McMaster University

Brighter World

SUSTAINABLE DEVELOPMENT GOALS

McMaster University

Sustainable Development Goals

Report | 2024

McMaster students Whadia Khwaja and Colleen Wardlaw, members of Karen Kidd's research lab, examine soil samples taken from Hidden Valley Park in Burlington, Ontario.

Advancing human and societal health and well-being

At McMaster, we are devoted to the cultivation of human potential.

We are committed to taking a collaborative approach to improving people's lives, contributing to global knowledge and finding creative solutions to some of our most complex challenges.

One of the ways we fulfil this commitment is by producing groundbreaking research in fields ranging from health care to business, arts and culture to advanced manufacturing. We're empowering the next generation to create a Brighter World.

- Research
- Engagement
- Teaching
- Operations

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Goals:

Land Acknowlegement

McMaster University recognizes and acknowledges that it is located on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the Dish With One Spoon wampum agreement.

McMaster researcher **Magdalena Janus** studies early childhood development of children with and without developmental challenges, as well as the social determinants of children's health.

End poverty in all its forms everywhere

Health equity for children in low-income neighbourhoods

A **new study by McMaster University researchers** reveals that children from low-income neighborhoods are significantly more likely to have health disorders, such as physical, emotional, and learning impairments, compared to those from wealthier areas. This study, which analyzed data from more than 1.4 million kindergarteners across Canada, highlights the strong link between socioeconomic status and children's health outcomes. The findings emphasize the need for targeted health supports in underprivileged communities, including better access to healthcare, nutrition, and housing, to ensure that all children have the opportunity to thrive and overcome health-related challenges early in life.

Menstrual equity on campus

The **McMaster Period Equity Project**, launched this year, provides free pads and tampons to students, staff and faculty through bins and dispensers in select washrooms on McMaster's main campus. In a 2018 Plan International Canada study of 2,000 women, nearly a quarter (23 per cent) of all surveyed, and a third (33 per cent) of women under 25 reported struggling to afford menstrual products for themselves or their dependents. There are big plans for the project in the coming year when it is expected more washrooms on campus will be serviced with free menstrual products to reduce period poverty in the McMaster community.

Community care for older adults

Health conditions that come with age and poverty often lead to more trips to the emergency room, and more calls to 911. A team of researchers at McMaster University's Department of Family Medicine developed Community Paramedicine at Clinic — **CP@Clinic** — which sees paramedics hold drop-in sessions in social housing locations where seniors live, assessing risks and providing tailored education. The result? A decrease in 911 calls, strengthened connections with primary health-care providers and improved quality of life for patients. Health Canada has funded a national expansion of the service.

16,043
Number of employees at McMaster (excluding faculty and clinical faculty)

1,036
Number of full-time faculty

Addressing job insecurity

Poverty is more than the lack of income and resources to live one day to the next. It means hunger and malnutrition, sub-standard housing, limited access to education and social discrimination. The **Poverty and Employment Precarity in Southern Ontario** (PEPSO) research project is a joint university-community initiative led by McMaster University and the United Way Toronto & York Region in partnership with more than 30 university, community, labour, government and media partners. Its goal has been to gather data on trends in precarious employment and to encourage policy debate and further research. PEPSO has influenced key policy decisions, expanded existing knowledge and served as a foundation for further research.

Amplifying voices

The **McMaster Community Poverty Initiative** (MCPI) connects faculty, students and staff to community groups and people living in poverty. It ensures policy development is fully informed by people with firsthand knowledge about what it means to be poor and to live in Hamilton. As a partner with **Living Wage Hamilton**, MCPI advocates for a minimum wage that allows workers to earn enough to pull themselves and their families out of poverty, which affects health, education levels and the community's economic prosperity.

2030 goals: a poverty-free future

McMaster is a partner in the International Association of Universities (IAU) **Cluster on Higher Education and Research for Sustainable Development**, which promotes the role institutions around the world must play in meeting the SDGs and Agenda 2030. The Cluster works on all dimensions of the SDGs, combining economic, social, cultural and environmental sustainability. Led by the University of Ghana, McMaster is focusing on SDG 1 (No Poverty).

Closing the Hunger Gap

Researchers from McMaster University, in collaboration with Hamilton Food Share, conducted a **four-year study** that found approximately one-third of all low-income households in Hamilton, Ontario, use a food bank at least once a year and those households are commonly ones with children. While it may be unsurprising that household income is the key variable associated with food bank use, the analysis found that gross income in households that rely on food banks is 40 to 60 per cent lower than that of an average low-income family. The findings suggest government income supports are not sufficient to provide the basic needs for a household that relies on these programs.

Providing urgent financial relief

The university provides **emergency financial support** to students in need — including those facing a lack of funds for basic living expenses or required technology for courses, pending eviction and negative circumstances beyond their control.

McMaster's Hospitality Services partners with student groups to provide Loonies for Lunches, a campaign aimed at improving students' access to food and nutrition.

End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

Planning an accessible campus food system

In 2023, McMaster University invited students, staff, and faculty to help shape the future of its campus food system through the development of the **McMaster Campus Food Charter**. In a survey organized by the McMaster Okanagan Office of Health & Well-being, participants shared their views on what makes food healthy, accessible, and sustainable. The feedback gathered during this consultation will guide the Charter, which is designed to promote food sovereignty and sustainable food practices. With support from the Student Wellness Centre and Hospitality Services, the initiative is working to create a more inclusive and healthy campus food environment.

Cultured meat for sustainable protein

A team of McMaster University researchers is taking a leading role in a Canadian initiative aimed at making cultured meat more affordable and accessible to everyday consumers. The project, supported by a **$10 million investment from Genome Canada**, brings together Canadian experts, including a significant contingent from McMaster. The ultimate goal is to produce slabs of cultured beef comparable to traditional steaks. Similar technology could be used to make pork, poultry and other meat. Cultured meat can help meet the growing global demand for protein while avoiding the slaughter of animals and significantly reducing the environmental impact of producing meat from traditional animal sources.

Healthy meals on a budget

The **Student Wellness Centre** has a pantry full of resources to help make healthy, affordable choices, including recipes, tips, food guides and weekly discounts for area grocery stores with a student ID. **Food for Thought**, a working group comprising food enthusiasts from campus and community groups, offers interactive classes for McMaster students with a focus on creating healthy, tasty meals on a budget.

Growing food, growing community

The community engagement component of the **School of Interdisciplinary Science** brings together students, faculty and community partners. Past projects include the McMaster Teaching & Community Garden, designed to facilitate local food production alongside teaching and learning opportunities; nutrition workshops for Hamilton seniors; creation of a permaculture garden to explore sustainable agriculture; and a partnership with the United Way to create an urban farm for experiential learning.

Building collective food solutions

Hamilton Community Food Centre (HCFC), a project of the Neighbour to Neighbour Centre (N2N), offers food-based programs that bring people together to grow, cook, share and advocate for good food. **Researcher Tina Moffat** received funding to evaluate the youth food programming at the HCFC, part of a growing movement of food centres across Canada that move beyond charity models of food banks to give food-insecure populations access to nutritious food in a dignified manner.

Climate change's threat to food

The **McMaster University Centre for Climate Change** studies, among other things, the impact human activities have on the environment. Crop failures and diminishing yields due to weather events can put food security at risk. Water scarcity caused by climate change could lead to wide-scale famine. At the other end of the spectrum, flooding may contaminate food and water sources. Research into the societal impact of climate change provides the necessary information to understand the challenge and develop solutions.

Local actions for global impact

With close to 4 million meals served on campus every year, the university has the purchasing power to leverage support for a sustainable food system. McMaster is committed to **buying local**. To that end, 43 per cent of the produce purchased by the university in 2022-23 was local, an almost 10 per cent increase of the annual target of 35 per cent.

Feeding others, spreading kindness

After digging into the data on food insecurity in Hamilton, four undergraduate students came together to create **Loonies for Lunches**, a campaign that offers customers the opportunity to add $1 to their purchase that is then donated to an initiative that enables students to privately access groceries on an as-needed basis.

Nutritious food, happier lives

The student-run **Food Collective Centre**, the university's on-campus food bank, offers a number of supports for students, staff, alumni and Hamilton community partners. The collective advocates for best practices to improve food security and is dedicated to ensuring food is always available. It offers programs such as the monthly Good Food Box, filled with affordable, fresh produce, and Lockers of Love, a confidential way to request and receive non-perishable food items and health supplies.

51% Plant-based purchases compared to meat purchases

43% Local produce purchased by hospitality services at McMaster

McMaster researcher **Jon Stokes' lab** uses artificial intelligence to identify and discover new antibiotics.

Ensure healthy lives and promote well-being for all at all ages

AI discovery targets deadly superbug

In a major breakthrough, scientists at McMaster University and MIT have used artificial intelligence to discover a new antibiotic that could combat one of the world's most dangerous superbugs. The pathogen, Acinetobacter baumannii, is a drug-resistant bacteria that poses a serious threat to vulnerable hospital patients, causing pneumonia, meningitis, and life-threatening infections. The newly discovered antibiotic, abaucin, specifically targets this superbug, reducing the risk of antibiotic resistance. This AI-driven approach offers a faster way to tackle harmful bacteria and could revolutionize how new antibiotics are discovered to fight the growing global threat of superbugs.

1st in Canada in the Times Higher Education's Impact rankings for SDG 3. Number 12 in the world.

25th in the world for clinical and health programs.

Cultural health equity

The **Indigenous Health Learning Lodge** (IHLL) works alongside McMaster University's Faculty of Health Sciences towards creating a learning environment that is culturally safe — to work with humility to enable sustainable systems change and to advance the work around concepts of truth, reconciliation and anti-colonization in all aspects of Indigenous health and well-being. The work of IHLL is based upon six strategic pillars: Indigenous Ways of Knowing; Student Supports and Services; Faculty Leadership and Support; Research; Education and Curriculum, and Administration.

Promoting health in senior years

The **McMaster Institute for Research on Aging** seeks to address the complex issues facing an aging population worldwide, while working to engage older adults, their families, health-care providers and other key stakeholders to optimize the health and longevity of the aging population. These efforts include making the university more accessible to seniors and developing practical solutions to reduce the social isolation experienced by older members of the community. **McMaster Optimal Aging Portal** provides an internationally available information-sharing resource for citizens, clinicians, health-care professionals and policymakers on aging, offering the latest scientific evidence on aging and health-care topics for seniors.

Shaping global health

The **Population Health Research Institute**, founded by McMaster and Hamilton Health Sciences, is a global health institute and world leader in large clinical trials and population studies. An international network of almost 400 scientists, investigators and research fellows work together to address global health challenges such as cardiovascular disease, poverty-related infectious disease and under-nutrition, Type-2 diabetes, stroke and cognitive decline. To date, more than 1.5 million people have participated in studies in 102 countries.

Preventing future pandemics

The COVID-19 pandemic brought to light the disproportionate effects that infectious diseases can have on different people, depending on age, class, race, gender, ability, and geography. **McMaster University's Global Nexus** leads cutting-edge research and is training the next generation of scientists and scholars in the fight against infectious disease outbreaks. It offers innovative academic programming at the undergraduate and postdoctoral levels, with plans to offer certificate and micro-credential programs for professionals interested in pandemic response. The goal is to ensure that McMaster remains at the forefront of a responsive and resilient future.

Advancing cancer treatment with nuclear

McMaster University and the Nuclear Research and Consultancy Group in the Netherlands are collaborating on research in the field of nuclear medicine. Working together, these two globally renowned research reactors will provide the world with the highest quality radioiodine (I-125) for the treatment of prostate and other types of cancers. Now the largest research reactor at a Canadian university, the McMaster Nuclear Reactor is one of a suite of research facilities at McMaster that generate discoveries in medicine, clean energy, nuclear safety, materials and environmental science. It is one of the world's largest suppliers of the medical radioisotope iodine-125, used in the treatment of prostate cancer.

Healthy health systems

The **McMaster Health Forum** is a leading international collaboration centre that works to ensure health systems around the world are strengthened by evidence-informed policymaking. Active for a decade, the forum recently broadened its focus to include social systems and the Sustainable Development Goals. Its 75-plus partners include the World Health Organization, the PanAmerican Health Organization and departments at all levels of government. Its free, searchable databases — **Health Systems Evidence and Social Systems Evidence** — are the most comprehensive access points for policymakers, researchers and stakeholders seeking evidence on a wide range of issues, accessed by 13,500 registered users globally.

$250 million
Investment in COVID-19 research at McMaster

Savage Bear, Director for the **McMaster Indigenous Research Institute**, is the National Director of **Walls to Bridges**, an education program bringing post-secondary education to incarcerated and formerly incarcerated students.

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Strengthening Indigenous teaching and learning

McMaster University is breaking down financial barriers for Indigenous students with the launch of the ionkhihahonnién bursary program. Named after the Mohawk phrase meaning “they’re making a path for us,” the program provides financial support for tuition and living expenses, such as housing, childcare, and transportation. Open to members of the Haudenosaunee and Mississauga nations, the bursary aims to reduce the challenges Indigenous students face in accessing post-secondary education. By easing financial burdens, McMaster is fostering a more inclusive and supportive environment, helping students focus on their studies and reconnect with their cultures.

Learning through community engagement

MacChangers is a co-curricular experiential learning program at McMaster. Students from all Faculties are given the opportunity to propose innovative solutions to the most pressing problems confronting society as identified in the UN SDGs and the City of Hamilton’s **Our Commitment to Our Community** strategic plan. Recent projects include reducing paper receipts in local business, designing a new bike lane in the city’s core and an online resource to address housing needs.

1.4 million Library Patrons Annually

4.2 million Titles available from campus libraries

Education access for all

Older adults can take advantage of many **learning opportunities** at McMaster. Those 65 years and older — providing they meet admission and prerequisite requirements — may enrol in tuition-free for-credit courses, only paying an application fee. Enrolling as a listener is an option for those who wish to take a course for the joy of learning, but not for credit. McMaster Learning for 55+ offers an affordable lineup of classes geared to this age group, with topics such as arts and literature, science and technology, health, wellness, and business and innovation. The university is also a member of the **Age Friendly University network**, a global body comprising higher-education institutions committed to becoming universally accessible.

Creating roads to higher education

The **McMaster Children & Youth University** (MCYU) delivers free programming for children and youth aged seven to 14 in all areas of science, technology, engineering, arts and math (STEAM). The programs — which include a family lecture series, workshops and online activities — share McMaster research in a way that is fun and accessible to children and youth. The goal is to empower and academically prepare young people, especially those at a socioeconomic disadvantage, to aspire to a university education. MCYU also works to deepen the university’s relationships with schools and organizations in neighbourhoods where high school completion rates are disproportionately low.

Sustainability at the core of learning

The **Academic Sustainability Programs Office** oversees the SUSTAIN courses, a suite of five undergraduate courses open to students in all faculties, and offers an Interdisciplinary Minor in Sustainability, with more than 70 courses to choose from. It also operates the Sustainability Internship Program, which allows students to focus on a real-world sustainability project for a course credit.

Building bridges through partnerships

McMaster enjoys a strong, longstanding partnership with Six Nations Polytechnic, including the **SNP-University Consortium** Agreement. Under the agreement, McMaster and five other universities offer credit courses for the first year of a general BA in the Six Nations community, which are then transferrable to any of the participating universities. The program is intended to improve education completion and employment opportunities, as well as support community control of postsecondary education. Since its inception, more than 250 students in the program have successfully completed their undergraduate degrees. In a further expansion of opportunities, students at a partner college who complete two years of Indigenous-focused courses may **continue their education** at McMaster for two years to earn an Honours BA in Indigenous Studies in addition to their college diploma.

86 Canada Research Chairs

16 World’s Most Highly Cited Researchers (Clarivate)

Advancing Indigenous teaching and learning

McMaster University’s new **Indigenous Studies Department** is home to the Indigenous Studies undergraduate program, a future graduate program, and research and community-focused activities. The Indigenous Studies undergraduate program, one of the longest-standing programs of its kind in Canada, incorporates a unique teaching structure of Indigenous knowledge which involves many Indigenous peoples and Elders. This unique perspective assists students from various cultures and backgrounds learn about the history and lives of Indigenous peoples within an Indigenous perspective. The faculty and staff who work within the Indigenous Studies Department are dedicated to teaching Indigenous perspectives and issues, as well as the success of its students.

McMaster professor **Esther Chin** is the founder of **STITCH**, a portable, affordable, reusable simulator that allows clinicians to practise treating postpartum hemorrhage, a complication that kills tens of thousands of women each year.

Achieve gender equality and empower all women and girls

Creating inclusive spaces for 2SLGBTQ+ students

In line with McMaster University's commitment to gender equality and inclusivity, the new Queer Study Buddies program at McMaster's Mills Memorial Library provides a dedicated space for 2SLGBTQ+ students to connect, study, and build community. The weekly event offers a welcoming environment where queer students can support one another, promoting both academic success and emotional well-being. This initiative aligns with SDG 5 by fostering a more inclusive campus and empowering marginalized groups to feel confident and supported. Through initiatives like Queer Study Buddies, McMaster is working to create a more equitable and inclusive future for all students.

Ensuring equal opportunities

At McMaster, admissions are based on academic performance, not gender. In recent years, the number of female undergraduates has outnumbered male undergraduates, according to the **McMaster University Fact Book**. For example, 55 per cent of undergraduate students in 2023-24 identified as female, compared to 43 per cent as male. The university has a number of programs that actively recruit female students, particularly in science, technology, engineering and math (STEM) and areas that have traditionally seen lower female enrolment.

Fostering an inclusive culture

Through its **Equity and Inclusion Office**, the university seeks to foster an environment of inclusion and collegiality that goes beyond non-discrimination and harassment policies. In partnership with Pride at Work Canada, the university celebrates all employees, regardless of gender expression, gender identity and sexual orientation. McMaster's gender-neutral washrooms are open to all on campus and Rainbow and Transgender Pride crosswalks at the main entrance reinforce the importance of making visible and validating the lives of LGBTQ2SI+ community members.

Women leading in engineering

McMaster's Faculty of Engineering incoming undergraduate fall 2023 class is more competitive and includes more women than ever before. Engineering received more than 16,000 applications for its undergraduate programs, a historic high and a five per cent increase over last year's total. The **2023 incoming class** includes a variety of statistics that support the Faculty's EDI Strategy, notably that 43 per cent of students identify as female. Engineers Canada reports that women make up only 22 per cent of engineering undergraduate students in Canada and an even more lacklustre 13 per cent of licensed engineers. Increasing gender parity at McMaster Engineering doesn't only improve students' educational experience; it also prepares a new generation of women engineers to lead.

Inspiring the next generation of women

McMaster hosts many programs, initiatives and activities to encourage young women to consider careers in the STEM fields — Science, Technology, Engineering and Math — such as the Girls in Science Day. The **Faculty of Engineering** offers summer camps, STEM Girls Clubs for elementary students, conferences such as Go ENG Girl and Go CODE Girl for female high school students, and other outreach efforts.

Developing future women leaders

Mentoring and supports bolster the success of women on campus — staff, academics and students at all levels. Some are formalized programs, while others are less structured, as best suits the needs of the individual. These include job shadowing with industry leaders, women in leadership conferences, female-centric associations, and the **McMaster Women in Science and Engineering (WISE) Initiative**.

Supporting caregivers for work-life balance

Several made-at-McMaster programs allow faculty to take leave without significant financial or career repercussions, such as the **Life Events Support Program**, which helps mitigate the impact of various leaves (parental, family medical) on research productivity. The university offers numerous child care options: the **Child Care Centre** run by the students' union, open to the young children of undergraduate and graduate students, as well as the community at large; the on-campus **McMaster Children's Centre**; and free child care to participants in the **McMaster Discovery Program**, open to members of the public whose circumstances have not allowed them to benefit from a university education.

Championing gender and justice initiatives

McMaster University Library has launched a year of engaging programming centred on gender and justice. In collaboration with campus and community partners, Transformative Stories: Year of Gender and Justice will bring attention to the library's gender and justice focused collections, resources, and expertise, as well as related work and stories throughout McMaster and Hamilton. Transformative Stories: Year of Gender and Justice began in September 2023 and continues through April 2024, with lectures, books displays, author readings, featured resource collections, and more. A key partner is McMaster's Gender and Social Justice Program under the lead of professor and director Catherine Anderson.

55:43
Student ratio of females to males

3 of 5
Faculty deans who are women, Including engineering, humanities, and science

McMaster researcher **Karen Kidd and her lab** research the ways in which human activities affect freshwater and marine ecosystems.

Ensure availability and sustainable management of water and sanitation for all

Researchers warn of pharmaceutical pollution in waterways

McMaster's Karen Kidd, along with a team of international researchers, is raising alarms about the impact of pharmaceuticals contaminating rivers and lakes. These pollutants, which include antidepressants, antibiotics, and even everyday caffeine, pose significant risks to aquatic life, causing developmental and behavioral changes in fish and other species. The researchers are calling for more sustainable drug design and improved wastewater treatment to prevent further harm to ecosystems and water quality. By educating the public on proper drug disposal and investing in better water treatment, we can protect both wildlife and human health from the dangers of pharmaceutical pollution.

Driving change for global water access

Why do almost one billion people go without daily access to safe water? How does climate change affect water-borne illness? And why does half the world's population go without adequate sanitation? The **Water Without Borders** program at McMaster seeks to answer these questions and more.

New centre tackling water challenges

Work-integrated learning is a core component of McMaster's graduate **Global Health program** which requires students to complete a 10-week practicum to gain hands-on experience in the field of global health. Among the organizations where McMaster students gain this experience is Solidarity Engineering which works to provide basic needs like water, sanitation, and hygiene in places of disaster, conflict and displacement. McMaster student Dena Atallah **shared her experience** supporting this United Nations goal for asylum seekers in cartel-controlled cities along the U.S.-Mexico border, where she learned how to navigate the complex political situation while providing life-saving water, sanitation and hygiene interventions.

Collaborating for sustainable water solutions

McMaster spreads the word about good water management in a number of ways. McMaster Water Week celebrates water and related research in a community fair atmosphere with area organizations in a variety of fields. **The Rock Garden** in the Royal Botanical Gardens incorporates best practices in sustainable garden design and management, including pollinator-friendly species and drought-tolerant perennials that require less water.

Innovating sustainable water management

According to the **Facility Services Energy Management Plan** (2021/22), 28 irrigation systems operate on campus based on a schedule — not the most efficient way to operate, if the system waters the grounds while it's raining. A pilot project involving a 10-acre field used an advanced control system that tracks weather data to make adjustments to the schedule as needed. Thus far, the results have been promising.

200+ Free water refill stations throughout campus.

Stay hydrated, refill and reduce waste

More than 200 water stations on campus provide free, clean drinking water to students, staff, faculty and visitors. Water bottle refilling stations on campus have eliminated the use of more than 20 million water bottles since 2010.

Harnessing data for water security

The **McMaster University Centre for Climate Change** studies water resources and hydroclimate — vital research, considering the availability of fresh, clean water is expected to decline due to climate change. The **Spencer Creek Watershed** adjacent to campus offers a living laboratory for McMaster researchers to collect data and better understand how land use affects drinking water quality, lake health and biological ecosystems, from the creek to Hamilton Harbour and out into the Great Lakes.

Water is essential to all life

Water is necessary to all forms of life, and has been recognized by the United Nations as a fundamental human right that affects everything from physical and mental health to peace and security. As the home of the **United Nations University — Institute for Water, Environment and Health**, McMaster plays a crucial role in resolving water problems and ensuring all have access to this vital resource.

Exploring connections between race and water

Zahra Tootonsab, who is enrolled in the PhD program in the Faculty of Humanities' **Department of English and Cultural Studies**, is exploring the relationship between place and race, and what it means to live in a healthy environment. Her research focuses on water pollution in Canada and Iran, and how Indigenous knowledges in both places can help inspire environmental activism and promote water security. Tootonsab says she is making difficult connections and having difficult conversations about who we are in Canada and what our relationship is to the land, as well as what Indigenous knowledge can teach us about our relationship with water and the land. In 2022, Tootonsab received a Wilson Leadership Scholar Award.

McMaster researcher **Jim Cotton** is the founder of **HARvEST**, a novel technology that harvests and recycles waste heat to reduce greenhouse gas emissions in a cost-effective and scalable way.

Ensure access to affordable, reliable, sustainable and modern energy

Collaborating for a sustainable energy future

At a recent Energy Transition Workshop hosted by McMaster University and the First Nations Power Authority (FNPA), researchers, Indigenous communities, and industry leaders came together to explore pathways toward a cleaner energy future. The two-day event emphasized the need for meaningful engagement with Indigenous communities as Canada transitions to more sustainable energy solutions. Attendees discussed how renewable energy projects, such as replacing diesel in remote areas, can support both environmental and community development goals. By prioritizing collaboration and leveraging Indigenous knowledge, the workshop demonstrated the critical role partnerships play in building reliable, affordable, and clean energy systems that benefit all communities.

Advancing clean energy innovation

The mission of the **McMaster Institute for Energy Studies** (MIES) emphasizes the economic and environmental impacts of all stages in the energy process. MIES researchers come from the sciences, engineering, social sciences and business administration. Its areas of study include the development of semiconductor nanowires for solar energy, combining nano-technology, photonics and energy technology; affordably reducing the noise and vibration performance of vertical axis wind turbines for deployment in urban areas; increasing the power output of nuclear reactors, which will be used for electricity generation in Canada for decades to come; and fuel cells, the bridge to storing all the power produced by the sun and wind.

Harnessing renewable energy

Global energy demands are expected to double in the next 20 years, while the world struggles to reduce greenhouse gas emissions. The need to get every joule possible from renewable energy sources is clear. One tool may be advances in **high-power conversion systems**, as researched in the **Department of Electrical & Computer Engineering**. Even small improvements in efficiency can reap significant rewards when dealing with large-scale wind or solar farms — and potentially lower costs.

Shaping a sustainable energy future

As part of McMaster's commitment to a safe and sustainable campus, the university performed a study in 2020 to provide an analysis of the main campus carbon emissions and develop a plan for reaching the goal of net zero carbon emissions. The **Net Zero Carbon Roadmap** explores reducing greenhouse gas emissions and proposes altering methods of power generation, energy conservation measures for our buildings, electrification and heat recovery projects, and fleet transition to electric vehicles. Design strategies for new construction projects include high-performance building envelopes, efficient ventilation, and LED lighting with occupancy sensors. Renewable energy production using photovoltaic installations and carbon capture strategies are also potential future elements of the plan.

Unlocking grid potential for clean energy

Producing sustainable, clean energy from solar panels and wind turbines is part of the solution. The **Smart Grid Engineering Lab** lets future engineers study how that energy — often produced at different ranges than current methods — can be fed into existing power grids safely and efficiently without overwhelming the system. At the other end of the grid, the state-of-the-art facility can help determine how to best address the energy demands of electric cars and other emerging technology.

Driving green technology advancements

The swelling demand for renewable energy and the looming net-zero deadline set by the Canadian government mean that advancements in the creation and storage of low-carbon electricity are critical. **Drew Higgins**, an assistant professor of chemical engineering, and his team are hard at work at McMaster University to address those challenges – designing new batteries to store solar and wind energy, creating emission-conversion technology that uses electricity to convert carbon dioxide into useful fuels and chemicals, and pursuing other advancements to improve the supply of clean energy. Ultimately, the goal is to find ways to use renewable electricity to power things society needs.

Maximizing energy efficiency solutions

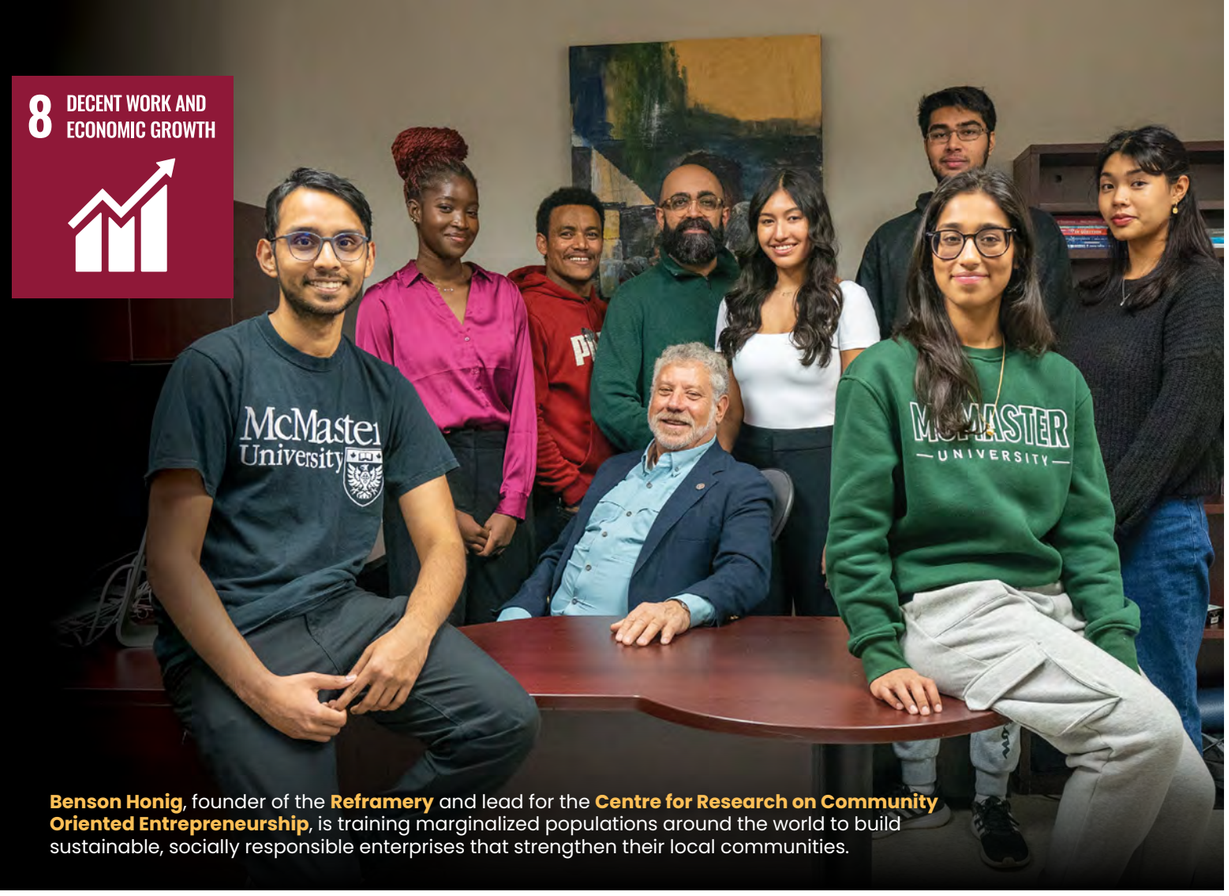
We lose as much as 70 per cent of the energy we produce in energy transmission through the electricity, natural gas and pipe oil pathways that supply our communities. Research by Jim Cotton in the **Department of Mechanical Engineering** is finding ways to take back that energy through harvesting heat, with sides of improved energy efficiency and reducing greenhouse gas emissions. Initiatives in integrated energy systems research include experimental and computational investigations of heat transfer, thermodynamics and fluid dynamics.

Tackling the energy storage bottleneck

When **Keena Trowell**, assistant professor of mechanical engineering, thinks about the conversation on climate change, she sees a crucial gap. Trowell's research explores a full transition away from a heavy reliance on hydrocarbon fuels, while taking on a "bottleneck" that she believes evades people's attention: the storage challenge. While batteries may be one of the first solutions to energy storage that come to mind, battery storage is a relatively expensive way to store energy and there isn't enough lithium to store energy on the scale needed to fully transition away from fossil fuels. She's researching a closed-loop process of using metals as the energy storage vector.

Fueling the future with clean power

The undergraduate **Power and Energy Engineering Technology** program is all about power — power quality, protection and control; energy management; and renewable energy technologies such as biomass, fuel cells, geothermal, solar and wind. This unique diploma-to-degree program is made for college graduates who wish to power up their education to the next level, as all qualified applicants receive two years' worth of advanced credit from their previously completed college diploma or university degree.



Benson Honig, founder of the **Reframery** and lead for the **Centre for Research on Community Oriented Entrepreneurship**, is training marginalized populations around the world to build sustainable, socially responsible enterprises that strengthen their local communities.

Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all

Equipping students with skills for the workforce

McMaster University's annual Student Staff Development Conference empowers student employees with the skills and confidence needed for success in the professional world. Through interactive workshops on networking, financial management, and personal branding, participants gain valuable career-ready skills. The event, hosted by the Student Success Centre and Human Resources Services, is part of a broader initiative to prepare students for meaningful employment, aligning with goals of fostering decent work and economic growth. By offering work-integrated learning and mentorship, the conference supports students in building lifelong employability skills, many of which lead to successful careers within McMaster and beyond.

3,600+ undergraduate co-op placements annually.

Empowering diversity in trades

Canadians may have noticed that during the pandemic it has been especially difficult to find a technician to look at their furnace or schedule an appointment to have their car repaired in a timely manner. McMaster University's Mojan Naisani Samani, a PhD candidate with the DeGroote School of Business, and Rick Hackett, Canada Research Chair in Organizational Behaviour & Human Performance, **propose a number of recommendations** to address the current shortage of tradespeople, such as removing obstacles to women and minorities entering the trades; providing more hands-on learning earlier in life to foster interest in the trades, and highlighting role models to show how rewarding a career in the trades can be.

Fostering inclusion at work

McMaster has been consistently recognized as one of Canada's Best Diversity Employers. The national list focuses on five employee groups: women; visible minorities; persons with disabilities; aboriginal peoples; and lesbian, gay, bisexual and transgender/transsexual peoples. The publication cited the university's efforts to help employees manage their work-life balance through flexible work options, ongoing employee development opportunities and subsidized memberships for the on-campus health club.

Improving labour conditions

The School of Labour Studies offers certificates, undergraduate and graduate programs for students seeking careers in law, community development, policy analysis, teaching, research and more. Members of the **faculty** seek answers to such questions as: How do national dreams propel migrant workers into global circuits of labour? What are the causes and ramifications of work injuries and illnesses among racialized precarious workers? And how do gender identity and sexual orientation affect worker experiences in non-metropolitan cities?

A global perspective

How is the world of work changing in a globalized world? What counts as work and who is a worker? What impact does extreme employment precarity have on the health and well-being of workers? Affiliated with the university's School of Labour Studies, the **Institute for Work in a Global Society** (WIGS) research group brings a social science perspective to issues of concern to paid and unpaid workers.

Digital innovation for entrepreneurs

From Brazilian women to aging sex workers in Kenya and other marginalized persons, Benson Honig has provided entrepreneurial training across the globe. Now, the DeGroote School of Business professor is taking a virtual incubator to Kenya to encourage new business opportunities for the region's multigenerational refugees and to promote cross-global engagement using enhanced digital techniques. Honig created the **Reframery**, a virtual incubator, in 2020 with long-time research collaborator and William Paterson University professor Ana Siqueira.

Raising labour ethics standards

McMaster is committed to the **International Labour Organization** (ILO), which promotes an end to oppression, exploitation and abuse of workers worldwide. Suppliers, subcontractors and licensees of the university are expected to comply with these standards, including an obligation to respect, promote and realize the principles of fundamental labour rights, freedom of association and the right to collective bargaining, the elimination of all forms of forced or compulsory labour, the effective abolition of child labour, and the elimination of discrimination against women.

Achieving pay equity

Pay equity and the concept of equal pay for equal work matter to McMaster. Collective bargaining ensures frequent pay equity checks for unionized staff, while faculty pay is analyzed annually to pinpoint — and eliminate — any systemic gender imbalance. On an equity related note, there has been a consistent year-over-year increase in the number of women among all employee groups and across most of the faculties at McMaster.

The **McMaster Nuclear Reactor** is more than just a research reactor. On top of supplying the world with medical isotopes and conducting research into clean, sustainable energy, it also trains the next generation of nuclear industry leaders.

Build resilient infrastructure, promote sustainable industrialisation and foster innovation

Closing the loop

There is 4.5 billion pounds of available recyclable vinyl materials in the United States and Canada each year and only 29 per cent is recycled effectively. The rest is left to languish in landfills. Creating a circular vinyl economy for PVC is an area of focus for McMaster University Associate Professor of Chemical Engineering, **Li Xi**, and **Kushal Panchal**, a McMaster Engineering grad, co-founder and president of **Oligomaster Inc.**, a sustainable solutions startup promoting research and innovation in the plastics and coating industry.

In 2024, the brand new, state-of-the-art McLean Centre for Collaborative Discovery for business is slated to open. The 10-storey building is targeting Leadership in Energy and Environmental Design (LEED) Gold certification.

ICE powering communities

The ICE-Harvest project — Integrated Community Energy and Harvesting Systems — pulls excess heat created by electricity generation and heat production at the community level, then redistributes it where and when it's needed through a combination of heat pumps and absorption chillers. The research, inspired by the project installed at the **Gerald Hatch Centre** will help communities to site, design, optimize and control ICE-Harvest systems to economically achieve greenhouse gas reduction targets and better manage the energy grid.

Resilient buildings

The **Gerald Hatch Centre** — a living laboratory for researching and applying sustainable building technologies as well as being a student centre for experiential learning — was built to meet a zero-net energy threshold and demonstrate its potential as a **standalone resilient facility**. The **Ron Joyce Centre**, the Burlington site of the DeGroote School of Business, is a LEED Gold certified building, demonstrating sustainable site development, water efficiency, energy efficiency, materials selection and indoor environmental air quality.

Innovation at McMaster's core

Located just east of the main campus, the **McMaster Innovation Park** (MIP) supports startups and scale-ups with a focus on life sciences and biotechnology; engineering and advanced manufacturing; and information and communication technology. A bridge between academia and industry, MIP is home to 70 companies, with more than 800 people working on-site. MIP helps students and industry transform ideas from vision to commercial reality, bolstered by the technical prowess of McMaster and other academic institutions.

Eco-friendly energy breakthroughs

The McMaster Advanced Control Consortium (MACC) brings together academics and industry to develop chemical processes that are environmentally friendly, socially acceptable and economical. Under the theme of Sustainable Design, MACC researchers are developing more sustainable processes to convert biomass, coal, natural gas, shale oil and nuclear energy into electricity, gasoline, diesel, methanol, dimethyl ether and hydrogen. While not yet in a position to satisfy power demands on a municipal scale, process innovations can reduce carbon dioxide emissions, improve thermal and carbon efficiencies, reduce fossil fuel consumption and increase profitability.

Greener logistics

The free shipping offered by many online retailers comes with a hidden price few shoppers are aware of when they click the Buy Now button — emissions from more delivery trucks, wear-and-tear on roads, traffic congestion and heavy vehicles through residential areas. **Elkafi Hassini**, a supply chain management expert with the DeGroote School of Business and head of the Smart Freight Centre at McMaster, is working to find ways to make ecommerce more efficient while taking less of a toll on communities. The Smart Freight Centre's $11-million, four-year initiative **CLUE: City Logistics for the Urban Economy** will see researchers at McMaster and its partners execute 24 projects to bridge the knowledge gaps in Canada's urban freight system.

Greenhouse goes green

A state-of-the-art greenhouse at McMaster University is being built keeping "green" in mind. The 11,400-square-foot greenhouse will be the first building on campus to use a **sustainable geothermal system** for heating and cooling. Another highlight of the design is climate-controlled spaces, with dedicated research and learning areas. Scientists will use the space to explore critical questions relating to plant survival in the face of adverse conditions and plant immunity, in addition to understanding how plants and microbes can collaborate to improve plant growth and minimize the use of fertilizers and pesticides.

70,000+ Number of cancer patients treated worldwide each year with medical isotopes produced by the McMaster Nuclear Reactor.

Jim Dunn, professor and director of the **McMaster Institute for Health Equity**, and a team of researchers from several fields of study are investigating the root causes of inequities found in health outcomes among countries and within nations.

Reduce inequality within and among countries

Building opportunities and connections

McMaster continues to support scholars at risk through the Scholars at Risk Program. Established in 2022, this program aims to support McMaster faculty, departments, and research centers in employing forcibly displaced researchers and scholars remotely and locally. This includes refugees, those displaced within their country of origin, or those living in conflict-ridden situations and at risk of violence. So far, seven scholars have been supported, including scholars from Ukraine, Afghanistan, and Palestine.

Understanding health inequities

The **McMaster Institute for Health Equity** promotes healthier, fairer lives for all by understanding and highlighting the underlying causes of inequity. At the global level, stark inequities are found in health outcomes between countries, but dramatic differences in health status and outcomes are also found within nations – even affluent countries like Canada. The institute draws on McMaster's strengths in interdisciplinary research, knowledge mobilization and community engagement and as one of the top universities in the world for health and medicine.

2,452
Credit-transfer students (an increase of 7.8 per cent compared to 2019-20) from 20 Ontario Universities and 20 Ontario Colleges of Applied Arts and Technology.

Accessible voting for communities

What impact could online voting have in Indigenous communities? This is a question that **Chelsea Gabel**, McMaster University associate professor and Canada Research Chair in Indigenous Well-Being, Community Engagement, and Innovation, and Nicole Goodman, associate professor of political science at Brock University, have sought to answer with their research. This involves working with Indigenous communities, incorporating guidance for research design, questions and project outcomes. Using this community-engaged research approach, Gabel and Goodman have found that online voting is appealing to Indigenous communities as a way of enhancing participation, self-determination and governance.

Understanding loss and grief

Ingrid Waldron, HOPE Chair in Peace and Health in the Global Peace and Social Justice Program, and Chandrima Chakraborty, professor in the Department of English and Cultural Studies and the Director of the **Centre for Peace Studies**, are creating spaces for marginalized communities to share their stories to better understand the loss and grief that racialized communities experienced during the COVID-19 pandemic. Their hope is that centering the voices and experiences of marginalized populations will lead to better public health responses.

Equity community of practice

The School of Nursing has created an Equity Community of Practice to build a community of staff and faculty at the School of Nursing dedicated to deepening and affirming their understanding of equity, the recognition of systemic social inequalities that create unfair structural barriers to equal opportunity and meaningful engagement.

Access is everything

McMaster's Access Program helps undergraduate students from underrepresented groups succeed, from the application process through to graduation. Those groups range from first-generation university students and older learners to racialized minorities or those from low-income families and neighbourhoods. The university's **Equity, Diversity and Inclusion Strategy** sets a course to champion the benefits of diversity and address persistent biases and inequities; and identify and implement best practices to achieve EDI goals by driving cultural, systemic and personal change. The confidential **Employment Equity Census Report**, which invites staff to help the university collect information to assist in decision-making, is in line with this strategy.

12 Black academics hired under a cohort hiring initiative announced in November 2020. The strategic initiative will accelerate McMaster's efforts to recruit and retain a diverse group of excellent teachers and scholars.

Advancing Indigenous health research

The **Indigenous Health Learning Lodge** works alongside the Faculty of Health Sciences towards creating a learning environment that is culturally safe – to work with humility to enable sustainable systems change and to advance the work around concepts of truth, reconciliation and anti-colonization with all aspects of Indigenous health and well-being. The lodge includes a research hub dedicated to advancing the Indigenous Health Initiative Strategic priorities. Namely, to lead and inform Indigenous health research at McMaster, support Indigenous and non-Indigenous researchers engaged in Indigenous health research, foster collaboration between researchers both on campus and with Indigenous community members, and work towards supporting self-determining, Indigenous health processes.

Canada Excellence Research Chair Laureate **Ali Emadi** and his team at the **McMaster Automotive Resource Centre** is making inclusive, accessible and sustainable transportation a reality.

Make cities inclusive, safe, resilient and sustainable

Housing improves health

Jim Dunn spent more than a decade studying Regent Park, the largest urban redevelopment project in Canadian history. He found clear evidence that people who are more satisfied with their housing and neighbourhood, and who feel safer and more secure, also enjoy improvements to their overall health. Dunn is the Director of the McMaster Institute for Health Equity, and the Senator William McMaster Chair of Urban Health Equity. His latest work is as the director of the **Canadian Housing Evidence Collaborative**, an ambitious new pan-Canadian research network that brings together researchers, policymakers and individuals with lived experience from across Canada to tackle the complex issues involved in making safe, healthy housing affordable for all Canadians. The network was created to support the National Housing Strategy, a 10-year federal initiative that aims to cut homelessness in half and create housing for those with the greatest need — women and children fleeing abuse, Indigenous youth, people working through mental health conditions or addictions, and others who are marginalized or vulnerable.

Predictive models help protect cities from climate damage

Cities can use artificial intelligence to protect critical infrastructure against climate change and save on costs from extreme weather like floods and wildfires. McMaster engineering researchers are using machine learning to predict the impact of climate change and devise ways to enhance climate adaptation and resilience. Their research also features evolving virtual models, based on real data and testing, which can predict how the physical version of the model will be affected.

Moving a greener way

Riding the bus is great. Riding an electric bus is even greater. A project led by **Moataz Mohamed**, assistant professor of civil engineering at McMaster University, was awarded federal funding in 2022 to develop educational tools and promote best practices to support **zero-emission vehicle (ZEV) fleet adoption awareness in transit**. Natural Resources Canada announced the $101,775 investment among several projects to reduce pollution from the transportation sector. The McMaster University project will result in the first Canadian interactive information portal for ZEV adoption in transit. The investment, Mohamed said, will help move more than 22 million Canadians in a greener way across hundreds of thousands of kilometres a day.

Art equals creativity

Coins, antiquities, paintings, sculpture, maps — the **McMaster Museum of Art** houses more than 6,000 objects that illustrate the history of art from the late 15th Century to the 21st Century, including a carefully curated collection of Canadian art. The museum offers free lectures, workshops and guided tours for the public for all ages. McMaster's four on-campus **libraries** — Mills Library, Innis Library, H.G. Thode Library and the Health Sciences Library — and their study zones and learning spaces, physical and **digital**, are also fully open to the public without charge. Aside from traditional services, historical archives from cultural figures and collections of rare books, the libraries offer space for podcasting, digital production and a makerspace with 3D printers, laser cutters and other tools for creating.

250+

Students and researchers at the McMaster Automotive Resource Centre are looking for sustainable, inclusive transportation solutions that will change the way we move.

A nature-rich campus

McMaster University is woven deeply into the fabric of the community. The campus sits on 141 hectares in Hamilton, Ont. — the City of Waterfalls — in a **nature-rich setting** of waterfalls, valleys, meadows, wetlands and forests. The 12-hectare central core of campus is largely reserved for pedestrians and cyclists. The campus is part of a natural trail system managed by the Royal Botanical Gardens and the Conservation Authority. Public art, performances and cultural events are available to the public throughout the year, along with free access to historic buildings, archives, botanical and scientific collections.

Next generation of inclusive mobility

Each person in a community faces unique barriers to safe, efficient and accessible travel. And many of the current transportation systems fail to meet all three of these goals. But it doesn't have to be that way. McMaster researcher **Ali Emadi**, a global expert on vehicle electrification and smart mobility, is determined to build a more inclusive transportation system that is safer, more equitable, more reliable and more sustainable. And he's teamed up with industry partner Cubic Transportation System to do just that.

The power of connection

The Indigenous Circle — Karahakon Kateweienstha (Learning in the Forest) in Mohawk, and Nibwaajkaawin Teg (Place of Wisdom) in Ojibway — was created under the guidance of McMaster's Indigenous Education Council. Featuring tiered stone around a stage in the form of a medicine wheel, the space represents the interconnectivity of all beings. The area demonstrates the role nature and outdoor spaces play in teaching and learning and signifies the importance of Indigenous knowledge to the growth of the McMaster community. The circle also hosts performances, ceremonies and meetings.

Fostering sustainability

With a campus that places a priority on pedestrians, it's only natural that McMaster should encourage sustainable commuting for the entire campus community. Students receive free bus passes for the school year, and transit links on campus connect McMaster to Hamilton, Toronto, Niagara and points beyond. The campus serves as a hub for a city-wide bike-share program, which offers students a discounted membership. To reduce the number of cars coming to campus, the university has a carpool program that provides designated parking spots, as well as the opportunity to split the cost of a parking permit between multiple users.

McMaster researcher **Keena Trowell** left her career as a designer when she realized that she wanted to do more to solve the climate crisis. Now, she's helping to power the next generation of clean energy.

Ensure sustainable consumption and production patterns

The promise of renewable energy

Mechanical engineering professor Keena Trowell and her team are investigating ways to take renewable energy like hydrogen and make it in a way, based on water-metal reactions, that can be easily moved around. Trowell, a member of the McMaster Institute for Energy Studies, argues that metal fuels could be part of Canada's solution to decarbonizing its energy supply and could be traded on the global energy market as oil, coal and natural gas are traded today.

Family ties build better cars

A collaboration among McMaster researchers, industry partner Nemak and the federal government's CanmetMaterials Technology Laboratory (CMAT) has resulted in the development of a new family of alloys that bonds aluminum with iron to create a high-strength material at least 35 per cent lighter than a traditional aluminum alloy. McMaster's Sumanth Shankar, professor of mechanical engineering, and Xiaochun Zeng, research scientist, share credit for the invention of the material. The **new die casting alloy** is anticipated to bring value to the automotive industry as it searches for novel and cost-effective ways to reduce vehicle mass and move the industry toward greater sustainability.

Leaders in training for sustainability

Sustainability efforts on campus are bolstered by the growing number of students enrolled in some of the innovative academic sustainability programs offered at the undergraduate and graduate level. McMaster's Interdisciplinary Minor in Sustainability offers more than 70 courses from faculties across campus. The Sustainable Future Program provides students with opportunities for interdisciplinary, student-led, community-based and experiential education focused on sustainability. The student-led projects — which tackle everything from waste management practices to promoting a bike buddy program — are tagged in the program's **annual report** with the SDGs they connect with the most.

25% of materials on campus recycled/reused

26.9% of materials on campus composted

Energy harvesting and reuse

Jim Cotton is a mechanical engineer who's using his research to develop thermal and electrical systems that allow harvesting and sharing of energy that would otherwise be wasted. Cotton's Integrated Community Energy and Harvesting **(ICE-Harvest)** systems embed integrated thermal and electrical generation, as well as storage, within communities, so they can be powered, heated and cooled in a way that's cost-effective and carbon-reduced. ICE-Harvest captures waste heat from various parts of the community, like sports arenas, grocery stores, and big box centres, and transfers this energy to other buildings.

New pathways for tech waste

McMaster's ACCESS Tech IT Collection, Reuse, and Donation program accepts computers, smartphones, tablets and other technology from staff, faculty members and students. These items, that otherwise would end up in landfill, are wiped and refurbished for donation for those in need in partnership with a local non-profit. For the technology not suitable for donation, McMaster partners with a local business to safely recycle and dispose of the item. The program holds an annual technology collection event and free pick up of technology, organized by program collaborators including Academic Sustainability Program students and McMaster staff in Facility Services and University Technology Services. The university's libraries also offer recycling bins for batteries, electronics and writing tools such as pens and highlighters. In 2018, McMaster diverted more than 8,500 pounds of electronic waste away from landfills through recycling, a three-fold increase year over year.

One industry's waste is another's green product

For **DeGroote School of Business** marketing professor **Devashish Pujari**, sustainable packaging goes well beyond getting rid of single-use plastics. Part of an interdisciplinary research team, Pujari is currently investigating how companies can move to a circular economy model, in which nothing goes to waste.

Compostable hospitality on menu

Dining facilities at the university use compostable cutlery, coffee cups, paper straws and take-out containers. Products are clearly labelled as compostable to encourage users to dispose of them in organic waste bins across campus. In 2019, **Hospitality Services** added 194,000 compostable coffee cups and eliminated 1.3 million pieces of plastic cutlery. Also, disposable napkins used at campus facilities are made from 100-per-cent post-consumer recycled paper and are fully compostable.

Promoting ethical business practices

McMaster was an early adopter of a policy to ensure that suppliers of goods to the university conduct their businesses ethically. The **Code of Labour Practices** demands they pay dignified living wages, treat women equally, and safeguard health and safety. As well, as one of the first Canadian universities to be a signatory to **The Okanagan Charter**, McMaster has used this collective, international benchmark to promote the health of people, places and our planet.

More than 100 students and community volunteers traveled to the **McMaster Carbon Sink Forest** for a tree planting event earlier this year. The model forest is used to monitor how much carbon dioxide is being pulled out of the atmosphere by each tree to help mitigate the impacts of climate change.

Take urgent action to combat climate change and its impacts

Tackling greenhouse gas emissions in health care

The health care sector in Canada is responsible for 4.6 per cent of Canada's total greenhouse gas emissions, recent studies show. Myles Sergeant, assistant clinical professor in the Department of Family Medicine and McMaster's postgraduate medical education lead for sustainable health care, says solutions must come from the supply chain. "Our sector needs to focus not just on the cost or quality of a product; we need to push our suppliers to be transparent about their carbon footprint, enforce procuring from sustainable suppliers and also make changes to adopt a circular economy." An example of the circular economy is purchasing washable, reusable medical gowns that are created once and used 80 times, says Sergeant, who is executive director of the Canadian Coalition for Green Health Care.

Delivering climate change solutions

The **McMaster University Centre for Climate Change** connects science, technology and policy to deliver a broad range of local and global climate change solutions. Aside from understanding the impact of climate change, the centre's goals include exploring perceptions of and responses to climate change, encouraging the application of science in meeting it head-on and developing public policies to meet societal challenges caused by future climate change.

Community collaborations on climate

In Canada's Arctic, the safety of Inuit and northerners depends on sea ice, and the movements of fish and caribou are part of daily life. In this environment, the effects of climate change are glaringly evident. But policymakers don't always have the information, resources or will to consider the community's experiences of climate change. Geographer Gita Ljubicic and her cross-disciplinary team at StraightUpNorth are closely involved with local communities, co-creating solutions that pair social and environmental research, and Inuit and scientific knowledge in decision making.

Cleaning up international waters

A new global centre focused on climate change promises to address complex water crises that span international boundaries and jurisdictions. Co-led by Gail Krantzberg, professor and program lead from McMaster's Masters of Engineering and Public Policy Program, and Drew Gronewold from the University of Michigan, the **Global Centre for Understanding Climate Change Impacts on Transboundary Waters** will bring to the forefront diverse perspectives on governance structures, organizations and management strategies.

Bolstering sustainable transportation

Climate change and environmental emissions are intertwined with economic prosperity and must be considered for the sustainability of the transportation industry and the planet. The **McMaster Institute for Transportation and Logistics** (MITL) is a non-profit organization of private and public-sector investors that works with business and government partners to address challenges and brings together the resources, expertise and experience the industry desperately needs. The MITL's key focus areas are research, education and outreach.

Campus as a sustainability lab

Transforming McMaster's campus into a living laboratory for sustainability is a university priority. Our focus on environmental sustainability runs through every part of the university, from innovative teaching and research to the campus environment and operations. Each year, we publish **a snapshot** of these collective measures to advance environmental sustainability within our institution, the communities that surround us and around the world. **McMaster's Sustainability Strategy** was developed through an engagement process with input provided by students, faculty and staff.

Investing in united climate action

McMaster has pledged with several other leading Canadian universities to work together on climate change initiatives across invested assets, as part of **Investing to Address Climate Change: A Charter for Canadian Universities**. It agrees to incorporate environmental, social and governance factors into investment practices, and to regularly assess the carbon intensity of portfolios and set targets to reduce them. The university has also signed the **United Nations Principles for Responsible Investments**, committing to transparent measurement, carbon-reduction goals and reporting. As part of responsible investing practices, McMaster has pledged a 45-per-cent carbon reduction of the public equities within the investment pool by 2030.

Advanced sensors decode forests

The forests in eastern North America and around the Great Lakes form a natural carbon sink, meaning they absorb more carbon dioxide from the atmosphere than they release. Geographer Altaf Arain uses advanced sensors to monitor the energy, carbon dioxide and water fluxes, temperature, soil moisture, tree height and diameter of trees at Turkey Point Observatory to determine which trees and forests are the most resilient in changing environmental conditions. His work here is part of a number of national and international networks that monitor crucial ecosystems. such as North American Carbon Program, Global Fluxnet and Global Water Futures. The data also informs Arain's climate and hydrologic modelling research, which uses advanced technology to discern patterns that help predict climate change.

Sarah Dickson-Anderson, professor of engineering, and her students are advancing research that emphasizes water security in rural, remote and Indigenous communities.

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Using the world's oceans for carbon removal

Chemical engineering associate professor Charles de Lannoy and postdoctoral fellow Bassel A. Abdelkaderi are collaborating with researchers at the University of Toronto to test promising technologies to de-acidify the oceans and sustainably remove CO2 from the atmosphere, safely storing it in water. The carbon removal process technology offers a more cost-effective solution to existing methods, and may pave the way for scalable, affordable CO2 removal.

Arctic communities empowered

McMaster and Ottawa's Carleton University are home to the **OceanCanada Arctic Ocean Working Group**, which covers Canada, Denmark, Norway, Sweden and the United States. The group's key goal is the empowerment of community voices in the Arctic region, developing policy-relevant recommendations for protection, conservation and management of coastal and ocean resources. The **United Nations University Institute for Water, Environment and Health** — based out of McMaster — is also a member of OceanCanada.

Solutions to wildfire run-off

Wildfires burn an average of 2.5 million hectares of Canadian forests every year. After a fire, ash and other organic materials end up in source water, threatening the drinking water of nearby communities. Civil engineering professor **Sarah Dickson-Anderson** and her partners at the University of Waterloo have found that organic filters composed of sand coated with a living layer of microbiological material can effectively remove ash and other dissolved organic matter from drinking water after wildfires.

Water paradise is home-based lab

Researchers in the Faculty of Science use the **Cootes Paradise Marsh** — a 600-hectare marshland at the western edge of Hamilton Harbour — as a living laboratory to explore the impact of effluents and treated wastewater on aquatic life in the marsh. The team hosts information sessions in partnership with the Royal Botanical Gardens to increase public knowledge of water quality and raise awareness of research findings.

Fish science unveils behaviour evolution

The **Aquatic Behavioural Ecology Lab** (ABEL) investigates the evolution of complex breeding systems, social behaviour, reproductive tactics and decision-making in animal societies, primarily using fish as subjects. Like humans, fish are vertebrates, and make good comparative model species to try to uncover the evolution of behaviour. As well, there is a great deal of economic interest in fish as a food resource, as a recreational sport and aquarium hobby. ABEL's three main field locations are Lake Tanganyika — the second deepest lake in the world — in the East African Rift valley; Hamilton Harbour and Lake Ontario; and beaches in the Pacific Northwest.

Past history informs fisheries trends

The **Fisheries Archaeology Research Centre** investigates long-term trends in fisheries production resulting from environmental change and human exploitation. The work helps address current concerns with global climate and environmental change and the effects of over-fishing in different parts of the world. One major ongoing research program monitors 10,000 years of fish and shellfish use on the coast of British Columbia. A second major area of ongoing research concerns the effect of human colonization in Polynesia on the production and productivity of reef fisheries.

Wetland ecosystems, species at risk

iWetland, out of the McMaster Ecohydrology Lab, draws information from automated and crowdsourced monitoring stations in the Georgian Bay Biosphere Reserve, the world's largest freshwater archipelago. Working with provincial parks and First Nations communities, the team hosts events to raise awareness of wetland ecosystems, species at risk and the iWetland citizen science initiative. It also installed a weather station in the Magnetawan First Nation, training MFN staff to operate the equipment.

Water security across two decades

The United Nations University Institute for Water, Environment and Health (UNU-INWEH), hosted at McMaster, is one of 13 UN universities and think tanks aimed at resolving pressing global concerns — in this case, water security. UNU-INWEH, which has been in operation for more than 25 years, is helping to bridge the gap between research and policy in the quest to make a difference in the lives of billions. It promises to continue to offer new insights, tools and solutions as the United Nations projects global water demand to increase by more than 50 per cent by 2040.

Small materials hold big answers

A team of researchers in the department of chemical engineering is looking for solutions to large environmental problems using very, very small materials: nanoparticles. One project is a Global Water Futures initiative to resolve the issue of **water quality** on Six Nations of the Grand River. Along with analyzing the contaminants in the water, they're developing nanocomposite membranes that not only filter water, but also resist getting clogged with biofilms, bacteria and other foulants.

McMaster researcher **Pat Chow-Fraser** studies the impact of human activities on the ecological health of aquatic ecosystems, especially coastal wetlands and tributaries of the Laurentian Great Lakes.

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss

Citizen scientists, AI experts and researchers join forces to find fish

Biology professor Pat Chow-Fraser and PhD student Danielle Montocchio from the Wetlands Ecosystem Research Lab used to wield nets to study fish off Georgian Bay. Now they've enlisted volunteers, artificial technology and underwater cameras to study fish who've been staying in deeper water because of swings in water levels caused by climate change. The monitoring research is being used to help protect a fragile coastal wetland from development.

Bee-utiful buzzy pollinators

McMaster is proudly home to over 75 solitary bee homes and counting! In 2021, students from a third-year Academic Sustainability Program class project (SUSTAIN 3S03 – Implementing Sustainable Change) successfully supported McMaster's application to become a certified Bee City Campus. McMaster SUSTAIN students and Facility Services are committed to continue protecting pollinators by adding new elements to bee-related projects on campus yearly. When people think of bees, they often think about the honeybee. But a group of McMaster students, staff and researchers are hoping that a new **bee nesting garden** on McMaster's campus will make people think about native bees and the huge impact they have on our planet.

Planting a healthy future

The McMarsh project was initiated several years ago as a university-wide collaboration aimed at restoring an ecologically sensitive wetland located on Parking Lot M in the west campus. McMarsh is a further expansion of a 30-metre buffer that was established around Parking Lot M in 2017 when 140 native trees and shrubs were planted where paving was removed to reduce the amount of runoff into nearby Coldwater Creek. McMarsh is now part of a larger project which is reimagining a broader portion of the west campus. The Watershed Trust is currently being co-led by the Faculty of Humanities and the Faculty of Science and allows for opportunities for experiential learning and integrated campus community projects in this area of the campus. Plans for McMarsh are currently being reviewed and the Watershed Trust initiative will be explored in more detail through the Campus Master Planning process to begin in the coming year.

Lessons from the land

Geographers at the School of Earth, Environment and Society are investigating how **forest ecosystems** in southeastern Canada function and respond to climate change and extreme weather conditions. Extensive land use changes, agricultural activities and forest harvesting in the Great Lakes region are putting pressure on water resources, as are more frequent extreme weather events and climate change. Funded by a Global Water Futures grant that supports a multidisciplinary team of researchers from multiple universities and other collaborators, the project is intended to help guide municipalities and conservation authorities in developing watershed management strategies to account for shifts in land use and climate change.

One tree at a time builds a forest

According to the Campus Sustainability Assessment Framework, there are about **5,000 trees** on the main campus, not including the woodland property that surrounds the campus. The university commits to planting new trees every year, often on planting days that bring together community members and students. McMaster typically plants more than 200 trees a year through facilities and student initiatives. All of the trees varietals on McMaster's campus are mapped using geolocation.

Noise pollution and species health

A team of Canadian researchers, that includes McMaster University experts, are studying how boat noise affects ocean toadfish in their near-shore habitats. The team found significant differencess between fish behaviour in response to noise in the lab and in the field — differences that might have led strictly lab-based researchers in the wrong direction. As researchers work to understand how humans impact animals and their natural habitats, such as the impact of noise pollution on species, it's critical that the data they use to make these assessments have ecological validity, says **Sigal Balshine**, a professor in the Department of Psychology, Neuroscience and Behaviour at McMaster and a study author.

Drier peatlands raise fire risk

International research led by **McMaster scientists Mike Waddington and Manuel Helbig** has pinpointed dramatic differences in the ways boreal forests and peatlands regulate water loss. The problem is, most global climate models assume all biome is trees, not the spongy bogs and fens of peatlands, which are prone to drying out as the climate warms. Drier peatlands mean bigger, more intense fires that can release vast amounts of carbon into the atmosphere, accelerating global warming.

The forest as a learning environment

The 46-hectare **McMaster Forest** has been designated by the McMaster Senate and the Board of Governors as environmentally significant natural land to be used for ecologically sensitive teaching, research and recreation purposes. It is an incredibly biodiverse area of mixed forests, old-growth forests, wetlands, meadows, creeks and prairie. Many undergraduate courses use the property, and it's the site of undergraduate and graduate research projects. The public is welcome to visit the forest.

McMaster's Centre for Human Rights and Restorative Justice, founded by **Bonny Ibhawoh**, is a research centre dedicated to the multidisciplinary and transnational study of human rights and restorative justice processes around the world. It aims to address historical atrocities and contemporary human rights violations.

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Seeding societal impact through collaboration

McMaster has created the Societal Impact Academy to foster research and knowledge creation, mobilization and exchanges to shape responsible, ethical impact in society. The initiative features seed grants to support meaningful campus-society collaborations across disciplines, a luncheon series highlighting community and research partnerships, pitch competitions aimed at graduate students to showcase the positive impact of their research, and a resource network designed to bring communities who conduct work with societal impact together.

Peace and Reconciliation Network

Olive Wahoush, Associate Professor in the School of Nursing at McMaster University, is co-lead for the Teaching and Learning working group of the **Commonwealth Peace and Reconciliation Network**. The network brings together an interdisciplinary collective of academics, researchers and professional staff from more than 40 universities across the Commonwealth who work in the fields of peace, truth, justice, and reconciliation. Knowledge, capacity and resources can be shared through the network to engage in activities that have a direct impact on university practice and the wider world.

Examining war and violence

The interdisciplinary **Peace Studies** program is concerned with war and peace, violence and non-violence, conflict and conflict transformation. By focusing attention on problems of conflict, particularly of a violent nature, researchers attempt to improve our methods of analyzing and dealing with these problems. The university also hosts the Hope Chair in Peace and Health. As well as teaching and conducting research, the chair works collaboratively to establish on-campus and community events and programs.

Collaborating with our neighbours

McMaster University has a main campus in west Hamilton bordered by three residential neighbourhoods and multiple sites in the heart of downtown Hamilton, in Burlington and other communities. Therefore, strong working relationships between McMaster and its surrounding communities are paramount to supporting the vitality and well-being of the university and greater Hamilton area. The President's Advisory Committee on Community Relations provides an open forum for respectful dialogue and ongoing collaboration between the university and our neighbours. As part of the Hamilton Anchor Institution Leadership, McMaster collaborates with the city's other large public- and private-sector members to address Hamilton's complex challenges.

$800,000

Funding pledged in 2022 by McMaster University to seed two new funds that will help students and scholars at risk around the world, including in Afghanistan and Ukraine, among other countries.

Democratic innovations shared globally

Participedia: A Global Partnership to Create and Mobilize Knowledge About Democratic Innovations examines public participation in governance and what forms work best for specific problems and issues, under specific circumstances. The research team, which includes McMaster Chair of Global Human Rights Bonny Ibhawoh as a co-investigator, aims to map this rapidly developing domain of political innovation to create the information base necessary for high-quality research and evidence-based public policy practice.

Future sustainability leaders

Paris Liu, a McMaster Engineering graduate and former president of **Zero Waste McMaster**, attended COP27 as a student delegate. She joined students from all over the world as they reviewed progress from COP26, moved talks beyond negotiations and looked to begin implementing solutions that will reverse the effects of climate change.

Monitoring global human rights

In his **role as chair** of the UN Expert Mechanism on the Right to Development, **Bonny Ibhawoh** — who holds the university's Chair in Global Human Rights — works to monitor, evaluate and report on conditions around the world related to the rights of individuals and countries to freely enjoy economic, social, cultural and political progress.

Training the next generation of leaders

A new generation of Canadian leaders will be provided with the tools they need to tackle Canada's most complex issues thanks to the ongoing support of former McMaster chancellor L.R. Wilson. The newly founded **Wilson College of Leadership and Civic Engagement** features a unique curriculum nested in the faculties of Humanities and Social Sciences and crossing multiple fields of study. Every student will take part in experiential learning opportunities, including internships and other placements, where they will work with public and private sector leaders.

Advancing research and innovation is at the heart of a new partnership between **McMaster and the University of Liverpool**. The two research-intensive universities have launched a $500,000 seed fund that will support collaborations in areas of complementary research strength, including health research across the life stages and research and development in port design and sustainability.

Strengthen the means of implementation and revitalize the global partnership for sustainable development

Dialogues explore key global challenges

The new McMaster Dialogues discussion series is aimed at bringing together experts, students, faculty and staff for roundtable talks on key global challenges. The inaugural discussion, facilitated by Bonny Ibhawoh, vice-provost, International, focused on how to enhance multilateralism for international peace and security in an increasingly conflicted world. Panelists included Lisa Schwartz, professor of Health Research Methods, Evidence & Impact; Rick Monture, professor of Indigenous Studies; and Don Abelson, academic director, Wilson College of Leadership and Civic Engagement.

Improving global health systems

Now in its 13th year, the **McMaster Health Forum** is designated as the WHO Collaborating Centre for Evidence-Informed Policy. The Forum's goal is to generate action on the pressing health-system issues of our time. It strengthens health systems — locally, nationally and internationally — and gets the right programs, services and drugs to the people who need them.

Technology uncovers the past

A team of researchers is using modern tech to uncover new insights into settlement patterns, farming and economic practices of ancient Mayan settlements dating back more than 1,000 years. Using high-resolution airborne light detection and ranging technology, researchers analyzed large sites in the Upper Usumacinta River basin of Mexico and Guatemala to uncover ancient dams, irrigation channels and other patterns formed by farmers centuries ago. **Shanti Morell-Hart**, an associate professor of anthropology at McMaster and co-author of the study, said her team will conduct additional excavations in upcoming field seasons to recover botanical residues from ancient artifacts, fields and trash pits. They will collaborate with researchers from other universities who are tracking warfare, water management and the origins of Maya cities.

McMaster has student exchange agreements with more than 90 postsecondary institutions worldwide.

Water think tank

McMaster is the only university in Canada to serve as host and partner to a United Nations University through the **Institute for Water, Environment and Health** (UNU-INWEH) which acts as the UN think tank on water. Researchers at McMaster play a key role in Global Water Futures (GWF), a collaboration driven by four major institutions to transform the way communities, governments and industries in Canada and other cold regions of the world prepare for and manage increasing water-related threats. GWF is the largest university-led freshwater research program ever funded worldwide, in part with a $77.8-million grant from the Canada First Research Excellence Fund. In 2020, GWF extended funding for two McMaster projects and awarded three new projects funding for a total of $2.4 million. The UNU-INWEH recently received a $10-million funding extension from the Canadian government.

Teaming up for change

MacChangers pairs multidisciplinary teams with community members to propose innovative solutions to challenges facing Hamilton, as well as the global community. The non-credit program welcomes students from all faculties to share their expertise and there is no cost to enroll. In alignment with the city's 25-year community vision, past projects include developing a resource hub for housing needs; closing gaps in the cycling path between the university and the downtown core; and reducing exposure to open-air secondhand smoke by promoting a smoke-free section along King William, a popular restaurant row.

Pandemic preparedness collaborations

McMaster launched the **Global Nexus** to ensure Canada and the world are better able to manage the human and economic devastation of COVID-19 and avert future pandemics. Led by McMaster researchers from many disciplines, the Global Nexus is developing an international network of scientists, clinical health and medical specialists, engineers, social scientists, history and policy researchers, economics and business experts devoted to one goal: preventing future pandemics and mitigating global health threats like antimicrobial resistance. The innovative network has garnered international attention, as well as government and philanthropic support, throughout the pandemic.

Prioritizing global education

The **McMaster Global annual showcase** turns the spotlight on the university's mission to make global engagement in education and sparking ideas an integral part of its presence in Canada and the world. A host of free activities, lectures and workshops are open to all. McMaster Global is engaged in international partnerships that involve research collaboration, faculty exchanges, student exchanges and mobility agreements and joint supervision of doctoral students.

Supporting collaborative research

A new partnership between McMaster and the University of Birmingham has led to the creation of a seed fund that will support collaborative research projects at both institutions. The **BIRMAC Project and Ideas Fund** will help fund nine collaborative, interdisciplinary research projects in fields of study ranging from age-friendly communities and urban sustainability to quantum materials and entrepreneurial support for refugees.

University Impact Rankings for the SDGs

Established in 2015, the United Nations Sustainable Development Goals set out a vision for countries and institutions worldwide to come together in a concerted effort to end poverty, reduce inequalities, improve health and education, and advance sustainability and economic growth while addressing climate change.

In 2019, Times Higher Education introduced its Impact Rankings, which measure universities' contributions in support of the UN SDGs. In 2024, McMaster University **ranked 30th globally** out of 1,900 universities from around the world, demonstrating McMaster's commitment to advancing human and societal well-being locally and globally.

Sustainable Development Goals and Rankings

SDG 1: No Poverty
28th in the world and **6th in Canada**

SDG 3: Good Health and Well-Being
15th in the world and **1st in Canada**

SDG 6: Clean Water and Sanitation
7th in the world and **1st in Canada**

SDG 9: Industry Innovations and Infrastructure
53rd in the world and **4th in Canada**

SDG 10: Reduced Inequalities
35th in the world and **2nd in Canada**

SDG 12: Responsible Consumption & Production
35th in the world and **5th in Canada**

SDG 17: Partnerships for the Goals
27th in the world and **1st in Canada**

McMaster is a university with impact

We are **ranked among the top 30 universities globally for impact** and, through our cutting-edge research and world-class teaching and learning, we are advancing human and societal health and well-being in our community and around the world.

As the birthplace of problem-based learning, we have a rich history of educational innovation. Ranked among **Canada's most research-intensive universities**, we work across disciplines to find creative solutions to complex problems, helping to improve people's lives and build a brighter future for all.

McMaster University | Brighter World

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