BOLD DISCOVERY GLOBAL RESILIENCE

ALIGNED IN URGENT PURPOSE FOR THE BENEFIT OF ALL

STRATEGIC PLAN 2021–2025

Northwestern | INSTITUTE FOR SUSTAINABILITY AND ENERGY

The actions
we all take over
the next ten years
will come with
consequences.

Either we begin
to restore
Earth's capacity
to support
life as we know it...

Or, we risk
global catastrophe
across our
ecosystems and
communities.

Time is running out.

In this strategic plan,
the Institute
for Sustainability
and Energy
at Northwestern
sets forth
our bold ambitions
for a sustainable
future
and the actions
we will take
to realize them.

We call on you to join us.

ALIGNED IN URGENT PURPOSE FOR THE BENEFIT OF ALL.

ISEN STRATEGIC PLAN 2021–2025

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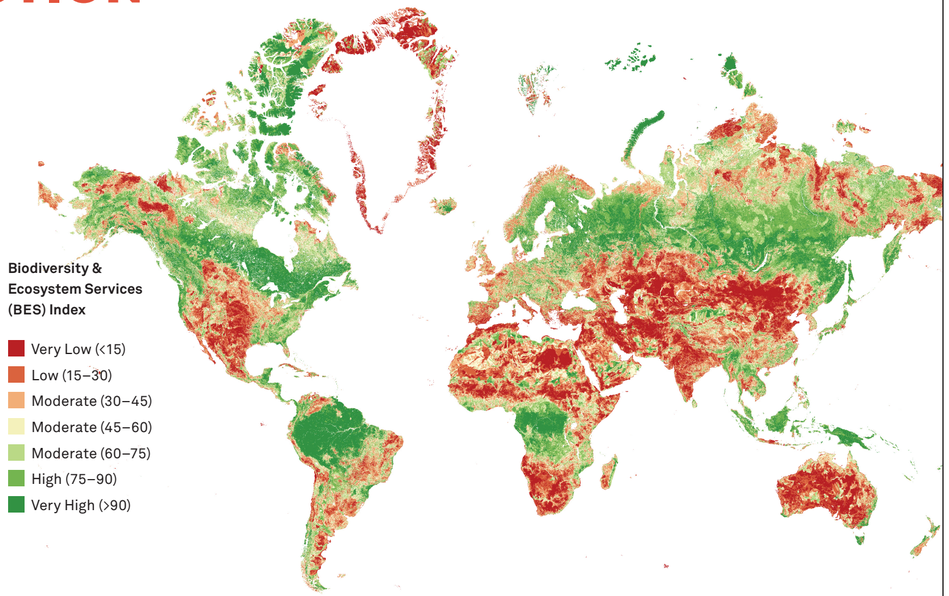
EVERY MOMENT MATTERS
EVERY ACTION COUNTS

Emboldened by the global imperative to accelerate a decarbonized future, ISEN's strategy builds Northwestern's capacity for sustainability and energy research, education, and engagement with goals designed for speed, scale, and impact.

Economies all over the world are vulnerable to biodiversity and ecosystem services decline.

55% of global GDP depends moderately or highly on biodiversity and ecosystem services.



Swiss Re Institute 2020. *Biodiversity and Ecosystem Services: A business case for re/insurance.* Retsa A., Schelske O., Wilke B., Rutherford G., de Jong R., Zurich.

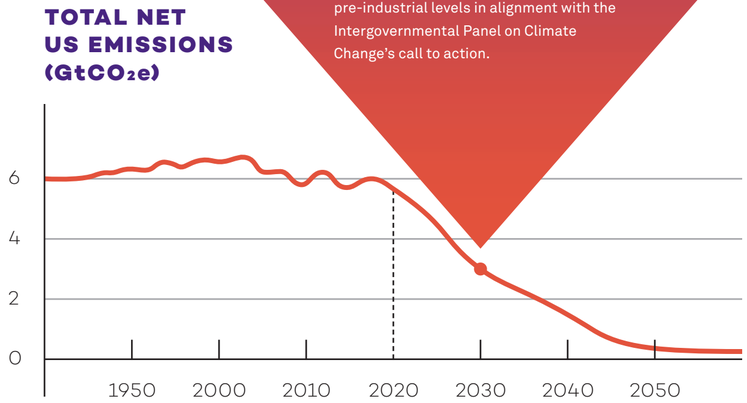
The circumstances of the COVID-19 pandemic underscore just how critical continuous investment in discovery and education is to our ability to adapt and mitigate worldwide risk. The collaborative researchers who developed lifesaving vaccines within just one year—enabled by private sector funding and prior advancements in next-generation genomic sequencing—give us all hope. Their achievement inspires and instructs us to redouble investment in basic science discovery and to envision future climate change solutions beyond the constraints of current knowledge.

The pandemic also put social factors at the epicenter of resilience, demonstrating the undeniable need for broad science education, attention to diversity, socioeconomic equity, and environmental justice. It brought into sharp focus the vital role that collective decision-making among public and private sector stakeholders plays in overcoming worldwide challenges.

Our histories have shown that well-resourced scientific collaboration aligned in urgent purpose can drive transformative technological, political, and socioeconomic change. We now have the responsibility and opportunity to safeguard life on Earth for future generations.

50%
DECADE OF CONSEQUENCE

Science unequivocally shows that cutting greenhouse gas emissions in half within the next decade is critical to reaching a global net-zero trajectory by 2050. This is our time to take action to limit global temperature increases to between 1.5°C and 2.0°C above pre-industrial levels in alignment with the Intergovernmental Panel on Climate Change's call to action.



BOLD DISCOVERY GLOBAL RESILIENCE

As academics and scientists, we measure Earth's history in intervals marked by major events that leave distinctive fossil and geological records, which typically span from tens of thousands to billions of years.

Standing in stark contrast, the current interval, labeled by some the Anthropocene to reflect the dominant impact of human beings on Earth's physical, chemical, and biological systems, is most alarmingly characterized by the rate at which human activity has radically altered our planet's natural climate system.

This indelible human fingerprint reminds us that just as we have been responsible for driving a planetary-scale perturbation that could significantly degrade quality of life for generations to come, we also have the power to change this trajectory.

By leveraging the University's multidisciplinary assets, the Institute for Sustainability and Energy at Northwestern can meet our planet's climate and energy challenges on three fronts: collaborative scientific discovery, interdisciplinary and experiential education, and globally engaged partners and alumni.

ISEN's 2021–2025 strategic plan—*Bold Discovery, Global Resilience*—articulates a vision for and a commitment to accelerating the speed, broadening the scale, and deepening the impact of climate and energy solutions worldwide.

We invite you to align with us in urgent purpose as we overcome the hurdles of current knowledge and finite resources and rise to this challenge together.

Michael R. Wasielewski
Clare Hamilton Hall Professor of Chemistry
Executive Director, Institute for Sustainability and Energy at Northwestern (ISEN)
Director, Center for Molecular Quantum Transduction (CMQT)

"ISEN's 2021–2025 strategic plan—*Bold Discovery, Global Resilience*—articulates a vision for and a commitment to accelerating the speed, broadening the scale, and deepening the impact of climate and energy solutions worldwide."

AMERICA'S BEST UNIVERSITIES
US News & World Report 2021

TOP 10
Overall rankings, national universities

TOP 20
Across all graduate categories

2021–2025 OUR STRATEGY

The Institute for Sustainability and Energy at Northwestern's 2021-2025 strategic plan has emerged from a multiyear effort of engaging representatives across the spectrum of our stakeholder groups, including leadership and faculty, senior university administration, members of the ISEN Executive Council, and key strategic partners worldwide.

This plan builds Northwestern University's fundamental strengths and articulates through ISEN a new vision built on two complementary pillars: to amplify the University's capacity for discovery with speed, scale, and impact in climate and energy transition and in the development of resilient communities.

THE TWO PILLARS

Climate and Energy Transition

The first pillar encompasses interdisciplinary approaches to understanding climate and carbon cycle dynamics and to developing ecological, technological, economic, and policy solutions for climate adaptation and mitigation.

Sample project scopes include climate modeling, decarbonization, sustainable materials & circular economy, sustainability- and energy-related finance & capital markets, and policy & governance.

Resilient Communities

The second pillar encompasses implementation strategies, developed with communities and stakeholders, to address acute and chronic stressors stemming from global sustainability and energy challenges. Investment in these solutions strengthens people and planetary health.

Sample project scopes include sustainable development and infrastructure, ecosystems & biodiversity, preparedness & adaptation, climate change & public health, and equity & social justice.

VOICING OUR COMMITMENT ACCELERATING SOLUTIONS

The Institute for Sustainability and Energy at Northwestern's mission is to expand the University's global leadership in sustainability and energy through transformational research, interdisciplinary education, and engagement.

Launched in 2008 as an initiative under the leadership of former Northwestern President Henry S. Bienen, ISEN was named a pillar of the University's *We Will* strategic plan in 2011. Two years later, Northwestern elevated ISEN to institute status with the overarching charge to discover, integrate learning and experience, connect with community, and engage with the world.

ISEN supports the scientific research and teaming of Northwestern faculty members, builds educational value for current students, and forges collaborative networks that include alumni and the broader sustainability and energy community. ISEN also deepens public understanding of scientific and policy issues by continually expanding the reach and impact of our own and partner communications.

In alignment with the University's commitment to social equity and inclusion, ISEN examines and supports actions to overcome the pervasive systemic injustices that place a disproportionate share of the economic and environmental burdens of climate change on communities of color and under-resourced regions. Equalizing the impact of sustainability and energy solutions globally is integral to building resilient communities worldwide.

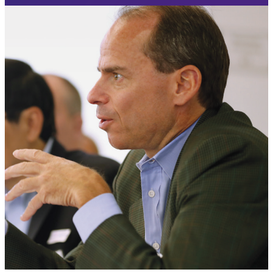
Ubben Program for Climate and Carbon Science

Northwestern researchers combined climate modeling with public health data to evaluate the impact of electric vehicles (EVs) on US lives and the economy. By applying the social cost of carbon and value of statistical life metrics to their emission change results, the research team assigned dollar values to the avoided climate and health damages that could be brought about by EV adoption. These commonly used policy tools attach a price tag to long-term health, environmental, and agricultural damages.

Exploring legal solutions to help protect the Amazon

ISEN connected Northwestern's Environmental Advocacy Center with World Wildlife Fund to study opportunities to incorporate "natural capital," such as rainforests, into infrastructure projects in the Amazon. This could lead to legal and policy changes to better protect the environment in the Amazon and the interests of indigenous people.

Leading global alliances for climate change solutions



ISEN brings local, national, and international partners together with Northwestern faculty and students to develop sustainability solutions that can be applied in the Chicago region and beyond. From monitoring water in Illinois prairie to developing efficient lithium-ion batteries, ISEN supports collaborative education and research across the University and the world.

> "We will contribute to the solutions for renewable energy and a sustainable environment and to how public policies and economic incentives promote implementation of new technologies and practices."
>
> **Northwestern University Strategic Plan**

LEADERSHIP TEAM

Our multidisciplinary leadership team includes world-renowned faculty and experts from core disciplines across the University.

Michael R. Wasielewski
Executive Director, ISEN; Clare Hamilton Hall Professor of Chemistry; Director, Center for Molecular Quantum Transduction

Michael R. Wasielewski's research centers on light-driven charge transfer and transport in molecules and materials, photosynthesis, nanoscale materials for solar energy conversion, spin dynamics of multi-spin molecules, quantum information science, and time-resolved optical and electron paramagnetic resonance spectroscopy.

His work has resulted in over 725 publications, with honors and awards that include election to the National Academy of Sciences and the American Academy of Arts and Sciences; the Bruker Prize in EPR Spectroscopy; the Josef Michl American Chemical Society Award in Photochemistry; the International EPR Society Silver Medal in Chemistry; the Royal Society of Chemistry Physical Organic Chemistry Award; the Chemical Pioneer Award of the American Institute of Chemists; the Royal Society of Chemistry Environment Prize; the Humboldt Research Award; the Arthur C. Cope Scholar Award of the American Chemical Society; the Porter Medal for Photochemistry; and the James Flack Norris Award in Physical Organic Chemistry of the American Chemical Society.

Demetria Giannisis
Senior Managing Director, ISEN

Brad Sageman
Co-Director, ISEN; Academic Director, Master of Science in Energy and Sustainability; Professor of Earth and Planetary Sciences

Center Directors

Mercouri Kanatzidis
Charles E. and Emma H. Morrison Professor of Chemistry and Professor of Materials Science and Engineering; Director, Center for Advanced Materials for Energy and the Environment

Justin M. Notestein
Professor of Chemical and Biological Engineering; Director, Center for Catalysis and Surface Science

EXECUTIVE COUNCIL

James A. DeNaut (WCAS '84)
Co-Chair, ISEN Executive Council
Managing Director, Thurston Group; Trustee, Northwestern University

Michael Cox (SoC '02)
Co-Chair, ISEN Executive Council
President, CFO, BluePath Finance

James DeNaut is a member of the Northwestern University Board of Trustees and a Managing Director of Thurston Group. Previously, he was a Senior Managing Director, President, and Chief Executive Officer of Nomura Securities International, Inc., Asia's global investment bank. Jim has over thirty years of investment banking experience. He has worked on numerous M&A and financing transactions throughout his career. Jim graduated with an MBA from Harvard Business School, an MPA from Harvard Kennedy School of Government and a BA from Northwestern University.

Michael Cox launched BluePath Finance in 2012, after a career in investment banking. He is the President and Chief Financial officer at BluePath, which invests in energy efficiency and distributed renewable generation projects, and has invested over $300M in projects across the country through a broad network of partners. Michael was born and raised in Northwest Illinois and he, his wife, son and two daughters live in California. Michael received his B.S. from Northwestern University and J.D. from the Georgetown School of Law.

Leigh Avsec
Vice President, Investor Relations & Corporate Affairs, Fortune Brands Innovations

Henry S. Bienen ('09 H)
President Emeritus, Northwestern University

Ken Boyce
Senior Director, Principal Engineering, UL Solutions

Avram Buchbinder (TGS '11)
Sr. R&D Manager of Catalysis Applications, Honeywell UOP

Michelle Carr
Illinois State Director, The Nature Conservancy

Sunny Elebua
Senior Vice President, Chief Strategy & Sustainability Officer, Exelon

Steve Feldman (McC '92)
Partner, Hahn Loeser & Parks LLP

Darpan Kapadia (KSM '00)
Chief Operating Officer of LS Power

Nat Kreamer (SoC '99)
Chair, AMP Robotics; Founder, Fairtide

Mark S. Lillie (McC '81)
Partner, Kirkland & Ellis LLP (retired); Former Chief Counsel, Federal Highway Administration

Stacy Mahler (KSM '14)
Head of Sustainability (US), Smart Infrastructure, Siemens

Anthony Mann
President & CEO, E-J Electric Installation Co.

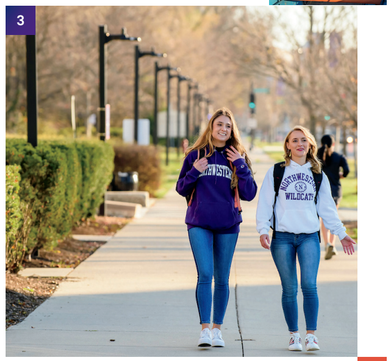
Pin Ni
President, Wanxiang America; Trustee, Northwestern University

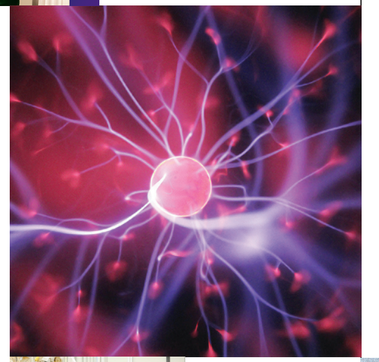
Ray O'Connor (KSM '88)
Partner, Energy Capital Ventures; Managing Director, Samuel A. Ramirez & Co.

Tom O'Flynn (WCAS '82)
Venture Partner, Energy Impact Partners; Board Director, TransAlta; Lead Operating Director, Dimension Energy (a Partners Group Co.)

Kevin Self (KSM '91)
Senior Vice President, Strategy, Business Development & Government Affairs, Schneider Electric

Bruce Stephenson (WCAS '87)
Senior Vice President, Corporate Strategy, Leidos





1 In ISEN's Flex Lab, a postdoc studies how organic molecules can be used to create quantum computers.

2 Researchers study interglacial periods in northwest Greenland to understand past Arctic warming.

3 ISEN leads the Master of Science in Energy and Sustainability, a one-year professional degree program that prepares leaders in technology, economics, and policy.

4 A postdoc TNC NatureNet Science Fellow developed a river management model based on the Magdalena River in Colombia.

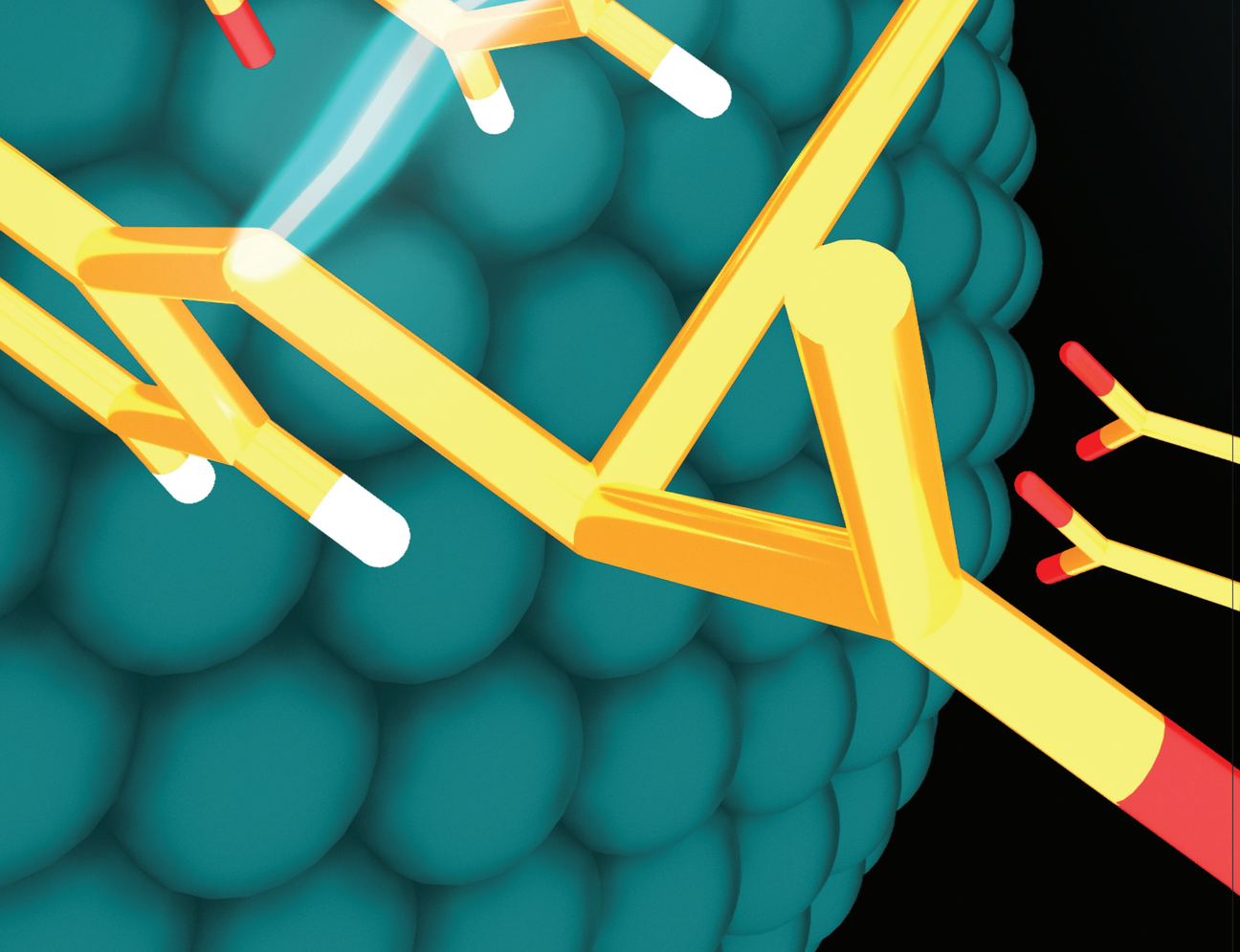
5 Northwestern journalism students tour ISEN's GIANTFab lab to hone science-based reporting skills.

6 ISEN's Center for Catalysis and Surface Science is one of the world's premier institutes for the discovery, synthesis, and understanding of catalysts and catalytic reactions.

7 ISEN's conferences and seminars address key sustainability and energy issues and trends.

8 A student-led project with additional funding from ISEN allows smallholder farmers in India to adapt to climate change and drought.

9 Funding from ISEN helps students travel for field research, including this site visit to Greenland to collect lake sediment cores.



COLLABORATIVE SCIENTIFIC DISCOVERY

OUR LEGACY THE FUTURE

Photo: Eileen Molony

Bold scientific exploration is a hallmark of Northwestern's research enterprise. Our faculty take on humanity's toughest challenges, working collaboratively across disciplines to create breakthrough solutions—and a better world.

At Northwestern, we pioneer new biochemical compounds that become blockbuster drugs. We create new materials and processes that drastically lower the cost of building a cleaner, more resilient electric grid and that advance next-generation manufacturing possibilities. We are at the forefront of innovative and transformative fields, including synthetic biology and bio-inspired and bio-integrated technologies. Our pathbreaking research in nanoscience has revealed incredible potential at the smallest scales, while our detection of gravitational waves from merging black holes sheds light on mysteries at the most colossal level.

Northwestern has a long history of interdisciplinary research leadership, harnessing expertise from across more than 90 school-based centers and 40 University research institutes and centers (URICs) to create knowledge and translational impact across all fields. While biomedical research continues to be Northwestern's largest thematic focus, other areas of excellence, including nanotechnology, energy and sustainability, and quantum science, have also flourished and continue to show immense potential as foundations for high-impact University research.

The importance of climate science in the current sociopolitical environment signals an increased appetite for investment across funding agencies. Likewise, opportunities to work with corporate partners to scale up University intellectual property and technologies for sustainability and energy solutions have never been greater.

ISEN is an exemplar of Northwestern's research excellence—and of our institutional values. It's an interdisciplinary knowledge hub that fosters innovation and entrepreneurship to solve society's most challenging problems.

ISEN represents an investment in furthering the University's eminence. But it's more than that: its work matters for our collective future, as an institution and a society. ISEN and our other URICs epitomize one way that Northwestern fulfills its primary commitment: producing outstanding research and teaching that promote the public good.

Milan Mrksich
Vice President for Research
Henry Wade Rogers Professor of Biomedical Engineering
Professor of Chemistry
Professor of Cell and Developmental Biology

"ISEN is an exemplar of Northwestern's research excellence—and of our institutional values. It's an interdisciplinary knowledge hub that fosters innovation and entrepreneurship to solve society's most challenging problems."

TOP 10
National research universities, *US News and World Report* 2021

$893M
Annual sponsored research in fiscal year 2021

74%↑
Increase in sponsored funding in the past decade

ACCELERATING OUR GLOBAL IMPACT

ISEN's science thrusts are determined by faculty research priorities and sponsored research in areas such as energy technologies, sustainable materials, climate and carbon science, and water and ecosystem science.

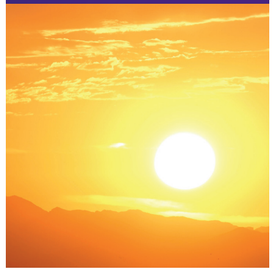
These core research thrusts are enabled by Northwestern's cross-cutting capabilities in economics and business, public health, law, communications, and emerging innovation platforms such as quantum information science. Joint research with corporate and non-governmental organization partners across global communities amplifies the translational impact.

ISEN also pursues discovery science and research through programs and centers that help transform our strategic vision into team science-driven impact.

- **Center for Advanced Materials for Energy and the Environment** is developing new materials for clean energy innovation and environmental remediation.
- **Center for Catalysis and Surface Science** promotes interdisciplinary research fundamental to the discovery and atomistically-controlled synthesis of catalysts that optimize the sustainability of industrial and consumer goods.
- **Center for Molecular Quantum Transduction** develops the fundamental scientific understanding needed to carry out quantum-to-quantum transduction (the coherent exchange of information between quantum systems and its essential use for information processing) through a bottom-up synthetic approach, which imparts atomistic precision to quantum systems.
- **Photo-Sciences Research Center** uses the energy and interrogating power of light to push back the frontiers of chemistry, physics, and biology.

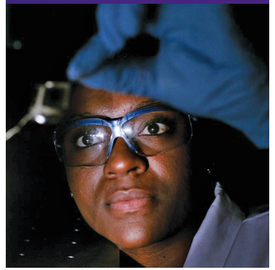
ISEN provides services to our affiliated centers and programs through expert staff teams that lead strategic planning, business and research administration, lab management, integrated marketing and communications, and corporate and donor engagement. Our agile service model extends to the management of strategic alliance partnerships and teaming agreements designed for the rapid integration of future centers of discovery.

Center for Advanced Materials for Energy and the Environment



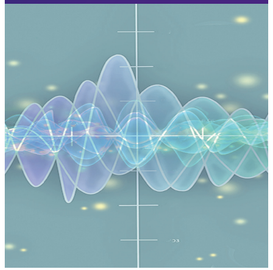
Researchers drive innovation in solar energy—a critical component of a renewable energy future. They helped spark a scientific revolution with a publication on how to create a solid-state perovskite cell and are more recently working on efficiency and stability. Their findings present hope for the ongoing development of the cells.

Center for Catalysis and Surface Science



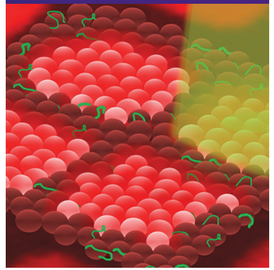
A Northwestern-led research team developed a new method for upcycling abundant, seemingly low-value plastics into high-quality liquid products, such as motor oils, lubricants, detergents, and even cosmetics. The discovery improves on current recycling methods that result in cheap, low-quality plastic products. The catalytic method serves a one-two punch by removing plastic pollution from the environment and contributing to a circular economy.

Center for Molecular Quantum Transduction



Northwestern University researchers were the first to document the role chemistry will play in next-generation computing and communication. Applying their expertise to the field of quantum information science, they discovered how to move quantum information on the nanoscale through quantum teleportation—an emerging topic within the field.

Photo-Sciences Research Center



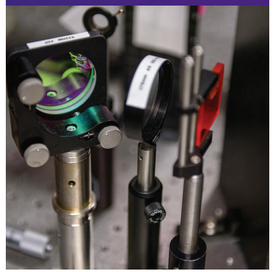
Chemists at Northwestern have used visible light and extremely tiny nanoparticles to quickly and simply make molecules that are of the same class as many lead compounds for drug development. Driven by light, the nanoparticle catalysts perform chemical reactions with very specific chemical products—molecules that don't just have the right chemical formulas, but also have specific arrangements of their atoms in space. And, the catalyst can be reused for additional chemical reactions.

EXPANDING COLLABORATIVE DISCOVERY

ISEN-managed labs and core facilities create the dynamic infrastructure and shared resources that enable the work of our centers, programs, and partner research networks.

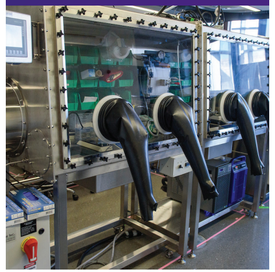
- **Flex Lab.** ISEN's primary laboratory houses collaborative research projects focused on everything from improved solar cell technology, battery materials, quantum materials, and fuel cells to improved catalysts for energy conversion and storage. Through Flex Lab, ISEN engages scientists, engineers, economists, and policy experts from academia, industry, and the public sector in global partnerships for prototyping and testing innovations and bringing them to market.
- **GIANTFab.** Founded in 2019, the Glovebox Inert Atmosphere (N_2) Thin-film Fabrication and Testing core facility provides students and investigators the unique capability to fabricate and test thin-film optical, optoelectronic, and electronic devices in a completely inert environment, which is especially important for solar cell fabrication.
- **REACT.** The Reactor Engineering and Catalyst Testing core facility is dedicated to aiding students and researchers in advancing their understanding of the chemical properties of solid interfaces used for environmental and energy processes. The heart of REACT's work is its focus on creating improved and less energy-intensive chemical reactions.

Flex Lab



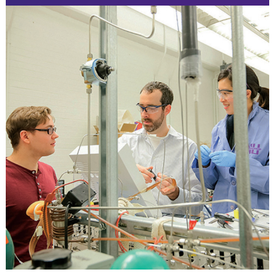
The Flex Lab is equipped to meet the diverse needs of educational, governmental, and private-sector research collaborators in sustainability and energy. In addition to providing access to a laser lab and basic amenities, the lab's state-of-the-art flexible design can be reconfigured to meet the layout and equipment needs of today's demanding research.

GIANTFab



The Glovebox Inert Atmosphere (N_2) Thin-film Fabrication and Testing core facility provides a range of equipment suitable for manufacturing and testing thin films of optically and electronically active materials inside a series of linked nitrogen-atmosphere gloveboxes. These materials are used in next-generation solar cells, LEDs, flexible and wearable electronic devices, and more, opening the doors to a brighter future in renewable energy science.

REACT



The Reactor Engineering and Catalyst Testing core facility is dedicated to aiding investigators in advancing understanding of the surface chemistry of materials. REACT offers a suite of standardized material interface characterization tools and takes a hands-on approach to developing users' expertise in instrumentation, standard practice, and experimental design.

> "ISEN provides vital scientific infrastructure to promote discovery in a collaborative environment. Our research facilities set the stage for the learning and innovation that will fuel our future."
>
> **Michael R. Wasielewski**

AMBITIOUS GOALS REALIZING OUR VISION

ISEN will realize our strategic vision for research by building new networks across our stakeholder base of faculty, students, alumni, and partners and by amplifying the power of convergent team science to solve global sustainability and energy challenges.

Secure substantial funding for rapid discovery of scalable solutions

Diversify funding sources for the climate and energy transition research pillar and triple the resource base to $15 million

Establish a foundational program for the resilient communities research pillar with a $5 to $10 million naming opportunity

Provide early-stage research funding and bridge sponsored research funding cycles by replenishing ISEN's seed funding program to $20 million

Establish a new ISEN faculty fund

Hire seven to ten new faculty lines over the next decade with joint appointments between ISEN and other University academic departments by establishing a $30 million endowment

Expand research and teaching communities of practice for sustainability and energy scholarship

Create collaborative coherence around complex research topics

Focus on expanding our resource base and partnerships for work in renewable energy, insurance and financial services, environment and biodiversity, public health, food security, transportation, and sustainable materials and manufacturing

Develop programs, partnerships, and structured alliances with public and private sector stakeholders

INTERDISCIPLINARY AND EXPERIENTIAL EDUCATION

LEARNING BY LEADING FULFILLING THE PROMISE

Northwestern students thrive on tough challenges. They confront Earth's deadly serious climate and energy challenges daily—researching new sustainable materials, developing economic models for technological adoption, delving deep into environmental public policy, and marching for social change.

Their passion reflects Northwestern's indomitable spirit—discovery, innovation, and theory applied in practice—to make our world a more resilient, equitable home for all.

Northwestern plays a pivotal role in inspiring and enabling our students to explore the intersections of their diverse interests, in and out of the classroom. As beneficiaries of top-ranked teaching by world-class scholars and practitioners, they develop the intelligence and ability required to lead at the front lines of climate and energy in academia, government, and the public and private sectors.

ISEN occupies a unique place in the University landscape as the first Northwestern research institute to offer a master's program. Working across schools and disciplines, ISEN empowers creative discovery, integrates student learning with experience, connects diverse communities, and engages with the world at large.

Northwestern's role on the global stage is pivotal. With no time to spare in addressing the climate crisis, ISEN's work has become more relevant than ever to preserving Northwestern's legacy and fulfilling its promise.

Kathleen Hagerty
Provost, Northwestern University
First Chicago Professorship in Finance
Professor of Finance,
Kellogg School of Management

> "Northwestern students thrive on tough challenges....Their passion reflects Northwestern's indomitable spirit—discovery, innovation, and theory applied in practice—to make our world a more resilient, equitable home for all."

20+
Majors and minors represented among ISEN Certificate students

1,000+
Northwestern alumni working in sustainability or energy sectors or roles

28
New graduate-level courses created for the MSES degree program

NEXT-GENERATION LEADERS

Northwestern educates and equips the next generation of public, private, and civic leaders to take on challenges and opportunities as diverse as the world in which they will live and work. Aligned with that purpose, ISEN maintains a multidisciplinary, experiential, and collaborative environment for undergraduate and graduate students from all backgrounds.

With a charter to bridge natural and social sciences with engineering, the humanities, business, communication, and law, the ISEN curriculum nurtures curiosity, creates new knowledge, and drives action. All programs represent strategic investments in future leaders and advocates for the world's ever-evolving sustainability and energy needs.

Since ISEN's founding, hundreds of students have passed through our programs on their way to high-impact careers. Our broader global network includes more than 1,000 alumni representing almost every Northwestern school and program and ranging from recent grads just starting their careers to seasoned C-suite executives at the top of their professions.

UNDERGRADUATE STUDY AND EXPERIENCES

First offered in 2013, the ISEN Undergraduate Certificate curriculum provides a core course of study in sustainability, energy, and climate for thousands of students. The program lives by the premise that its subject matter underpins a basic literacy that is important for everyone concerned about our collective climate future and absolutely essential for anyone who expects to have an impact on it.

Enrollment in the program's popular courses closely mirrors the overall demographics of the University's undergraduate student body. Certificate students represent more than 20 majors and minors across a broad array of degree programs. The certificate program's equally diverse teaching faculty members represent disciplines as varied as Earth and planetary sciences; chemical, mechanical, and industrial engineering; materials science; and philosophy.

GRADUATE STUDY ACROSS DISCIPLINES

ISEN's Master of Science in Energy and Sustainability (MSES), a one-year professional degree, prepares students to navigate the complex intersection of technology, business, and public policy in the energy and sustainability sectors. Launched in 2020, MSES has rolled out more than two dozen new courses covering applied topics in grid engineering, corporate sustainability, green finance, and circular economy.

These courses, available to the entire graduate community, also strengthen the credentials of other programs at Northwestern. ISEN plans to add new energy and sustainability courses continuously to keep the curriculum on pace with global innovation and progress.

MSES offers a hybrid teaching model, pairing eminent Northwestern scholars with senior practitioners to ensure students receive relevant, current perspectives on key trends and opportunities. Although the program is cohort based, students personalize their courses of study by choosing a specialization in energy and sustainable finance, energy technology, or sustainability.

Master of Science in Energy and Sustainability

Accelerated learning. Maximized impact.

- **A 12-credit program**, including a consulting capstone project
- **Ten months to completion**, to reduce tuition burden and time out of the workforce
- **MSES Scholars Fund**, merit-based grants to recruit and retain top graduate student talent
- **MSES International Scholars Fund**, to lessen the economic burden for students from lower-income areas and to ensure diversity of perspective and lived experience
- **Impact-focused career counseling,** personalized for each student

LIVING THE SOLUTION

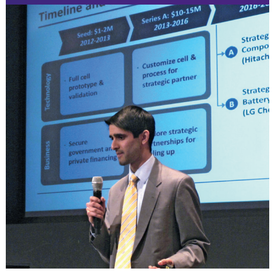
An exciting array of experiential curricular and extracurricular opportunities exemplifies Northwestern's "learn by seeing and doing" culture. Generous philanthropy—by the Resnick Family Social Impact Program, Wanxiang America, and others—funds many of these programs and makes possible new projects and engagement opportunities in areas of unmet need.

- Study abroad in China, Taiwan, Chile, Germany, or Israel in collaboration with the Global Learning Office and McCormick Global Initiatives
- Entrepreneurship in collaboration with the Office of the Provost and the Farley Center for Entrepreneurship and Innovation
- Social impact research and projects with global engagement partners
- Extracurricular activities through the rich University ecosystem of student clubs supported by ISEN formally and informally

Study Abroad

Students in the Wanxiang Fellowship Program study energy development in China focusing primarily on the country's transition from coal to more sustainable energy sources such as solar. Sponsored by Wanxiang, the largest China-based automotive components company, the program allows students to study renewable energy, Mandarin language, and Chinese culture through three courses and multiple excursions.

Entrepreneurship



Northwestern spinout companies have opportunities to compete for funding through programs such as VentureCat and the Clean Energy Trust Challenge. At these events, students present to a crowd of venture capitalists, civic leaders, and industry executives. Such opportunities support clean tech innovation in the Midwest by combining access to capital with premier mentorship and national exposure.

Social Impact Research

ISEN's Resnick Family Social Impact Program supports projects that address significant local and global challenges in sustainability and energy. Generous funding from Paula Stamler Resnick (WCAS '86) and Ira Resnick makes the program possible. Projects represent an array of academic disciplines and demonstrate innovation leading to impact.

Extracurricular Activities

NUsolar, the Northwestern University Solar Car Team, is an undergraduate student organization that designs, builds, and races solar-powered vehicles. The group's mission is to advance the education and career preparation of Northwestern students by providing hands-on experience while creating an outlet for students to showcase their skills and commitment to potential employers.

AMBITIOUS GOALS REALIZING OUR VISION

ISEN's strategic vision for education keeps Northwestern at the forefront of academic institutions for sustainability, energy, and climate scholarship and makes the University a priority destination for students and faculty alike.

Expand opportunities for climate and energy literacy

Engage Northwestern students across all disciplines by continuing to develop curricula in sustainability, energy, and climate topics

Advocate for a minimum undergraduate academic requirement in ISEN-related areas akin to distribution requirements in other Northwestern schools

Embed experiential and co-curricular programming in our education portfolio

Expand diverse climate and energy learning opportunities, including project-based entrepreneurship and social impact, research, and study abroad

Endow ISEN experiential and co-curricular education programs at a level of $3 million

Lower the cost barrier to education

Expand access to ISEN-managed student financial resources to attract the best undergraduate and graduate talent

Establish a climate corps student fellowships program with priority access for minority and under-resourced student communities with a $3 million endowment

Broaden Northwestern's sustainability and energy community

Hire seven to ten new faculty lines over the next decade with joint appointments between ISEN and other University academic departments by establishing a $30 million endowment

Expand the full-time master's cohort and create new program opportunities for executive education and part-time or joint-degree options in collaboration with other schools and departments

GLOBAL ENGAGEMENT

Solving our planet's climate and energy problems demands broad-based, urgent collaboration across institutions and disciplines worldwide. At ISEN, developing formal strategic engagements with corporate, civic, and not-for-profit partners is a fundamental operating principle.

Leveraging shared expertise and resources, ISEN and its partners discover, develop, and deploy sustainability and energy solutions more quickly and with transformative, long-term impact. Working at the crux of innovation and scalability, ISEN connects partners to the rich ecosystem of intellectual and human capital across Northwestern.

The following pages offer a few examples of our worldwide collaborations.

PARTNERING WITH PURPOSE

As a hub of interdisciplinary collaboration for Northwestern, ISEN fosters a broad array of partnerships. To realize our vision, ISEN leverages the resources of partner organizations and trusted networks to address gaps and drive systemic transformation toward more resilient global communities. Our engagement with others informs our strategy and enhances our ability to implement solutions—with a goal toward rapid scaling.

INSPIRING AND INFORMING STAKEHOLDERS

ISEN's integrated marketing communications team advances Northwestern's brand recognition across global sustainability and energy stakeholder groups.

This includes featuring a growing body of alumni who have professional roles in sustainability and energy through customized events and outreach.

ISEN collaborates with schools across Northwestern such as the Medill School of Journalism, Media, Integrated Marketing Communications and the Pritzker School of Law to magnify the impact of scholarship and research that is relevant to ISEN's mission.

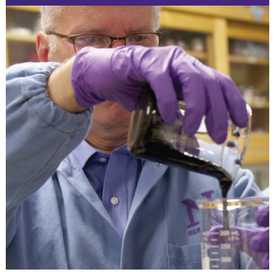
Through the Ubben Program for Climate and Carbon Science, faculty research explores public climate change opinion formation to understand effective communication about complex scientific topics.

Working with Corporate Partners

Discovering clean technology solutions with Exelon Corporation

Consistently ranked by *Fortune* as one of the nation's top utility companies, Exelon has worked with ISEN since 2016 through a master research agreement to support research focused on grid management and resilience, energy storage, renewable technologies, and energy efficiency. The findings will likely have implications for how energy is produced, transmitted, and consumed in the future.

Forming Multidisciplinary Consortia



Innovating through collaboration

The Program on Plastics, Ecosystems, and Public Health brings together experts from across Northwestern and collaborators from academic, civic, NGO, and industrial partner institutions to examine the lifecycle of plastics. As a consortium, they explore the implications for environmental and human well-being as well as scalable solutions, including the discovery of new sustainable materials.

Collaborating with Global NGOs

Extending the reach and scale of scholarship with World Wildlife Fund and The Nature Conservancy

ISEN's work with these two preeminent conservation leaders has generated a significant portfolio of science and technical research, law and public policy analysis, engagement and communications, and social equity initiatives. Representatives serve in a variety of ways on one another's advisory councils and provide research appointments.

Engaging Experienced Leaders and Experts

Supporting and influencing change

ISEN's Executive Council includes executives, sustainability leaders, and conservationists representing the renewable energy, industrial, and financial sectors and global environmental organizations. Council members advise our leadership team and other Northwestern decision makers on industry strategy, trends, and policy matters related to ISEN's mission and help bring financial resources to the Institute.

VOICES OF COLLABORATION

ISEN has a significant history of stakeholder engagement with global organizations and experts who are essential partners in discovery, experiential education, and the development of resilient communities.

"Our work with ISEN and its partners has given students this extraordinary opportunity not only to learn about the law, but also to actually experience it."

Nancy C. Loeb, Clinical Professor of Law Emerita; Director, Environmental Advocacy Center, Bluhm Legal Clinic, Northwestern University Pritzker School of Law

"Our sustainability mission at Colgate-Palmolive is to create a healthier, more sustainable future for all. Critical to this are innovation and collaboration, such as with ISEN. Connecting a wide range of industry leaders with ISEN's renowned faculty creates an invaluable dynamic to advance our shared global sustainability goals."

Greg P. Corra, Director, Global Packaging Innovation and Sustainability, Colgate-Palmolive Company

"ISEN is a constant source of engagement opportunities for faculty and students. It connects the Northwestern community to the biggest challenges in sustainability from the global to the local levels."

Abigail M. Foerstner, Associate Professor; Director, Health, Environment, and Science Specialization, Medill School of Journalism, Media, Integrated Marketing Communications

"Global sustainability challenges demand transformative solutions. Our partnership with Northwestern helps us address these challenges head-on. Together we're developing innovative approaches to environmental disaster management, ecologically sensitive and climate-resilient infrastructure, and conservation planning."

Kate Newman, Vice President, Sustainable Infrastructure and Public Sector Initiatives, World Wildlife Fund

"ISEN has been instrumental in introducing me to fellow researchers who are all thinking about solutions to the global problem of plastic waste. I appreciate the work the Institute has done in pulling together these sorts of teams."

Linda J. Broadbelt, Sarah Rebecca Roland Professor; Professor of Chemical and Biological Engineering; Associate Dean for Research, McCormick School of Engineering

"With the energy landscape evolving faster than ever, Exelon is building relationships with top research centers to create an ecosystem for advancing energy technology and ingenuity. This partnership brings together Exelon's industry and market expertise with Northwestern's deep research capabilities."

Chris M. Crane, President and CEO, Exelon Corporation

"When we try to think about how to address climate change, the center of gravity has really shifted to the private sector. The challenge for many business leaders is to think through how to integrate climate change considerations into the core of their business. ISEN is a leader in helping drive those conversations."

Klaus Weber, Thomas G. Ayers Chair in Energy Resource Management and Professor of Management & Organizations, Kellogg School of Management

"The partnership between Northwestern and The Nature Conservancy is a natural fit. Both are science-based, truth-seeking institutions focused on mitigating the effects of climate change and building a path toward a clean energy future."

Michelle Carr, Illinois State Director, The Nature Conservancy

TRANSFORMATION THROUGH ENGAGEMENT

To support its objective of conducting research with real-world impact, ISEN collaborates at global and local levels with partners including World Wildlife Fund (WWF) and The Nature Conservancy (TNC). Here is a snapshot of these efforts.

SCIENCE AND TECHNICAL RESEARCH

- **Building Materials for Environmental Disaster Reconstruction and Recovery (WWF):** Develop an interactive toolkit that supports environmentally responsible reconstruction following disasters and extreme weather events
- **Ecosystem Impact Analysis of Infrastructure Expansion in Myanmar and Southeast Asia (WWF):** Develop a quantitative procedure to assess the effect of earth-moving operations in natural landscapes and to identify sustainable design alternatives
- **Global Status of Infrastructure Financing (WWF):** Map past and future global infrastructure investments with the goal of encouraging sustainable planning
- **Gender Equity and Sustainable Construction (WWF):** Collaborate on integrating gender considerations into the decision-making process of post-disaster community construction projects in developing countries
- **Climate Change and Global River Systems (TNC):** Study the effects of climate change on global river systems in Colombia
- **Community-Based Research on Green Infrastructure in Chicago (TNC):** Assess communities' experiences with urban flooding and the value of nature-based infrastructure
- **Preventing Poaching and Deforestation with Technology (TNC):** Test Northwestern University bioacoustic technology aimed at preventing poaching and deforestation
- **Nature's Impact at the Indian Boundary Prairies (TNC):** Measure the environmental impact of urban prairies in Chicago's southwest neighborhoods
- **Visiting Scholar Appointments at Northwestern (TNC & WWF):** Host visiting scholar appointments for members of both organizations with emphasis on sustainable community resilience, urban biodiversity, and floodplain restoration

LAW AND PUBLIC POLICY RESEARCH

- **Hydroelectric Impacts in Nepal and the Amazon (WWF):** Examine hydroelectric power development impacts
- **Support Solar Energy Development in Cambodia (WWF):** Study the legal and technical viability of using floodplains in Cambodia as future sites for large-scale solar energy farms
- **Disaster Recovery and Asbestos Legal Study in Africa, Latin America, and Asia (WWF):** Outline legal avenues for global asbestos remediation in post-disaster environments
- **Global Plastic Waste Prevention (WWF):** Craft model legislation that would create standards, governance processes, incentives, and disincentives to achieve the goal of no additional plastic leakage into nature by 2030
- **Mainstreaming Natural Capital and Livelihood Planning in the Amazon (WWF):** Support compilation of laws and policies related to "mainstreaming" ecosystem and livelihood considerations for infrastructure planning
- **Disaster Relief in Latin America and the Caribbean (WWF):** Examine public policies in Guatemala, Jamaica, and Colombia with a focus on the interaction between environmental laws and disaster risk management
- **Arctic Wildlife Protection (WWF):** Conduct a joint analysis of laws and guidelines that govern the region to protect wildlife from harmful effects of increased underwater industrial activity
- **Innovative Water Protection Policies in Montana (TNC):** Develop legal models for implementing water conservancy districts in the state
- **Implement Wetlands Permitting Regimes in the Pacific Northwest (TNC):** Design public policy structures aimed at implementing effective wetland permitting protocols
- **Limit Agricultural Runoff in the Mississippi River Basin (TNC):** Produce model legislation to prevent agricultural pollution
- **Protect Groundwater in Minnesota (TNC):** Investigate water pollution management policies
- **Preserve Healthy Watersheds in Colorado (TNC):** Revamp the state's water conservation policies and funding regime

STAKEHOLDER ENGAGEMENT

- **Nature-Based Methods for Flood Mitigation in Thailand and Southeast Asia (WWF):** Educate government stakeholders, academics, and NGOs on successful community engagement for nature-based flood management interventions
- **Global Sand Crisis Symposia (WWF):** Explore global sand shortages and study sustainable sand extraction, concrete production, and infrastructure development
- **TNC Leadership on ISEN Executive Council (TNC):** Collaborate with Director of the Illinois Chapter of TNC, as a member of ISEN's Executive Council
- **Plastics, Ecosystems, and Public Health (TNC & WWF):** Engage with both organizations in the Program on Plastics, Ecosystems, and Public Health at ISEN, a multidisciplinary team science initiative

ALUMNI LEADERS AND ADVOCATES

Engaged alumni from across all of Northwestern's schools and programs rank among ISEN's greatest sources of collaboration and support. In 2016, ISEN began to build a network of Northwestern alumni working in sustainability or energy sectors or roles—from seasoned C-suite executives to the newest graduates just starting their careers—regardless of their school or background.

Since then, this network of leaders and advocates has grown to more than 1,000 members. We expect this network to grow even more rapidly because of increased academic and experiential programming, heightened awareness of sustainability and energy challenges related to the climate crisis, and the broad relevance of our work across disciplines and industries.

Our alumni bring new insight and depth of understanding to our ongoing research. They help guide current students to potential career paths, support the professional growth of fellow alumni, and serve as university ambassadors around the world.

Yuxi Suo (TGS '18)
Researcher, BlackRock Global Sustainable Investing

Samir Mayekar (WCAS '06, KSM '13)
Co-founder, NanoGraf Technologies; Deputy Mayor, City of Chicago

Steve McDougal (KSM '95)
Co-founder and CEO, 3Degrees

Javier Manzanares (KSM '01/KH-02)
Co-Chief Executive Officer, Green Climate DAO

Neha Palmer (KSM '07)
CEO, TeraWatt Infrastructure

Danielle Merfeld (TGS '99)
Vice President and Chief Technology Officer, General Electric Renewable Energy

Liz Georges (Law '94)
Senior Director, Climate Communications, World Wildlife Fund

Richard Shandross (McC '79)
Associate Director of Energy, Sustainability, and Infrastructure, Guidehouse

Mark Silberg (WCAS '14)
Special Advisor, Climate and Energy, Governor Jared Polis

Dana Jennings (WCAS '06)
Senior Project Manager for Global Sustainability, LinkedIn

Will Schafer (KSM '05)
Vice President of International Marketing, Beyond Meat

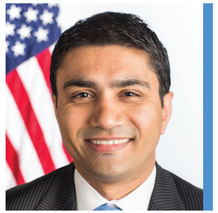
Karen Zelmar (WCAS '93)
Senior Vice President, Network Planning, Volta Charging

Matt Price (McC '01)
President, Activate

Cassi Saari (WCAS '11)
Natural Areas Project Manager, Chicago Park District

John Romankiewicz (McC '06)
Senior Analyst, Beyond Coal Campaign, Sierra Club

Tiffany Kwakwa (McC '16)
Project Manager, US Army Corps of Engineers



Rohan Patel (BSM '03)
Senior Global Director, Public Policy and Business Development, Tesla

Laura Oakleaf (SPS '05)
Associate Director, Illinois Solar For All, Elevate Energy

Rob Opsomer (KSM '13)
Executive Lead for Systemic Initiatives, Ellen MacArthur Foundation

Bryce Meredig (TGS '12)
Scientific Advisor, Citrine Informatics

Burgess S. Davis (WCAS '03)
Vice President, Chief of Staff, Office of CEO, PepsiCo

Joseph LaRusso (TGS '81, Law '89)
Energy Efficiency and Distributed Resources Finance Manager, City of Boston Environment Department

Please note: Professional titles of alumni are current as of this publication date. To learn more about our alumni, please visit https://isen.northwestern.edu/sustainability-and-energy-alumni

AMBITIOUS GOALS REALIZING OUR VISION

In the years ahead, ISEN will magnify our impact through the optimization of stakeholder engagement and translational research with partners. Our strategy will focus on partnerships with the greatest potential impact on combating climate change and ensuring community resilience. By supporting existing relationships and continuously reassessing partner needs, ISEN will minimize duplication and amplify the scale and scope of our educational and scientific work.

Expand the expertise and diversity of the Executive Council

Target private- and public-sector organizations involved in the transition to a low-carbon, climate-resilient future

Increase representation in key areas, such as renewable energy, insurance and financial services, environment and biodiversity, public health, food security, transportation, and sustainable materials and manufacturing

Deepen engagement with Northwestern alumni to advance our strategy

Leverage alumni expertise through a new recurring speaker series

Build community by convening groups in the Midwest, West Coast, East Coast, and key global locations

Deepen the impact of our partnerships

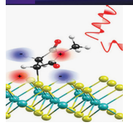
Grow student and faculty engagement opportunities by emphasizing applied research and experiential learning

Understand and jointly address policy challenges with partners, including technoeconomic and socioeconomic issues

Grow strategic, measurable outreach to support our mission

Heighten the impact of communication channels and technologies by establishing a $3 million endowed fund

Increase targeted stakeholder communication by launching *Empower* magazine



1 ISEN hosts speaking engagements in geographic hubs to highlight Northwestern expertise and scholarship.

2 ISEN graduate students tour a solar array on the Evanston campus.

3 With funding support from ISEN's Resnick Family Social Impact Program, a student-developed educational board game teaches students and young adults about the United Nation's Sustainable Development Goals.

4 Northwestern students can graduate with two ISEN credentials: an undergraduate certificate or Master of Science in Energy and Sustainability degree.

5 Alumni events include presentations and networking opportunities in Evanston and San Francisco.

6 Professor Bradley Sageman, ISEN co-director and academic director, engages with members of the ISEN Executive Council.

7 Students may study sustainability and energy abroad, including energy technology and policy in China with support from the Wanxiang Fellows Program.

8 Northwestern researchers have developed the first global index of susceptibility to coral bleaching.

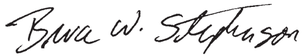
ALIGNED IN URGENT PURPOSE

The vision, strategy, and goals presented in this plan set our course for the next five years during this most consequential "climate decade." We believe that progress to reach global climate change mitigation and adaptation targets by 2030 emphatically depends on rapid implementation of decarbonizing policies and innovations to sustain all life on Earth. Thus, an overarching objective of our strategy is to amplify the power of Northwestern's impact as global communities unify around scientific and socioeconomic solutions to meet humanity's greatest challenge.

Speed, scope, and scale are critical to realizing our vision to empower the University's contribution to meaningful sustainability and energy impacts. Opportunities for transformational innovation are possible and depend on the continuous engagement of diverse communities, investment in team science, and implementation through partnerships across multiple sectors.

Our long-term plan also includes continued investment in the very fabric of our university, as we gain momentum to establish a school for sustainability and energy—built on Northwestern's renowned culture of multidisciplinary research and scholarship.

Support for and collaboration with ISEN at this time will accelerate our work to secure a sustainable future built on scientific advancement, restored ecosystems, and socioeconomic equity for all. We invite you to join us, aligned in urgent purpose for the benefit of all.



Bruce Stephenson
Former Chair, ISEN Executive Council;
Senior Vice President, Corporate Strategy, Leidos

Demetria Giannisis
Senior Managing Director, ISEN

"Opportunities for transformational innovation are possible and depend on the continuous engagement of diverse communities, investment in team science, and implementation through partnerships across multiple sectors."

Demetria Giannisis

"Support for and collaboration with ISEN at this time will accelerate our work to secure a sustainable future built on scientific advancement, restored ecosystems, and socioeconomic equity for all."

Bruce Stephenson

DISCOVER YOUR ROLE TODAY

Explore how you can help us implement our strategic plan and realize our vision for the future of the planet.

Contact Us

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