

McMASTER UNIVERSITY

# Sustainable Development Goals

REPORT | 2023

SUSTAINABLE  
DEVELOPMENT  
GOALS



*Pat Chow-Fraser  
Faculty of Science Research Chair in Great Lakes Ecosystem Health Indicators*



## 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.

### LAND ACKNOWLEDGMENT

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.

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RESEARCH:



ENGAGEMENT:



TEACHING:



OPERATIONS:







Gina Agarwal, Canada Research Chair in Vulnerable Individuals in Primary Care, is reducing the impact of poverty on older adults with a program that brings paramedics to their apartments for regular checkups.

## End poverty in all its forms everywhere.



### Supporting 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.



### Better health 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.



### Research in precarious employment

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 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.



### Letting voices be heard

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.



### Goals for 2030

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).



### No one goes hungry

No one should have to decide between paying the electricity bill, buying a warm coat and boots for winter, or eating three meals a day. Or two. Or one. The student-run **Food Collective Centre** is dedicated to ensuring that food is always accessible to support food-insecure individuals. Its goals includes cultivating stronger food systems on campus and in the surrounding community, and advocating for best practices to improve food security.



### The need to feed everyone

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.



### Urgent monetary 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.



“Meat production right now is not sustainable. There has to be an alternative way of creating meat.”

Ravi Selvaganapathy, Canada Research Chair in Biomicrofluidics



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

2 ZERO HUNGER



### High steaks

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.



### Foodies on 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.



### Where the green grass grows

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.



### Collective nutrition

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.

3.7M

MEALS SERVED ON CAMPUS

43%

LOCAL PRODUCE PURCHASED BY HOSPITALITY SERVICES AT McMASTER



### Global warming effects

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.



### Think globally, act locally

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.



### Share the love

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 would be donated to an initiative that enables students to privately access groceries on an as-needed basis.

24/7

THE McMASTER COMMUNITY FRIDGE IS OPEN AROUND THE CLOCK, 365 DAYS OF THE YEAR TO HELP STUDENTS AND COMMUNITY MEMBERS FACING FOOD INSECURITY



### Fighting campus hunger

McMaster University students in SUSTAIN 3S03: Implementing Sustainable Change worked with the McMaster Student Wellness Centre, MSU Food Collective Centre and others to install the **McMaster Community Fridge**. Stocked by community monetary and in-kind donations, the fridge offers accessible, nutritious and free produce, packaged meals and other food staples. It is open 24/7 for anyone to access. According to a survey by Meal Exchange Canada, two in five Canadian university students experience food insecurity. The study also found that food insecurity negatively impacted the physical and mental health of students, re-emphasizing the importance of initiatives like the community fridge.



### Good food, good mood

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.





Dawn Bowdish, Canada Research Chair in Aging and Immunity, is spearheading multiple research projects, among which include better understanding the short- and long-term impact of COVID-19 on the immune system.



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

**3** GOOD HEALTH AND WELL-BEING



### Preventing the next pandemic

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 new **Global Nexus School for Pandemic Prevention & Response** leads cutting-edge research and is training the next generation of scientists and scholars in the fight against infectious disease outbreaks. The school 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.

**1<sup>st</sup>** IN CANADA IN THE TIMES HIGHER EDUCATION'S IMPACT RANKINGS FOR SDG 3. NUMBER 12TH IN THE WORLD.

**36<sup>th</sup>** IN THE WORLD FOR CLINICAL AND HEALTH PROGRAMS (TIMES HIGHER EDUCATION)



### Development across the globe

The UN Sustainable Development Goals are fundamental to the work of McMaster's **Global Health Office**, which connects researchers, educators, students and clinicians with global development organizations and funding agencies. For the last decade, the Global Health Office has formed partnerships with institutions and governments in developing countries — advancing the education of female health professionals in Pakistan, improving the health of vulnerable people in Indonesia, and increasing access to health education in underserved communities in the High North regions of Canada and Norway. Educational partnerships for the Doctoral and Master of Science in Global Health span five continents. Research areas include data science, health equity, pandemic planning and infectious disease, and refugee health and humanitarian crises.



### Treating cancer with nuclear medicine

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.



### Evidence-based health

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



### Health and longevity in the golden 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.



### Global health outlook

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.



### Cultural health safety and reconciliation

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.



Vanessa Watts, Paul R. MacPherson Chair in Indigenous Studies, has introduced a powerful course that examines the sociopolitical and historical relations between Indigenous peoples and Canada in a post-1951 time period, and how colonialism, assimilation, and resistance movements are situated in an era of reconciliation.



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

4 QUALITY EDUCATION



### Strengthening 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.



### Courses rooted in sustainability

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.

1.4 million

LIBRARY PATRONS ANNUALLY

4.2 million

TITLES (ALL FORMATS) AVAILABLE FROM CAMPUS LIBRARIES



### Learning is for everyone

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.



### Pathways 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.



### Community-based learning

**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.



### Power in partnership

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.

76

CANADA RESEARCH CHAIRS

16

WORLD'S MOST HIGHLY CITED RESEARCHERS (CLARIVATE)



### Strengthening student success

The made-at-McMaster **Archway** program partners all first-year students with a coach and mentor to provide proactive guidance based on their goals, interests and needs, providing a supportive virtual community online. The **Student Success Centre** is the go-to resource for programs, services and events to help all students achieve their academic, personal and professional goals. It's where students connect with support for online learning, writing, tutoring and skills development. As part of its **International Student Services** section, the centre hosts orientation and social events intended to help newcomers adjust to life in Canada.





Charu Kaushic, Scientific Director of the Canadian Institutes of Health Research's Institute of Infection and Immunity, has dedicated her career to fostering the next generation of female scientists.



# Achieve gender equality and empower all women and girls.



**5 GENDER EQUALITY**

## A year of gender and justice

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.



## Equal opportunity

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, 56 per cent of undergraduate students in 2020-21 identified as female, compared to 44 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.



## Creating a culture of belonging

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 LGBTQ2S+ community members.



## Engineering success for women

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.

<b>56:44</b> STUDENT RATIO OF FEMALES TO MALES	<b>3 of 5</b> FACULTY DEANS ARE WOMEN: ENGINEERING, HUMANITIES, AND SCIENCE
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Heather Sheardown, professor of chemical engineering, recently became McMaster's first female dean of the Faculty of Engineering.



## Empowering the next generation

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 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**.



## Support for caregivers

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.



## Targeted outreach programs

The DeGroot School of Business' strategic outreach and focus on women has produced an uptick in the number of female students considering business studies and careers. In 2019-20, 60 per cent of the students in the Integrated Business & Humanities program were women; 77 per cent of students in the Master of Finance program were women.



Research by Sara Dickson-Anderson, professor of civil engineering, and her graduate students is fostering improved water security for rural, remote and marginalized communities.



## Ensure availability and sustainable management of water and sanitation for all.

**6 CLEAN WATER AND SANITATION**



### Students in solidarity supporting sanitation

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.



### Seeking change

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.



### Right as rain

Rainwater collection systems on campus reduce the university's reliance on municipal water systems, storing the collected water in cisterns. The water is filtered and disinfected for use for both drinking and non-drinking purposes. The **Engineering Technology Building** was designed to reflect the faculty's strategic plan, Engineering a Sustainable Future, and features rainwater harvesting for wastewater flushing and landscape irrigation.



### A united effort

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.



### Sustainable solutions

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



### Refill your cup

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 over 20 million water bottles since 2010.



### Data-driven decisions

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 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.



### Place, race, and water

**Zahra Tootonsab**, who is in her third year of her 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.





“Transitioning to a sustainable energy economy is a must for preserving our environment and mitigating the devastating effects of climate change.”

*Drew Higgins, assistant professor, chemical engineering*



## Ensure access to affordable, reliable, sustainable and modern energy.

### 7 AFFORDABLE AND CLEAN ENERGY



#### Developing energy technology for a green future

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.



#### The green team

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 nanotechnology, 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.



#### May the force be with you

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.



#### Mapping our 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.



#### Start me up

The university has a **fleet** of 13 electric vehicles as well as free charging stations, but those may need to change, if research in the **Department of Electrical & Computer Engineering** eliminates some of the challenges related to recharging batteries in electric and autonomous vehicles. How about high-power wireless and ultrafast chargers in a **drive-thru charging station**? First a prototype, then some industrial partners. Then, who knows?



#### Grid (un)locked

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.



#### Big energy

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.



#### Powering up the future

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.



Labour Studies professor Stephanie Ross's research and teaching explores the ways in which ordinary people make social change through collective action in the face of powerful forces to the contrary.



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

**8** DECENT WORK AND ECONOMIC GROWTH



### Building a digital community of global 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.



### Role models

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.



### A place for us

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.



### Labouring for change

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.

McMaster introduced a smudging protocol in 2018, affirming the right of Indigenous faculty, staff and students to engage in smudging on campus, a practice to purify a space and/or to release negative thoughts, emotions and energy.



### Best ombuds

McMaster employees are actively encouraged to raise concerns about their working environment, both formally and informally, though the university works with employee groups to identify and resolve issues before they become a problem. Employees may turn to the **Ombuds Office** for confidential help. The **Equity and Inclusion Office** has a broad mandate, but in more narrow terms, it's there to find and address inequity and exclusion.



### The right thing to do

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.

**3,600+**

UNDERGRADUATE CO-OP PLACEMENTS ANNUALLY.



### Closing the gap

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 state-of-the-art teaching and research greenhouse opening in 2024 is truly green with many sustainable features incorporated in its design.

# Build resilient infrastructure, promote sustainable industrialisation and foster innovation.

**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE



## Putting the green in McMaster's new greenhouse

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.



## Back on the ICE

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.

IN 2024, THE NEW, STATE-OF-THE-ART McLEAN CENTRE FOR COLLABORATIVE DISCOVERY FOR BUSINESS IS SLATED TO OPEN. THE 10-STORY BUILDING IS TARGETING LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) GOLD CERTIFICATION.



## Facility to be resilient

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 DeGroot 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 station

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.



## Fueling good alternatives

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.



## Signed, sealed, delivered I'm green

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 DeGroot 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.

**70,000**  
NUMBER OF CANCER PATIENTS TREATED WORLDWIDE EACH YEAR BY MEDICAL ISOTOPES IODINE-125 AND HOLMIUM-166 PRODUCED BY THE McMASTER NUCLEAR REACTOR.



## Positive reaction

The **McMaster Nuclear Reactor** is the world's only self-funded research reactor, providing neutrons for research and producing vital medical isotopes. Access to neutrons is essential to support Canadian innovation in medicine, environmental and agricultural science, advanced materials and clean energy technology. The university has **teamed up with Bruce Power**, the world's largest operational nuclear facility — which provides electricity to Ontarians and medical isotopes globally — to develop and promote nuclear technologies in the province.

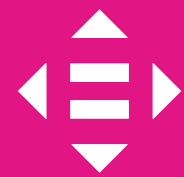


Chelsea Gabel, McMaster University associate professor and Canada Research Chair in Indigenous Well-Being, Community Engagement, and Innovation, is working with academic partners to support voting accessibility for Indigenous communities.



## Reduce inequality within and among countries.

10 REDUCED INEQUALITIES



### 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.



### Promoting healthier lives for all

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.

6,820

FULL-TIME FIRST-GENERATION STUDENTS (ABOUT 21 PER CENT OF McMASTER STUDENTS), MORE THAN 500 INDIGENOUS STUDENTS (1.7 PER CENT), AND 2,465 STUDENTS (7.6 PER CENT) WITH DISABILITIES.



### New approaches to voting

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.



### Dismantling barriers

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.

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.



### Supporting global higher education

McMaster is the host institution for **Academics without Borders** (AWB), a virtual, volunteer-driven NGO that connects academics in the developed world with colleagues and universities in developing countries. With its ongoing engagement with AWB, McMaster seeks to support higher education to foster greater prosperity, equity and well-being for all. Recent projects include bolstering rural medicine in Nepal and developing a centre that assists students with disabilities at the State Islamic University in Yogyakarta, Indonesia.



### Helping students succeed

**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.



### Addressing inequalities in care

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.





“Mobility and transportation are overdue for new thinking that will open access and improve mobility for all. With the right approaches, we can make all forms of mobility, along with the systems that organize and connect them, more accessible, inclusive, functional and sustainable for everyone.”

*Ali Emadi, Canada Excellence Research Chair Laureate*

## Make cities inclusive, safe, resilient and sustainable.

11 SUSTAINABLE CITIES AND COMMUNITIES



### Driving the 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.



### Improving lives for all

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.



### Walking the walk

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.



### A greener way to move

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.



### An open campus

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.



### A picturesque campus

McMaster University is woven deeply into the fabric of the community. The campus sits on 350 acres in Hamilton, Ont. — the City of Waterfalls — in a **nature-rich setting** of waterfalls, valleys, meadows, wetlands and forests. The 30-acre 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.

**250+**

STUDENTS AND RESEARCHERS AT THE McMASTER AUTOMOTIVE RESOURCE CENTRE ARE LOOKING FOR SUSTAINABLE, INCLUSIVE TRANSPORTATION SOLUTIONS THAT WILL CHANGE THE WAY WE MOVE.



### The beauty of interconnectivity

**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.



“As a society, we will need a combination of strategies to reduce energy use and carbon emissions where we live, learn and work, and we should be planning 25 years out.”

*Jim Cotton, mechanical engineering professor and expert on sustainability*



## Ensure sustainable consumption and production patterns.

**12** RESPONSIBLE CONSUMPTION AND PRODUCTION



### 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.

McMASTER WAS ONE OF THE FIRST CAMPUSES IN CANADA TO BAN THE WIDESPREAD USE OF PLASTIC BAGS, PHASING OUT THE USE OF NEARLY 150,000 PLASTIC BAGS.



### Building the cars of tomorrow

A collaboration among McMaster researchers, industry partner Nematik 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.



### Training leaders in 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



### Reusable energy

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.



### Safe disposal of 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.



### Reusing pays off

The **Choose To Reuse** program encourages students, faculty and staff to use reusable mugs and green food containers — and get a discount on their beverage and food purchases — while dining on campus. The fee to join the program was \$5, until Hospitality Services pushed to provide campus residents with a free Choose to Reuse membership card, resulting in a 294-per-cent jump in the use of the green eco-containers from 2018 to 2019.



### Compostable hospitality

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 good health

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.





Altaf Arain, professor of Earth, Environment & Society, leads the McMaster Centre for Climate Change, a research hub that brings together scientists and researchers from across McMaster and beyond to create a brighter world for the 7.8 billion people and millions of other species who call Earth home.



# Take urgent action to combat climate change and its impacts.



## 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.



## Inspiring communities to take action

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.



## Co-creating climate solutions

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, the resources or the 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.



## Tech solutions to climate change

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.



## 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.



## Close climate connections

Sean Carey, a professor in the School of Earth, Environment and Society and director of the **McMaster Watershed Hydrology Group**, has spent nearly three decades studying the drastic impact of climate change on water levels, land and communities in the Yukon. Local Indigenous communities have always played a role in his work, Carey says, but over time the relationship has become more closely connected. Not only are they sharing knowledge, but they are also guiding his research. Together, their work is critical to maintain long-term measurements to document and guide climate adaptation strategies that respond to the changes that are occurring in northern Canada.



## A living 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.



## Addressing the climate crisis together

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-percent carbon reduction of the public equities within the investment pool by 2030.





The main focus of biology professor Karen Kidd's research is on understanding the effects of human activities on the health of freshwater and marine ecosystems.



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



## 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.



## Smarter policy

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.



## The other side of sunscreen

An international team of scientists that includes Michael Risk, professor emeritus in the **School of Earth, Environment & Society**, has found further evidence that a common UV filter found in some sunscreens is killing coral and other wildlife. The substance in question is a class of compounds known as oxybenzone. Researchers found that in every place there is a bay with corals that humans use, the corals have stopped reproducing — and researchers think it's the sunscreen. Previous studies have found UV filters like oxybenzone also pose a hazard to marine life. Risk and his colleagues want oxybenzone banned everywhere.



## Water world

Researchers in the Faculty of Science use the **Cootes Paradise Marsh** — a 1,482-acre 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.



## The science of 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.



## Back to the future

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.



## Raising awareness

**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.



## Two decades and counting

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 over 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.



## Thinking small to solve big problems

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.





“What we do here when we create these gardens is we take an area that would otherwise be a bit of a desert to the bees and we provide habitat nesting sites.”

Susan Dudley,  
biology professor



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

**15** LIFE ON LAND



## Protecting the pollinators

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.



## Auditory cues

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 differences 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.



## Back to nature

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.



## Learning 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.



## A forest on campus

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 varieties on McMaster’s campus are mapped using geolocation.



## Warm and buzzy

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.



## Risk of fire

**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.



## Into the woods

The 115-acre **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 multi-disciplinary 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.



**16** PEACE, JUSTICE AND STRONG INSTITUTIONS



## 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.



## Truth, justice & reconciliation

**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.



## Give peace a chance

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.



## Working 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.



## Knowledge sharing

**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.

**\$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.



## 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.



## 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.





Antibiotic resistance is responsible for more than 1.2 million deaths per year. Working alongside researchers from Massachusetts Institute of Technology, Jon Stokes and his students used artificial intelligence to discover a new antibiotic capable of fighting drug-resistant bacteria.



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



## 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.

**17 PARTNERSHIPS FOR THE GOALS**



## Strengthening 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.



## A window into 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 solutions

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.



## Driving real 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.



## A new approach to pandemic preparedness

McMaster launched the **Global Nexus School for Pandemic Preparedness & Response** 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.





# 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 2023, McMaster University ranked 33<sup>rd</sup> globally out of 1,591 universities from across 112 regions across the world, demonstrating McMaster's commitment to advancing human and societal well-being locally and globally.

Sustainable Development Goal	Global Ranking	Canada Ranking
<b>Overall Ranking</b>	<b>33</b>	<b>7</b>
<b>SDG 1 – No Poverty</b>	12	4
<b>SDG 3 – Good Health and Well-being</b>	12	1
<b>SDG 8 – Decent Work and Economic Growth</b>	88	6
<b>SDG 9 – Industry, Innovation and Infrastructure</b>	55	5
<b>SDG 10 – Reduced Inequalities</b>	49	5
<b>SDG 17 – Partnerships for the Goals</b>	57	8



# McMASTER IS A UNIVERSITY WITH IMPACT

We are **ranked among the top 40 universities globally for impact** and, through our cutting-edge research and world-class teaching and learning, we are focused on advancing human and societal health and well-being – in our community and around the world.

As the founders 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.



**BRIGHTER  
WORLD**



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