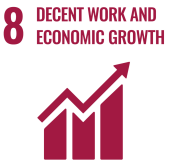
Global Goals Jam Canada Winter 2022 Program Topics

The Global Goals Jam Canada Winter 2022 is based on three selected Global Themes with a choice of three topics each, participants will choose one topic.

1. Leave No One Behind - Equality and Non-Discrimination

Solutions to address rising inequalities and discrimination

- Increasing financial inclusion
- Reducing gender disparity
- Making the workplace more inclusive



The scope of the problem is daunting. Inequalities of wealth and income have reached historic proportions, and inequalities in opportunities and outcomes relating to education, health, food security, employment, housing, health services and economic resources are having equally devastating effects. These inequalities disproportionately affect particular groups on the basis of race, sex, language, religion, age, ethnicity, disability, migrant or economic status, and so on. In addition, gender-based discrimination remains one of the most prevalent forms of discrimination across the globe. Click Here to learn more on this theme.

2. Clean Water and Sanitation

Solutions for sustainable management of water resources

- Cleaning up the Grand River and/or Great Lakes.
- Water conservation and pollution of groundwater resources.
- Agricultural water conservation and increasing water efficiency

Water connects every aspect of life. Access to safe water and sanitation can quickly turn problems into potential – empowering people with time for school and work, and contributing to improved health for women, children, and families around the world.

Access to water and sanitation are recognized by the United Nations as human rights, reflecting the fundamental nature of these basics in every person's life. Lack of access to safe, sufficient and affordable water, sanitation and hygiene facilities has a devastating effect on the health, dignity and prosperity of billions of people, and has significant consequences for the realization of other human rights. Click Here to learn more on this theme.

3. Climate Change

Solutions for climate change issues:

- Manage waste, reduce, reuse, recycle and recover
- Reduce Carbon Footprint/ Greenhouse gas emission
- Mitigate and Adapt to Flooding and Forest Fires.

Climate change is affecting every country on every continent. It is disrupting national economies and affecting lives. Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme.

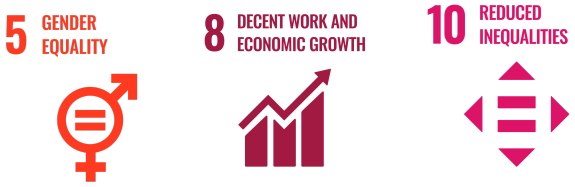
Although greenhouse gas emissions are projected to drop about 6% in 2020 due to travel bans and economic slowdowns resulting from the COVID-19 pandemic, this is a temporary improvement. As the global economy begins to recover from the pandemic, emissions are expected to return to higher levels.
Click Here to learn more on this theme.

More on Themes in detail:

1. Theme: Leave No One Behind - Equality and Non-Discrimination

Solutions to address rising inequalities and discrimination(EDI)

- Increasing financial inclusion
- Reducing gender disparity
- Making the workplace more inclusive



Summary

In recent decades, the economy has expanded globally, social indicators have improved for many, and the proportion of people living in absolute poverty has fallen. Yet we have also seen a dramatic rise in inequalities within and between countries, and the concentration of wealth and power in fewer and fewer hands. Many people, particularly the poorest and most marginalized, are being excluded from development and falling farther and farther behind. This only breeds frustration and mistrust, and undermines progress and peace.

Rising inequalities and pervasive discrimination are not inevitable. Rather, they are the result of decades of policies and dynamics that have undercut equality and rolled back efforts to build better lives for all. This contradicts the very purposes and principles of the United Nations, as enshrined in the Charter's commitment to "equal rights", "better standards of life" and the "economic and social advancement of all peoples". The United Nations system is therefore duty-bound to combat these trends.

The transformative 2030 Agenda for Sustainable Development, including its Sustainable Development Goals, offers fresh hope, setting out a new paradigm for more inclusive and sustainable development to ensure freedom from fear and want for all people, without discrimination. If that hope is to be realized, all stakeholders must act urgently in a whole-of-society effort to implement the new Agenda, working in partnership to address the root causes of conflict and deprivation — including discrimination, marginalization, exclusion and other human rights abuses — and to halt and reverse the deepening divisions in our societies.
It was with this vision in mind that the United Nations System Chief Executives Board for Coordination committed to put equality and non-discrimination at the heart of the United Nations

system's support to the Sustainable Development Goals. Indeed, inclusive and sustainable development is the best way to prevent conflict and crisis and to generate equitable progress for all people, everywhere.[1]

Introduction

The scope of the problem is daunting. Inequalities of wealth and income have reached historic proportions, and inequalities in opportunities and outcomes relating to education, health, food security, employment, housing, health services and economic resources are having equally devastating effects. These inequalities **disproportionately affect particular groups** on the basis of race, sex, language, religion, age, ethnicity, disability, migrant or economic status, and so on. In addition, gender-based discrimination remains one of the most prevalent forms of discrimination across the globe.

In recognition of this challenge, the **2030 Agenda for Sustainable Development** is, in large measure, an **agenda for equality**. It recognizes "rising inequalities within and among countries", "enormous disparities of opportunity, wealth and power", and persistent "gender inequality" as "immense challenges" confronting the world today. So central is the imperative of combating ine-qualities and discrimination that the 2030 Agenda includes two goals explicitly focused on this issue: Sustainable Development Goal (SDG) 5 (gender equality) and SDG 10 (inequality within and among countries). In addition, all other SDGs call for more equitable development and universal access to the constituent elements of development for all people. The 2030 Agenda calls for the disaggregation of data across all goals in order to measure the extent to which its central pledge to leave no one behind has been met.[2]

'Equity' is the fair and respectful treatment of all people and involves the creation of opportunities and reduction of disparities in opportunities and outcomes for diverse communities. It also acknowledges that these disparities are rooted in historical and contemporary injustices and disadvantages. Equity is the process; equality is the result.
'Diversity' is the demographic mix of the community and involves recognizing and respecting everyone's unique qualities and attributes, but focuses particularly on groups who remain underrepresented.
'Inclusion' is the creation of an environment where everyone feels welcome and respected, focusing on groups that remain underrepresented. It means creating the conditions in which everyone has the opportunity to fully participate and everyone's talents are valued and celebrated.

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[1] UN System CEB for Coordination. (2017). Leaving No One Behind: Equality and Non-Discrimination at the Heart of Sustainable Development. Retrieved from: https://unsceb.org/sites/default/files/imported_files/CEB%20equality%20framework-A4-web-rev3.pdf
[2] UN System CEB for Coordination. (2017). Leaving No One Behind: Equality and Non-Discrimination at the Heart of Sustainable Development. Retrieved from: https://unsceb.org/sites/default/files/imported_files/CEB%20equality%20framework-A4-web-rev3.pdf

It is important to note that while an inclusive group is by definition diverse, a diverse group is not always inclusive. An inclusive (group) strives for equity and respects, accepts and values differences.[3]

Inclusiveness, equality and equity are not just issues for developing countries. Though marginalisation and vulnerability take different forms in different countries, and different groups are left behind in different contexts, the presence of these groups and individuals is universal and constant. Reducing these domestic disparities must be elevated as a priority. Furthermore, inclusiveness and equality are global, not only national matters. The significant gaps between developed and developing countries persist and even widen. We should not forget that whole countries can be 'left behind'. [4]

Current State of Affairs

Inequality remains the defining challenge of our era and has been thrown into greater relief by the global COVID-19 pandemic. The pandemic has reversed many development gains and set back progress on the Sustainable Development Goals (SDGs), including SDGs 5 and 10, as the unequal impacts of COVID-19 are further exacerbating inequalities.

Even before the pandemic, inequalities were already unsustainable, destabilizing economic, social and political systems, increasing systemic risk and generating social unrest. Rising income inequalities were consistently compounded by multiple forms of discrimination, deprivation and disadvantage on the basis of age, sex, gender, disability, race, ethnicity, origin, religion, economic or other status, particularly for women and girls. At least half of the people in the world already did not have access to the health services they needed and about 100 million people were being pushed into extreme poverty each year because of out-of-pocket spending on health.

Today, COVID-19's immediate health crisis, and longer-term social, economic, humanitarian and human rights consequences, are being shaped by – and exacerbating - these existing patterns of deep inequality within countries. With its unequal impacts, the pandemic has hit hardest the people that already face poverty, marginalization and discrimination, including women and girls, racial and ethnic minorities, workers in the informal sector, the old, those living in poverty, and those without access to health, water, sanitation, education and information. Although the fiscal response to the crisis has been unprecedented, most of the social protection and labour market measures have been gender-blind. Furthermore, the fiscal stimulus has been overwhelmingly concentrated in the Global North. With limited fiscal space to respond to the immediate crisis in low or middle-income countries, there are risks of rising inequalities between countries. And more recently, "Vaccines have sadly become the new

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[3] University of Toronto. (2022). Equity, Diversity & Inclusion. Retrieved from: https://research.utoronto.ca/equity-diversity-inclusion/equity-diversity-inclusion

[4] Together 2030. (2019). Realizing the SDGs for All: Ensuring Inclusiveness and Equality for Every Person, Everywhere. Retrieved from: https://sustainabledevelopment.un.org/content/documents/23216Together_2030__Position_Paper__HLPF_2019.pdf

frontier in the struggle for equality"as the High Commissioner on Human Rights recently underlined. The COVID-19 pandemic has found fertile soil for a bitter harvest.[5]

Current Trends

Countries differ in their levels of inequality, even in cases where their levels of development, exposure to global trade, technological innovation and effects of climate change are similar. Policies, institutions and regulatory frameworks matter, at local, national and global levels.
COVID-19 is a fork in the road. Responses to the crisis that focus narrowly on regenerating economic growth will do little to address inequalities. Building back better in the wake of the COVID-19 crisis calls for addressing the root causes of inequality and vulnerability, rather than just cushioning shocks temporarily or palliating market failures. Harsh austerity measures that cut back on social protections will deepen poverty and inequality, and could risk intensifying public discontent, further weakening trust in institutions, and leaving people vulnerable to risks of future shocks. Yet according to a recent study, budget cuts are expected in 154 countries this year, and it has been estimated that 6.6 billion people or 85% of the global population will be living under austerity conditions by next year, a trend likely to continue at least until 2025.[6]

Challenges

Rising inequalities across the world have become one of the defining challenges of our time.

Deepening, divisive and destabilizing inequalities both within and among countries are putting sustainable development at risk, stirring social unrest, undermining social progress and threatening economic and political stability, which affect all of the pillars of the United Nations system's work, from development and human rights to peace and security.

1. Inequalities of wealth and income

A recent International Monetary Fund (IMF) discussion note has argued that "widening income inequality is the defining challenge of our time" with the gap between rich and poor at its highest level for decades in the advanced developing economies. Income inequality has increased substantially since 1990 in most of the developed countries, with Asia and Eastern Europe also seeing marked increases in inequality. The United Nations Development Programme (UNDP) has shown that by 2014, more than 75 percent of the population of developing countries lived in societies with a more unequal income distribution than they had in the 1990s. Only Latin America has seen declines in income inequality, which is a direct result of recent policy decisions to reverse inequalities, yet it remains the most unequal region in the world.12

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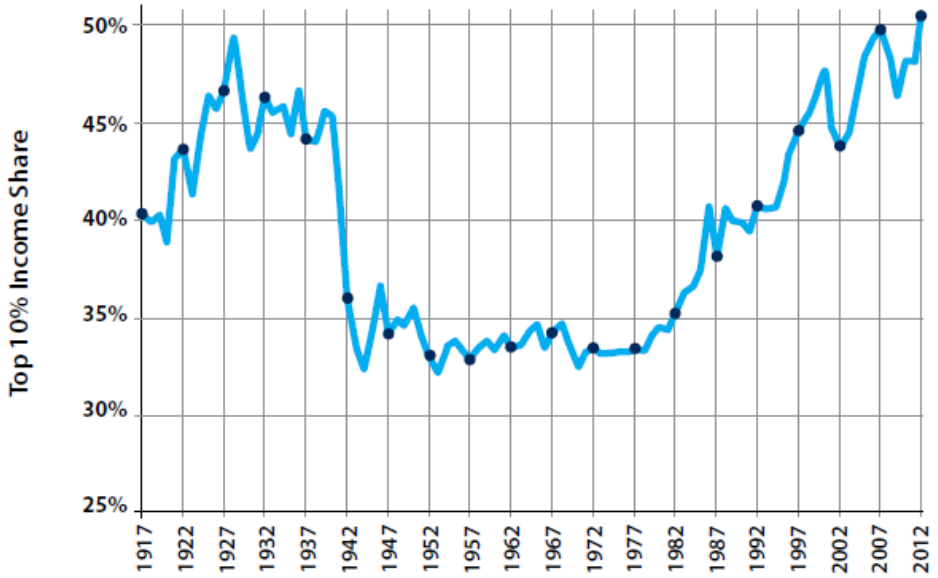
[5] UN Inequalities Task Team. (2021). Building Back Fairer: Equality in a Post-COVID World. Retrieved from https://unsceb.org/sites/default/files/2021-06/Concept_note_ITT_Inequalities_Event_1.pdf

[6]UN Inequalities Task Team. (2021). Building Back Fairer: Equality in a Post-COVID World. Retrieved from https://unsceb.org/sites/default/files/2021-06/Concept_note_ITT_Inequalities_Event_1.pdf

The work of the French economist Thomas Piketty has graphically illustrated how inequalities in the developed economies are reaching levels not seen since before the 1929 Great Crash and the Great Depression as illustrated in Figure 1 on pre-tax income inequality in the United States.

Figure 1.

Top 10% Pre-tax Income Share in the US, 1917-2012



Source: Piketty and Saez, 2003 updated to 2012. Series based on pre-tax cash market income including realized capital gains and excluding government transfers. 2012 data based on preliminary statistics.

Inequalities in wealth are even more extreme than inequalities in income.

Globally, as highlighted in a recent IMF publication, the top 1 percent of the world's population now owns almost half of the world's wealth. Recent reports from the Oxfam suggest that the world's 84 richest individuals now own as much as the poorest 3.5 billion people combined. In most countries with available data, the share held by the top 1 percent is rising at the expense of the bottom 90 percent. In the United States of America, the top 1 percent now holds one-third of the total wealth, while low- and middle-class households are increasingly indebted. Inequality deepened after the global economic crisis of 2007-2008, with the wealthiest capturing most of the gains of government responses to the crisis such as quantitative easing, while austerity policies have disproportionately affected the less well off, illustrating how policy choices can have a marked distributional impact.

2. Other forms of inequality

There are stark inequalities that are not only related to income and wealth, but also intrinsically related to other forms of inequalities, which also amount to failures to achieve internationally agreed human rights. These include inequalities in opportunities and outcomes related to education, health, food security, employment, housing and health services, as well as in accessing economic resources.

These inequalities affect some populations disproportionately, often because of their sex,

age, ethnicity, disability, migrant, health or economic status etc. For example, the world's poorest children are four times more likely not to go to school than the world's richest children, and five times more likely not to complete primary school. Migrant and stateless children may be excluded from school due to their uncertain legal status; girls may be withdrawn from school to care for the family; and pregnant girls and children including with disabilities are frequently excluded from school and face institutionalized discrimination, stigmatization and neglect. Around 43 per cent of out-of-school children at primary and secondary levels are children living in countries affected by humanitarian crises.

3. Gender-based discrimination

Gender-based discrimination remains one of the most prevalent forms of discrimination, creating barriers to the development of the full potential of half of the world's population. Deep-seated discriminatory norms and harmful gender stereotypes, prejudices and practices, including unequal pay for equal work and gender-based violence against women and girls, continue to prevent equality and the full realization of women's human rights. Progress in promoting gender equality has been slow, with stagnation and even regression in some countries, and a backlash against women and girl's rights in a number of contexts. Discrimination in the law persists in many countries, particularly in family, nationality, health inheritance laws, including laws that restrict women's access to and control over resources. In many countries, laws and regulations also restrict women's access to sexual and reproductive health services that only women need. Unmarried women and adolescents are very often denied access to sexual and reproductive health services, information and education due to economic, social, legal and cultural barriers.

Women remain underrepresented in decision-making in the public and private arenas at all levels and sectors. Women in the workforce face poorer conditions, unfair care burdens and lack of decent work, and are overrepresented in vulnerable and informal employment having fewer prospects for advancement. Women's salaries are lower than men's in almost all countries, and according to the International Labour Organization (ILO), the gender pay gap persists where women earn on average 77 percent of what men earn for work of equal value; there is an even wider absolute gap for higher-earning women. There is evidence that women with children incur a further wage penalty, known as the "motherhood pay gap".

At the current rate of progress, pay equity between women and men will not be achieved until 2086. Unequal pay has cumulative impacts, resulting in greater inequality and poverty for older women. Women also continue to bear heavy and disproportionate unpaid care workloads, and face unacceptably high levels of preventable maternal mortality, particularly for adolescent girls, indigenous and rural women, women belonging to minority groups, and stateless and displaced women.

4. Discrimination against other population groups

Many other forms of discrimination also persist against other population groups (e.g. discrimination on the basis of race, ethnicity, religion, age, disability, sexual orientation and gender identity, etc.), among whom are many people affected by multiple and intersecting forms of discrimination that produce and reproduce deep inequalities across generations. People from particular ethnicities, castes, minorities, and indigenous peoples, as well as groups in situations of vulnerability, persons with disabilities or

mental health problems, migrants, refugees, stateless and displaced persons, children, youth, older persons, slum dwellers, people living with HIV/AIDS and sexual minorities (especially women), are often excluded, disempowered and discriminated against in law, policy and practice, resulting in inequalities in both opportunities and outcomes.

According to one study measuring the progress towards achieving the Millennium Development Goals (MDGs) in Nepal, under-five mortality rates among Dalit communities (90 per 1,000 live births) were more than double those of the Newar caste (43 per 1,000 live births), while in Vietnam, only 7 per cent of ethnic minority households had access to improved sanitation compared to 43 per cent of the majority Kinh and Chinese groups. Similarly, in South Africa, the incomes of black Africans were only 13 per cent of white incomes. The most recent ILO Global Wage Report highlighted that discrimination and wage penalties suffered by women, migrant workers and workers in the informal economy who are often from disadvantaged groups contribute to income inequality.

Racism and xenophobia are often at the root of discrimination against particular groups, often involving restrictions or restrictive interpretations of laws, policies and practices, which can also affect the situation of, inter alia, migrants, asylum-seekers, refugees, internally displaced persons and stateless persons. Islamophobia has become a global phenomenon, challenging the realization of a broad range of human rights for millions. Indigenous peoples face particular challenges: they are frequently underrepresented politically; they are denied control over their own development based on their own values, needs, rights and priorities; they lack access to social and other services; and they are frequently the victims of forced displacement as a result of the exploitation of natural resources and other development projects. Some groups are also particularly vulnerable and marginalized because governments refuse to protect them from discrimination and exclusion, such as lesbian, gay, bisexual, transsexual and intersex (LGBTI) persons, men who have sex with men, sex workers, people living with HIV/AIDS, people who inject drugs, prisoners and people in detention. [7]

The upcoming World Diversity in Leadership Conference (Edmonton, AB, Canada, June 20-24, 2022) themed: “Leveraging diversity to advance innovation and entrepreneurship” included the following current issues as topics for their event[8]:

- Making the Most of Diversity in Teams
- The impact of Women Entrepreneurship in STEM
- Diversity in Sports
- Managing Workplace Diversity & Inclusion
- Diversity in Innovation
- Women in Leadership
- Entrepreneurship & The Youth
- Intercultural education and leadership
- Inclusion & Diversity Strategies for Youth
- Supporting Gender Identity and Expression
- TRANSFORMING PAIN INTO POWER
- Bias During Interviews and Hiring

[7] UN System CEB for Coordination. (2017). Leaving No One Behind: Equality and Non-Discrimination at the Heart of Sustainable Development. Retrieved from: https://unsceb.org/sites/default/files/imported_files/CEB%20equality%20framework-A4-web-rev3.pdf

[8] WODIL. (2022). World Diversity in Leadership Conference: Leveraging diversity to advance innovation and entrepreneurship. Retrieved from: https://diversityconference.ca/

Based on the current topics of importance discussed in this chapter, the following are the selected topics for this Theme of the Global Goals Jam Canada 2022.

Proposed Topics

1. Increasing financial inclusion

The challenges created by the global pandemic and recent racial and social injustice events have increased awareness of inequities and financial instability across the globe. They highlight the need for financial institutions to make a global commitment to advance financial inclusion—providing access to useful and affordable financial products and services —to meet the needs of the underserved market. The Global Findex database shows that 1.7 billion adults worldwide are *unbanked,*meaning they do not participate in any basic financial products or services. In the United States, more than 30 million households are considered unbanked or *underbanked*—they have limited access to basic financial products and services. Therefore, a range of opportunities exists for financial services providers to be a force for change.

Global C-suite surveys have shown that CEOs, when asked to measure and evaluate their business performance, ranked making a positive societal impact high on their list of factors. Creating positive social impact is clearly a worthwhile goal. But it is in how an organization devotes meaningful effort, time, and experience toward public well-being—its corporate social purpose—where committed, sustainable change can be realized. While businesses have a responsibility to pursue profits for their shareholders and their organization, having a well-defined corporate social purpose can also build brand and reputation, attract and retain talent, and contribute to the betterment of the communities they serve. This, in turn, helps the firm appeal to socially conscious customers, promotes innovation, and stimulates opportunities for profitable growth by penetrating new market segments.

Aligning purpose and profit: The four dimensions of financial inclusion
The financial inclusion framework (figure 1) enables leaders to assess and address their organization's financial inclusion strategy across four dimensions: organization, offerings, community, and the broader ecosystem. Firms should evaluate the strategic, operational, and technological impact on an organization's stakeholders—its workforce, customers, vendors, partners, and the external marketplace–within each of the four dimensions. This exercise can help leaders determine priorities, develop strategies, and forge new market relationships to move from strategy to action.[9]

[9] Davis, C. (2021). Driving purpose and profit through financial inclusion. Stronger together. Deloitte Insights. Retrieved from: https://www2.deloitte.com/us/en/insights/industry/financial-services/purpose-through-inclusive-finance.html

FIGURE 1

The financial inclusion framework

Organization
Addressing financial inclusion within the organization's workforce

Aligning sales strategies to financial inclusion goals

Community
Making commitments to the geographies and communities where the organization recruits, operates, and invests

Offerings
Developing and deploying products and services to reach underserved communities

Ecosystem
Amplifying impact through vendors, partners, and public platforms

Source: Deloitte Center for Financial Services

Innovation in Financial Inclusion:

Traditionally, banks operating in emerging markets (EMs) have not viewed financially excluded individuals, and micro, small and medium enterprises (MSMEs) as profitable target customer segments. However, technological advances are increasingly reducing the cost of serving these customers and opening up a potentially significant growth opportunity for banks. EY believes that driving greater financial inclusion will not only generate sizable economic benefits — boosting gross domestic product (GDP) by up to 14% in large developing economies such as India, and 30% in frontier markets, such as Kenya — but could also increase banking revenues by US$200b. However, improving financial inclusion will be easier in some markets than others. The types of market infrastructure and government policies that will make it easier for banks to rapidly expand financial inclusion through innovative strategies [include]:

- Customizing offerings
- Developing innovative channel strategies
- Employing creative risk mitigation and credit profiling techniques[10]

[10] EYGM Limited. (2017). Innovation in financial inclusion: Revenue growth through innovative inclusion. Retrieved from: https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/banking-and-capital-markets/bcm-pdf/ey-innovation-in-financial-inclusion.pdf

Financial Education:

Large technology firms, such as Apple, Alibaba, Amazon, Facebook, eBay, Google and Tencent, have recently started to offer financial services that include payment, insurance and loans. The entry of these so-called big techs could pose opportunities as well as challenges related to financial inclusion. On one hand, big techs have the potential to draw large numbers of people who do not use banks or financial institutions—known as unbanked people—into the financial system. On the other hand, improved financial inclusion may lead to elevated fraud risks if people lack the required knowledge and skills to use the services safely. It may even lead to undesirable financial outcomes, such as over-indebtedness, which could eventually introduce financial stability risks to the larger financial system.

Financial education can improve people's financial knowledge and skills and this might lead to their making more responsible financial decisions, but only if the financial-education initiatives are well-designed. Careful attention should be paid to the exact design of such programs, such as their length (e.g., in hours, weeks or years) and timing (e.g., whether they should take place right before the purchase of a financial service), as well as the specific audience targeted (e.g., particular income or age groups). If these programs are not designed and implemented in such a way that they deliver the intended results, then there is a large risk that they will be ineffective.[11]

2. Reducing gender disparity

Goal 5 [of the SDGs is] focused on gender equality and set the ambitious target of achieving gender equality and empowering women and girls everywhere by 2030. Five years later, large gender gaps remain across the world, and the early evidence suggests that the COVID-19 pandemic has had a regressive effect on gender equality.

Economic Benefits:

Gender inequality is not only a pressing moral and social issue but also a critical economic challenge. A 2015 report from the McKinsey Global Institute (MGI), *The Power of Parity: How advancing women's equality can add $12 trillion to global growth*, explored the economic potential available if the global gender gap was narrowed. Five years ago, women generated 37 percent of global GDP despite accounting for 50 percent of the global working-age population. The research found that in a best-in-region scenario in which all countries match the performance of the country in their region that has made the most progress toward gender equality, $12 trillion a year could be added to GDP in 2025. That would be equivalent in size to the GDP of Japan, Germany, and the United Kingdom combined, and roughly double the likely growth in global GDP contributed by female workers between 2014 and 2025 in a business-as-usual scenario. Both advanced and developing economies would stand to gain considerably; all regions could achieve at least 8 percent in incremental GDP over business-as-usual levels. In a full-potential scenario in which women match men's participation in the workforce, their sector mix, and their full-time mix of jobs, the additional GDP opportunity could be $28 trillion, or an

[11] Jonker, N. & Kosse, A. (2020). The Interplay of Financial Education, Financial Literacy, Financial Inclusion and Financial Stability: Any Lessons for the Current Big Tech Era? Bank of Canada. Retrieved from: https://www.bankofcanada.ca/2020/08/staff-working-paper-2020-32/ and https://www.bankofcanada.ca/wp-content/uploads/2020/08/swp2020-32.pdf

additional 26 percent of annual global GDP in 2025. That would be roughly equivalent to the GDP of the United States and China. The COVID-19 pandemic has added new urgency—and new risks—to achieving the economic benefits of gender parity. We have updated our calculations accordingly.

Advances Offset by Rising Prices and Insecurity:

Although women in advanced economies of the Organisation for Economic Co-operation and Development have made far-reaching gains as workers, consumers, and savers over the past two decades, much of this progress has been offset by rising costs and new forms of insecurity that disproportionately affect women. Between 2000 and 2018, women accounted for two-thirds of 45 million jobs created in 22 OECD countries, but many of these jobs were part-time or independent work that were less secure and offered lower pay and fewer benefits. In this period, female part-time employment increased by 2.3 percentage points, versus a 0.7-percentage-point increase in full-time employment for women. As consumers, women—and men—benefited from a sharp decline in the prices of many discretionary goods and services such as communications and recreation, but that was offset by rising costs of housing, healthcare, and education that absorbed 54 to 107 percent of the average household's income gains in Australia, France, the United Kingdom, and the United States. As savers, the outlook for women is also challenging. One study found that while women's median net wealth is higher overall than it was two decades ago, a large gender gap remains. In Europe, women's median net wealth is 62 percent that of men.

Women Working Double Shift:

While women face inequality in the world of work, they also face inequalities in the home. Around the world, women do three times as much unpaid care work as men. As one of many examples around the world, the "double shift" is a fact of life for millions of women in China, who go out to work but then do the lion's share of work in the home as well. On average, they work nearly nine hours a day, and only about half of that is paid. Putting the two together, on average women in China work almost one entire day a week more than men. In some countries like India, women do almost ten times as much unpaid care work as men. This phenomenon is by no means confined to developing economies; it is a consistent fact that women work a double shift in advanced economies, too. In the United States, for instance, women still do almost twice as much unpaid care work as men; 54 percent of women but only 22 percent of men report doing all or most of the housework. Even among individuals who earn the majority of their household's income, 43 percent of women who are primary household income earners continue to do all or most of the household work, compared with only 12 percent of men. In addition, working women are more likely than their male colleagues to have a working spouse: 81 percent of women are part of a dual-career couple and have two careers to balance, while only 56 percent of men are part of a dual-career couple.

Growing Challenges from Automation:

Growing automation adoption adds to the challenges that women face in the workplace. MGI research found that the share of women whose jobs are replaced by machines and will likely need to make job transitions due to automation is roughly the same as for men: up to one in four over the next decade may have to shift to a different occupation.

Between 40 million and 160 million women globally may need to transition between occupations by 2030, often into higher-skill roles.
The particular challenge for women is that long-standing barriers make it harder for them to adapt to the future of work. Women and men alike need to develop (1) the skills that will be in demand; (2) the flexibility and mobility needed to negotiate labor-market transitions successfully; and (3) the access to and knowledge of technology necessary to work with automated systems, including participating in its creation. Unfortunately, women often face long-established and pervasive structural and societal barriers that could hinder them in all three of these areas. Women may have less time to refresh or learn new skills or to search for employment because they spend much more time than men on unpaid care work. They may also face financial constraints in doing so. And they may not have the professional networks and sponsors that could make it easier for them to navigate job transitions, among other factors. Moreover, women tend to have less access to digital technology and lower participation in science, technology, engineering, and math (STEM) fields than men. If women make these transitions, they could find more productive, better-paid work; if they don't, they could face a growing wage gap or leave the labour market altogether.

Economic Fallout from COVID 19:

On employment, research has found that women's jobs globally are 1.8 times as vulnerable to this crisis as men's jobs. Women make up 39 percent of global employment but accounted for 54 percent of overall job losses as of May 2020. Globally, part of the reason is that women are disproportionately represented in industries that are expected to decline the most in 2020 due to COVID-19. Another factor is that during the pandemic, even more unpaid care work such as childcare and home schooling fell to women as nurseries and schools closed; in the United States, for example, the amount of time women spend on household responsibilities has increased by 1.5 to two hours, according to one study. The pandemic may have had noneconomic consequences for women, too—some reports suggest that the prevalence of violence against women from an intimate partner may have increased during lockdowns. If no action is taken to counter the gender-regressive impacts of COVID-19, we calculate that global GDP growth could be $1 trillion lower in 2030 than it would be if women's unemployment simply tracked that of men in each sector. That hit to growth could be even larger if increased childcare responsibilities, a slower recovery, and reduced public and private spending on services such as education and childcare force women to leave the labour market permanently. However, if action is taken to advance gender equality, $12 trillion could be added to global GDP in 2030 compared with the baseline, as noted earlier; this implies a $13 trillion potential compared with the gender-regressive scenario in which global GDP slides back by $1 trillion in 2030. A middle path—taking action only after the crisis has subsided rather than now—would reduce the potential opportunity by more than $5 trillion.

Leaky Career Pipeline:

Over the years, our research with LeanIn.Org has found some progress in the advancement of women through the corporate pipeline in North America. In the 2019 Women in the Workplace report, we found that, of entry-level workers, 48 percent were women, compared with 45 percent in 2015. Women made up 21 percent of the C-suite, compared with 17 percent in 2019. However, as these numbers show, women are underrepresented at all levels of organizations, and the pipeline is leaky between the entry level and the C-suite. The biggest obstacle to women on the corporate ladder is a

"broken rung" in the first step up to the manager level. For every 100 men hired or promoted to manager, there are only 72 women—and only 58 black women. After this initial degree of drop-off, it is very difficult for women to make up the ground lost. If differences in promotion rate are aggregated across five years, this equates to a difference of one million women in leadership roles.

Women of colour are especially underrepresented in the North American workforce and face the steepest drop-offs. In North America, 18 percent of entry-level positions are held by women of colour, but their representation in the C-suite is 4 percent, according to our 2019 Women in the Workplace research. These outcomes are mirrored in the day-to-day experiences of women of colour in the workforce—56 percent of black women say they and their peers have equal opportunity for growth, compared with 69 percent of white women. Women of colour also experience more workplace "microaggressions." For example, 40 percent of black women and 30 percent of Asian women say they needed to provide more evidence of their competence than others, compared with 28 percent of white women and 14 percent of men.

We find similar trends across the world. Across Asia–Pacific, for instance, there is only one woman in leadership positions for every four men. In some countries in East Asia, there are only 12 to 20 women leaders for every 100 men.[12]

Women's Participation in STEM:

Gender inequality in Science, Technology, Engineering and Mathematics (STEM) fields persists in many countries. It tends to begin before entering the workforce: in middle school and high school, girls become less motivated to pursue STEM in future education.

Around the world, women have a low rate of representation in STEM. In Japan these figures are particularly low: they comprise only 1.6% of those in Mechanical Engineering, 3.6% in Applied Chemistry, and 4.4% in Physics. The under representation of women in STEM fields influences the persistence of the gender wage gap.

This study investigated how STEAM (adding "Arts" to STEM) learning affects female youths' interest in STEM. The study used a 3-day design thinking workshop as an intervention. Design thinking centers on understanding and solving real-world problems. Rather than emphasizing individual work, it uses a set of procedures that helps learners embrace ambiguity, engage in deep analysis, and build communication. These procedures include empathy building, needs-finding, brainstorming, prototyping, and testing. Design thinking has become more common in educational contexts in recent years as it has been shown to improve students' problem-solving skills and creativity as well as increase their interest in STEM careers.

The STEAM workshop produced measurable changes in the youth who participated:

- Participants showed increased interest in engineering, e.g., higher scores for a question about enjoying imagining creating new products.

[12] McKinsey Global Institute. (2020). Ten things to know about gender equality.Retrieved from: https://www.mckinsey.com/featured-insights/diversity-and-inclusion/ten-things-to-know-about-gender-equality

- Participants' creative confidence—their ability to work in uncertainty and be open to feedback—increased. They became less self-conscious about sharing their thoughts and showed fewer negative perceptions about failing.
- Participants' positive perceptions of STEM shifted, with an increase in their beliefs that STEM careers not only require technical knowledge but also communication, collaboration, and creativity.
- Participants' beliefs that STEM can make a world a better place, and that people who study STEM care about others, increased. This is important as prior research has shown that under-represented groups are more likely to pursue STEM professions if they believe STEM can improve others' lives.
- Finally, participants' desires to pursue a career in STEM—even if they must balance work and family— increased. Participants scored higher than before the workshop when asked if they would consider a career in science, starting their own business, and staying in the workforce after having children.
- While participants increased their interest in pursuing STEM, their beliefs around gender norms and STEM – which are deeply rooted in social and cultural contexts – were unchanged. There was no significant change in their response to questions such as "Girls can have a greater, more positive impact on society" or "Women should pursue STEM fields in the future".

Implications:
Girls can benefit from more awareness about, and opportunities to participate in, STEM—A 3-day workshop that exposed girls to STEM projects, ideas and mentors transformed not only their desire to pursue STEM careers but also their beliefs about what STEM can do. Initiatives to demystify STEM for underrepresented groups may be helpful in increasing their interest in these fields.
Design thinking and other empathy-based pedagogical approaches to STEM (STEAM) may foster more diversity—The design thinking workshop allowed girls to better understand how STEM is connected to empathy and to improving the world, which in turn made STEM more appealing to them. STEAM learning could draw more women and underrepresented groups into these fields, helping to create a new and diverse generation of STEAM leaders and thinkers who use creative and empathy-based approaches.[13]

Canada:

There is growing awareness among the global community that gender equality is a cornerstone of inclusive growth. Canada scores well on several metrics of gender equality. However, to drive greater gender equality results, the Government of Canada commissioned the OECD to undertake a Review which assesses the policy and institutional framework from a whole of government perspective.

OECD Reviews (such as this) provide a detailed assessment of the structures, practices and approaches that a government has in place to deliver gender equality outcomes. The Review benchmarks current arrangements against good practices and policy developments across other OECD countries.

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[13] Gender and the Economy. (2021). Using design thinking to encourage girls' participation in STEM. Rotman School of Management. Retrieved from: https://www.gendereconomy.org/using-design-thinking-to-encourage-girls-participation-in-stem/

The OECD Review assesses five pillars of governance for gender equality. These pillars are tailored to Canada's specific needs and priorities, and build on the provisions of the 2015 OECD Gender Recommendation:

1. The role of a government-wide gender equality strategy
2. Canada's institutional approach to gender equality
3. Policy tools to deliver gender equality results
4. Openness, transparency and accountability in relation to gender equality
5. Advancing gender budgeting in Canada

KEY RECOMMENDATIONS

1. Building on the recently introduced Gender Results Framework, it would be beneficial to develop an overarching strategy for gender equality to help to orient, coordinate and drive gender equality initiatives forward – in the budget process but also beyond - as part of Canada's results and delivery agenda.
2. In the context of formalising Status of Women Canada (SWC) as an official department, consideration could be given to scaling up its mandate to expand the focus from solely women and include broader issues related to gender equality, aligning with the scope of GBA+. This, together with appropriate resourcing, would help enable SWC to become the policy hub and "go-to institution" on issues of gender equality.
3. To maximise the impact of GBA+ (Gender Based Analysis Plus) on gender equality outcomes, there is room to continue to strengthen its application, scope, quality and rigour, as recognised by the Budget 2018 commitment to improve the evidence-base for GBA+. The quality of GBA+ could be further improved through greater transparency with regard to GBA+ undertaken across government.
4. To strengthen accountability for the government's actions on gender equality the Parliament of Canada and the Office of the Auditor General should build on their successful interventions in the area of GBA+ through greater incorporation of a gender perspective in their own areas of work. Parliamentary committees should also establish a fixed "home" for scrutiny of gender equality-related content in the budget.
5. Building on the steady progress in relation to gender budgeting efforts, the government should continue to develop the gender equality-related content presented in the budget and ensure a wide range of gender budgeting tools are implemented across the budget cycle. This would be supported by the introduction of a rolling programme of gender budget baseline analysis and through stronger incorporation of a gender perspective in ex post gender budgeting tools such as evaluation and spending review.

These recommendations will help improve gender equality and justice in Canada in key areas of current concern, that are identified by the Canadian Women's Foundation as:

1. Gender Pay Gap (78.6 cents average earned by full-time working women for every dollar men make)
2. Women and Pandemics (increased risk of gender-based violence, more economic stress, increased burden of caregiving and housework, reduced access to support)
3. Gender-based Violence (intimate partner violence, violence against women, domestic violence, affects on children, sexual assault rates)
4. Sexual Harassment and Assault (workplace harassment, consent, reporting, sexual violence prevention, challenging sexual violence, social media movement, viral reporting, support survivors)
5. Women and Poverty (gendered poverty, economic instability)
6. Women in Leadership (politics, board members, barriers, challenges)

7. Online Hate and Cyberviolence (cyberbullying, root causes, rates, impacts, policy, legislation, women in politics and media)
8. Barriers for Girls (mental health, stereotypes, sexualization, empowerment, belonging)
9. Intersectional Feminism (Terminology, intersectionality, Gender-Based Analysis Plus, allyship)[14]

3. Making workplace more inclusive

Hiring people with diverse backgrounds and characteristics is an achievement that you reflect on with pride. So now you can check off the diversity and inclusion (D&I) box on your to-do list for building a great workplace … right?

Not so fast. Diversity is only half of the D&I picture. Creating a culture where people are respected and appreciated requires another level of effort that may not be getting the investment it needs.

"We often forget the 'I' in the D&I conversation," says Johnny C. Taylor, Jr., SHRM-SCP, president and chief executive officer of the Society for Human Resource Management (SHRM). "The challenge is in having a culture where all employees feel included. It's a major investment to bring talent into your organization, so why bring them in if they're not happy when they get here? You've got to get the inclusion part right."

Think of diversity as being similar to selecting people for a chorus who have different musical backgrounds, vocal ranges and abilities. The inclusion piece of D&I means making sure that those different voices are heard and valued and that they contribute to the performance.

When employees who are different from their colleagues are allowed to flourish, the company benefits from their ideas, skills and engagement, according to SHRM/Economist Intelligence Unit research. The retention rate of those workers also rises.[15]

Inclusion can be measured by a sense of belonging, connection and community at work. It's really about how you feel connected to your workplace and the people around you. An organization that has mastered inclusion is one where people feel encouraged to bring their "whole selves" to work. Between voicing diverse points of view and finding a sense of connection to others, this is what makes inclusion real.

Research shows that inclusive workplaces are six times more likely to be innovative and twice as likely to meet or surpass financial goals. On top of that, employees who feel able to bring their whole selves to work are 42% less likely to plan on leaving for another position within a year. At the core, it's true that the higher the level of inclusion, the higher the level of well-being and engagement in your employees, which can lead to better business results.

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[14] Canadian Women's Foundation. (2021). The Facts: Gender Equality and Gender Justice. Retrieved from: https://canadianwomen.org/the-facts/

[15] Gurchiek, K. (2018). 6 Steps for Building an Inclusive Workplace. Society for Human Resource Management. Retrieved from: https://www.shrm.org/hr-today/news/hr-magazine/0418/pages/6-steps-for-building-an-inclusive-workplace.aspx

Based on a study of more than 2,000 U.S. workers, Limeade found that individuals with higher well-being and engagement have higher inclusion. In fact, employees who feel included at work were more engaged and more likely to recommend their company as a great place to work. And while leader and manager behaviour is important to perceptions of inclusion at work, interactions between peers is paramount.

An inclusive workplace is cooperative, collaborative, open, fair, curious, accountable and so much more. Take a look at these seven components of inclusion, plus tips for helping to create an inclusive workplace:

1. Access to resources: Give employees the support necessary to be inclusive. Whether it's employee resource groups or technology, natural and valuable solutions are easy starting points to influence individual behaviours.

Tip: For more inclusive meetings, encourage employees to send agendas and materials in advance so everyone feels prepared. Protect time by setting up technology properly, and be sure to actively involve all members.

2. Having a voice: Employees need to feel they have a say in decisions that impact their work. And leaders and managers should proactively find ways to give employees a voice.

Tip: Talk informally, hold focus groups or have weekly surveys that measure or address inclusion. Make sure employees know that it's not a taboo topic and that your door is always open.

3. Being accepted and valued for who you are: Individuals need to feel connected to a common cause — something bigger — but also recognized for their uniqueness. It's crucial that employees feel their organization values the unique perspectives and skills they bring to work.

Tip: Have intentional conversations with your employees that not only recognize their great work, but explain why you value them and their great work. Acknowledge them at the individual level for specific achievements or even small wins to show you truly care and take part in their successes.

4. Learning and development: Employees must feel they have the opportunity to develop and advance their careers at their organization. Without learning and development as a key component of inclusion and broader company values, you'll stunt employee growth and limit innovation.

Tip: Offer employees the opportunity — whether it requires time, funding or encouragement — to expand their professional and personal goals by supporting further education, learning a new skill or developing a hobby or passion.

5. Collaborative environment: When teams feel a stronger sense of connection between each other, they're able to utilize the strengths and skills of every individual. Collaboration is key for the success of your business and a huge piece of inclusion in the workplace.

Tip: Pause to ask what others think in a meeting. Make sure to give credit where credit is due, even if the person who came up with the idea isn't in the room.

6. Intentionally focusing on inclusive practices: Promote diverse ideas and perspectives and take action. Focus your efforts on inclusive practices that will become second nature to employees and are woven into the culture, mission and values of the organization.

Tip: Leverage the practices that you have, and think about how you're using those to teach about inclusive actions. It's not only about asking employees questions, but asking the right questions.

7. Creating a sense of belonging: Employees' sense of belonging at their organization can affect their levels of intent to stay at their organization, and their well-being, engagement and overall success in their roles.

Tip: Make your inclusion efforts feel exciting — something your employees will want to rally around. For instance, we branded our inclusion program "Kaleidoscope" and executed an internal marketing plan that includes guest speakers, happy hours, employee-driven resource groups and even a hashtag to drive buzz.[16]

Canada:

From community streets to corporate boardrooms, no place of work or leisure is immune to change – and change is long overdue. But to enact it, we must persistently push for inclusive work cultures and equitable opportunities for employment and leadership. To achieve real, lasting progress we still need to figure out how to effectively implement and sustain the strategies and solutions that move us from good intentions to meaningful transformation.

One of the ways exclusion persists for Black, Indigenous and People of Colour (BIPOC) is in the form of employment and wage gaps. They are significantly underrepresented in senior leadership and entrepreneur roles, and overrepresented in precarious, entry-level positions – especially BIPOC women, who also bear the burden of disproportionately high levels of discrimination. The emotional burden of overcoming the impacts of this experience prevents BIPOC women from achieving their full potential.

To transform the status quo, we need to change who's at the top – who calls the shots in our places of work and our systems of political power. Underrepresented voices shouldn't just be at the table, we need to see them at the head. When diverse voices and experiences are in leadership roles and able to set policies and reshape cultures, new opportunities emerge to deconstruct and rebuild organizations. And our ways of working and living can become truly inclusive.

This isn't a new idea. And there's an abundance of evidence to support the positive impact of diverse leadership on employee well-being, workplace cultures, and organizational success. But how do we get there?

Our work at the Conference Board of Canada is focusing on the barriers and enablers of pathways to leadership for women –including women's representation on boards of directors, i.e. one of the ways the evidence shows that we can disrupt the status quo.

After years of advocacy and mentorship, as well as shifts in norms and policies, we've seen some progress – for white women. The largest private companies in Canada have achieved 30 per cent representation of women on their boards – the oft cited threshold for enabling a change in boardroom culture. Yet only about six per cent of board seats are held by BIPOC people, and less than one per cent are held by Black directors. The same story rings true for senior executive roles.

Our latest workplace inclusion project focuses on a regulation designed to accelerate the representation of women on corporate boards. This regulation requires all companies listed on the Toronto Stock Exchange to publicly report on the number of women on their

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[16] Hamill, L. (2019.) What An Inclusive Workplace Actually Looks Like, And Seven Ways To Achieve It. Forbes. Retrieved from: https://www.forbes.com/sites/forbeshumanresourcescouncil/2019/02/04/what-an-inclusive-workplace-actually-looks-like-and-seven-ways-to-achieve-it/?sh=478419c9316b

boards and any efforts they're taking to increase that number. If a company chooses not to disclose this information or engage in these efforts, they must explain why.

Commonly referred to as "comply or explain," the idea is that transparency will act as a motivator to get companies moving towards greater board diversity. But questions remain as to whether a comply or explain approach effectively accelerates change. This is a challenge that we've set out to explore, understand and answer.

Another challenge: within the existing regulations, "women" are considered one broad category. No further information is available on whether women appointed to boards represent other communities such as Indigenous or persons of colour. This itself highlights a critical opportunity to become more sophisticated about intersectionality in gender diversity and inclusion efforts – especially for vastly underrepresented groups like BIPOC women. That being said, we also contend that a deeper understanding of the comply or explain approach is a necessary place to start if we want to change who's at the top.

The end goal of our research is to figure out what's working, what's not, and continue to benchmark progress. We aspire to figure out how to scale what works across sectors and equity groups and apply lessons learned from our women-first lens to ongoing efforts that focus on representation and inclusion of non-white women and other equity groups.

Recent social movements have exposed the limitations of earlier attempts to improve workplace inclusion and diverse leadership. They've also opened a window of opportunity. The strides we're making to evaluate approaches, like comply or explain, will hopefully help us to speed up change and ensure this important moment doesn't go to waste.[17]

Leave No One Behind - Equality and Non-Discrimination

Solutions to address rising inequalities and discrimination(EDI)

- Increasing financial inclusion
- Reducing gender disparity
- Making the workplace more inclusive

[17] Black, S. & Giammarco, M. (2020). Aiming for the top: The push for an inclusive corporate Canada. The Conference Board of Canada. Retrieved from: https://www.conferenceboard.ca/insights/featured/inclusion/aiming-for-the-top-the-push-for-an-inclusive-corporate-canada

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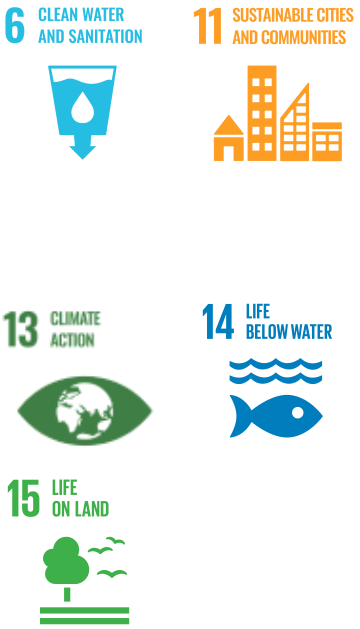

2.Theme: Clean Water and Sanitation

Solutions for sustainable management of water resources

Proposed Topics:

- Cleaning up the Grand River and/or Great Lakes.
- Water conservation and pollution of groundwater resources.
- Agricultural water conservation and increasing water efficiency

Summary

Access to water and sanitation are recognized by the United Nations as human rights, reflecting the fundamental nature of these basics in every person's life. Lack of access to safe, sufficient and affordable water, sanitation and hygiene facilities has a devastating effect on the health, dignity and prosperity of billions of people, and has significant consequences for the realization of other human rights.

People are rights-holders and States are duty-bearers of providing water and sanitation services. Rights-holders can claim their rights and duty-bearers must guarantee the rights to water and sanitation equally and without discrimination.[18]

Introduction

Water connects every aspect of life. Access to safe water and sanitation can quickly turn problems into potential – empowering people with time for school and work, and contributing to improved health for women, children, and families around the world.

Today, 771 million people – 1 in 10 – lack access to safe water and 1.7 billion people – 1 in 4 – lack access to a toilet.

Women:
Women are disproportionately affected by the water crisis, as they are often responsible for collecting water. This takes time away from work, school and caring for family. The lack of water and sanitation locks women in a cycle of poverty. Women and girls spend 200 million hours every day collecting water [worldwide].

Health:
The water crisis is a health crisis. Nearly 1 million people die each year from water, sanitation and hygiene-related diseases which could be reduced with access to safe water or sanitation. Every 2 minutes a child dies from a water-related disease. Access to safe water and sanitation contributes to improved health and helps prevent the spread of infectious diseases. It means reduced child and maternal mortality rates. It means reduced physical injury from constant lifting and carrying heavy loads of water. As we face the COVID-19 pandemic, now more than ever access to safe water is critical to the health of families around the world.

Children:
Children are often responsible for collecting water for their families. This takes time away from school and play. Access to safe water and sanitation changes this. Reductions in time spent collecting water have been found to increase school attendance, especially for girls. Access to safe water gives children time to play and the opportunity for a bright future. Additionally, 1 in 3 schools lacks access to basic water and sanitation and the 3rd leading cause of child death is diarrhea.

Economy:
Time spent gathering water or seeking safe sanitation accounts for billions in lost economic opportunities. $260 billion is lost globally each year due to lack of basic water and sanitation. Access to safe water and sanitation at home turns time spent into time saved, giving families more time to pursue education and work opportunities that will help them break the cycle of poverty. Additionally, universal access to basic water and sanitation would result in $18.5 billion in economic benefits each year from avoided deaths alone.[19]

The current State of Affairs

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[18] UN Water. (2021). Human Rights to Water and Sanitation. Retrieved from: https://www.unwater.org/water-facts/human-rights/

[19] Water.org. (2022). The Water Crisis. Retrieved from: https://water.org/our-impact/water-crisis/

Making sure that there is water and sanitation for all people, for all purposes, by 2030 will help future-proof global society against the many and varied threats coming down the line. Our immediate, shared task is to establish safe water and sanitation services in homes, schools, workplaces and health care facilities. We must increase investment in water-use efficiency, wastewater treatment, and reuse, while financing the protection of water-related ecosystems. And we must integrate our approaches, with improved governance and coordination across sectors and geographical borders.

We must make sure that decision makers are clear about the economic case: when we invest in water it has a catalytic effect on other areas such as health, education, agriculture and job creation.

The economic case for achieving SDG 6 is well known and beyond question. Ours is a battle for human health, dignity and opportunity.

SDG 6 is critical to sustainable development. Safe drinking water and sanitation are human rights. Access to these services, including water and soap for handwashing, is fundamental to human health and well-being. They are essential to improving nutrition, preventing disease and enabling health care, as well as to ensuring the functioning of schools, workplaces and political institutions and the full participation in society of women, girls and marginalized groups.

SDG 6, however, goes far beyond water and sanitation services to cover the entire water cycle. Aside from domestic purposes, water is needed across all sectors of society, to produce food, energy, goods and services. These uses also generate wastewater which, if not properly managed, can spread diseases, and introduce excess nutrients and hazardous substances into rivers, lakes and oceans. Ultimately, as ecosystems provide water to society, a significant share of the water needs to stay within the ecosystems for them to remain healthy. Healthy ecosystems in turn safeguard the quantity and quality of freshwater, as well as overall resilience to human- and environmentally-induced changes.

The effects of climate change are often seen in changes in water availability, such as increasing water scarcity in some regions and flooding in others. Consequently, water is a key factor in managing risks related to famine, disease epidemics, migration, inequalities within and between countries, political instability and natural disasters. With limited water resources, it is important to fairly balance the water requirements of society, the economy and the environment. Also, most of the world's water resources are shared between two or more countries. As such, the development and management of water resources has an impact across transboundary basins, making cooperation essential.[20]

Current Trends

The Sustainable Development Goals highlight the importance that the global community places on water and there is increasing demand for innovative and effective approaches to water management. With widespread competing demands on water, maintaining environmental sustainability and meeting the needs of the most vulnerable members of society must both be addressed.[21]

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[20] UN Water. (2021). Summary Progress Update 2021: SDG 6 — water and sanitation for all. Retrieved from: https://www.unwater.org/app/uploads/2021/12/SDG-6-Summary-Progress-Update-2021_Version-July-2021a.pdf

[21] OECD. (2021). The Water Challenge. Retrieved from: https://www.oecd.org/water/

Many predict that by the end of this century water will dominate world natural resources politics as oil does today. Access to water is widely regarded as a basic human right, and was declared so by the United Nations in 1992. And yet the water crisis grows: although the total volume of water on the planet may be sufficient for our needs, much of it is misallocated, wasted, or polluted, and the poorest of the poor live in arid areas where water is scarce. The coming decade will require new perspectives on water resources and reconsideration of the principles of water governance and policy.[22]

[As a result] availability of water of the right quality, at the right time and place to meet environmental, economic and human needs requires active water resources management. To assist policymakers in addressing this challenge, the OECD is working on policy responses in the following key areas:

- Financing water resources management
- Policy coherence
- Information for water management
- Water pricing
- Water and climate change[23]

Canada:
In 2018, Cape Town was steadily inching toward Day Zero. Three years of punishing drought had reduced the city's rain-fed reservoirs to just 17 percent capacity. It seemed possible that the South African metropolis might become the first major city in the world to run out of water. Luckily, disaster was narrowly averted when rain arrived in the fall of 2018 and restored the water supply.

But scientists warn that, as the planet continues to warm and extreme weather events become more common, scenarios similar to what transpired in Cape Town will surface in other parts of the world. Even Canada is not immune to this threat. In fact, some places in Canada have already had to cope with water shortages.

In 2015, Regina and Moose Jaw, Saskatchewan, had to ration water supplies due to an inability to treat a toxic algae bloom in Buffalo Pound Lake, which supplies drinking water to both cities. In 2016, a summer drought led to water restrictions in southern Ontario and Nova Scotia, and in 2018 stringent water restrictions were imposed on many southern Alberta communities and farms due to reduced river flows. Even Vancouver, a city perched on the edge of a rainforest, has recently begun rationing summer water use due to a combination of rising consumer demand and a shrinking of the mountain snowpack that supplies the city's reservoir.

"The Vancouver situation has some eerie parallels to Cape Town," says John Pomeroy, a world-renowned hydrologist at the University of Saskatchewan who has spent three decades studying ways to reduce the impact of water-related natural disasters. Dr. Pomeroy believes that Canadian municipalities should be looking at ways to store water and encourage reduced consumption. "Every community and province needs a drought plan – how they will deal with water shortages to maintain supplies to priority users and how they will apportion water when it runs short."

The fact that Canada faces real threats to its water security will surprise many Canadians, as the popular perception is that we are a country with a virtually inexhaustible supply of water. "It's a myth of abundance and it has affected water policy. It's allowed us to be a little bit lazy," says Rob de Loë, a

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[22] Whiteley, J. M., Ingram, H., & Perry, R. W. (Eds.). (2008). *Water, place, and equity*. MIT Press. Book Overview Retrieved from: https://www.amazon.ca/Water-Place-Equity-Thomas-Arnold/dp/0262731916
[23] OECD. (2021). Water Resources Management. Retrieved from: https://www.oecd.org/env/resources/waterresourcesmanagement.htm

professor in the faculty of environment, resources and sustainability at the University of Waterloo and a member of its Water Institute.

Dr. de Loë notes that much of Canada's water is simply not accessible. Although we possess about 20 percent of global freshwater resources, only seven percent is considered renewable – and most of that drains north toward Hudson's Bay and the Arctic Ocean, putting it out of reach of the roughly 90 percent of Canadians who live within 160 kilometres from the nation's southern border. "You tell people in Ontario that we have a limited amount of water and they will point to the Great Lakes and laugh," he says. "But you can only take a modest amount of water from the lakes without doing damage. The lakes aren't like a keg at a college beer party where you empty one, then just roll out another one."

A number of water experts contend that Canada's approach to water management badly needs revamping. In her 2016 book Boiling Point: Government Neglect, Corporate Abuse and Canada's Water Crisis, author Maude Barlow describes our existing water protection regulations as uneven and generally inadequate. "They are a patchwork of outdated, vague and even conflicting regulations with no coherent overarching principles or rational planning," she writes. "Many of our laws were originally enacted well over a century ago for a country that was still largely rural and agrarian and whose population mostly extracted water for their own use."

As it stands, portfolios such as agriculture, health, water and wastewater treatment are shared between multiple agencies and levels of government, while water itself flows across municipal, provincial, territorial and sometimes national boundaries. The federal government notes that no less than 20 federal departments and agencies share responsibility for freshwater across Canada.

Even something as basic as drinking water suffers from this disjointed approach. Incredibly, there is no federal law that governs the standard for drinking water. The job is left to the provinces, which create their own guidelines. The drawback with this is consistency. As Dr. Pomeroy notes, "You end up with a mixture of standards. Some provinces do a great job and some don't."

The piecemeal division of responsibilities has made it difficult to generate and implement a national vision for water management. But the need to develop one is becoming increasingly urgent, especially when one considers that the major natural disasters most likely to afflict Canadians – drought, flooding and forest fires – are closely tied to water and that all three are expected to increase in severity due to climate change. The GWF estimates that $28 billion has already been spent responding to and repairing the impacts of climate-related water disasters between 2000 and 2017. During the next five years, flooding alone is expected to cost the federal government's disaster assistance fund more than $650 million a year. Yet, despite this looming threat, Canada is the only G7 country without a national flood-forecasting system.

A recent study of 16 Canadian cities, conducted by the Intact Centre on Climate Adaptation at U of Waterloo, found that these municipalities had made little progress to limit their risk of flooding over the past five years, scoring an average of C+ in flood-readiness. If a large-scale flood were to occur this spring, the impact on Canadians, compounded by the pandemic, could be "catastrophic," said Blair Feltmate, co-author of the study and head of the centre.

In Western Canada, flooding and drought are both directly affected by the snowpack conditions in the Rocky Mountains. The snow that falls here provides everything from drinking water to irrigation for agriculture for tens of millions of people across North America. "But we're gradually losing it," says Dr. Pomeroy. "As temperatures rise, the mountain snowpack is melting faster and earlier. As a result, the

water is moving through river basins more quickly than in the past and leaving them parched by the end of summer."

We are also losing our glaciers, which supply water flow in late summer and fall when other stream components are small. Glacial coverage on the Albertan side of the Rockies has declined by as much as 25 percent, and at least 300 glaciers have vanished entirely, in the past 30 years.
Parched conditions in the west have fueled the threat of major forest fires, such as the immense Fort McMurray wildfire in Alberta in 2016. The conflagration caused the evacuation of almost 90,000 people and became the most expensive natural disaster in Canadian history, destroying 2,400 buildings and causing an estimated $10 billion in damage.

In British Columbia, where forest fires have been burning at a record pace, forestry experts warn that the province may soon have to contend with wildfires on a scale similar to those that recently devastated Australia. The increase is not thought to be entirely a product of climate change, but it is certainly a key factor. Longer-lasting heat waves suck the moisture out of the forests, making them susceptible to ignition from lightning and human carelessness. A report by the Pacific Climate Impacts Consortium at the University of Victoria found that B.C.'s 2017 wildfire season may have been up to 11 times more destructive due to the effects of climate change.

Forest fires also pose a threat to drinking water, says Dr. de Loë. "Forest fires can deliver suspended solids and nutrients like dissolved organic carbon and bioavailable phosphorus that can lead to conditions that challenge drinking water treatment operations beyond their response capacities."

Another destructive side-effect occurs at high altitudes where soot from the fires is darkening glacial ice. The darker colour absorbs more sunlight, melting the ice. "Parts of the glaciers look as dark as an agricultural field," says Dr. Pomeroy. "There is algae growing on the ice now and it's helping to hold the soot in place. This was never a part of the predictive models we had. It's been a nasty surprise."

Another water-related issue that rarely makes the headlines is the lack of clean drinking water in remote communities. It is more prevalent than one might suppose, notes Lee Jackson, a professor of evolutionary biology at the University of Calgary who has been studying water supplies for both small rural communities and larger centres. "On July 7, 2020, for example, there were 750 boil-water advisories in Canada," says Dr. Jackson.

"It is hard for city folk to imagine the problem," says Madjid Mohseni, a professor of chemical and biological engineering at the University of British Columbia. "These people have to be careful to never drink the water. They may have children in the house and so the psychological pressure is enormous. Some are fly-in communities where the bottled water has to be delivered. But what if the water doesn't arrive?"

Dr. Jackson says there are technological solutions available to help these communities and that researchers at U of Calgary's faculty of science have devised a drinking water and wastewater treatment system scaled to a community of 750 to 1,000 people. "It's an on-the-ground solution to the water issues of remote communities, with value-added components: biofuel production, a greenhouse, and the production of phosphorus-rich fertilizer, which can be used by the community or sold for profit," says Dr. Jackson.

"This technology exists and is being used in the Netherlands. The issue is that we need to find a way to get this into communities. The cost is approximately $1.5 million per community. This work is at a concept stage and we're trying to find communities that are willing to partner with us."

Another issue with water treatment plants is that their design must be appropriate to the target community. “Are there people living there with the skill set to operate them? It’s vital to select the right technology for the setting,” says Dr. Mohseni, who also serves as the scientific director for the RESEAU Centre for Mobilizing Innovation, headquartered at UBC and funded by the Natural Sciences and Engineering Research Council. The group, which works with various partners, offers solutions for remote Canadian communities that have problems obtaining clean drinking water either due to organic contaminants or some form of heavy metals pollution. These communities range in size from a couple of households to about 2,000 people.

Dr. Mohseni says his group found it needed to get the individual communities involved in the projects and listen to their concerns if they were to be successful. “It’s essential to understand the values that are held by these remote communities because they may not be the same as our own. This is even more critical with First Nations communities.”

Dr. Jackson says that the traditional government approach has been to administer solutions from the top down, a strategy that often ignores consequences. “The federal government just announced it was going to spend $1.5 billion on water treatment in Indigenous communities, but nowhere is there any mention of what they intend to do with wastewater produced in these plants. It’s a major concern of people in these communities.”

Oliver Brandes believes that formulating more meaningful water policies means changing the mindset that sees water as a resource to be extracted to one that needs to be nurtured and preserved. Dr. Brandes, who is co-director of the POLIS Water Sustainability Project based at UVic’s Centre for Global Studies, believes Canada’s national approach to water security needs to be overhauled. This overhaul should focus on modernization of the Canada Water Act (which has not been modified since it was passed in 1970), and policy renewal “that focuses on building climate change resilience, advancing reconciliation with Indigenous peoples and ensuring effective water governance.”

Carleton’s Dr. Ormeci says Canada has been slow to change regulations and adopt new water policies that reflect current conditions and demographics. “We don’t do enough to protect our water resources. Up until 2012 we didn’t even have a legal standard for treating wastewater effluent,” she says. In fact, until very recently several Canadian coastal cities continued to dump raw sewage directly into the ocean.

The last holdout, Victoria, which was spewing 130 million litres of raw sewage daily directly into the Juan de Fuca Strait, announced this past December that its new $775-million wastewater treatment plant was finally up and running. The plant took over four years to build but decades of debate to finally get started as local politicians contended that the natural currents in the strait created the “perfect flush.”

“There is always a lag behind the scientific understanding of an issue and the incorporating of the science into engineering decisions,” says Ali Nazemi, an assistant professor in the department of building, civil and environmental engineering at Concordia University. “Making things more difficult is climate change, which is moving at an unprecedented rate,” adds Dr. Nazemi, who is also director of the Water Security and Climate Change lab at Concordia. “It’s even more of a problem in Canada, where the temperature is rising at twice the global average. In the North, it is increasing at three times the global average.”

Fortunately, help may be on the horizon. This past year, Prime Minister Justin Trudeau instructed the minister of environment and climate change to establish a Canada Water Agency that will "work together with the provinces, territories, Indigenous communities, local authorities, scientists, and others to find the best ways to keep our water safe, clean and well-managed." An online national panel discussion, involving more than 650 scientists and water management professionals that took place on May 13, 2020, marked the start of a series of national and regional discussions that are expected to inform the development of the new agency.

Dr. Nazemi senses an opportunity. "There are a lot of good things happening on the research side. I believe we can apply the lessons we have learned to other countries. We could become exporters of science to the world. We have the expertise and we also have a head start because we are already dealing with these warming questions."

In the meantime, more research needs to be done, says Dr. Pomeroy, pointing to problems of diminished groundwater quality, shrinking lake ice, the growth of toxic algae in lakes, thawing permafrost in Canada's North, and the lack of empowerment of Indigenous communities to manage their own water sources.

Looming over the entire issue is the spectre of climate change. "As we lose our snow and ice, floods can happen anytime of the year, droughts can be more severe, and our hydrological stability is lost. Our rivers become much more dangerous, more variable and less predictable," says Dr. Pomeroy. "Climate change is like going down some pretty terrifying rapids, and it's going to take expert canoeing to get through this."[24]

Challenges

In addition to the global challenges and Canadian overview detailed above, the following details focus on the current Canadian challenges.

Freshwater:

Defining key performance indicators, milestones and timelines, and publicly tracking/communicating progress towards achieving the objectives is recommended. Because management of freshwater resources rests with many (e.g. provinces, territories, Indigenous communities, municipalities and in some cases international agencies), achieving the stated objectives requires a champion and sufficient resources to ensure efficient coordination and sharing of information.

Ongoing boil water advisories in Indigenous communities must be addressed. While we cannot speak from the perspective of members of these communities, …best practices learned in developing and managing water resources in Ontario can be drawn from. For example, methods to engineer and maintain infrastructure, training and ongoing education of water treatment system operators, ongoing investment in data collection and source water protection.

The sustainable management of our water resources will require a community effort, therefore we support efforts to promote public engagement. Sharing of data regarding water use and water quality may further this goal. For example, contrasting the success we have achieved thus far in managing the Great Lakes, and gaps still to be closed in continuing to improve the Great Lakes watershed quality. This community effort includes Indigenous communities. It is our understanding that while the province, municipalities and conservation authorities have different responsibilities and resources,

[24] Banks, K. (2021). Canada's troubled waters. University Affairs. Retrieved from: https://www.universityaffairs.ca/features/feature-article/canadas-troubled-waters/

there is not always the resources or directive to facilitate sharing between these entities and Indigenous communities.

The Federal Government should continue to play a leading role in coordinating sustainable transboundary management of freshwater resources with the United States. As the climate changes there may be increased pressure to draw water outside watersheds, therefore, ongoing leadership in sustainable management of these shared resources is critical.

Significant groundwater aquifers are mapped, but there is limited information about local aquifers and limited data about how water quantity and quality will change over time as the climate changes. Many development (community intensification) decisions are based on modelling water taking with respect to a specific development at a specific point in time. However, investment in mapping, tracking and modelling of aquifers into the future may ensure more sustainable use of groundwater resources. This will be critical in Ontario in particular where urban sprawl is leading to community growth further from traditional surface water sources (e.g. the Great Lakes, Ottawa River, Lake Simcoe).

Leadership in freshwater technology, innovation and infrastructure is identified as an objective and …this is important to maintaining our strength in this regard. Specific areas in which we intend to maintain leadership, or become leaders in, freshwater technology, innovation and infrastructure are not identified, but should be considered. Specific areas of continued investment may include continued support of research into emerging contaminants of concern and solutions to mitigate them at the point of discharge (sewage treatment) or at intake (drinking water treatment).

Other opportunities for leadership rest in addressing:

- water quality issues in Northern and Indigenous communities,
- the need for solutions that can be deployed and maintained in areas with smaller population,
- the fewer resources to maintain infrastructure that was originally developed to serve our cities.

Freshwater Policy, Coordination and Multilateral Engagement:

While Federal, Provincial, Municipal and Indigenous freshwater management jurisdictions exist, it is important to note that geographic variations in freshwater issues are common, hence the need for a collaborative effort by all stakeholders to capture and share information and best practices. For example, when a new threat is identified: by coordinating and sharing knowledge, upgrades can be made to treatment standards, infrastructure design, and training requirements.

The Federal Government can draw from/build upon the Conservation Authority model in Ontario, which tasks entities with managing watersheds. This model depends on access to sustained funding for data gathering/management and technical resources. This model could be expanded to increase our understanding and management of groundwater resources and enhance sharing of freshwater protection best practices at the federal and international levels.

Freshwater Prediction to Inform Climate Change Adaptation and Disaster Risk Reduction:

Although water resources are primarily a provincial resource, the Federal Government has an important role to play in the collection of meteorological and hydrologic data through the Water Survey of Canada (established around 1908) and the Atmospheric Environment Service. Federal program cuts in the 1990's resulted in a significant reduction in the number of water gauging stations operated by the Water Survey of Canada through agreements with the provinces. Across Canada the number of water level gauging stations was reduced by 724 stations – 21% of the network. The Atmospheric Environment Service budget was cut by roughly 50% in this same period – resulting in

the thinning out of the hydrometric network. The creation of the Canada Water Agency would be an opportune time to assess whether our data collection system is sufficient to support the planning and studies needed for sound water management policies**.**

Flooding:

An important aspect of managing Canada's water resources is the reduction of damages from large flood events. Canada has had many devastating floods – Burin Peninsula, Newfoundland 1929, Winnipeg 1953, Toronto 1954, Fort McMurray 2020 Saguenay 1996 to name just a few. In addition to private damages, these floods have necessitated large federal costs through federal/provincial cost-shared disaster assistance and the shared costs of dikes, dams and other flood prevention works.

The most effective way of reducing flood damages is through better land use planning and development controls to prevent flood vulnerable development in flood prone areas. The Province of Ontario has a great record in this regard as after the 1954 Hurricane Hazel flooding, good flood plain development policies were implemented through the Flood and Fill Regulations under the Conservation Authorities Act and sound municipal regulations implemented under the Ontario Planning Act and Policy Statements.

However, other provinces were lacking these planning measures and flood damages across Canada kept increasing. In 1974, the Federal Government initiated a national Flood Damage Reduction Program (FDRP) to identify flood risk areas through mapping and to take measures to discourage flood prone development in these mapped areas. Agreements were made with most provinces, including Ontario, to share the cost of mapping and associated measures in flood risk areas. A key component of the program was the introduction of measures to discourage further flood risk development. The Federal Government would not provide CMHC insured mortgages for new flood-prone development nor would new development be eligible for federal flood disaster relief.

Under the Canada/Ontario Flood Damage Reduction Program, 1978 – 1998, over 500 communities were mapped and 320 flood risk areas were designated.

The Canadian Government planned to continue the FDRP on a reduced "maintenance level" scale to keep the maps current and keep the policies to deter flood prone development in place. However, federal program cuts in the late 90s led to the complete termination of the FDRP. Despite this, there is still a critical need to update mapping and maintain flood damage reduction policies. As a result, in many areas, flood risk maps are 25 years out of date. In addition, climate change is affecting the flood risk standards that should be used. In many areas, the standard has been the so-called 1:100 year flood level – this is the level associated with a flood risk of 1.0% each year. However, with climate change expected to increase the occurrence of extreme meteorological events, the flood risk standard should be re-evaluated.

While flooding is referenced in the Canada Water Agency discussion paper, it remains unclear whether the proposed flood risk mapping program will be carried out by ECCC or NRCan. NRCan had already been given the lead and some funding – but has little expertise in flood risk mapping, while ECCC has no money but some remaining expertise. Some clarity is needed on which agency will have this responsibility.

Northern and Indigenous Communities:

The effects of climate change are more pronounced in northern communities. These communities also often have less engineered infrastructure to respond to these changes. Changes in weather patterns may affect the quantity and quality of water supply and increase flooding events. Climate change is also anticipated to affect the ecosystems that naturally regulate water quality and quantity. Ongoing research to model, monitor and adapt to climate change is absolutely necessary.

…the government's intent and effort [is] to ensure that Indigenous Peoples are fully consulted in a meaningful way during the entire process of shaping and establishing the Clean Water Agency and in providing leadership and expertise.

[We]...need to ensure that:

Indigenous peoples have greater autonomy in freshwater management as part of the recognition and implementation of their right to self-government, and as an element of their vision for self-determination;

- the Government of Canada respects Indigenous rights, interests, and their relationships with freshwater ecosystems, in decisions related to development, commercial industries, conservation, and general freshwater governance;
- Indigenous knowledge systems carry equal weight to the Crown's ways of knowing; and
- the inclusion of traditional and contemporary Indigenous governance structures in the management of fresh water and the broader environment.

Furthermore, …there is a need for the government to invest in engineering training on how to properly engage with Indigenous communities, and therefore ensure that systems are properly designed, developed and integrated into these communities. It is also important for engineers to understand the need to operate infrastructure and/or gather data in the context of Indigenous laws, institutions, knowledge systems and values. The federal government must ensure that the engineering profession is properly equipped to serve Indigenous communities across Canada.

Agriculture:

Agriculture is a significant contributor to the Canadian economy, generating about $140 billion in annual GDP. In 2018, Canadian agricultural producers used approximately 2.95 billion cubic meters of water to irrigate crops. This is a figure that has grown over the years as a result of changing climate conditions in Western Canada (i.e. dry weather conditions in Saskatchewan, Alberta and British Columbia). In light of this growing need for freshwater to support irrigation and livestock, a resilient freshwater management strategy is critical to sustain the agricultural sector and sustainably manage water resources.

While the agricultural sector relies on a large quantity of clean and reliable surface and groundwater for safe and efficient food production, it also has a significant impact on the surrounding environment, including freshwater sources. Industrial agricultural waste is a significant contributor to poor water conditions resulting from high concentrations of phosphorus and nitrogen associated with crop fertilizer and animal waste.

When crops are overdosed with fertilizers and animal waste is sprayed on fields, these contaminants eventually migrate into groundwater and surface water sources. The result is the pollution of groundwater resources like in Walkerton, Ontario and/or surface water bodies like Lake Erie.

High concentrations of agricultural contaminants make water treatment challenging, more costly, and threatens the sustainability of freshwater resources.

The efforts of the Government of Canada, through AAFC, the Canadian Agricultural Partnership, and the various agricultural organizations and programs are targeted at helping farmers across provinces and territories by focusing on priorities that will support sustainability of their operations. To support freshwater management activities across the country, a Canada Water Agency may provide leadership in:

- Coordination, monitoring and information gathering, and education of farmers to allow them to make informed decisions in their operations;
- Supporting agricultural innovations and efficient water technologies that will increase resilience and sustainability;

- Pushing for policy frameworks freshwater management and encourage more farms that will support stronger to utilise these new technologies for water conservation.

New technologies for agricultural water conservation are design upgrades and tools that increase water efficiency for agricultural use without compromising the quality and quantity of agricultural produce that sustains the whole of Canada. These technologies include:

1. More efficient irrigation equipment – These are upgrades to the traditional gravity or pumped irrigation systems that will allow efficient use of water in farms and avoid water wastage. Examples of these tools are:
    a. Drip irrigation systems that deliver water directly to the plant roots thereby reducing evaporation with water spraying systems;
    b. Smart irrigation systems, which are automated irrigation systems that save significant amount of water and reduce equipment wear by adapting to:
        i. Irrigation schedule – programmed to water during cooler parts of the day so water loss can be reduced;
        ii. Current conditions - monitors soil moisture and weather using apps in an automated system that measures and regulates flow with flow meters and control valves.
2. Soil management techniques that encourage healthy soil which promotes nutrient and water retention.
3. Where possible, recycling water by capturing runoffs due to overwatering or poor soil for irrigation.
4. Building reservoirs or ponds to capture and store rainfall for use throughout the year. This can help minimize impact to the surrounding watershed.
5. Development of best practices and funding to facilitate the implementation of naturalized buffers (e.g. biological systems engineering) at the periphery of agricultural operations to recapture runoff and attenuate resultant impacts.

An effective tool for a farm would combine all or part of these useful technologies to enhance water management for agricultural use and sustain its production.

Economic Sectors:

[There is] need for the Federal Government to work:

- Together with other governments and partners, support economic sectors in developing and implementing sector-specific freshwater sustainability strategies that consider both present and future challenges and opportunities.
- Together with other governments, academia, industry, and others support the development, testing, and implementation of innovative technologies and approaches for sustainable freshwater management.
- Collaboratively to improve coordination of science pursuits and information gathering activities to bridge knowledge gaps across jurisdictions and economic sectors, and ensure access to the data and knowledge needed to make effective freshwater management decisions.

The energy sector (comprising oil and gas development and electricity generation) requires a large quantity of Canada's water resources to function. The petroleum industry utilizes water injection (an oil recovery process), thermal power plants and hydroelectric power plants rely upon significant volumes of freshwater for cooling and power generation respectively making the oil and energy sectors some of the largest water reliant sectors in Canada.

In the western provinces of Canada where oil and gas activities are predominant, the major challenges appear to be competing demand for water by other sectors (e.g. agriculture and manufacturing) and

the risk of groundwater sources drying up in seasons of drought which has been amplified by effects of climate change.

In Southern Ontario, there are more than 120 hydroelectric facilities producing 40% of power generated in Ontario. The amount of electricity a hydropower installation can produce depends on the quantity of water passing through its turbines and on the height at which the water falls (hydrostatic head) – the bigger the reservoir, the better with hydroelectric power generation. Hydroelectric power provides the means to meet Canada's increasing energy needs without substantially increasing our carbon footprint but hydroelectric dams have also contributed to the disruption of ecosystems upstream and downstream, with short and long term effects on freshwater characteristics. Periods of drought present challenges to freshwater shortage for hydroelectric generation as the longer-term effects of climate change are manifested.

Science:

Many communities in Ontario are situated along the Great Lakes and rely on these surface water bodies for their freshwater needs. We share the Great Lakes with the United States and, therefore, water takings and discharge of waste into the Great Lakes affects a large number of people on both sides of the border.

Many emerging contaminants of concern are not treated by our traditional waste treatment processes, so we increase the risk that these contaminants end up in our drinking water. Traditionally, dilution has been the solution, but many new emerging contaminants of concern are bioactive at very small concentrations (e.g. picomolar) and many of our toxicological models assume acute exposure but aren't well positioned to address chronic exposures (e.g. over a lifetime). Ongoing research into these emerging contaminants, development of technologies to treat them at the point of discharge or water intake and collaboration with the provincial and state authorities that set compliance standards is required.

Water quality will also be affected by climate change as it relates to the cycling of nutrients in surface water bodies and inputs of point source contaminants due to hardening of urban areas, peak storm events, and loss of natural capacity to attenuate impacts (e.g. wetlands). Ongoing monitoring and modelling of our water resources is necessary for engineers to make good design decisions to ensure the resiliency of infrastructure and to identify opportunities and best practices to reduce strain on water resources.

Data:

[It is important to increase] efforts to promote the gathering and sharing of data. Data regarding the quantity and quality of surface and ground water resources informs engineering design. Efforts to aggregate data and evaluate trends over time, and to model effects of climate change would be welcomed. Groundwater resources in particular (e.g. regional and local aquifers) are currently poorly characterized.

Technology, Innovation and Infrastructure:

Canada is generally a leader in water infrastructure and technology, however, investment in drinking water and sewage treatment infrastructure often lags these developments by many decades, due to capital budget limitations. We support the stated objectives in the Discussion Paper and the efforts of the Government to ensure ongoing leadership in the development and implementation of freshwater technology, innovation and infrastructure.

Ongoing investment to upgrade existing infrastructure (with consideration to resiliency in response to our changing climate) is required given that much of our infrastructure in Southern Ontario was developed in the early to mid last century. For example, many older communities still rely on

combined sewers, which contribute to degraded water quality during peak precipitation events that are anticipated to become more intense and frequent.[25]

Clean Water and Sanitation

Solutions for sustainable management of water resources

Proposed Topics:

- Cleaning up the Grand River and/or Great Lakes.
- Water conservation and pollution of groundwater resources.
- Agricultural water conservation and increasing water efficiency

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3.Theme: Climate Change

Solutions for climate change issues:

Topics:

- Manage waste, reduce, reuse, recycle and recover
- Reduce Carbon Footprint/ Greenhouse gas emission
- Mitigate and Adapt to Flooding and Forest Fires.

Introduction

Today, the term “carbon footprint” is often used as a shorthand for the amount of carbon (usually in tonnes) being emitted by an activity or organization. The carbon

[25] Ontario Society of Professional Engineers. (2021). Toward the Creation of a Canada Water Agency. Retrieved from: https://ospe.on.ca/wp-content/uploads/2021/03/Canada-Water-Agency-Discussion-Paper-Response.pdf

footprint is also an important component of the Ecological Footprint since it is one competing demand for biologically productive space. Carbon emissions from burning fossil fuels accumulate in the atmosphere if there is not enough biocapacity dedicated to absorbing these emissions. Therefore, when the carbon footprint is reported within the context of the total Ecological Footprint, the tonnes of carbon dioxide emissions are expressed as the amount of productive land area required to sequester those carbon dioxide emissions. This tells us how much biocapacity is necessary to neutralize the emissions from burning fossil fuels. Measuring it in this way enables us to address the climate change challenge in a holistic way that does not simply shift the burden from one natural system to another. The climate problem emerges because the planet does not have enough biocapacity to neutralize all the carbon dioxide from fossil fuel and provide for all other demands[26].

Climate change is an urgent and deadly challenge affecting all living beings. Numerous innovative ideas about affecting change are embodying the growing consumer demand to fight climate change. Thankfully, corporations have the influence and impact to reduce key drivers contributing to climate change, whether it's through their raw materials procurement, supply chain inputs, vendor selection, or influence on customers and consumers' preferences. Pairing corporations' scale and influence with the passion, ingenuity, and technology of startups, solutions reversing climate change can be created and enacted at scale[27].

Forest fires and flooding is another implication of climate change globally.

Fire is a seasonal summer threat because it can only start, intensify, and spread in hot, dry weather. According to the fire researcher Mike Flanniga in along with other researchers, climate change is predicted to worsen all three ingredients across most of Canada, making global warming a triple threat to our forests.To figure out what climate change means for forest fires in Canada, Flannigan and a team of researchers at the Canadian Forest Service analyzed the findings of almost 50 international studies on climate change and fire risk. They found that our future looks "smoky" because climate change will worsen the three major factors that influence wildfire: having dry fuel to burn, frequent lightning strikes that start fires, and dry, windy weather that fans the flames.[28]

Current State of Affairs

Key Findings, the National issues report, 2021[29]:

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[26] FootprintNetwork. (2017.) Climate change and the Ecological Footprint https://www.footprintnetwork.org/2017/11/09/ecological-footprint-climate-change/

[27] Wung, T. (2019). 24 Innovative Startups Making Climate Change Impact in 2019. https://www.rocketspace.com/corporate-innovation/24-innovative-startups-making-climate-change-impact-in-2019

[28] Forest Fires and Climate Change https://climateatlas.ca/forest-fires-and-climate-change

[29] National Resources Canada https://changingclimate.ca/national-issues/

1. **Communities of all sizes across the country are experiencing the impacts of climate change on their infrastructure, health and well-being, cultures and economies.** Local action to reduce climate-related risks is increasing, although limited capacity is challenging the ability of many communities to act.
2. **Climate changes are threatening the vital services that Canada's ecosystems provide and are negatively impacting our water resources.** Effective coordination, cooperation and adaptive management, as well as conservation efforts, can help to reduce impacts. Nature-based approaches to adaptation that maintain or restore ecosystems, such as wetlands, are a cost-effective and sustainable means of moderating climate change impacts and building resilience.
3. **While climate change will bring some potential benefits, overall it will impose increasing economic costs on Canada.** A changing climate affects all sectors of Canada's economy through impacts on production, operations and/or disruption to supply chains. Disclosure of climate-related risks is emerging as a key driver of adaptation in the private sector.
4. **We must look beyond our borders when assessing the impacts of a changing climate for Canada.** Climate change impacts occurring elsewhere in the world, as well as the steps that other countries take—or do not take—to adapt, can strongly affect food availability, trade and immigration. These impacts place additional stress on Canada's communities, businesses and government services.
5. **Large gaps remain in our preparedness for climate change, as demonstrated by recent impacts of extreme weather events, such as floods and wildfires**. Accelerating progress on adaptation through rapid and deliberate plans and actions is vital for Canada's economic and social well-being.
6. **Lessons on good practices are continuing to emerge and are helping to guide successful adaptation.** These include empowering strong leadership, collaborating broadly, and adopting flexible management approaches. Incorporating diverse perspectives and sources of knowledge, such as Indigenous Knowledge Systems, is also imperative for effective adaptation.

Current Trends

New Green Deal

This is the time to embrace elements of a 'Green New Deal' and rethink Canada's place in energy, natural resources, and environmental stewardship for better population health. Embedding environmental stewardship and health security throughout the policies implemented following COVID-19 would not only help achieve targets under SDG 13 (Climate Action), but also SDG 3 (Good Health and Well-being), SDG 7 (Affordable and Clean Energy), SDG 14 (Life Below Water), SDG 15 (Life on Land), and SDG 17 (Partnerships for the Goals). The pandemic has

made it clear that diseases and environmental disasters do not respect borders. It has also highlighted the relevance of planetary health, which refers to both human health and the state of the natural systems on which it depends. Canada can serve as a global leader in protecting planetary health and strengthening global institutions tasked with this mission[30].

Grey vs. Green

As discussed at a roundtable organized by the Ontario Society of Professional Engineers (OSPE), bringing together leaders and experts from Green Infrastructure Ontario, various Southern Ontario Conservation Authorities, stormwater and environmental services of the Cities of Markham and Kitchener, Insurance Bureau Canada, engineering firms and environmental organizations:

Cost and Benefit Analysis

- More reliable data that adequately considers the costs and benefits of green infrastructure is needed.
- A comprehensive assessment of the financial, environmental and social costs and benefits of both grey and green infrastructure is required to properly conduct a full cost-benefit analysis.
- It is important to understand and take into account both positive and negative externalities when assessing the impact of both grey and green infrastructure.
- Green infrastructure is less predictable than grey infrastructure, and in many ways harder to quantify because some benefits are more intangible. Not all land "performs" equally, and therefore the long-term benefits of green infrastructure may vary.

Grey vs. Green?

- Most experts and engineers present at the roundtable recognized the fact that the current rhetoric of grey vs. green infrastructure is not constructive.
- Green and grey infrastructure are complimentary and can enhance each other.
- A project by project analysis is important to determine what type of infrastructure is required given a specific set of variables.
- Low Impact Development (LID) can be used to increase capacity and offset the pressures on existing infrastructure.

Climate Change

- "Natural" or green infrastructure should be considered alongside grey infrastructure solutions at all levels of government as a way of limiting flood risk

[30] BCCIC. (2020). Reading Between the Lines: Accelerated ... https://www.bccic.ca/sdg-report-2020/

across jurisdictions.
- Green infrastructure can help to offset other risks and consequences of climate events, including declining biodiversity, increasing temperatures, forest fires, ice storms, wind storms, etc.
- Green Infrastructure adapts better to changes in climate, while grey infrastructure is very susceptible and can be negatively impacted by these events.

Throughout OSPE's roundtable, there was a clear consensus that more frequent and severe flooding is stressing Ontario's existing infrastructure, and therefore there is a need to better mitigate and adapt. Some steps that need to be taken include:

- Municipalities must understand the need to adapt to changing weather patterns and consider innovative solutions, taking into account solutions that could be delivered by both grey and green infrastructure.
- There is a need to better educate the general public about the opportunity and possibility green infrastructure has in addressing weather-related events. This means that there must be a cultural shift that provides the public with a better understanding of how natural features can provide essential services.
- Provincial and municipal governments need to understand that grey infrastructure cannot be placed everywhere, and that investment has to be sustainable.
- Elected officials must also understand that there is risk in not acting, and that the current infrastructural state in the province is not suited to deal with intense weather patterns.[31]

Sustainable Production and Consumption

Shifts in transportation include increased adoption of electric vehicles and related infrastructure, various solutions for ride-sharing, environmentally friendly bikes and scooters. Top ways to combat climate change in agriculture include reducing meat consumption, specifically red meat to minimize greenhouse gas emissions, leveraging technology to reduce excessive land and vehicle dependencies, and optimizing water transportation and usage.

Managing landfill and oceanic waste can be primarily done through reducing the initial production and then during the reuse/recycle and clean-up processes, with a focus on major contributors to environmental waste such as single-use plastics, textiles/clothing, and food waste. The three main areas are waste reduction (trash to treasure), waste reduction and cleanup and waste management (efficient and

[31] Ontario Society of Professional Engineers. (2019). OSPE brings engineers and experts together to discuss green infrastructure in Ontario. Retrieved from: https://ospe.on.ca/advocacy/ospe-brings-engineers-discuss-green-infrastructure/

optimal waste processing)[32].

Sustainability in product design and supply chain is often impacted by profit margin. The circular economy is “a new way of doing business that extracts as much value as possible from resources by [re-imagining], recycling, repairing, reusing, repurposing, or refurbishing products and materials — eliminating waste and greenhouse gas emissions at the design stage.” This movement has been gaining global momentum in recent years[33].

Climate Change and Fire Weather

According to the recent study by fire researcher Mike Flannigan and several other scientists predicts that western Canada will see a 50% increase in the number of dry, windy days that let fires start and spread, whereas eastern Canada will see an even more dramatic 200% to 300% increase in this kind of “fire weather.” Other studies predict that fires could burn twice as much average area per year in Canada by the end of the century as has burned in the recent past.[34]

Climate Change and COVID-19

According to Natural Resources Canada, although dealing with the COVID-19 pandemic has dominated the world’s attention, the issue of climate change remains firmly embedded in many global, national and sub-national dialogues. Indeed, while we are still trying to understand the pandemic shocks that are rippling through our social, economic and environmental systems, some encouraging insights are emerging that are relevant to responding to climate change. The response to COVID-19 thus far has shown that once individuals, businesses and governments understand the risks, they are willing to make major changes to protect lives and livelihoods, even in the face of uncertainty. The experience of the past year has also demonstrated the advantages that can be realized through cooperation, the progress that can be achieved through aligned efforts, and the critical role that the private sector and civil society play in responding to global challenges.

Mitigation

There’s a vicious cycle connecting forest fires and climate change: warmer

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[32] Wung, T. (2019). 24 Innovative Startups Making Climate Change Impact in 2019. https://www.rocketspace.com/corporate-innovation/24-innovative-startups-making-climate-change-impact-in-2019

[33] Government of Canada. (2020). Circular Economy https://www.canada.ca/en/services/environment/conservation/sustainability/circular-economy.html

[34] Forest Fires and Climate Change https://climateatlas.ca/forest-fires-and-climate-change

temperatures make fires more likely, and burning forests release greenhouse gas pollution that makes global warming worse. This means that overall efforts to reduce greenhouse gas emissions and slow global warming will also help prevent forest fires. And on the other hand, working to reduce the number and severity of forest fires will also help slow climate change. A world of ever-increasing fire risks and consequences will demand more fire bans and forest closures as well as more innovative and life-long fire education to reduce the number of human-caused fires.

Adaptation

Facilitating long-term sustainability of ecosystem function is the foundation of climate change adaptation. Just as there is no single approach to sustainable forestry, effective climate change adaptation will vary by ecosystem, management goals, human community, and regional climate. If adaptation is addressed in a piecemeal fashion (ecological, geographic, and social), large areas and numerous communities within the forest sector may suffer the consequences of poor preparation, slow response, and inefficiencies.[35]

There are a number of things individuals and municipalities can do to reduce fire risk. Fire Smart [https://www.firesmartcanada.ca] guidelines are available for individuals and community leaders. Municipalities can create and maintain fire buffers around and within their communities by bulldozing trees, removing built-up forest litter, and making creative use of parks and open spaces as fire breaks. And individual homeowners and businesses can design buildings with fire safety in mind, for example avoiding the use of flammable materials in construction and landscaping. Concentrating fire-fighting budgets and capacity on wildfires that directly threaten human lives and livelihoods will prevent the most catastrophic impacts, naturally, reduce the buildup of dry fuel in the wilderness, and prevent firefighting costs from growing wildly out of control along with our worsening forest fires.[36]

Climate Change

[35] Strategies for Adapting to Climate Change https://www.fs.fed.us/psw/publications/millar/MillarSwanson_inpress.pdf
[36] Forest Fires and Climate Change https://climateatlas.ca/forest-fires-and-climate-change

Solutions for climate change issues

Topics:

- Manage waste, reduce, reuse, recycle and recover
- Reduce Carbon Footprint/ Greenhouse gas emission
- Mitigate and Adapt to Flooding and Forest Fires.

Resources

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