EXECUTIVE SUMMARY

MEASURING PROGRESS TOWARDS **CLEAN GROWTH**

When it comes to the relationship between climate change and economic growth, pessimists and optimists abound. Pessimists tend to see the historical relationship between economic growth and greenhouse gas (GHG) emissions as inextricably linked—believing Canada can either pursue growth or reduce emissions, but not both. In the extreme, some pessimists argue Canada's climate objectives should always come second to the pursuit of growth and jobs, while others see abandoning growth as the only path to achieving Canada's climate objectives.

Optimists, on the other hand, are convinced smart policy and technological change will deliver growth while fighting climate change. To the optimist, clean energy and clean technologies can reduce Canada's emissions while generating new sources of economic growth and jobs.

Where does the truth lie? Do Canadians need to sacrifice economic growth, jobs, and income to address climate change? How can Canadian businesses stay competitive through a low-carbon transition? Can the promise of clean technologies replace lost jobs and income if higher-carbon sectors face declining investment and demand? Who will struggle and who will benefit along the way to a cleaner future?

These questions are at the heart of the Institute's research on **clean growth**—defined as inclusive economic growth that reduces GHG emissions, strengthens resilience to a changing climate, and improves the well-being of Canadians. They are also particularly relevant as governments wrestle with how to make progress on climate change while driving an economic recovery in the wake of the COVID-19 pandemic.

This paper highlights the multiple facets of clean growth by unpacking the connections between economic growth, climate change, and human well-being. We identify 11 data-driven indicators that, together, can guide efforts by governments, businesses, and communities to not only tackle climate change but to do so in a way that achieves sustained growth and the best overall outcomes for people and society as a whole.

WHAT IS **CLEAN GROWTH?**

Clean growth is inclusive economic growth that reduces greenhouse gas emissions, strengthens resilience to a changing climate, and improves the well-being of Canadians.

SKEPTICAL OPTIMISTS

Simultaneously achieving economic growth and significant progress on climate change won't just happen by itself. It's not enough to naively hope that economic growth and jobs will magically fall into place as emissions decline. That's where skeptical optimism comes in—a commitment to pursue clean growth, while systematically rooting out and solving the myriad challenges that could derail progress.

Skeptical optimism is vastly preferable to the pessimist's choice between climate action or economic growth. At its core, skeptical optimism recognizes the importance of contributing to efforts that keep the increase in average global temperatures well below 2 degrees Celsius. Canadian well-being is at stake: without bold global action on climate change, Canadians face rising costs and significant health risks. The best outcomes for Canadians will come from building resilience to the physical effects of climate change while keeping up with the accelerating global low-carbon transition.

At the same time, skeptical optimism recognizes that economic growth can be a catalyst for the future prosperity and well-being of Canadians. Economic growth generates jobs and incomes, while providing governments with the fiscal capacity for high-quality services and supports, such as health care, social programs for disadvantaged groups, public education, roads, and transit.

Clean growth is ultimately about how to achieve these goals simultaneously—addressing climate change, growing economic prosperity, and improving human well-being—without compromising one outcome for another.

CLEAN GROWTH INDICATOR FRAMEWORK

Measuring success on clean growth requires going beyond tracking Canada's GHG emissions. Canada has committed to achieving net-zero GHG emissions by 2050, which could spark major transformations in the country's economy and society. Measuring GHGs is important, but it only tells one part of the larger clean growth story.

Canada needs broader measures that fully capture the depth and complexity of these transformations. It needs measures that can shed light on what is happening with the economy at the national, regional, and local level, and how people are affected by the clean growth transition. It needs measures that illuminate connections between climate change, economic growth, and human well-being, making it possible to identify pressure points and areas where new or amended government policy can achieve better outcomes. Climate policy will be most durable and lasting if it reflects concerns relating to investment, competitiveness, jobs, equity, and affordability. Similarly, economic and social policy will be more successful if it incorporates climate change objectives.

Making progress on each of these elements of clean growth is imperative, yet Canada currently lacks a framework to measure success. For this reason, the Institute's first report on clean growth offers a data-driven assessment of progress to date—and identifies gaps in data that are preventing Canadian policy makers from tracking, analyzing, and understanding progress over time.

Clean growth success cannot be measured by any one data point. The 11 indicators we present capture the complex web of challenges and opportunities, synergies and conflicts that emerge in the pursuit of climate progress, economic growth, and Canadians' health and well-being.

As the figure on the following page illustrates, our framework groups the 11 indicators into three categories: two overarching **goals** of clean growth—low-carbon growth and economic resilience; the **catalysts** of clean growth, which include technology development and adoption, and indicators related to trade and infrastructure; and the **foundations** of clean growth: thriving ecosystems, low-carbon jobs, clean air, inclusive resilience, and affordable energy.

11 CLEAN GROWTH INDICATORS

THE GOALS OF CLEAN GROWTH

The overarching objective of clean growth is to address climate change while growing the economy. Measuring progress requires breaking that goal into two parts, with the first indicator focused on low-carbon growth and the second looking at economic resilience to a changing climate.

Cultivating a clean growth future for Canada will require considering this suite of indicators as a whole and using them to guide priorities and assess progress in the decades ahead.

The **low-carbon growth indicator** tracks the decoupling of GHG emissions from gross domestic product (GDP) over time. We find that all provinces managed to decouple economic growth from greenhouse gas emissions between 2005 and 2018, and six provinces decreased emissions while growing their economies. Evidence also suggests that the territorial economies are decoupling as well (although data limitations prevent us from including the territories in our comparative analysis).

Our analysis finds that progress on low-carbon growth relies on three activities: finding new, low-carbon sources of growth, shifting to lower-carbon sources of growth, and reducing emissions in existing sources of growth. There is significant scope for more detailed research on these three drivers; future research could be supported by enhanced datasets that match economic and GHG data in Canada.

The **economic resilience** indicator focuses on limiting the costs Canada faces from a changing climate. While a dearth of data limits our ability to assess progress on building economic resilience, this indicator highlights some of the key areas where improved tracking of the costs of a changing climate could inform policy and investment decisions.

We use cost estimates of natural disasters as a starting point, which includes costs to households, businesses, and government. Our analysis finds that the costs of floods and wildfires have increased over time, as a result of both climate and non-climate factors; however, we also find that data limitations prevent us from capturing the full scope of these costs. Cost estimates for the 2016 Fort McMurray fire, for example, range between $4 billion and $9 billion depending on which costs are included. Better tracking of a broader range of climate-linked costs over time, combined with improved assessments of future risks, will help support better decision-making by governments, businesses, and homeowners.

CATALYSTS OF CLEAN GROWTH

The next set of indicators target areas that are catalysts for low-carbon growth and economic resilience: technology development, technology adoption, investment in low-carbon and resilient infrastructure, and low-carbon and resilient trade and competitiveness. These interconnected indicators together form the engine that can accelerate clean growth.

Developing technology that makes it easier and cheaper to reduce emissions and improve resilience can reduce the economic impacts of transition while generating new sources of growth and jobs. To measure technology development, we consider GDP estimates for environmental and clean technology products. While the dataset does not capture all potential sources of economic activity consistent with low-carbon growth and economic resilience goals, it provides a useful starting point. Overall, we find that economic activity associated with environmental and clean technology in Canada has increased over time, but has been uneven across provinces and territories. It is dominated by renewable electricity and clean technology services such as construction; however, real GDP from clean technology manufacturing grew 20 per cent between 2012 and 2018.

One of the biggest barriers to technology development is slow adoption. Data on resilience technologies is limited, so we focus on low-carbon **technology adoption**. Our headline indicator compares Canada's energy intensity and proportion of low-carbon energy to other G7 countries. While we have one of the highest levels of low-carbon energy (25 per cent) due to hydroelectric and nuclear power, our energy use per unit of GDP is significantly greater than other G7 countries. This contrast highlights the magnitude of the technology adoption challenge if Canada is going to significantly reduce emissions without slowing growth. According to a 2017 survey, only 10 per cent of Canadian firms have adopted clean technologies. Accelerating adoption supports low-carbon growth by driving strong domestic markets for new innovations and reducing emissions per unit of output.

Low-carbon and resilient trade and competitiveness is also a catalyst of clean growth. Increased global demand for low-carbon and resilient products and services creates growth opportunities for Canadian businesses, while spurring innovation and economies of scale that drive down the costs of technology adoption over time. We therefore consider exports and imports of environmental and clean technology as a percentage of GDP for this indicator. While it does not include the full range of economic activities that reflect progress, the indicator shows signs that Canada's trade activ-

ity in low-carbon goods and services is increasing over time. Fully assessing Canada's competitiveness would require a broader analysis across the economy, including sectors that may be vulnerable to shifts in global markets and investment patterns resulting from a low-carbon transition.

Given the long life of infrastructure, investment patterns can have a significant effect on low-carbon growth and economic resilience. **Infrastructure investments** that are not low-carbon or resilient will increase future costs, while limited investment in low-carbon enabling infrastructure—such as electricity transmission or electric vehicle charging—can slow technology adoption.

According to this indicator, public and private investment in electricity transmission and distribution increased significantly between 2009 and 2019, while investment in wind and solar power declined. In terms of the overall stock of infrastructure, oil and gas infrastructure has increased alongside electricity transmission, electricity distribution, and hydroelectric power generation. While increased investment in low-carbon and resilient infrastructure is generally positive, making choices on where to invest scarce public and private dollars to attain low-carbon growth and economic resilience requires broader data and analysis.

FOUNDATIONS OF CLEAN GROWTH

The final indicator set considers the foundations of clean growth. While it may be technically possible to make progress on decoupling emissions from growth or reducing the costs of climate change, without progress on these foundational elements the resulting change is less likely to be lasting and durable.

These indicators target five areas where we see the greatest risks and potential to pursue low-carbon growth that improves the well-being of Canadians. Indigenous-led policies and plans are particularly important for making progress on these indicators, given that climate change is expected to disproportionately affect the livelihoods, health, and well-being of Indigenous peoples. At the same time, Indigenous communities are well placed to play a significant role in nature-based and clean energy climate solutions.

The first foundational indicator focuses on **low-carbon jobs.** Maintaining stable and gainful employment is a primary concern as Canada and the world accelerate action to reduce GHG emissions. Transition creates both employment risks and new prospects, which are experienced unevenly across sectors, regions, and individuals. This indicator assesses progress in terms of achieving aggregate growth in jobs as emissions decrease, while minimizing regional and individual job loss and ensuring broad access to new employment opportunities. We look at the decoupling of employment and GHGs over time, and consider risks at the sector, community, and individual level.

Our analysis finds that employment in Quebec is the least tied to GHG emissions, while employment in Saskatchewan is the most tied to emissions. In Newfoundland and Labrador, growth in GHG emissions has been almost the same as growth in employment, whereas most other provinces have decoupled employment and emissions trends since 2005. Smaller communities dependent on one sector are generally more at risk of employment loss, as are individuals with lower levels of education and skills. A higher proportion of Indigenous employment is also in sectors that may be at risk.

The second foundational indicator is **affordable energy.** Households struggling to make ends meet are more vulnerable to rising costs for essential goods and services, such as heat, electricity, and transportation. Tracking and monitoring households' expenditures in these areas can help identify concerns and inform the development of relevant policies as energy systems shift. This indicator therefore looks at energy expenditures as a share of total expenditures by level of income. In general, Canadian households spent less of their income on energy in 2017 than in 2010, but households in the lower-middle to upper-middle income categories—

particularly in Atlantic Canada—continue to spend the largest shares on energy.

The third foundational indicator is **inclusive resilience**, reflecting the concern that those most vulnerable in society will bear the brunt of climate change. Those with financial means and privilege can move, rebuild, adapt, and recover more quickly than those in poverty or those who face challenges due to health, age, discrimination, or disability. Climate change threatens to exacerbate societal inequities; by better understanding who is most vulnerable, governments can develop targeted policies to protect and support them.

We use poverty as an indicator for those that are vulnerable but also identify several other measurement opportunities at the local level. At the national level, the poverty rate fell from 16 per cent of the population in 2006 to nine per cent in 2018 due to policies such as the National Child Benefit and a stronger labour market. The most significant reductions were in major cities such as Toronto, Vancouver, and Montreal.

Despite this progress, however, poverty rates remain high for some groups, such as non-elderly adults living on their own and single mothers under the age of 18, indicating that some Canadians remain highly sensitive to climate impacts and poorly equipped to deal with them. Indigenous communities also face higher risks from climate change. For instance, nearly 22 per cent of residential properties on Indigenous reserve lands in Canada are at risk of a 100-year flood. The physical impacts of climate change will exacerbate pre-existing challenges for Indigenous peoples relating to poverty, housing, health, and lack of infrastructure.

Clean air is the fourth foundational indicator. The enormous opportunity to improve the health of Canadians and limit health risks from a warming climate is often overlooked in efforts to reduce GHG emissions. Air pollutants come from many of the same sources as GHGs, and the evidence is clear that air pollution increases the risk of respiratory, cardiac, and neurological disease, causing over 14,000 premature deaths each year in Canada. Tracking progress on clean air can highlight regions and sources where policies could provide significant air pollution and GHG benefits. In Vancouver in 2017–18, for example, nitrogen dioxide (NO_2) emissions exceeded national air quality standards. Given that transportation is a major source of NO_2 emissions, efforts to encourage greater use of public transport, active transportation, and electric vehicles could generate significant health benefits, while also addressing a major source of GHG emissions.

Thriving ecosystems represent the last foundational indicator. Thinking of ecosystems strictly in the context of nature conservation ignores their essential contribution to achieving objectives relating to economic growth, human well-being, and climate change. Ecosystems provide clean water, clean air, food, natural resources, and wildlife habitat, and they are central to the well-being and self-determination of Indigenous peoples. They also store carbon and support resilience to a changing climate through temperature regulation, soil retention, and reducing flood risk.

As interest grows in carbon offsets, planting trees, and other nature-based climate solutions, a holistic view of the status of Canada's ecosystems and the many benefits they provide can help guide and inform policy development. Unfortunately, however, ecosystem data is very limited. For this indicator, we rely on the land use, land use change, and forestry data provided in Canada's National Greenhouse Gas Emission Inventory, which estimates some of Canada's land-based emission sources and sinks. The data highlight the critical role of Canada's boreal forest as a carbon sink and the magnitude of forest emissions in British Columbia associated with wildfires, insect infestations, and slash burning practices.

FINDINGS AND RECOMMENDATIONS

We draw three big conclusions from the 11 different indicator categories. These conclusions support a series of recommendations for governments and point to several areas for further exploration and analysis.

CONCLUSIONS

1. **Achieving climate, economic, and well-being objectives simultaneously is possible but requires substantial collaborative effort.** With the right policies and actions, reducing GHG emissions, improving resilience, growing the economy, and increasing well-being can be mutually reinforcing. However, policy makers and Canadians should not underestimate the level of effort required. It is easy to say Canada needs to achieve economic growth while significantly reducing GHG emissions but much harder to spell out how to do so. It is also easy to say that no one should be left behind but much more difficult to put mechanisms in place to protect vulnerable Canadians.

2. **Policy makers lack much of the data required to measure progress towards clean growth.** Measuring Canada's progress on clean growth is not a simple exercise. In some cases, the indicators are so multi-dimensional that they are difficult to measure with only a handful of statistics. In others, the data simply are not available to comprehensively assess progress. Data are fundamental to identifying connections and interactions relevant to clean growth. Data allow for governments to measure progress and can inform potential course corrections. Investing in new and better data that connect climate change to economic growth and the well-being of Canadians will lay the foundation for future research and the development of policies that support clean growth success.

3. **Canada's progress on clean growth has been slow or uneven in several areas.** Our analysis highlights areas where Canada could accelerate progress, including: decoupling GHGs from GDP in regions of the country that are lagging; developing and adopting low-carbon and resilient technology; addressing the sectors, communities, and individuals that risk losing jobs as Canada transitions to a lower-carbon future; and halting loss and degradation of ecosystems. The analysis also identified opportunities that are not being fully captured with current approaches, including investing in low-carbon and resilient infrastructure and acheiving health benefits by reducing air pollution.

RECOMMENDATIONS FOR GOVERNMENTS

- **Establish explicit cross-mandate accountabilities within government,** by providing clear direction (e.g., in Ministers' mandate letters) to consider integrated climate change, economic, and well-being objectives and by establishing formalized horizontal governance structures (such as a low-carbon growth committee).
- **Better connect GHG data to economic data.** Clean growth research and policy development requires easily accessible GHG data that matches GDP, employment, trade, and other data.
- **Improve GHG data for Canada's territories.** Researchers need better data to include territories in comparative analyses with provinces.
- **Collect more and better data on the costs of extreme weather events.** The consistency and comprehensiveness of the Canadian Disaster Database should be improved.
- **Broaden cleantech data to include more climate-relevant technologies.** This should include economic activities that may not be purely "clean" but are consistent with low-carbon growth pathways. It should also include technologies that support adaptation and resilience to a changing climate.
- **Tag public infrastructure investments for better tracking.** We propose slotting climate-related infrastructure investments into four categories: 1) low- or no-carbon, 2) low-carbon enabling, 3) resilient, and 4) natural.
- **Develop more complete metrics of society's vulnerability to a changing climate.** Vulnerability to a changing climate depends on multiple factors, including pre-existing sensitivities (such as poverty or underlying health conditions), exposure to climate impacts, and ability to adapt before and after climate events occur. Right now, few metrics fully capture all components.
- **Improve data and reporting on ecosystem trends and related climate implications.** Canada needs an organization with capacity comparable to the Canadian Forest Service for ecosystems such as wetlands and coastal and estuarine areas to coordinate improved measurement of carbon sinks and sources and undertake analysis on climate resilience benefits. The federal government should also work towards reporting more comprehensive GHG data on natural disturbances, such as wildfires and permafrost thaw, on unmanaged lands.
- **Use near-term investments to support a long-term clean growth transition.** Governments can play a key role in overcoming barriers to private investment, particularly at a time when economies are struggling and capital is limited. Policies and investments made today can plant seeds that grow into long-term low-carbon and resilient economic growth.

In addition to the 11 indicators analyzed, this report highlights important data gaps, research questions, and policy questions that need to be answered to support Canada's journey towards clean growth. We identify several areas below that would benefit from greater research and analysis.

PROSPECTIVE AREAS FOR FURTHER EXPLORATION BY GOVERNMENTS AND RESEARCHERS

- **Undertaking strategic clean growth assessments.** Several governments in Canada require policy proposals to include a strategic environmental assessment. The federal government has also developed a climate lens for major public investments in infrastructure. It is worth exploring an expansion of these tools to explicitly incorporate a broader set of criteria linked to clean growth objectives. For example, while an infrastructure project would naturally consider general economic objectives, it might not consider low-carbon growth objectives. A low-carbon growth lens could lead to a greater emphasis on "enabling" infrastructure investments that support low-carbon technology development and adoption.
- **Connecting technology development with technology adoption.** Since a lack of domestic technology adoption is a significant barrier to growth for clean technology companies, policy tools that aim to accelerate adoption rates could also consider areas where Canadian companies are showing signs of success but struggling to find domestic buyers. This could help grow strong domestic markets that better position Canadian companies for international success.
- **Linking economic development and skills policies with climate-related employment risks and opportunities.** Some communities and regions may be more vulnerable than others because they have a concentration of employment in an at-risk sector. Individuals with lower levels of skills or education may also be at greater risk. Strengthening the connection between forward-looking climate change transition scenarios and economic development and skills policies could help reduce vulnerability and connect people with low-carbon growth opportunities.
- **Targeting urban transportation.** Our indicators show multiple reasons to consider a greater emphasis on urban transportation—such as slower levels of technology adoption in transport, rising GHG levels, and increased evidence of a link between urban air pollution and adverse health outcomes.
- **Slowing the loss of climate-related ecosystem services.** Slash burning practices used by logging companies, draining of wetlands for agriculture or development, deforestation for industrial activities, and many other actions are decreasing the benefits nature provides to people today and will provide to people in the future. Climate change will further exacerbate many of these pressures on ecosystems.
- **Supporting Indigenous-led opportunities that accelerate clean growth.** Indigenous-led initiatives can achieve multiple economic, social, environmental, and climate benefits simultaneously. Additional support for Indigenous protected areas, land management, renewable energy projects, resilient housing, fire management, and other opportunities linked to climate change objectives could help accelerate clean growth progress in Canada.