around the globe have made strides in recent years by announcing net-zero targets and passing ambitious climate policy.

Resources for the Future at COP27

The Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change brings together nearly 200 nations for an annual meeting to assess the progress that's been made in achieving global climate objectives, and to make the further decisions that are necessary to promote their effective implementation.

The conference was held this year in Sharm el-Sheikh, Egypt, and RFF hosted several events at the conference:

Confronting Dual Crises

At this November 10 event in Sharm el-Sheikh, moderated by RFF President and CEO **Richard G. Newell**, a panel of global experts explored two major crises that are on the minds of global decisionmakers—the energy crisis and the climate crisis—and how nations in different regions are balancing and advancing goals related to decarbonization, energy prices and sources, and the future security and transition of the energy system.

Industrial Decarbonization, Border Measures, and Climate Clubs

Countries around the globe have made strides in recent years by announcing net-zero targets and passing ambitious climate policy. However, ambitious climate policies to achieve net-zero emissions are at risk if international trade shifts the source of emissions to jurisdictions with less ambitious

emissions policies. At this November 11 event, **Billy Pizer** moderated a discussion that involved US Senator Sheldon Whitehouse and a number of leading international scholars.

US Climate Policy: The Road Ahead

At this November 14 event, we turned to recent US legislative efforts to reduce emissions—primarily the Inflation Reduction Act, the Infrastructure Investment and Jobs Act, and the Creating Helpful Incentives to Produce Semiconductors and Science Act. Our panelists projected the path ahead for the implementation of these historic climate policy packages and their international implications, with **Billy Pizer** moderating the session.

Richard G. Newell also participated in a panel discussion on November 15 about the future of voluntary carbon markets. He pointed out the need for these voluntary carbon markets to be backed by sound research and transparency in a *Common Resources* blog post that highlighted key issues from the conference: "Coming out of COP27, RFF will step up its activities on voluntary carbon markets."

Defining "Energy Communities" in the Inflation Reduction Act

The passage of the Inflation Reduction Act in August 2022 introduced a slew of incentives to bolster clean energy production in the United States, including one provision that offers a 10 percent increase in federal tax benefits if a clean energy project is sited within an "energy community." But how, exactly, is such a community defined?

A new paper, released in November by **Daniel Raimi** and **Sophie Pesek**, detailed several interpretations of this provision, with the authors finding that the definition of energy communities likely covers between 42 and 50 percent of US land area. The researchers also noted that the definition is unlikely to precisely target communities that will be most heavily affected by the transition away from fossil energy.

In light of these findings, Raimi and Pesek developed their own definition of an energy community that would more narrowly target fossil fuel–dependent communities. They suggested targeting counties rather than larger geographic areas (which currently are used in the law), cutting the unemployment requirement, including counties with operational coal-generating units and mines, and more. And they suggested scaling financial incentives to reflect the level of fossil fuel activity in each county, so that only a portion of energy communities would receive the full 10 percent tax incentive.

"The purpose of developing our own definition is mainly to show that federal resources could be more precisely targeted," said Pesek. "Policies can evolve, and it's important to look at this issue from multiple angles and perspectives and to provide some avenues for future policy evolution. Supporting fossil fuel communities as the United States decarbonizes is incredibly important; taking extra care to make sure that decisionmakers approach it with all available options will help ensure that no community gets left behind."

SOPHIE PESEK

"Policies can evolve, and it's important to look at this issue from multiple angles and perspectives and to provide some avenues for future policy evolution."

IN NUMBERS

Our researchers found that the definition of energy communities likely covers

42–50%

of US land area, noting that the definition is unlikely to precisely target communities most affected by the transition away from fossil energy.

IMAGE Deb Snelson / Getty Images

Fostering the Forest Economy in the United States

T he director of RFF's Land Use, Forestry, and Agriculture Program, **James Boyd**, joined the *Resources Radio* podcast to discuss the implications of recent private-sector and government investments in US forests for wildlife and forest management.

Boyd noted that the US land carbon sink, comprising soil and vegetation, "already stores 50 years' worth of our annual emissions, and it removes about 12 percent of our annual emissions every year. The question—and what Congress is hoping for—is that we could ramp that sink up and get more out of it. There's a lot in the [Inflation Reduction Act and Infrastructure Investment and Jobs Act] about that."

MEET OUR TEAM

James Boyd

Moderated a discussion at RFF's Net-Zero Economy Summit, which brought together top experts to discuss carbon sinks and other land use issues.

chinaface / Getty Images
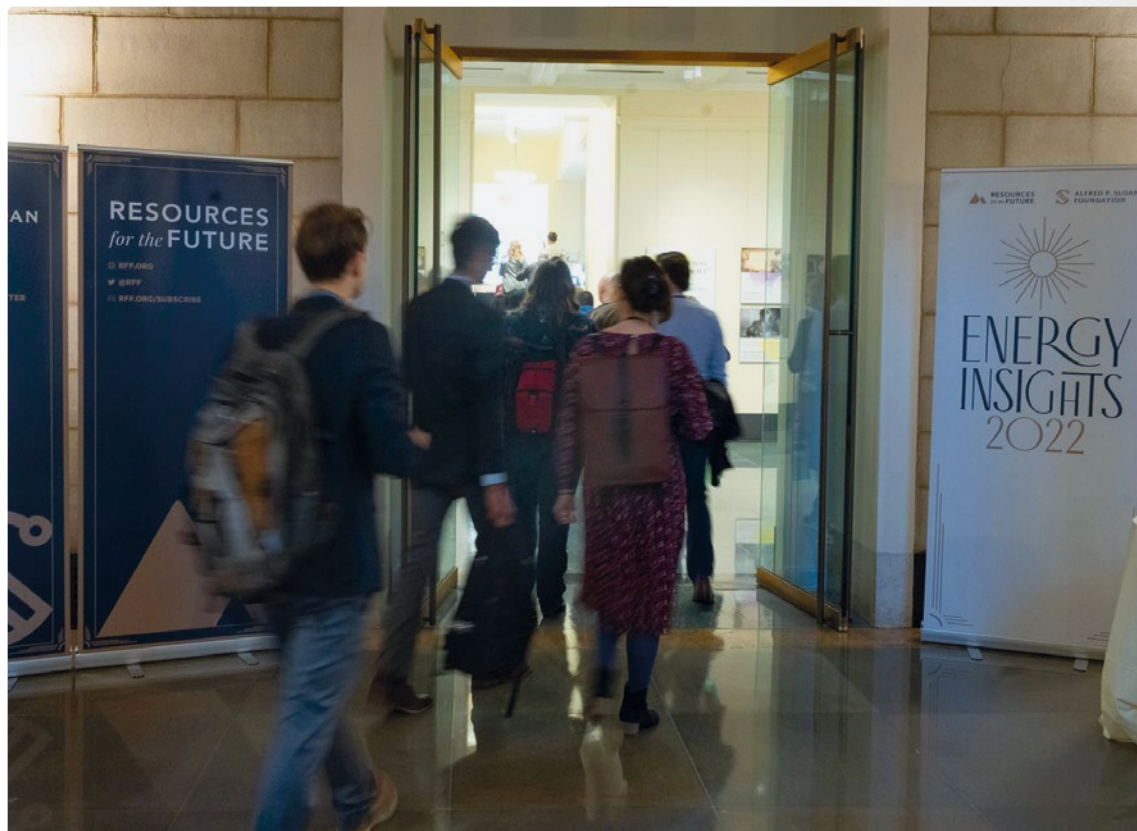
Examining Energy Insights

In December, RFF and the Alfred P. Sloan Foundation hosted Energy Insights 2022, a two-day conference that focused on cutting-edge research to inform decisionmaking on energy and the environment.

In December, RFF and the Alfred P. Sloan Foundation hosted Energy Insights 2022, a two-day conference that focused on cutting-edge research to inform decisionmaking on energy and the environment. The event engaged a diverse community of academic, government, corporate, and nongovernmental-organization experts in conversations about the future of energy research and policy in the United States, building on lessons learned across a range of sectors and disciplines.

The conference started with a session that explored how research has informed recent policy developments and how the policy and research communities can evolve and strengthen their relationship, which was moderated by RFF President and CEO **Richard G. Newell** and involved **Kevin Rennert** as a panelist.

Participants in the event had the opportunity to dive deeper into topics of interest during concurrent sessions, while additional programming covered topics that included equity in the energy transition, data and modeling for decisionmaking, and the way in which research-oriented funders are looking at the energy and climate landscape.

IMAGES RFDCphoto

Quantifying the Societal Benefits of Satellite Data

For nearly six years, RFF has partnered with NASA and other organizations through the Consortium for the Valuation of Applications Benefits Linked with Earth Science (VALUABLES), measuring how Earth observations from satellites benefit people and the environment when the information is used to make decisions.

The consortium also has built an interdisciplinary community to advance this work. VALUABLES hosted a capstone event in December to celebrate the consortium community and spotlight research achievements. Participants gathered to connect, discuss research results and resources, reflect on lessons learned, and look ahead at future trends in socioeconomic assessment and impact measurement for Earth observations. Participants looked ahead to identify future opportunities for the community to document and measure the societal value of Earth observations.

"I'm proud of the collaborations and partnerships we've built through this consortium and the insights developed from the work we have done," said VALUABLES Consortium Director **Yusuke Kuwayama**. "We hope this community keeps growing and that more studies are done moving forward. The consortium's work has shown how people can structure productive research and capacity-building activities with Earth scientists, social scientists, and decisionmakers who want to quantify the benefits that Earth science information can yield when it's used in decisions."

IMAGE NASA
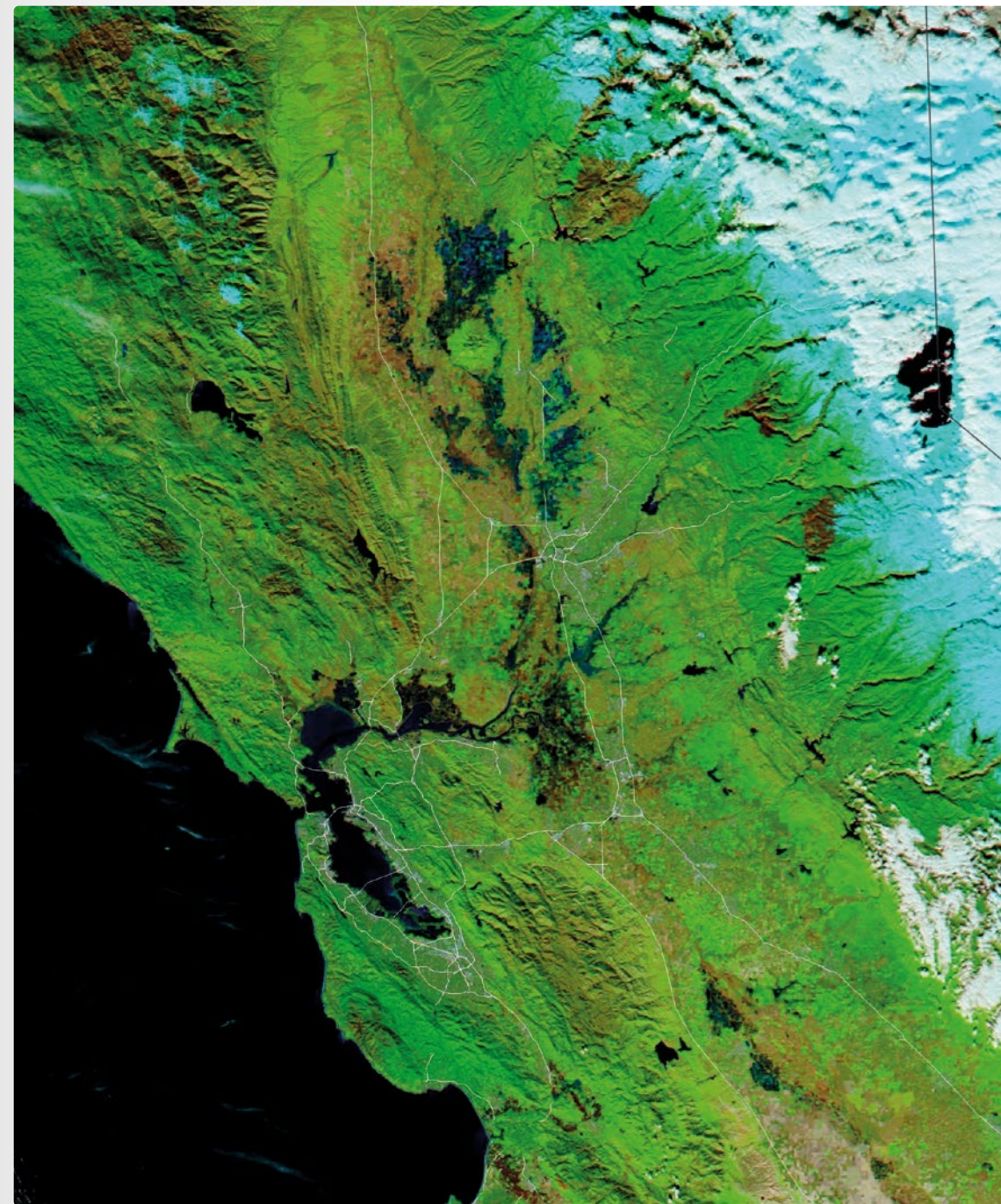
MEET OUR TEAM

Yusuke Kuwayama

Coauthored several explainers that detailed how researchers can quantify the socioeconomic benefits of satellite data.

YUSUKE KUWAYAMA

"I'm proud of the collaborations and partnerships we've built … and the insights developed from the work we have done."

Hurricanes Sweep Up Housing Markets in Florida

A peer-reviewed study in the *Journal of Environmental Economics and Management* showed that, between 2000 and 2016, communities in Florida hit by hurricanes saw no long-term change in housing demand. Instead, prices stabilize after a storm, and more than a quarter of all homes end up occupied by higher-income households than before the hurricane arrived and caused damage.

The paper, coauthored by **Yanjun (Penny) Liao**, received substantial attention from media outlets in Florida and around the country, including a *New York Times* climate-focused newsletter, the Weather Channel, Yahoo, *Miami Herald*, and about 20 local print and radio outlets.

Jodi Jacobson / Getty Images

Exploring Proposed Clean Hydrogen-Hub Projects

Under the US Infrastructure Investment and Jobs Act, Congress allocated $8 billion for the creation of multiple hubs, dubbed "H2Hubs," to support clean hydrogen in the United States.

These hubs—defined as a "network of clean hydrogen producers, potential clean hydrogen consumers, and connective infrastructure located in close proximity"—are intended to be the first step toward the creation of a national network of clean hydrogen producers and customers that could facilitate the emergence of a clean hydrogen economy.

In September 2022, the US Department of Energy released a funding opportunity announcement for the program, which ultimately will lead to between six and ten clean H2Hubs across the country receiving funding. Given substantial interest across the United States from both public- and private-sector stakeholders, **Yuqi Zhu**, **Lucie Bioret**, **Aaron Bergman**, **Jhih-Shyang Shih**, and **Alan Krupnick** set about analyzing a variety of activities associated with the start-up of the program.

Alongside a series of blog posts, one major outcome of the project was an interactive data tool that maps the H2Hub project applicants geographically and notes their proposed production methods, end uses, project partners, and more. As of January 2023, the tool tracked 27 different proposed projects that have publicly announced their intent to seek funding.

MEET OUR TEAM

Yuqi Zhu
Joined RFF after earning a master's degree in public policy from Harvard Kennedy School.

MEET OUR TEAM

Lucie Bioret
Joined RFF full time after establishing collaborations with RFF researchers through her internship at the World Bank.

Reducing Greenhouse Gas Emissions from Agriculture

Roughly 9 percent of US greenhouse gas emissions comes from activities in agriculture, not counting energy use in the sector. Discussion of methods for mitigating agricultural emissions has been spurred by the passage of the Inflation Reduction Act in 2022 and the reauthorization of the Farm Bill.

The Inflation Reduction Act and other policies could help bolster voluntary reductions in greenhouse gas emissions by farmers and ranchers.

In an issue brief released near the end of the year, **Michael A. Toman**, **Emily Joiner**, and coauthors from several other institutions examined the opportunities and challenges related to several policy approaches that can induce farmers and ranchers to shift their practices toward lower greenhouse gas emissions. "Reducing agricultural emissions (even as output expands to meet growing demand) contributes to net zero by reducing the need for 'negative emissions'—that is, carbon capture and storage in sectors other than agriculture," wrote the authors.

MEET OUR TEAM

Michael A. Toman
Published several articles in peer-reviewed journals about reducing carbon emissions in the developing world.

MEET OUR TEAM

Emily Joiner
Participated in a *Resources Radio* podcast episode that profiled RFF's talented research analysts and associates.

Our Leadership

RFF draws on expertise from a world-class Board of Directors and the support of an engaged group of individuals, foundations, corporations, and other institutions.

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*RFF thanks departing Board members Elaine Dorward-King, David Hawkins, and Bob Litterman for their service.

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*We truly appreciate the commitment of RFF's Business Leadership Council members. *Italics* indicate matching gift donors.

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Financial Summary

In fiscal year 2022, RFF's operating budget was $16 million, over 70 percent of which came from grants from foundations, governments, and other organizations, alongside individual and corporate contributions.
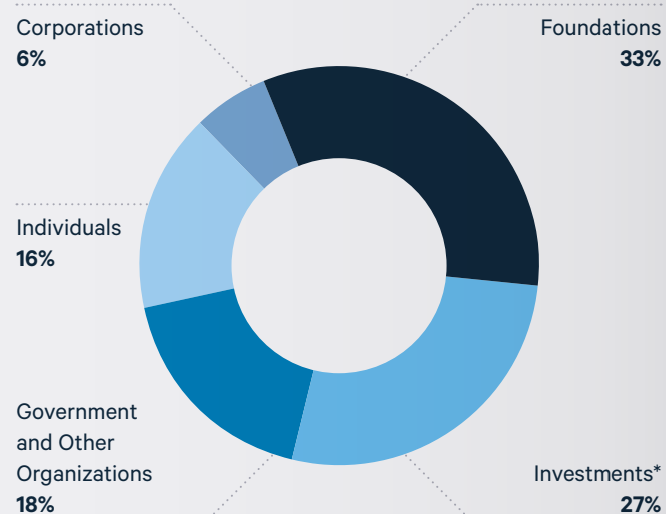
RFF's operating budget in fiscal year 2023 is $17.5 million. RFF augments its operating revenue with net income from the RFF building and earnings from the RFF reserve fund. At the end of fiscal year 2022, the reserve fund was valued at $56 million.

RFF research and policy engagement represented 77 percent of total expenses in 2022. Management, administration, and development expenses combined were 15 percent of the total.
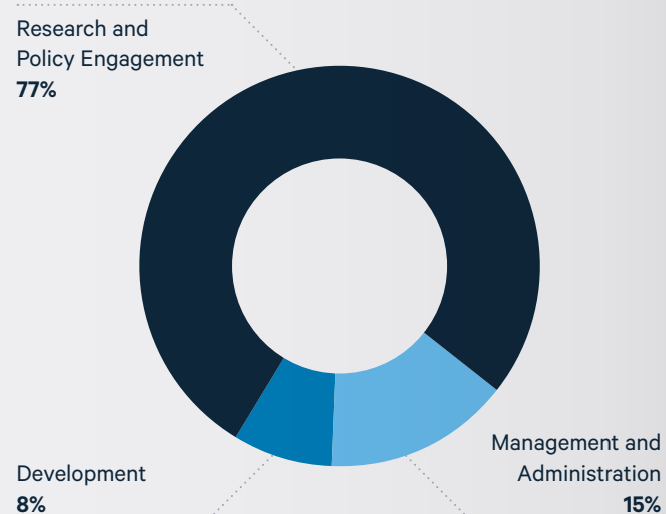
RFF's audited financial statements, as well as detailed breakdowns of revenues and expenses, are posted on our website annually. These can be accessed at:

www.rff.org/about/ financial-reporting

Revenue Breakdown

Corporations
6%

Foundations
33%

Individuals
16%

Government and Other Organizations
18%

Investments*
27%

Expenses Breakdown

Research and Policy Engagement
77%

Development
8%

Management and Administration
15%

*The Investments category includes investment earnings designated for operations.

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