



INFRASTRUCTURE REPORT

REPORT SUMMARY

Infrastructure is the foundation of our economy and of modern society, but is often taken for granted until it fails to work.

Michigan and the nation made big investments in infrastructure in the 20th century, which are starting to show their age and are overdue for improvement. Michigan's University Research Corridor (URC)—an alliance of Michigan State University, University of Michigan and Wayne State University—has been making contributions to infrastructure innovations and talent development that

have and continue to reshape how people and businesses interact with their built and digital environments.

This report documents these contributions over time, and showcases how URC institutions are accelerating discovery and driving real-life applications that improve our world.

During the past five years, URC institutions conducted \$1.64 billion in infrastructure-related research and initiatives in the fields of water, mobility, energy and communications. R&D efforts that spanned more than one category equaled \$274 million.

WATER /// \$205 MILLION

- Water is central to Michigan's identity and economy, with more than **104,000 square miles of water**, the most in the contiguous U.S.
- Along the state's extensive lakeshore, MSU and WSU researchers are continuously **testing new technologies** to keep public bodies of water safe, such as developing water buoys that provide real-time water quality readings at beaches and in threatened watersheds.
- Researchers at U-M are **improving stormwater handling systems** to lessen the impact of flooding, by developing autonomous sensors and valves that adjust in real time to **better manage water quality** and reduce flooding.

DID YOU KNOW?



1/5 MICHIGAN JOBS

is tied to industries—**tourism, agriculture and manufacturing**—closely related to water quality

URC researchers also work on more traditional mobility issues—from

IMPROVING HIGHWAY SAFETY

—to— *developing*

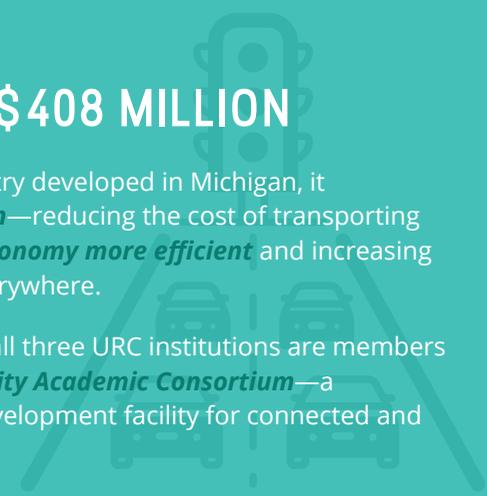
STRONGER CONCRETE

—to— *turning scrap*

TIRES INTO ASPHALT

MOBILITY /// \$408 MILLION

- As the modern automobile industry developed in Michigan, it **transformed the state and nation**—reducing the cost of transporting goods and people, **making the economy more efficient** and increasing standards of living for people everywhere.
- As long-time leaders in mobility, all three URC institutions are members of the **American Center for Mobility Academic Consortium**—a nonprofit testing and product development facility for connected and autonomous vehicles.





are making

HUGE BREAKTHROUGHS

in solar power generation and supporting new ways to harvest

SOLAR ENERGY

ENERGY /// \$695 MILLION

- As the nation moves toward renewable sources, biofuels represent a promising opportunity—U-M and MSU researchers are working on ways to use *algae to develop biofuels*, while WSU helped establish the National Biofuel Energy Lab in midtown Detroit.
- URC researchers are working on designing better batteries for the widespread adoption of *electric and hybrid vehicles*, while also trying to improve lithium-ion batteries by making them safer, longer lasting and less expensive.

COMMUNICATIONS /// \$630 MILLION

- URC institutions have paved many paths forward in *communications technology*, like establishing the Merit Network in 1966, which pioneered many forms of communication used in today's modern internet.
- URC researchers are working on advancing high-speed connectivity, enabling the expansion of the *'Internet of Things'* and bringing advanced broadband technologies to all communities.

CYBER SECURITY LEADER

thanks to:

- MSU's Cyber Security Lab
- U-M's Center for Computer Security and Society
- WSU's Cyber Range Hub

THE URC AWARDED

43% bachelor's degrees

63% master's degrees

86% PhDs

—*earned in Michigan*—
in infrastructure-related fields

TALENT

- As the need for talent to *rebuild and revolutionize* our infrastructure grows, the URC institutions provide 40 percent of Michigan's recent graduates who are prepared for infrastructure-related careers—**34,324 infrastructure-related** degrees from 2012 to 2016.

TECHNOLOGY COMMERCIALIZATION

- Technology commercialization is an *important outcome* of the research process.
- U-M researchers are working with the Michigan Department of Transportation to develop a stronger, more *durable concrete at a reduced cost*. The improved concrete could be a sustainable option for the freeze-thaw cycle that creates potholes.
- MSU entered a commercialization agreement with a Silicon Valley tech company that will use MSU's clear solar panel technology to work toward *eliminating the battery life limitations of mobile devices* and putting solar panels in place as windows for buildings.

Researchers at WSU developed

LOCATIONAL EMISSIONS ESTIMATION METHODOLOGY

—*which*—

can help power producers **track, manage, reduce and report** their facilities emissions

URC UNIVERSITY RESEARCH CORRIDOR®

