IN SERVICE TO SOCIETY

STRATEGIC VISION FOR CIVIL AND ENVIRONMENTAL ENGINEERING

Department of Civil & Environmental Engineering
University of Michigan

INTRODUCTION

MARCH 2025

In 2018, the Department of Civil & Environmental Engineering (CEE) embarked on a bold strategic visioning process aimed at identifying transformative opportunities to elevate our discipline and redefine the profession of civil and environmental engineering. This process culminated in a forward-looking vision anchored in five strategic priorities: Enhancing Human Habitat Experience, Shaping Resource Flows, Adaptation, Automation and Smart Infrastructure Finance. These priorities reflect our commitment to addressing society's most pressing challenges through innovative, people-first engineering approaches.

As we marked the five-year milestone of this initiative in 2023, we undertook a comprehensive review of our strategic plan to assess our progress and recalibrate our direction where needed. This reflective process reaffirmed the enduring relevance and transformative potential of our four core strategic directions. Wherever possible, we refined and sharpened these priorities to enhance clarity and focus. Notably, the "Smart Infrastructure Finance" priority has evolved into "Data-Driven Innovation" to better reflect emerging opportunities and the dynamic advancements shaping our field.

Data-Driven Innovation is a pivotal pillar of our future strategy. The integration of sensors, advanced data analytics, machine learning and simulation technologies opens unprecedented possibilities to revolutionize civil infrastructure systems. By leveraging these tools, we aim to pioneer new methodological and computational paradigms that empower us to design, plan, finance, construct and manage interconnected infrastructure systems with unparalleled efficiency and effectiveness. These innovations will play a critical role in ensuring the sustainability, security and resilience of communities in the decades ahead.

Our updated Strategic Vision is a testament to our dedication to leading the evolution of civil and environmental engineering. By aligning our efforts with emerging trends and societal needs, we aim to continue shaping a better future for all.

Yafeng Yin, PhD
Donald Cleveland Collegiate Professor of Engineering
and Donald Malloure Department Chair

OUR MISSION

Michigan Engineering provides scientific and technological leadership to the people of the world. We seek to improve the quality of life by developing intellectually curious and socially conscious minds, creating collaborative solutions to societal problems and promoting an inclusive and innovative community of service for the common good.

Civil & Environmental Engineering at the University of Michigan strives to serve society by enriching habitats and sustaining resources. We leverage our diverse community of scholars to expand the boundaries and accelerate the impact of our profession.

THE LANDSCAPE

The profession of civil and environmental engineering finds itself in a complex landscape that will strongly influence how it can address the grand challenges facing society. This landscape is defined by dimensions of society, business and technology.

SOCIETY

The well-being of society and its inhabitants has been central to the field of civil and environmental engineering since its earliest origins. Inarguably, the advancement of civil infrastructure systems and improved stewardship of the environment have drastically raised societal standards of living across the globe. Looking to the future, our profession will be challenged by dramatic global shifts in population, climate and income distribution. Today the world's population is 8.2 billion, but it is projected to approach 10 billion by mid-century. Rapidly increasing urbanization has shifted more than half of the world's population into large cities. Continued population growth and urbanization will require well-designed infrastructure to ensure current standards of living can be maintained without compromising environmental quality or public health.

In developed countries such as the United States, aging infrastructure and reduced infrastructure spending are making it more challenging to protect public well-being and retain public trust in infrastructure. With population growth rates largest in emerging economies, societies in these economies will be especially challenged in meeting their infrastructure needs. These communities may also have greater risk exposure to the effects of extreme weather events due to having fewer resources to prepare and adapt to changing environmental conditions.

BUSINESS

Economic growth is inherently tied to the infrastructure that supports the prosperity and security of society. Challenges such as climate change and urbanization could threaten future growth if infrastructure and the environment are strained. Hence, growth of the global economy will inevitably require innovation in all aspects of the infrastructure business. Inadequate long-term investment in infrastructure in many leading economies puts additional pressure on growth. In response, civil and environmental engineers need to find new and improved solutions to address these challenges and ensure infrastructure remains an engine for societal prosperity. The 20th century saw tremendous innovation in the profession to ensure the safety of the public. Today, we are expected to go beyond designing for safety and prescribe higher performance levels for our systems. To do so, civil and environmental engineering firms today crave tech-savvy professionals that have the capacity to conceptualize innovative ideas that shape the future. We need solutions that are technically sound, scientifically innovative and technologically current, yet also financially viable.

Traditional financing strategies based on a combination of debt and equity are insufficient to address the emerging financial needs associated with infrastructure renewal and expansion. As private financing plays an increasing role in infrastructure, a pressing challenge will be how the profession continues to uphold its leadership role in promoting social good.

TECHNOLOGY

A wave of emerging technologies will make the field of civil and environmental engineering the epicenter of societal innovation. The profession is already beginning to embrace the technological innovations originating from other domains including artificial intelligence, computing, sensing, DNA sequencing and synthetic biology, just to name a few. For example, a new generation of connected devices promises to make our habitats more responsive and adaptive. Computational power continues to grow, enabling modeling and data processing at previously unimaginable scales. Connected vehicles will transform the transportation landscape, while robots will build the cities of the future. Beyond information technology, new nanomaterials, membrane technologies and sequencing methods will transform how we learn and respond to our toughest environmental challenges.

Civil and environmental engineers will become much more than mere users of these technologies. A new generation of civil and environmental engineers is beginning to seize the opportunity to lead the development and meaningful implementation of these technologies by relying on their deep domain expertise in the built and natural environment.

SOCIETAL GRAND CHALLENGES

- Urbanization
- Energy Security
- Resource Scarcity and Preservation
- Climate Change
- Aging Infrastructure and Next Generation Infrastructure Needs
- Natural and Human-induced Hazards
- Education and Science Outreach
- Living in Extreme Environments

GUIDING PRINCIPLES

Throughout its history, the University of Michigan has made high-impact technological contributions that have revolutionized the field of civil and environmental engineering. The Department of Civil & Environmental Engineering is globally recognized for its impact in water quality engineering and biotechnology, advancing the field of soil dynamics, pioneering design principles that enhance the safety of civil engineering structures, developing more sustainable construction materials, introducing sensors for infrastructure monitoring, enabling the next-generation transportation systems and advancing the field of construction engineering and management as a science, among many more.

Looking ahead, the department will continue to tackle grand challenges that now confront our society by leading the pursuit of technological solutions while training the future leaders of industry. To achieve this mission, we will seek to expand the very identity of civil and environmental engineering to ensure our profession remains at the vanguard of emerging solutions. Three core principles serve as the foundation of our outlook and have strongly influenced our selection of strategic directions.

INTERSECTION OF SYSTEMS

Although there are still important scientific contributions to be made in many of the primary areas of the profession, we believe that future breakthroughs will emerge by understanding the "true system" that our habitat represents. Our habitat is fundamentally shaped by the interdependencies that exist among many domains, including people, natural and built environments and cyberinfrastructure. First and foremost, what we do as a profession is centered on people and their experiences within this complex habitat system. Exploring how people and communities operate and prosper in their environments while focusing on how communities can be resilient to disruptors must be our primary goals when addressing current and emerging societal challenges.

EXPANDING OUR IDENTITY

Over the last century, our profession has established the core scientific principles that inform our approaches to environmental stewardship and infrastructure resilience. While the pursuit of scientific advancement will remain a defining feature of our profession, it is imperative that we broaden our pursuits by translating the technological advances from other fields to yield novel solutions geared toward habitat optimization. We must also lead the way in innovative implementation and validation of the solutions to ensure the best interests of society are served.

RAPID INNOVATION

Societal grand challenges are significant and urgent—they demand an acceleration of the innovation process to quickly move solutions from concept to deployment. We will actively work with all stakeholders to accelerate the conversion of scientific advances into engineering practice, modernize public policies that impede adoption and educate the next forward-thinking engineers who will build and expand these new approaches in service to society. It is vital that our entrepreneurial spirit remain unencumbered to create the new business models that will be necessary to drive solution adoption while also ensuring our profession remains properly rewarded for its innovation.

ENHANCING HUMAN HABITAT EXPERIENCE

STRATEGIC DIRECTION 1 ENHANCING HUMAN HABITAT EXPERIENCE

The built and natural environment frames the daily human experience, facilitating social interactions, enabling movement of people and providing the resources needed to flourish. To enhance this experience, we will promote convergent ideas that are grounded in a profound understanding of social and historical contexts and in close partnership with those who experience our designs. Empathic listening will be essential for understanding how people experience the built environment, recognizing how participatory infrastructure design can bolster trust and usability. We are deeply committed to equitable and just access to the built and natural systems, embracing diverse viewpoints that reflect the principles of People-First Engineering. We will expand the fundamental body of knowledge underpinning impacts of infrastructure on human well-being, finance and policy. Our research will lay the groundwork for policy solutions that encompass human needs. Importantly, we will spearhead people-focused education to equip the next generation of civil and environmental engineers with participatory tools and perspectives that are essential to build holistic perspectives into their future practice.

(Left) University of Michigan researchers are designing novel, non-intrusive methods to monitor and control the quality of the built environment for improved health and well-being of building occupants. Here, U-M researchers inspect a robotic platform that monitors and maps air temperatures and air quality to facilitate automatic control of building heating, ventilation and air-conditioning systems.

(Right) University of Michigan researchers and students simulate the overtopping of a seawall by a tsunami at the Hydraulic Structures and Flood Risk lab, analyzing how water resources can be managed and redirected in extreme conditions to minimize damage and enhance resilience.

Air pollution accounted for
8 MILLION
deaths globally in 2021, becoming the second leading risk factor for death.

From 2000 to 2015, the global number of people without at least basic sanitation provision increased from 567 million to
667 MILLION.

By 2050, the number of people living in extreme poverty in urban communities worldwide, already close to 1 billion, could rise to
3 BILLION.

FRAMING THE HABITAT EXPERIENCE

INCLUSIVE MOBILITY

Researchers are working with state transportation agencies to address socioeconomic and demographic representativeness and behavioral biases present in current and emerging sources of travel data. Ensuring that infrastructure data represents all individuals, especially those who have been traditionally hard-to-reach, is critical for planning and designing systems that can maximize mobility and accessibility outcomes for everyone.

UNDERSTANDING MICROBIOMES

Our urban water system contains multiple complex microbial biomes that play important roles in human health and water infrastructure integrity. Researchers in CEE are studying the linkages between water and human microbiomes so that water infrastructure can be managed to maximize function and protect human and environmental health.

TAKE A DEEP BREATH

Diseases transmitted by air can spread rapidly from person to person; some, like swine flu or avian flu, can even spread from animals to humans. Sterilization of ventilated air, for example, using the non-thermal plasma device developed by U-M researchers seen here, can help prevent the spread of airborne pathogens.

SENSING STRESS

University of Michigan researchers are exploring methods to improve human mobility within the built environment, with particular focus on vulnerable individuals such as the elderly and people with physical disabilities. Here, a U-M graduate student discusses the use of wearable sensors that can help determine where elderly populations experience stress when interacting with infrastructure to determine what interventions could alleviate that stress.

THE WATER EXPERIENCE

Water quality and availability shape how people experience and value water. Through close collaborations with researchers in the disciplines of ethnography and epidemiology, U-M researchers are exploring how people experience the engineered water system and how water ultimately impacts nearly all aspects of their life.

SHAPING RESOURCE FLOWS

STRATEGIC DIRECTION 2 SHAPING RESOURCE FLOWS

Given the limited and uneven distribution of resources, we are re-envisioning resources management, built on a circularity mindset, systems thinking and deeper engagement.

Our plan is to implement cutting-edge scientific methods, craft novel business models and expand access to resources, thereby challenging the traditional ways of resource management. We are transitioning from a single-use mentality to a system-level, circular mindset. Leveraging co-design and community engagement, we aim to facilitate knowledge retransfer and promote conservation-oriented behaviors. By mapping and managing the interconnected dynamics of resource systems, we will shape resource flows toward holistic, system-level outcomes that optimize resource use.

Materials once deemed waste can now be safely reclaimed and utilized by communities. We are shaping resource flows through initiatives like extracting rich nutrients from urine to produce fertilizers for agriculture and maximizing carbon sequestration in the cementitious material and product production phase. This circular approach to resource management will play a central role in educating the upcoming generation of civil and environmental engineers.

(Right) Researchers and students develop a biodigester that converts organic solid waste from trash and wastewater into renewable methane, advancing sustainable energy solutions. This project exemplifies circular economy principles by reclaiming waste and transforming it into energy, reducing dependence on traditional sources and closing resource loops. By optimizing resource flows and minimizing environmental impact, the biodigester mirrors initiatives like nutrient recovery from urine and carbon sequestration, promoting sustainability in civil and environmental engineering.

Each year, 200 BILLION gallons of stormwater go down the drain in California, enough to supply 1.4 million households for a year.

Over the next 20 years, U.S. water utilities will require approximately **$1 TRILLION** to repair, maintain and improve water infrastructure.

On average, everyone uses **16 KILOS** of resources extracted from earth every day—metal, fossil energy and minerals. If you live in the western world this number is much higher—up to 57 kilos of newly-mined minerals per day.

SHAPING RESOURCE FLOWS

BY-PRODUCTS AS RESOURCES

“Pee-cycling” can shape resource flows by reclaiming nutrients from human waste, reducing reliance on synthetic fertilizers, and conserving energy. By diverting urine from wastewater treatment plants and repurposing it as fertilizer, the U-M research closes resource loops, promoting sustainable agricultural practices and minimizing environmental impact.

MAKING WAVES

Ocean wave energy constitutes a tremendous, untapped resource for utility-scale power in the United States. However, the development of devices to harness this resource is an enormous challenge. Not only must such devices be able to survive the harsh conditions encountered during storms and hurricanes, but they must also be equipped with sophisticated control systems that maximize the amount of energy they harvest from random waves. At the University of Michigan, researchers are collaborating with a number of commercial wave energy device developers to better understand control system design for these devices and to maximize energy output.

RESOURCE CYCLES

The way we harvest and leverage resources is constrained by how we initiate the infrastructure design process; it is influenced by "the way things have always been done." We are re-envisioning the value of wastewater, stormwater, solid waste and even waves as resources by exploring disruptive and transformative approaches to achieve efficiencies in resource harvesting. Here, a University of Michigan researcher works with a system that achieves resource recovery through energy offsets, enabled by sensor-mediated control.

LOCK IT DOWN

University of Michigan researchers are finding ways to sequester carbon in manmade materials, such as engineered cementitious composites or "bendable concrete" as shown here. The resulting product not only locks away carbon that would otherwise enter the atmosphere, but also has mechanical properties that may be superior to traditional concrete.

ADAPTATION

STRATEGIC DIRECTION 3 ADAPTATION

(Above) Flooding in densely populated areas has remained the costliest natural hazard of all weather-related events in terms of fatalities and material costs. Past events are clear harbingers of what is yet to come: estimates indicate that the number of people residing in the flow path of high-risk floods will double from one to two billion within two generations. CEE researchers are developing new computational methods to characterize floods at high resolution and quantify uncertainty in order to better understand and predict floods.

(Opposite page) The Amazon rainforests are highly biodiverse and play a critical role in global water, energy and carbon cycles. With no general consensus over rainforest vulnerability to the increasing drought frequency in the region, CEE researchers traveled to the Amazon to collect data on how trees respond to global climate changes.

Addressing challenges posed by climate change, urbanization and resource constraints demands a strategic shift toward *resilience by design*. This approach involves integrating resilience principles at the very core of civil and environmental engineering designs, ensuring that infrastructure is not only built to withstand current environmental conditions but is also adaptable to future uncertainties.

To achieve this, we will focus on developing advanced materials and construction techniques that enhance the durability, flexibility and reconfigurability of infrastructure. This includes the use of smart materials that can react and adapt to environmental changes, and modular design principles that allow for rapid modification and upgrading of infrastructure. We will explore pathways to decentralized water, air and energy infrastructure, equipped with modular process designs that respond to environmental fluctuations and shifting demands.

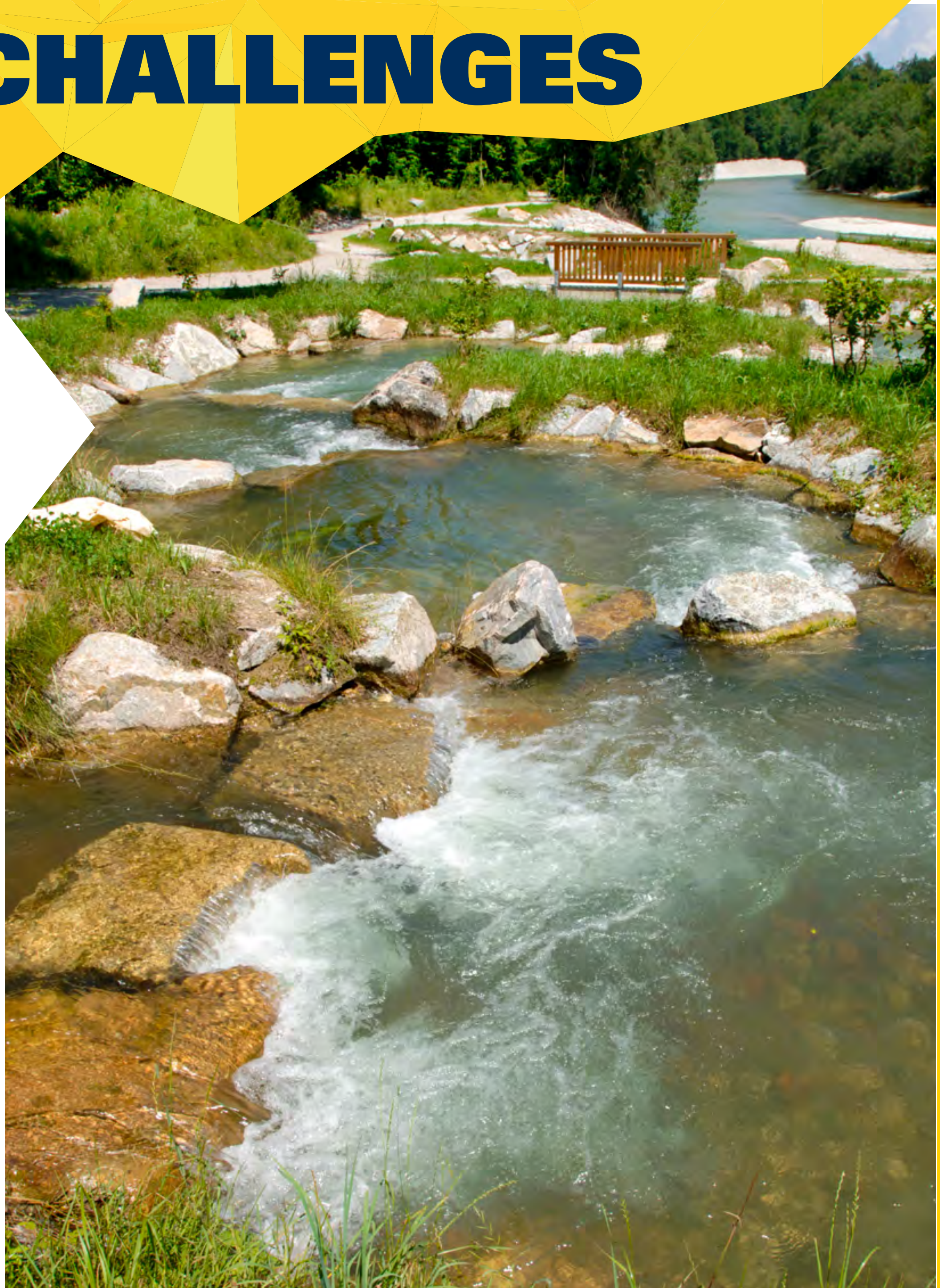
We will leverage predictive modeling and risk assessment tools to forecast and plan for potential environmental impacts, ensuring that resilience is a proactive, rather than reactive, component of CEE designs. By embedding resilience into the core of our engineering projects, we will enable infrastructure that is not only robust in the face of present challenges but is also prepared to adapt and thrive in the face of future environmental shifts and disturbances.

In 2024, flooding in West Africa affected
4 MILLION
people and destroyed more than 300,000 homes.

Natural hazards in the United States caused
$324 BILLION
in losses between 2017 and 2018.

Global sea levels have risen
20cm
in the last century.

ADAPTING TO MEET NEW CHALLENGES



ENGINEERED NATURALLY

Fish passage is an integral part of the civil infrastructure and energy grid. For too long, fish ladders were designed only with engineering constraints in mind, and biological consequences were ignored. Now, to help render our infrastructure sustainable, engineers are working with biologists and ecologists to better understand and quantify the interplay between fish species and flow conditions within these structures, leading to a "natural" design of fish ladders.

DYNAMIC ADAPTATION

Humans dynamically adapt to their evolving surroundings. This fundamental aspect of humanity is crucial to the successful long-term understanding and estimation of the resilience of communities to major natural hazards. Our researchers are enabling a new understanding of the ability of societies to respond to natural disasters and adapt to major perturbations by investigating community-level resiliency, which involves not only infrastructure resiliency, but also a human-centric dynamic adaptation assessment at the community level.

NEXT-GEN RESILIENCE MODELING

Extreme natural hazards, such as severe earthquakes and hurricanes, are among the most destructive forces to impact the built environment. Long-term adaptation of communities to such destructive forces requires the estimation of their resilience. Our researchers are developing a new generation of computational tools and models that will enable optimal strategies for supporting community resiliency to extreme natural hazards.

INSPIRED BY ORIGAMI

University of Michigan researchers are exploring origami-inspired structures that can morph into multiple new geometries to adapt their orientation, physical characteristics and function. Building components with multiple stable states could retrofit and adapt structures for ever-changing design requirements. Large-scale reconfigurable and deployable structures such as sea walls, bridges and shelters could be shared within a community and be used to reduce the impacts of natural disasters, and expedite recovery after the event.

AUTOMATION

STRATEGIC DIRECTION 4 AUTOMATION

The future of civil and environmental engineering is on the brink of a transformative revolution, propelled by the integration of robotics, AI, advanced materials, sensing and real-time controls. At its core, this evolution is exemplified by innovations such as automated mobility, robotic construction, adaptive utilities and autonomous water systems.

Just like self-driving cars, future energy grids, water systems and construction processes will adapt and optimize their performance in response to changing conditions. These breakthroughs signal a shift toward infrastructure systems that exhibit embodied intelligence by adapting and optimizing their performance in response to changing environmental and societal demands.

As automation becomes more ubiquitous, there arises a critical need for ethical and sustainable design. These systems, intimately intertwined with human lives, habitats and ecosystems, must be developed with a conscientious approach, prioritizing the well-being of both people and the planet.

This evolution of automation is not only transforming the CEE landscape but also reshaping career trajectories within the field. This paradigm shift underscores the urgency to reevaluate and innovate in education and workforce development.

(Left) Vehicle automation will revolutionize urban and rural mobility, and support a range of uses, from sole vehicle ownership to shared ownership, ridership and subscription services. The University of Michigan is not only the pioneer in the development and testing of automated vehicles, but also a leader in investigating the implications of vehicle automation on the design and operations of mobility services and systems.

(Opposite page) University of Michigan researchers are designing and building new robots that can adapt to rugged and unstructured conditions, and can work collaboratively with human co-workers to perform a wide variety of repetitive and physically-demanding construction tasks. Here, a U-M researcher inspects a joint-sealing robot that adaptively performs work by self-programming its motion based on the encountered workspace geometry.

Widespread use of autonomous vehicles could eliminate

90%

of all car accidents in the United States, prevent up to $190 billion in damages and health-related costs each year and save thousands of lives.

Cities around the world could spend as much as

$41 TRILLION on smart tech over the next 20 years.

The global robotics market will be worth

$218 BILLION by 2030.

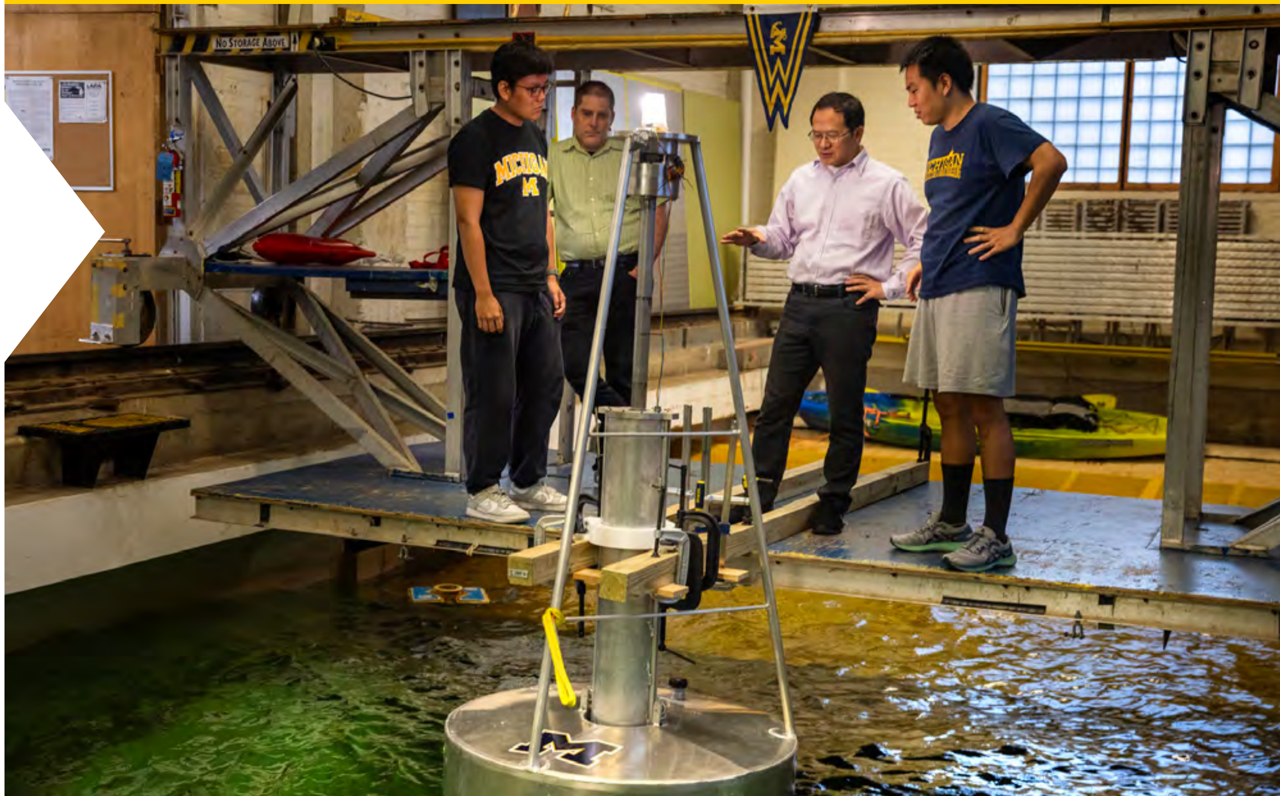
REACHING NEW LEVELS OF AUTOMATION

CONNECTIVITY & AUTOMATION

Vehicle automation holds the potential to substantially improve traffic safety, facilitate mobility and reduce traffic congestion, fuel consumption and emissions. Our researchers investigate how to leverage vehicle automation and connectivity to transform traffic control, facilitate truck platooning and create innovative shared mobility services. Researchers also examine the implications of vehicle automation on highway infrastructure, urban land use and environmental justice.

SELF-POWERED AUTOMATION

Automation is advancing with self-powered technologies that harness natural forces to enhance infrastructure resilience. Researchers at the University of Michigan use elements like wind, water currents and ocean waves to energize intelligent systems, allowing infrastructure to operate autonomously without grid power. These innovations integrate sensors, actuators and decision-making processes to convert nature's power into protective forces. For instance, ocean wave energy can power automated desalination for remote clean water supply.



HUMAN-IN-THE-LOOP DESIGN

The exponential growth in computing power at the disposal of engineers and scientists is resulting in models that produce massive sets of data. Technologies for automated mining of this data are crucial if the full potential of high-fidelity computation is to be unleashed. Our researchers are developing tools for automated human-in-the-loop data mining through virtual reality.

AUTOMATED FLOW

Just as self-driving cars revolutionize transportation, autonomous water systems are transforming how we manage water—from drinking water and wastewater to flood control and stream ecology. By integrating real-time data and AI-driven decision-making, these smart systems adapt instantly to changing conditions, ensuring reliability, efficiency and sustainability. Researchers at the University of Michigan are at the forefront of this revolution, deploying wireless sensors across the State of Michigan and beyond. These systems automate water monitoring, optimize infrastructure management and enhance infrastructure resilience, helping municipalities make faster, data-driven decisions. From automated dam operations in the Huron River Watershed to AI-powered sewer flow control in urban areas, smart water systems are reducing flooding, protecting drinking water and improving environmental health.

DATA-DRIVEN INNOVATION

STRATEGIC DIRECTION 5

DATA-DRIVEN INNOVATION

(Below) The approach to managing and utilizing infrastructure data is evolving beyond 20th-century methods. Innovative strategies are available for harnessing and monetizing infrastructure data—if you know where to find them.

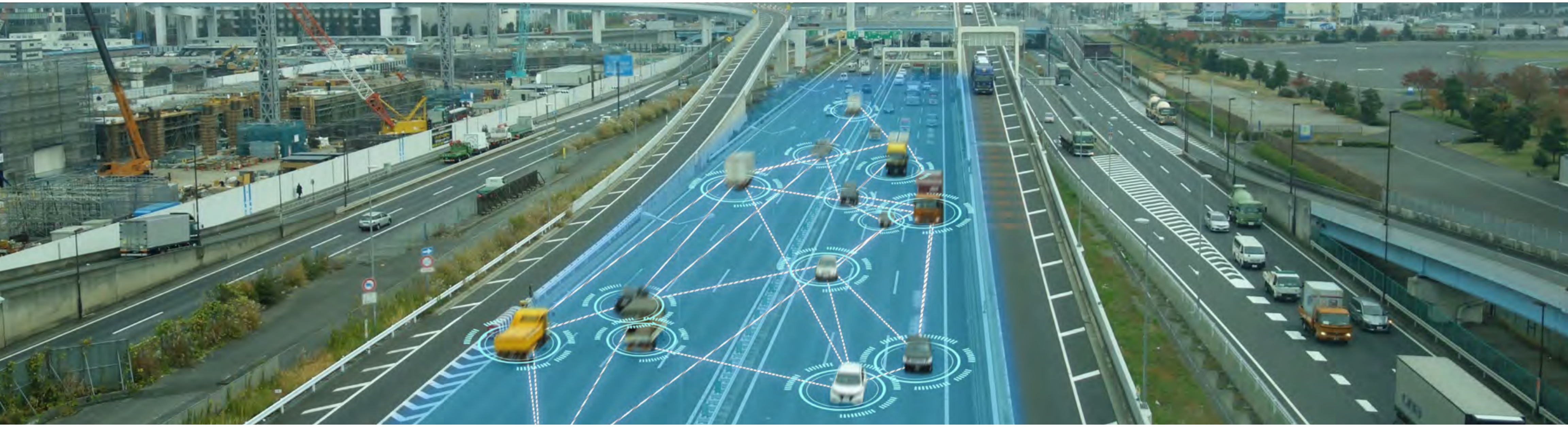
(Opposite page) Civil and environmental engineers require expertise in data analytics, information valuation and data-oriented project models. We're fostering collaborations with U-M's School of Public Policy to fully understand the implications of data-focused infrastructure design on technology, economy and society.

Natural and built environments continue to produce an expanding array of interconnected data. When harnessed, these data will bolster sustainability, resource management, resiliency and human experience.

We aim to leverage multi-source, multi-resolution and emerging data gathered by cutting-edge sensors and survey methods. By advancing computational methodologies—which span AI, robotics and simulation—we are poised to usher in new paradigms for supporting innovative designs, planning and operation. Insights derived from untapped data resources will enable novel instruments to finance the construction and maintenance of infrastructure systems.

Our environmental process engineers are capitalizing on the vast data resources lying dormant in our resource recovery facilities to reduce energy footprints and maximize treatment performance. Equally important, by offering equitable policy solutions and refined designs, we can address disparities in community resources and experiences.

Our goal is to expedite the adoption of data-enhanced and connected infrastructure systems to support sustainable, secure, efficient and resilient communities, while paving the way for educating a new generation of data-savvy engineers.



The 10-year infrastructure investment gap in the United States is

$2 TRILLION.

More than $5 trillion a year is available for infrastructure financing, of which

$1.4 TRILLION can't be invested

because the right financial models don't exist.

In 2020, the world generated

64.2 Zettabytes

of data—a 314% increase from 2015.

CREATING DATA-BACKED MODELS

BUILDING BLOCKS

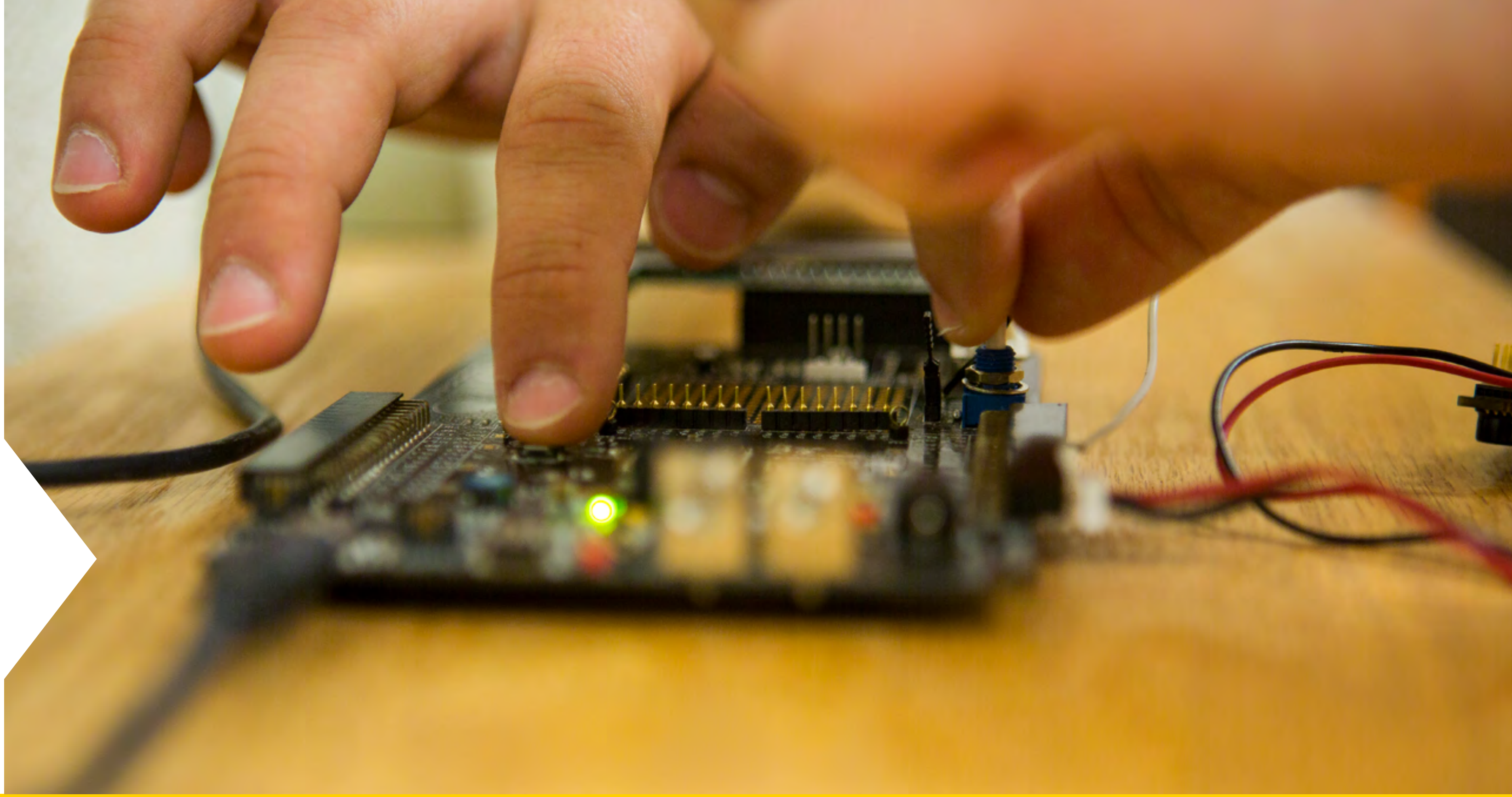
Data management, security and transactions are being revolutionized by blockchain technology. At the University of Michigan, we are partnering with leading blockchain entities and investors to empower researchers to innovate blockchain applications, notably in smart city contexts. Our exploration focuses on utilizing blockchain to revolutionize payment systems, monitor data from distributed sensors and craft smart contracts, enhancing transactional efficiency. These applications inform advanced data-driven financing and business strategies across various sectors.

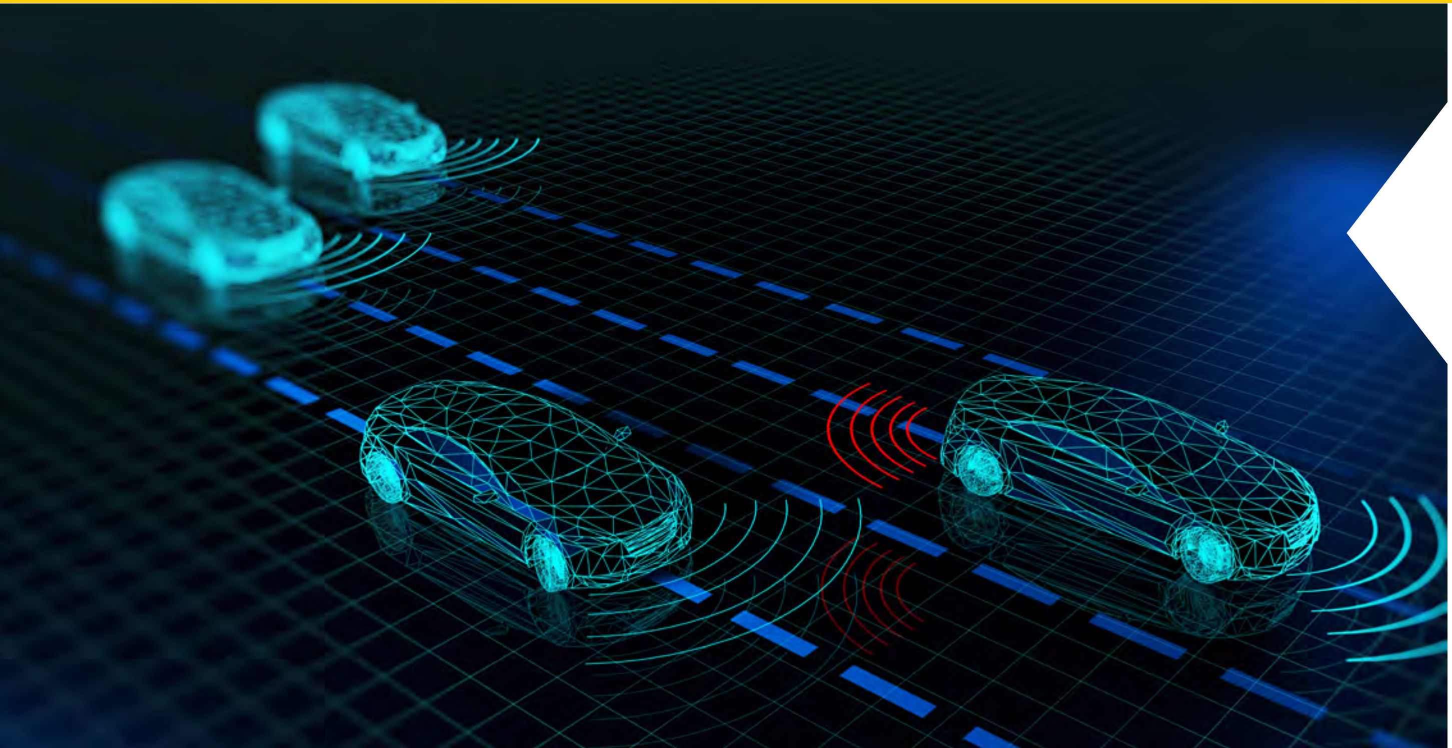
A NEW WORLD OF WATER

Rapid urbanization and industrial development have placed intense strains on global water resources, with an impact on assets valued at approximately $145 trillion. In this new era, data-driven approaches are crucial for valuing, allocating and funding water projects, from arid regions to the Great Lakes area. Leveraging data from advanced sensing technologies presents a vast opportunity to modernize water production and distribution, facilitating the creation of real-time water markets driven by instant data insights.

PREDICTING PERFORMANCE

The University of Michigan is a leader in creating and deploying sensors in our built and natural environments, giving researchers unprecedented insight into how infrastructure systems perform under environmental demands. The data generated are being explored to inform private investment strategies by predicting future performance of infrastructure. Additional means of monetizing sensed data from infrastructure are being advanced to assist asset owners with financing infrastructure maintenance.





DATA-DRIVEN PRICING INFRASTRUCTURE

Managing the financing of our nation's surface transportation infrastructure is increasingly complex. Our researchers are focused on devising data-driven methods to more accurately price this infrastructure. Utilizing detailed data on vehicle trajectories and occupancy rates, we aim to develop a granular pricing model. This model is expected to facilitate not just full cost recovery, but also promote more efficient facility use, and incentivize mobility service providers to minimize empty trips and optimize vehicle occupancy.

LEADING THE WAY

We are entering a pivotal and truly exciting era for civil and environmental engineering. We must seize the opportunity to expand our identity and keep pace with a changing world.

We have charted five directions to guide us in this effort. We will move swiftly and with resolve to ensure that all of our actions—big and small—are closely aligned with this strategic plan. Fostering a culture of diversity in our academic community will be integral to our success. This diversity of perspectives and experiences will drive innovation and creativity in our department.

We will push ourselves, and pivot as needed, to ensure that our fundamental discoveries surpass the needs of the communities we serve. We will refine and modernize our curricula to equip our students to be leaders and agents of change in their careers. We will invest in new research areas through new faculty and renovated laboratories. We will engage communities as equal partners in our research to work collaboratively toward real solutions.

We recognize that this is only the beginning of a journey, with much work to be done. As we implement our strategic vision, we will document our progress and share what we learn. We invite you to join us in this effort of serving society and the common good.

www.UMServiceToSociety.org


GIFT
2023
Kaolin, water

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STRATEGIC PLANNING COMMITTEE

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The strategic planning process was a collaborative effort among all members of the Department of Civil & Environmental Engineering at the University of Michigan, with special effort from staff and faculty members of the Strategic Planning Committee.

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