



cleanBC
our nature. our power. **our future.**

Roadmap to 2030



LAND ACKNOWLEDGEMENT

We acknowledge with respect and gratitude that this report was produced on the territory of the Ləkʷəŋən peoples, and recognize the Songhees and Esquimalt (Xwsepsum), and W̱SÁNEĆ Nations whose deep connections with this land continue to this day.

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A MESSAGE FROM PREMIER JOHN HORGAN

Here in British Columbia, people share a deep connection to the clean water, abundant forests and rich farmland around us. Our province's landscape is a source of beauty, food and economic opportunities. It is a source of great pride for all of us. There is simply nothing more important than protecting this natural inheritance for future generations.

Today, the things we cherish the most in B.C. are at risk like never before.

While we are living through a time of uncertainty and overlapping crises, the greatest challenge we face now and into the future is climate change. The threat is no longer decades or even years away. The impacts are all around us – from devastating wildfires and intense heat waves to droughts and dying crops.

Three years ago, our government introduced CleanBC – North America's most progressive climate action plan. In that time, we have regulated carbon emissions from the biggest polluters, legislated strong climate targets, and made it easier for people and businesses to switch from fossil fuels to clean energy solutions.

The scale of the climate emergency we are living through demands that we act with even greater urgency.

We have accomplished a lot together, but there is so much more we need to do. As British Columbians, we know we can't afford to delay action. That's why we're taking the next big step on our continent-leading plan and introducing new measures so that we can meet our Paris emissions reduction targets for 2030 and reach net zero by 2050.

The CleanBC Roadmap builds on the progress we've made. It will help power more businesses and communities with clean, renewable hydro power. Working with large industry partners, it will ensure sector-specific plans to reduce their climate pollution. Most importantly, it will encourage innovation of clean alternatives, which will become more affordable to British Columbians.

In developing this Roadmap, we listened to input from people across British Columbia – including consultation with Indigenous leaders and expert advice from the Climate Solutions Council. As the plan is rolled out, we will seize the opportunity to build stronger partnerships with Indigenous peoples by ensuring they share in decision making and the prosperity created in the low carbon economy.

Tackling climate change is not only our greatest challenge. It's also an opportunity to build a stronger, more resilient B.C.

The world has changed since we first launched CleanBC. But our province is uniquely well-positioned to thrive in the emerging clean economy. We have abundant clean energy and renewable resources. We are strategically located as a gateway to the Asia-Pacific region and a major port to the rest of North America.

By far our biggest asset is our people. If the recent forest fires and the pandemic have taught us anything, it's that we're best when we work together. It is that same sense of common purpose that we must bring to the fight against climate change. No one person, or government, can turn things around on their own. It will take all of us doing our part to seize the opportunity in overcoming this historic challenge.

That's what this plan is all about. Working together to chart a path to a cleaner, brighter future with good jobs and opportunities – for everyone.

Honourable John Horgan
Premier of British Columbia



A MESSAGE FROM MINISTER GEORGE HEYMAN

When we launched CleanBC in 2018 we were very clear that our modelling left us with an emissions gap. We needed to intensify our focus across all sectors to hit our emissions reduction goal by 2030. We have since introduced legislatively enforced accountability measures that support the findings of recent landmark reports from the Intergovernmental Panel on Climate Change and others. In short, everyone needs to do more to address climate change.

CleanBC set out a series of actions to begin a 30-year journey to build opportunity, keep communities strong and sustain human and ecological health. In many respects it set a standard for others to reference given its comprehensive approach. The Roadmap to 2030 takes its lead from CleanBC and takes us even further. In fact, it takes us to 100 percent of the achievement of our 2030 emissions reduction target and sets the course to fulfill our net-zero commitment by 2050.

The Roadmap is a clear articulation of where we need to expand and accelerate our action to reduce greenhouse gas emissions. It takes note of where things are showing signs of early success and where renewed approaches are necessary. It creates the opportunity for new partnerships like bringing together B.C.'s burgeoning clean tech sector with traditional industries to position B.C. products and services for new and evolving markets. Increasingly global investors are recognizing climate-centred technologies as critical in how we transition to living better on the planet. British Columbia is ideally positioned to take advantage of these new opportunities and the Roadmap supports that case.

A number of the actions will show rapid results as we commit to meeting or exceeding the federal benchmark on carbon pricing, enact requirements for all new buildings to be zero carbon by 2030 and eliminate emissions from all new cars by 2035. As these new technologies come on stream we will increase clean energy and fuel efficiency to support the transition.

Like all maps, the purpose of the Roadmap is to set the direction and offer choices to guide our efforts as we continue to track progress. It will allow us to anticipate challenges and potential changes in course. It expands on the principles of fairness and equity so that costs and benefits are evenly distributed as we introduce new measures.

The plan laid out in the pages that follow is admittedly technical. The tables, charts and analysis tell a story to help decision-makers across all sectors reach our goals. They are tools to help construct that better future we all want for our children and their children. In developing this plan we have not lost sight for one moment that ultimately the Roadmap is about people. It is about our connection to place, a place that we are seeing with new eyes through the lens of reconciliation and renewed relationships with Indigenous peoples. Our success will ultimately be determined by the way our natural environment responds to our choices in this journey. I am confident that with the Roadmap focusing our efforts we will arrive at our destination and more importantly we will all arrive together.

George Heyman

Minister of Environment and Climate Change Strategy



EXECUTIVE SUMMARY

The need to take urgent action together to reduce the impacts of climate change and build a strong clean economy for everyone has never been clearer than it has this past year. Two international reports outlined the challenge ahead and called for faster action. The landmark study from the International Panel on Climate Change¹ provided the latest scientific consensus on climate change and was characterized as a ‘code red for humanity’ by leading scientific and climate experts.

In British Columbia, we saw the impacts first-hand with an unprecedented heat wave, severe droughts and dangerous wildfires this past summer. These events were a poignant example of how serious the climate crisis is and why we need to act now.

Challenges and opportunities

This spring, the International Energy Agency also released a detailed report² outlining the challenges and opportunities of meeting net-zero emissions globally by 2050. The report acknowledged that countries around the world

are struggling to meet the moment with policies and plans to reduce emissions and create a vibrant, resilient low carbon future.

The last year saw growing recognition in the financial and business community that business-as-usual is no longer an option. Global investors like the Glasgow Financial Alliance for Net Zero – representing over \$80 trillion (USD) in investment capital – have called for an accelerated transition to net-zero emissions by 2050 at the latest. Increasingly, investors are asking for detailed plans outlining how companies can prosper in a carbon-constrained world as a prerequisite for investment.

1 International Energy Agency. (May 2021). Net Zero by 2050. Available online: www.iea.org/reports/net-zero-by-2050

2 Intergovernmental Panel on Climate Change. (2021). Sixth Assessment Report. Available online: www.ipcc.ch/assessment-report/ar6

These significant developments in the global economy represent major opportunities for British Columbia. Our province's CleanBC plan includes a wide range of actions to reduce emissions, build a cleaner economy and prepare for the impacts of climate change. Launched in late-2018, CleanBC is helping improve how we get around, heat our homes and power our industry – setting us on the path to a cleaner, stronger future. It includes groundbreaking policies that are leading the way forward on climate change. For example, we were the first in the world to make it law that all new car and truck sales would be zero-emission vehicles by 2040. Since that time, we've seen the highest uptake in electric vehicle purchases on the continent, thanks in part to CleanBC incentives and investments that make 'going electric' more affordable and convenient.

Across B.C., we have seen industries and businesses respond both to CleanBC actions and to the new global economic environment. At least half of all emissions from large operators in B.C. are now covered by a corporate commitment to reach net zero by 2050. We've worked with industry to accelerate this transition by investing in new technologies that reduce emissions and support good jobs for people. And we are accelerating industrial decarbonization by utilizing one of B.C.'s strongest assets in the fight against climate change – our supply of clean, abundant, and affordable hydro-electricity.

While we have made enormous progress in a few short years, we know there is much more to do. B.C. has not been immune to the challenges faced by other jurisdictions trying to reach their targets.

As required by our climate accountability legislation, government presents the latest information every year on progress to our emissions targets. New emissions projections show the road ahead is significantly more

challenging than when CleanBC was originally launched in 2018.

While there are several reasons for this shift – including revised emissions methodology from the federal government – it's clear that substantial new and sustained action is required to meet our commitments.



The CleanBC Roadmap to 2030 is our plan to achieve 100% of our emissions target while building a cleaner economy that benefits everyone. It includes a range of accelerated and expanded actions across eight pathways.

- Low Carbon Energy
- Transportation
- Buildings
- Communities
- Industry, including Oil and Gas
- Forest Bioeconomy
- Agriculture, Aquaculture and Fisheries
- Negative Emissions Technologies

The Roadmap will strengthen action in areas already showing positive results, as well as those at the earlier stages of transition. Each action is based on how affordable and available clean solutions are in each market – known as 'market readiness'. If low-carbon technologies are already available and affordable, for example, the

Roadmap will help increase their adoption on a wider scale through targeted supports, regulations and other policies. If technologies are limited in their availability and expensive, actions instead focus on supporting research, development, and commercialization to create affordable, clean options. This approach will help minimize costs and maximize benefits in the long run.



Foundational Roadmap actions include:

- A stronger price on carbon pollution, aligned with or exceeding federal requirements, with built in supports for people and businesses
- Increased clean fuel requirements and doubling the target for renewable fuels produced in B.C. to 1.3 billion litres by 2030
- An accelerated zero-emission vehicle (ZEV) law (26% of new light-duty vehicles by 2026, 90% by 2030, 100% by 2035)
- New ZEV targets for medium- and heavy-duty vehicles aligned with California
- Complete B.C.'s Electric Highway by 2024 and a target of the province having 10,000 public EV charging stations by 2030
- Actions to support mode-shift towards active transportation and public transit
- Stronger methane policies that will reduce methane emissions from the oil and gas sector by 75% by 2030 and nearly eliminate all industrial methane emissions by 2035
- Requirements for new large industrial facilities to work with government to demonstrate how they align with B.C.'s legislated targets and submit plans to achieve net-zero emissions by 2050
- Enhancing the CleanBC Program for Industry to reduce emissions while supporting a strong economy
- Implement programs and policies so that oil and gas emissions are reduced in line with sectoral targets
- A cap on emissions for natural gas utilities with a variety of pathways to achieve it
- New requirements for all new buildings to be zero carbon and new space and water heating equipment to be highest efficiency by 2030
- Implement a 100% Clean Electricity Delivery Standard for the BC Hydro grid
- A new program to support local government climate and resiliency goals with predictable funding
- Support for innovation in areas like low carbon hydrogen, the forest-based bioeconomy and negative emissions technologies
- Household affordability will continue to be a key focus, especially for those who need it most.

British Columbia's plan will be aligned with actions being taken at the federal, municipal and Crown corporation levels. When emissions reductions from these actions are considered, we expect B.C. to further surpass our 2030 emissions target.

These actions and others included in the Roadmap will help drive deeper emissions reductions at a faster pace and support clean economic opportunities.

In less than a decade, people across our province will live, work and play in a cleaner and more prosperous B.C. Almost all new vehicles sold in the province will be zero emissions. We'll see more people walking, biking and taking transit.



Our communities will be more comfortable with less pollution. New homes and buildings will no longer emit carbon pollution and will use energy much more efficiently, saving people money on their energy bills. They will be built using materials that are less carbon intensive. People will have more affordable options to retrofit their homes. The system that delivers natural gas to heat homes and businesses today will transition to also deliver cleaner fuels like renewable natural gas and hydrogen. And more of us will find jobs in the clean economy working to reduce pollution with innovative advanced technologies that are exported beyond our borders.

A central pillar of the Roadmap focuses on our abundant supply of clean and affordable hydroelectric power as an alternative to fossil fuels. B.C. is one of the few jurisdictions in the world with an electricity grid that can deliver close to 100% zero-emissions electricity to power our homes, businesses and vehicles. Further, by pairing this resource with our commitment to innovation and partnership between B.C.'s clean tech sector and traditional industries, we're

ensuring B.C. is ideally positioned for a world that is increasingly focused on near-term emissions reductions and reaching net-zero emissions by mid-century.

The Roadmap recognizes that we are at a defining moment of change and need to make sure we're ready for a global economy that is rapidly moving towards a future defined by net-zero emissions. It also builds on other efforts across government including the upcoming Climate Preparedness and Adaptation Strategy and economic plan, as well as work to modernize the forest sector and implement the recommendations of the Old Growth Strategic Review.

Nature often offers the best solutions to strengthening our response to climate change. In British Columbia, we are blessed to have a natural environment that sustains our health, strengthens our communities and builds hope for the future. The Roadmap demonstrates that at the core of our approach to climate change is a foundational commitment to protecting and preserving our environment now and for future generations.



CHAPTER 1: CLEANBC AND THE ROAD TO 2030

1.1 Accelerating Climate Impacts, Accelerating Climate Action

Climate change is often called the defining issue of our time. It demands simultaneous action on two fronts: reducing greenhouse gas emissions and making sure our homes, communities, businesses and infrastructure can withstand the impacts of a changing climate in the years to come.

It's hard work, but British Columbians are rising to the challenge – changing our behavior (what we buy, how we get around, how we heat and cool our homes), our economy (what we produce and how we produce it), and our energy system (how much and what kinds of energy we use, as well as how often we use them). More and more people are choosing electric vehicles, installing heat pumps in their homes and buildings, and investing in low carbon technologies and approaches.

These trends are encouraging. At the same time, we know we need to do much more. The pace and scale of climate change are accelerating, threatening so much of what we hold dear.

B.C.'S NET-ZERO COMMITMENT

Like our current emission reduction targets, B.C.'s commitment to a net-zero future will be backed by legislation. We'll engage with Indigenous communities, local governments, business, industry and others in 2022 to ensure the legislation is consistent with the targets, and the paths to reach them.

Net zero means that any greenhouse gas (GHG) emissions from our economy are balanced by equivalent amounts of GHG removals from the atmosphere. Working to achieve this balance will advance our economy, create good jobs and help to keep us competitive.

Net zero and the new global economic context

On top of these changes, international markets are shifting and demand is growing quickly for new climate-friendly technologies and services, renewable energy and low carbon products. Dozens of countries, accounting for roughly 70% of global GDP, have now adopted net-zero-by-2050 targets. Our neighbours and partners in the Pacific Coast Collaborative – Washington, Oregon and California – are significantly ramping up their own climate actions. And almost 20% of the world's biggest companies – representing annual sales of nearly \$14 trillion – now have plans to achieve net-zero emissions by 2050.³

During 2020, even with the global downturn created by COVID-19, investment in clean energy and climate solutions grew significantly. Companies and governments around the world put half a trillion dollars into renewable energy, electrified transport, electrified heat, energy storage, hydrogen production, and carbon capture and storage.⁴ And B.C. clean tech companies are at the forefront of this transition – with four on the 2021 Global Cleantech 100 list.

GLASGOW ALLIANCE

Over 250 firms with more than \$88 trillion in assets have joined forces to steer the global economy towards net-zero emissions. The Glasgow Financial Alliance for Net Zero, chaired by Mark Carney, UN Special Envoy on Climate Action and Finance and former Bank of Canada governor, brings together leading net-zero initiatives from across the financial system to accelerate the transition to net-zero emissions by 2050 at the latest.

Members include major asset owners and managers as well as banks with the power to mobilize trillions of dollars behind the transition to net zero.

Closer to home, the B.C. based [Catalyst Business Alliance](#) – a network of companies focused on clean growth – believes that climate change is the greatest risk to jobs and the economy. It champions strong climate and energy policy, and the creation of a resilient economy that benefits customers, employees, communities and the environment.

There's also a growing global movement to ensure that solutions are responsibly sourced and conform to high environmental, social and governance (ESG) standards. Investors with more than \$120 trillion worth of assets under management have signed on to the [United Nations Principles for Responsible Investment](#), which advocates a greater focus on ESG investing.

These developments support the business case for increasing our climate ambition. B.C. is well positioned to meet the interests of ESG investors with abundant clean energy, a vibrant clean tech sector, clean industries and a rich, diverse and growing bioeconomy.

³ Taking stock: A global assessment of net zero targets. (23 March 2021). Available online: www.eciu.net/analysis/reports/2021/taking-stock-assessment-net-zero-targets

⁴ BloombergNEF 2021 Executive Factbook. (March 2 2021). Available online: www.about.bnef.com/blog/bloombergnef-2021-executive-factbook

We're also making progress in partnership with Indigenous peoples, as part of our commitment to implement the [Declaration on the Rights of Indigenous Peoples Act](#). The Province and Indigenous peoples are working together to develop a province-wide, whole-of-government action plan, setting out a path towards reconciliation. The plan will describe the long-term actions needed to meet the objectives of the [UN Declaration](#), along with specific actions the Province will take in the next five years.

We've shown that working together with Indigenous peoples creates more opportunities for everyone. As the plan is implemented, we will have renewed opportunities to build stronger partnerships and better incorporate Indigenous rights, perspectives and interests into provincial climate plans and policies. We have heard clearly from Indigenous peoples about the importance of early and meaningful engagement, and that more can be done to increase capacity to ensure Indigenous peoples can participate most effectively. There is also enormous opportunity that comes with mobilizing Indigenous resources to build new economic opportunities while protecting the environment. We will further strengthen our consultation and engagement work on climate action, including with First Nations Economic Development Officers (EDOs) or similar leadership groups from Nations that don't have EDOs.



Ongoing engagement with Indigenous peoples has informed and shaped this Roadmap, the Climate Preparedness and Adaptation Strategy and our continued partnership on shared climate objectives. This includes work with the First Nations Leadership Council, which is developing a B.C. First Nations Climate Strategy and Action Plan.

These actions are consistent with our commitment to address our greatest challenges in ways that benefit people, communities and the environment, along with the economy. This Roadmap provides another set of opportunities to make our society more inclusive and sustainable – by putting people first and ensuring we consider and mitigate impacts to B.C.'s diverse populations.

“I would say with a pretty high degree of confidence that in the next three years a net-zero commitment and a plan to achieve it will be the norm for public companies”

– Mark Carney, UN Special Envoy on Climate Action and Finance and former Bank of Canada governor⁵

⁵ Financial Post. (September 21, 2021). Mark Carney says net-zero plan to be 'norm' for public firms in coming years. Available online: <https://financialpost.com/news/economy/mark-carney-says-net-zero-plan-to-be-norm-for-public-firms-in-coming-years>



1.2 How Does the Roadmap Work?

As we continue to implement the long-term actions in CleanBC, the Roadmap builds on our progress to date with an expanded and accelerated approach to meeting our targets and transforming markets for clean solutions. The Roadmap:

- Examines the eight key areas of our economy that generate emissions or can create solutions
- Assesses our progress in developing and deploying low- and zero-carbon products, approaches and technologies
- Sets out a series of pathways to support innovation in sectors where low carbon solutions are emerging, and drive deployment in sectors where they're already mature – helping to deliver more clean solutions, faster.

Some of the pathways are specific to economic sectors. Others cut across sectors to advance key objectives, such as developing our bioeconomy and exploring the potential of negative emissions technologies. Each pathway describes where we need to be by 2030 and maps out the most promising routes to get there – recognizing that some of these routes break new ground and will only reveal their strengths and weaknesses with time.

Foundational pathway actions to achieve our targets and advance market readiness for decarbonization include:

- Beginning in 2023, B.C.'s carbon tax will meet or exceed federal carbon price requirements, while considering impacts to household affordability. We'll also improve our industry programs to help meet our climate targets by supporting the adoption of new technologies while keeping our businesses competitive.
- New regulations will enhance the Low Carbon Fuel Standard, one of our most successful climate action measures. It requires fuel suppliers to make continuous reductions in their products' carbon intensity. We will double the target for renewable fuels produced in B.C. to 1.3 billion litres by 2030.
- We're accelerating our targets for zero-emission vehicles and we will set new standards for medium- and heavy-duty vehicles aligned with leading jurisdictions. By 2030, ZEVs will account for 90% of all new light-duty vehicle sales in the province (and targets of 26% by 2026 and 100% by 2035).

- We'll complete B.C.'s Electric Highway by 2024 and target having 10,000 public EV charging stations by 2030.
- A comprehensive Clean Transportation Action Plan in 2023 will support emission reductions by focusing on efficiency-first transportation options.
- A reduction of methane emissions from the oil and gas sector will lower emissions by 75% below 2014 levels by 2030, equivalent with the federal commitment. We'll also aim to eliminate methane emissions from oil and gas, mining, forestry and industrial wood waste by 2035.
- New large industrial facilities will be required to work with government to demonstrate how they align with government's 2030 and 2040 targets and submit plans to achieve net-zero emissions by 2050.
- The CleanBC Program for Industry will be enhanced to reduce emissions while supporting a strong economy.
- We'll implement programs and policies so that oil and gas emissions are reduced in line with sectoral targets.
- A greenhouse gas (GHG) cap for natural gas utilities – limiting emissions from the gas used to heat our homes and buildings and power some of our industries – will encourage new investment in low-carbon technologies and fuels (including renewable natural gas and hydrogen) and energy efficiency.
- By 2030, all new buildings will be zero carbon, and all new space and water heating equipment will meet the highest standards for efficiency.
- We'll implement a 100% Clean Electricity Delivery Standard for the BC Hydro grid.
- A new program will support local governments to continue taking climate action.
- We'll support innovation in areas like low-carbon hydrogen, the forest-based bioeconomy and negative emissions technologies.
- Household affordability will continue to be a key focus, especially for those who need it most.

Together, these measures will deliver significant reductions in GHG emissions. But the actions in this Roadmap are not just about climate change. Transforming our economy provides an opportunity to implement solutions that will also build on our broader social, environmental and fiscal priorities. These include:

- Advancing reconciliation with Indigenous peoples
- Improving people's health and well-being
- Spurring innovation in clean technologies that we can use and export to build a stronger economy and drive clean job creation
- Reducing inequalities so everyone has the opportunity to participate in, and benefit from, our growing clean economy
- Attracting investment based on sound ESG credentials.

This Roadmap will serve as an evolving plan to get us to our targets. Climate policy doesn't work if you set it and forget it, so the Roadmap will be updated as we move forward, learn from our experience and craft new solutions to meet our goals.

In the months and years ahead, we will continue to work with Indigenous peoples, recognizing their essential role as climate action partners. Many of the solutions we're developing and pursuing together will affect their territories, creating new opportunities for joint decision-making to advance self-government, self-determination and sustainable economic development in support of the Province's commitment to the *Declaration on the Rights of Indigenous Peoples Act*.

We will also continue working closely with local governments, industry, civil society partners and the independent [Climate Solutions Council](#) to further shape our pathways and hone our approaches to meet our targets for 2030 and beyond.

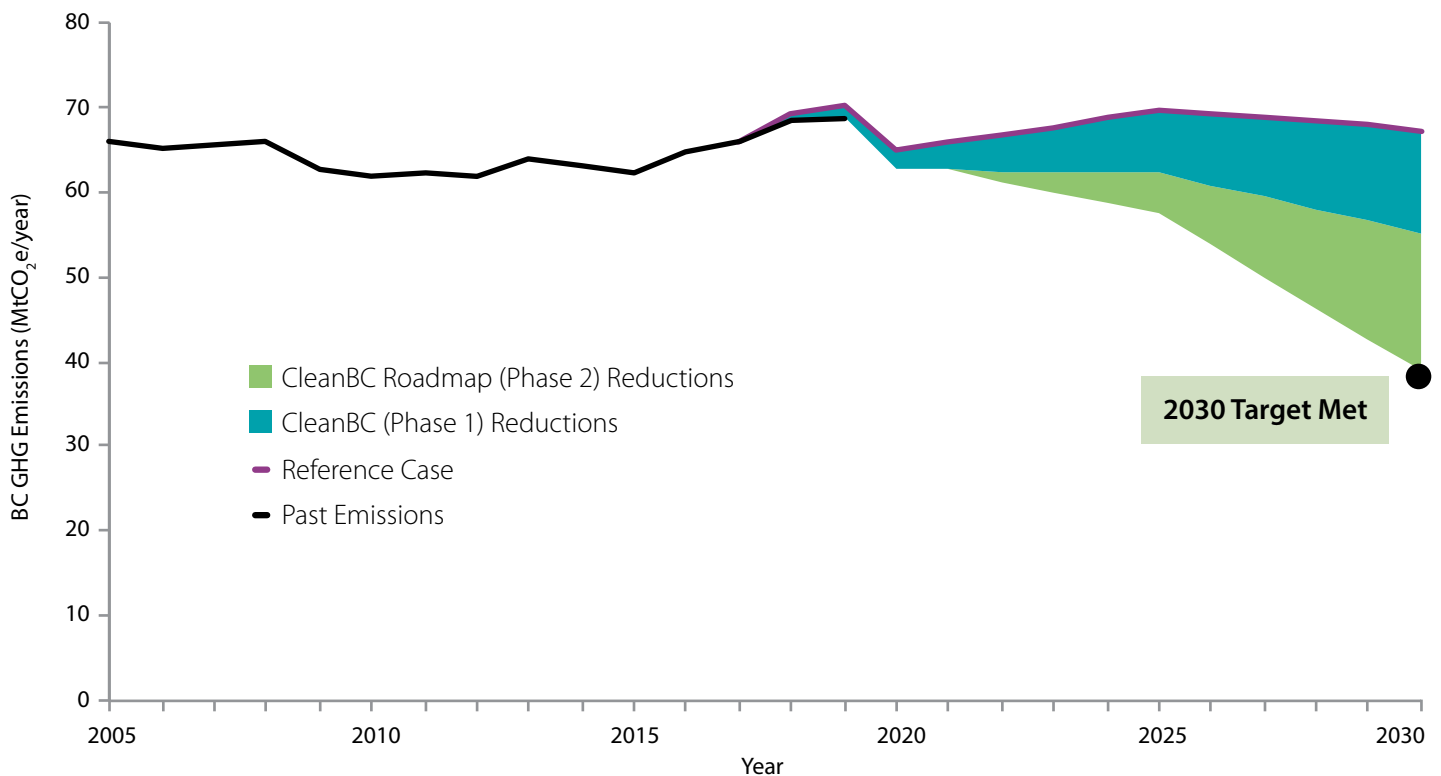
ENGAGEMENT WITH INDIGENOUS PEOPLES

Indigenous peoples across British Columbia were invited to contribute their knowledge and experience during engagements in 2021. The interests, opportunities, ideas and perspectives shared by Indigenous leaders and community members have helped shape the Roadmap to 2030. For example, through these conversations Indigenous peoples:

- Expressed interest in low carbon economic opportunities in their communities
- Affirmed the need for greater affordability and accessibility of CleanBC programs, leading to the commitment to a single-window access for all CleanBC incentives and programs and a renewed focus on affordability in program design
- Emphasized public climate education as key to support community decision making, understanding priorities and the importance of climate action, which influenced the Roadmap commitment to implement public awareness and education campaigns with a dedicated youth strategy
- Highlighted the importance of expanding clean transportation beyond ZEVs to ensure safe and reliable public transportation, which the Clean Transportation Action Plan's "efficiency first" approach will work to address
- Shared the need for cleaner transportation options suited to rural and remote living, contributing to the expansion of the Low Carbon Fuel Standard
- Expressed a desire for skills training to ensure participation in clean growth opportunities, as will be the focus in the upcoming workforce readiness framework
- Noted the high cost of transporting recycling and waste, leading to the commitment to a circular economy strategy.

In each pathway you'll find 'What we heard' boxes that provide examples of the perspectives of Indigenous peoples we worked with in the development of this Roadmap.

CleanBC Emissions Reductions



CLIMATE SOLUTIONS COUNCIL

B.C.'s [Climate Solutions Council](#) provides strategic advice on climate action and clean economic growth. It includes members representing Indigenous peoples, environmental organizations, industry, academia, youth, labour and local government. This Roadmap responds to many of the Council's recommendations, including:

- Increasing carbon tax in line with the federal benchmark while providing additional supports for emissions-intensive, trade-exposed industry
- Increasing the zero-emission vehicle standard for light-duty vehicles to between 80 and 100% by 2030
- Implementing medium- and heavy-duty, zero-emission vehicle regulations
- Supporting local governments
- Strengthening the Low Carbon Fuel Standard and implementing a new emissions cap for natural gas utilities.

By increasing the pace and scale of these and other CleanBC initiatives, the council says, "B.C. can both create more stable employment opportunities and achieve additional emission reductions that assist in getting the province on track for our 2030 climate change targets."



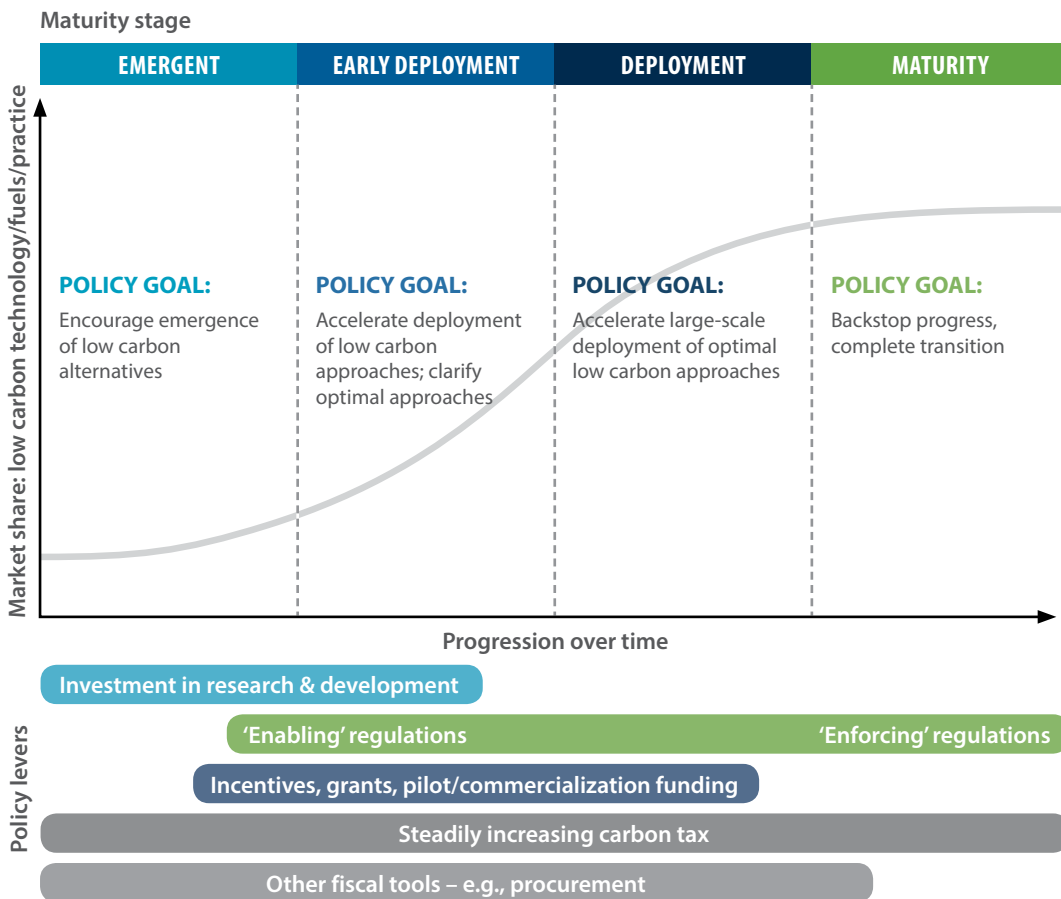
1.3 Climate Solutions – from Innovation to Wide-Scale Implementation

With CleanBC, our province began a set of bold, ambitious actions to transform our economy by shifting away from fossil fuels and towards clean, renewable energy and innovative technology. This Roadmap builds on our work to date and sets the stage for a broader, deeper transformation of large-scale societal systems – from how we produce and use energy to how we build low carbon, climate-resilient communities that keep us safe as the climate changes.

To reach this goal, we're focusing on tailoring approaches for each sector – recognizing that we need different tools for different market stages. Our actions will focus on growing markets for, and speeding up the adoption of, technologies we know are ready for deployment, such as zero-emission vehicles and heat pumps, while supporting research and development in areas where alternative solutions are still emerging.

In all cases, we will prioritize actions that solve unique problems or unlock co-benefits, such as improving people's health or achieving equity outcomes.

Stages of Market Readiness



Adapted from: Victor, D.G. et al. 2019. *Accelerating the Low Carbon Transition: The case for stronger, more targeted, and coordinated international action.* The Brookings Institution; and Meadowcroft, J. et al. 2021. *Pathways to Net Zero: A decision support tool.* Transition Accelerator Reports

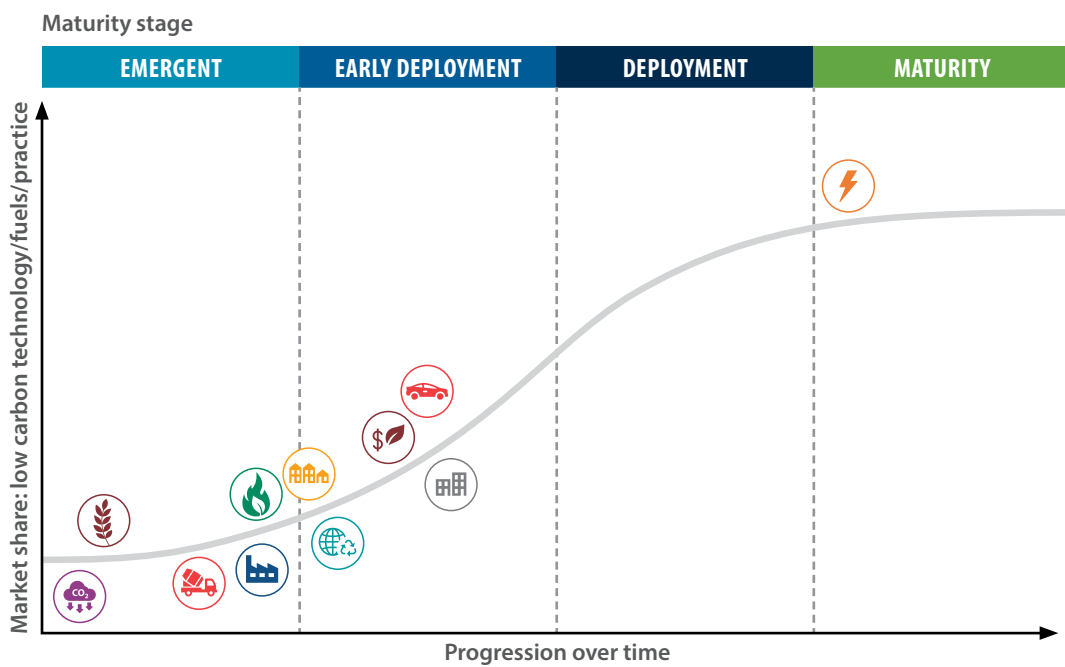
Market readiness indicators

To inform the types of actions needed to drive decarbonization, and to help us track our progress, we're developing a series of readiness indicators, which will be applied across the pathways. The indicators address key issues including:

- Market share of technologies, reflecting the extent to which low-emission solutions are being adopted
- Cost of transitioning to low-emission solutions
- Workforce and skills readiness, reflecting our capacity to adopt new approaches
- Economic and social opportunities, pointing to important co-benefits in areas such as reducing inequality and advancing reconciliation with Indigenous peoples.

Based on these indicators, we've developed a baseline (below) showing where each of the pathways or Roadmap elements is starting from.

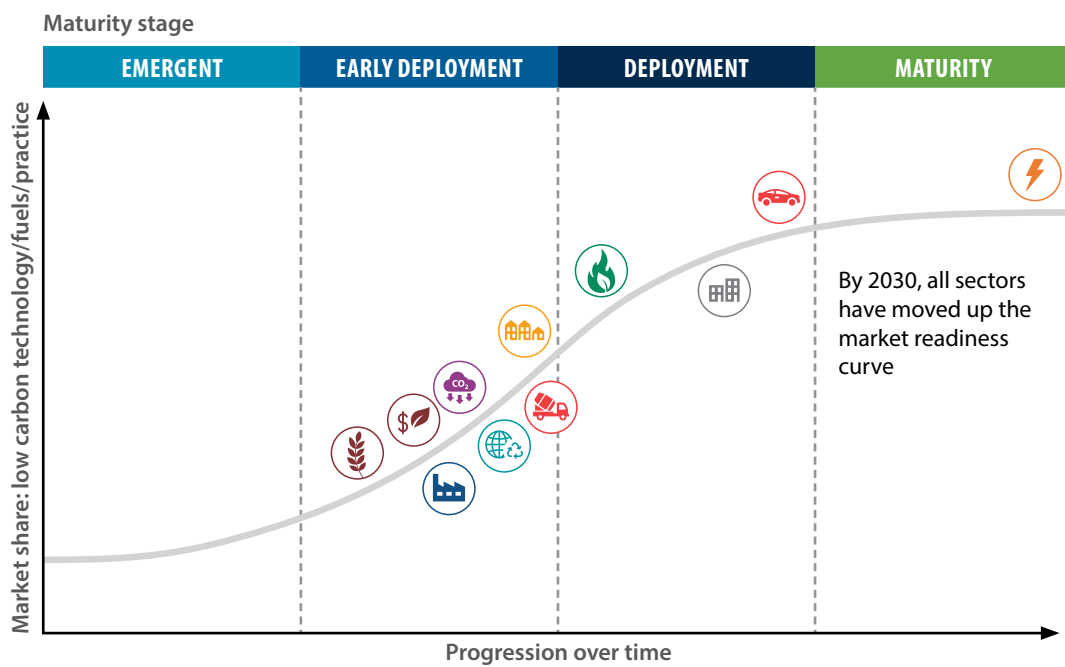
Current State of Market Readiness



- Agriculture, Aquaculture and Fisheries
- Buildings
- Industry/Oil and Gas
- Forest Bioeconomy
- Negative Emissions Technologies
- Personal Travel
- Low Carbon Energy
- Commercial Transportation
- Electricity
- Circular Economy
- Communities

By 2030, we will achieve the following advances in market readiness:

State of Market Readiness by 2030 with Roadmap



 Agriculture, Aquaculture and Fisheries


 Forest Bioeconomy

 Personal Travel

 Commercial Transportation

 Circular Economy


 Buildings

 Negative Emissions Technologies

 Low Carbon Energy

 Electricity

 Communities

 Industry/Oil and Gas

1.4 Modelling and Economic Analysis

To forecast the impacts of our climate actions, B.C. follows well-established best practices, using the best available data and sophisticated computer modeling. However, projections change over time as new information becomes available and methodologies are updated and it can be challenging predicting specific outcomes a decade or more away. As noted earlier, we now expect the measures in CleanBC (not including Roadmap actions) to achieve 32 to 48% of our 2030 targets – compared to the original estimate of 75%. The increased gap is due to several factors, including:

- Updated modelling: for example, new data on natural gas and electricity have lowered projected GHG reductions from industrial electrification
- Higher than expected emissions in sectors such as transportation and pulp and paper
- Changes in the federal approach to measuring emissions from sectors such as waste.

Detailed information on model updates and estimates are available as part of the 2021 [Climate Change Accountability Report](#).

Through the measures in this Roadmap we expect to reach 100% of the 2030 emissions target.

Impacts on jobs and GDP

In today's economy, citizens and the global financial community are insisting that governments and companies have credible, long-term plans to reduce climate pollution – making this Roadmap an economic necessity.

Based on provincial data, we expect investment in Roadmap initiatives to generate approximately 18,000 direct and spinoff jobs with:

- GDP increases of 19% by 2030 and 89% by 2050 from 2020 levels
- Job growth of 7% and 37% by 2030 and 2050 respectively from 2020 levels.

These are conservative estimates; the economic benefits could be even greater if, for example, new clean technologies turn out to cost less than we expect. The Roadmap, like any credible climate plan, will increase the cost of fossil fuels. Government will minimize the impacts by continuing the Climate Action Tax Credit and providing increased support to help people and businesses reduce emissions and costs.



CHAPTER 2: PATHWAYS

The pathways presented here are not unlike a road network, intersecting in various places and offering multiple routes to reach our destination. They're also affected by a number of broader, overarching initiatives that provide a foundation for ongoing climate action in British Columbia.

Carbon pricing

A price on carbon pollution is one of the most effective and economically efficient ways to reduce GHG emissions. Consistent with the recommendations of the Climate Solutions Council, B.C.'s carbon tax will continue to meet or exceed any federal carbon price requirements for 2023 and beyond.

What we heard

In the consultations that informed this Roadmap, we heard from many local governments, the Climate Solutions Council, and others that the carbon tax needs to be raised and in line with the federal benchmark. From industry, we heard there is overall support for carbon pricing, along with concerns about competitiveness and carbon leakage.

Between now and 2030, we'll analyze the price and program options that best support meeting our climate targets while protecting affordability and competitiveness for people and businesses. We are working to develop mechanisms to support long-term funding for climate action in B.C., including preparing for the impacts of climate change.

The federal government has announced a carbon price of \$170 per tonne in 2030, with annual \$15 increases beginning in 2023. B.C.'s current price is \$45 per tonne – already the strongest, most comprehensive carbon-pricing policy in Canada. Increasing the tax will support greater emissions reductions while encouraging sustainable growth and investment in new low carbon innovations.



At the same time, a higher carbon price can create challenges. For example, it can impact people who still depend on fossil fuels to get to work and heat their homes. It can also affect industries that sell their products in global markets, competing with producers who don't pay a carbon tax, or don't pay as much. Where carbon tax represents a significant operating cost that can't be addressed through investments in cleaner technologies, this can lead to carbon leakage – the movement of business, industry and jobs to places with lower carbon prices.

We'll explore other approaches to help make low-carbon options more affordable for low- and middle-income people in British Columbia. To promote greater fairness, we'll work with the federal government to explore ideas such as carbon border adjustments – ensuring that goods from places without strong climate policies face similar costs to those produced domestically. Through the CleanBC Program for Industry, B.C. uses carbon tax revenue to support emission performance improvements and competitiveness.

Government leadership

Every year since 2010, B.C. has achieved net-zero (carbon neutral) operations across the public sector, including health authorities, school districts, universities, and Crown corporations. As part of this Roadmap, we're building on our progress with the following new measures:

- Factoring climate considerations into government decision making, ensuring a focus on climate-resilient, zero- or low carbon projects. This priority will be delivered through capital projects as they include an assessment of these factors in their planning and approval processes
- Making zero-emission vehicles the default option for B.C. public sector fleets, with ZEVs accounting for 100% of light-duty vehicle acquisitions by 2027
- Requiring all new public sector buildings to align with our climate goals beginning with performance standards (2023) and moving to zero-carbon new buildings (2027)
- Developing and implementing a comprehensive strategy (2024) to transform our existing buildings portfolio to a low carbon and resiliency standard
- Implementing a public awareness and education campaign; this will include a dedicated strategy for connecting with youth and involving them in climate action
- Providing single-window access to all CleanBC incentives and programs.

Climate preparedness and adaptation

B.C.'s Climate Preparedness and Adaptation Strategy will be released in 2022, strengthening our capacity to anticipate and respond to the impacts of climate change in every part of B.C. These include sudden events like wildfires, floods and heat waves, as well as changes that happen more slowly like habitat loss, sea level rise and changes in growing seasons.

The strategy builds on the substantial work already underway in B.C. to adapt to climate change, lower long-term costs of impacts and help keep our communities safe, ensuring government programs and policies continue to achieve their goals as the climate changes. The strategy draws on a [2019 assessment](#) of the greatest climate risks to B.C. and outlines actions to prepare for them in ways that respect and respond to the diverse needs of people and communities across B.C.

Circular economy

A circular economy refers to a system where, by design, there is no waste – in contrast to the traditional Western model, which can be described as take-make-waste: we take raw materials, make them into products, use them and throw them away. The circular approach emphasizes sharing, reusing, repairing and recycling – eliminating waste and reducing GHG emissions while making better use of our resources.

What we heard

In the consultations that informed this Roadmap, people from Indigenous and remote communities said they face significant challenges and expenses to transport recycling and waste, especially when they have to use barges, forest service roads, or planes. There is support for developing a circular economy, including expanding B.C.'s continent-leading extended producer responsibility recycling system.



Circular economy in action: B.C. is keeping plastics in use and out of the environment

Learn more at: CleanBC.gov.bc.ca/success-stories

With this Roadmap, we're taking more steps to advance the circular economy, especially in sectors such as agriculture and forestry. They generate byproducts that can be used to create low carbon building materials, renewable energy and other clean products – generating value and new opportunities while shrinking our carbon footprint.

We will develop a Circular Economy Strategy in 2022, supporting both our climate goals and our economy. Key components will include advancing the [Plastics Action Plan](#) and requiring more manufacturers to take responsibility for their products' eventual recycling, reuse or safe disposal.

The strategy will build on recent actions we've taken to expand our continent-leading recycling system, which will include electric vehicle batteries and chargers, mattresses, and electronic products such as solar panels, lithium-ion batteries and e-cigarettes.

A Workforce Readiness Framework: Preparing for a cleaner economy

The global transition to a low-carbon future will create new jobs in a range of sectors, and we want to make sure those jobs benefit people across B.C. A workforce readiness framework is being developed to ensure people are positioned for good jobs in a future, cleaner economy and that B.C. has the workers needed for sustainable economic growth and innovation.

Some jobs will be new. In other cases, existing jobs will evolve to incorporate new technologies, approaches and innovations. Some areas will see immediate changes while others will experience smaller shifts over time as we build a future workforce that is more inclusive, resilient and adaptable – in partnership with Indigenous peoples, industry, post-secondary institutions and others.

The framework will include measures to ensure B.C. has the number and diversity of workers to meet employers' needs; ensure there are opportunities for workers to upgrade their skills to adapt to changing jobs; and new training programs, standards and credentials that workers and employers are increasingly looking for as we transition to a low carbon economy.

The framework will guide work with industry, stakeholders, and Indigenous peoples to understand developing job growth opportunities and the skills needed for the current and future clean economy, and to identify barriers to train, attract and retain workers to support the just transition to a low-carbon economy.

EXTENDED PRODUCER RESPONSIBILITY (EPR) AND THE CLEANBC PLASTICS ACTION PLAN

B.C. has one of the strongest, most comprehensive recycling systems in North America known as Extended Producer Responsibility (EPR). EPR requires producers to take responsibility for the lifecycle of their products, including collection and recycling. B.C.'s EPR strategy recovers \$46 million worth of materials annually and reduces greenhouse gas emissions by more than 200,000 tonnes of carbon dioxide equivalent. It generates an estimated \$500 million annually through recycling programs, and collects approximately 315,000 tonnes of plastic from bottles, packaging and electronics. We're expanding this system to include electric vehicle batteries and chargers, solar panels, more types of lithium-ion batteries, mattresses and e-cigarettes.

B.C. is building on this leadership in EPR and developing the circular economy on plastics supported by the CleanBC Plastics Action Plan, which identifies actions to ban single-use items and reclaim more materials. These aims are bolstered by the CleanBC Plastics Action Fund that encourages innovation to turn used plastics into new products, as well as the Clean Coast Clean Waters initiative that supported the largest shoreline clean-up in the province's history. This initiative partnered with Indigenous and coastal communities, as well as local tourism operators and environmental groups. More than 550 tonnes of marine debris has been removed to date, with the majority of the material being reused and recycled.



2.1 Low Carbon Energy

Whether it's for producing food, lighting and heating our homes, moving people and goods or supporting industrial growth – energy underpins almost every aspect of our lives and economy in British Columbia.

To decarbonize our economy and accelerate the shift to clean technologies in the buildings, transportation and industrial sectors, we need to use energy more efficiently and replace fossil fuels with clean energy, including more clean electricity, renewable natural gas, low carbon hydrogen and liquid biofuels.

What we heard

In the consultations that informed this Roadmap, industrial operators said low carbon fuels can provide short-term flexibility as a substitute for natural gas but to ramp up production we need to address barriers, such as:

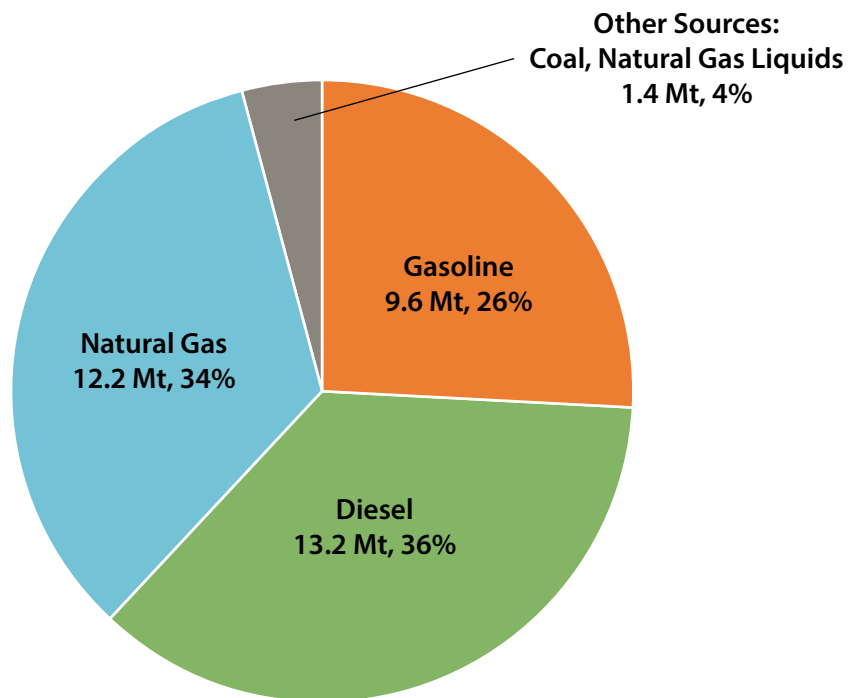
- *Biomass supply and uncertainties related to technology/capital purchases*
- *The impact of increasing transportation fuel costs on final production for certain industries*
- *The need for partnerships to implement the B.C. Hydrogen Strategy*

Indigenous peoples pointed to potential job creation opportunities through wood waste transfer facilities to create biofuel, as well as a waste collection program to support biofuel creation. There was also interest in more solar and wind power including cost sharing agreements.

Where we're starting from

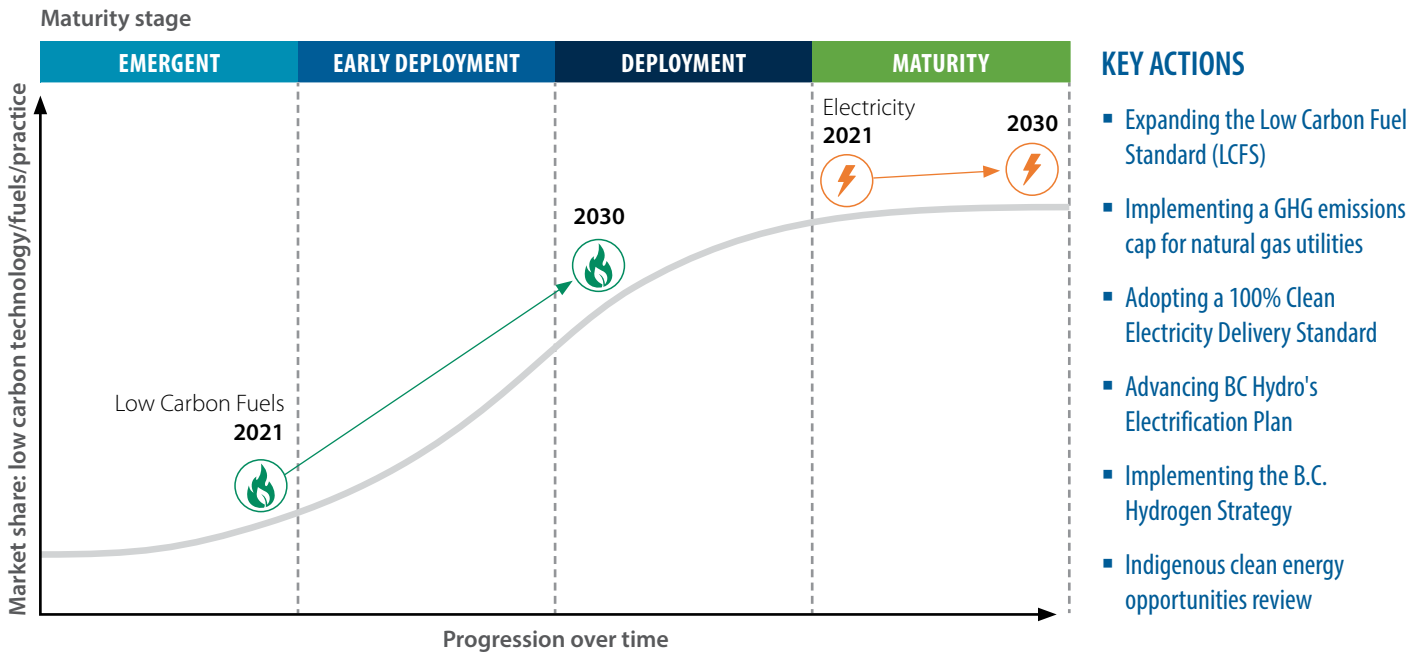
B.C. uses a diverse mix of energy types to meet demands from our transportation, industry and building sectors. Clean electricity currently accounts for only 19% of the total. Low carbon biomass and biofuels meet an additional 11%, and that proportion will rise in the future. However, most of our energy needs – the remaining 69% – are still met by fossil fuels, mainly in the form of refined petroleum products and natural gas. Fossil fuel production and consumption accounts for approximately 80% of B.C. emissions, underlining the need to move to cleaner fuels, faster. The pie chart below shows a breakdown of emissions by energy source.

2020 Emissions by Energy Source for Transportation, Buildings and Industry (Excluding Oil and Gas Sector)



Most of our electricity is clean and renewable, putting its market readiness stage at early maturity. Liquid biofuels are available but emergent, limited by a number of factors including the availability of feedstock, such as vegetable oils and tallow for products like renewable diesel. Low carbon gaseous fuels such as biomethane and hydrogen are also emergent, limited by factors such as capital investment, feedstocks and access to commercial-ready technologies.

Low Carbon Energy



THE PATH TO TRANSFORMATION – 2030 AND BEYOND

To maximize production of low carbon energy, we need a suite of regulatory and program initiatives that build on approaches we know work well and create incentives for new innovation.

Expanding the Low Carbon Fuel Standard (LCFS)

B.C.'s Low Carbon Fuel Standard is one of our most successful approaches to reducing GHGs from transportation. It requires fuel suppliers to progressively decrease the average carbon intensity of the fuels they supply to users in B.C.

With CleanBC, we increased its stringency by doubling the carbon-intensity reduction for gasoline and diesel from 10% to 20% by 2030. As part of this Roadmap, we intend to modernize the legislation governing the Low Carbon Fuel Standard, including to expand it to cover marine and aviation fuels beginning in 2023. We'll also consider new compliance options such as negative emissions technologies, while increasing the financial implications of failing to comply.

After careful assessment of impacts, we will raise our target beyond the current 20%, consistent with advice from the Climate Solutions Council, using 30% by 2030 as a starting point for further analysis and consultations. We will also double our commitment to develop production capacity for made-in-B.C. renewable fuels to 1.3 billion litres per year by 2030, creating new jobs and economic opportunities across the province.

Implementing a GHG emissions cap for natural gas utilities

B.C.'s existing pipeline infrastructure can play an important role in reducing greenhouse gases by transitioning away from delivering fossil natural gas to delivering renewable gas. B.C.'s gas utilities have been leaders in enabling this transition.

To help drive this transition, we will introduce a GHG emissions cap that will require gas utilities to undertake activities and invest in technologies to further lower GHG emissions from the fossil natural gas used to heat homes and buildings and power some of our industries.

Following further modelling and analysis, the cap will be set at approximately 6 Mt of CO₂e per year for 2030, which is approximately 47% lower than 2007 levels. Since emissions from gas consumption are linked to industry (excluding oil and gas) and the built environment, the cap is consistent with emissions targets for those sectors.

**From waste to clean energy:
B.C. companies are making the fuels
of the future**

Learn more at: CleanBC.gov.bc.ca/success-stories



Utilities will determine how best to meet the target, which could include acquiring more renewable gases as well as supporting greater energy efficiency. Measures in CleanBC allow gas utilities to use renewables such as synthetic gas, biomethane, green and waste hydrogen and lignin to achieve this.

The B.C. Utilities Commission will have a mandate to review gas utilities' plans, investments and expenditures to ensure they're aligned with the GHG emissions cap and cost effective, helping to keep rates affordable for people and businesses.

Adopting a 100% Clean Electricity Delivery Standard

B.C.'s abundant supply of clean electricity is one of our greatest allies in the fight against climate change. Currently, an average of 98% is from renewable sources, mostly hydro power.

As part of this Roadmap, we are committing to increase this to 100% – making our power even cleaner; creating new opportunities in areas such as the bioeconomy; and helping to attract new businesses by supporting their sustainability strategies. BC Hydro will meet the new standard by ensuring it has produced or acquired sufficient clean electricity to meet the needs of its domestic customers and phasing out remaining gas-fired facilities on its integrated grid by 2030.

**Micro-hydropower provides clean energy
and jobs for Kitasoo Xai'xais Nation**

Learn more at: CleanBC.gov.bc.ca/success-stories



Advancing BC Hydro's Electrification Plan

BC Hydro will advance its Electrification Plan by offering customers incentives, tools and business-to-business support to help them run their homes and businesses with clean electricity – and to reduce the time it takes to connect to the grid.

Subject to the approval of the BC Utilities Commission, over the next five years, the Crown corporation plans to invest over \$260 million to advance electrification, including more than \$190 million to promote fuel switching in buildings, transportation and industry and more than \$50 million to attract new customers – such as data centres and hydrogen producers – who can locate anywhere but see the advantages of B.C.'s clean, reliable, affordable hydroelectric power.

To help support and drive BC Hydro's focus on GHG reductions, we will add electrification and fuel-switching to its mandate, introduce an internal carbon price to evaluate electrification initiatives in regulatory applications, and enable investments in green hydrogen production and commercial vehicle incentives and infrastructure.

BC HYDRO'S INTEGRATED RESOURCE PLAN

BC Hydro is preparing an Integrated Resource Plan (IRP), which outlines how BC Hydro plans to provide reliable, affordable and clean electricity to meet customer demand now and into the future. It considers BC Hydro's 20-year projections of electricity demand in B.C. The IRP includes high and low load ranges and scenarios to account for a range of potential impacts, including support of CleanBC as policies and regulations are implemented and electrification ramps up to help achieve 2030 emissions reduction targets.

Implementing the B.C. Hydrogen Strategy

When burned or used in a fuel cell, hydrogen produces no carbon emissions. Hydrogen is one of the only solutions for decarbonizing sectors of the economy where direct electrification is not practical, such as heavy-duty transportation or industrial heating. When injected into the natural-gas grid, renewable hydrogen can displace fossil fuels for heating homes and businesses. Hydrogen can also be used for producing low carbon, synthetic fuels to reduce emissions in transportation and industry.

B.C.'s hydrogen sector is fueling green jobs

Learn more at: CleanBC.gov.bc.ca/success-stories



B.C. is the first province in Canada to release a comprehensive hydrogen strategy. The [B.C. Hydrogen Strategy](#) outlines how the Province will support the development of production, use and export of renewable and low carbon hydrogen for the next 10 years and beyond. It complements the [federal hydrogen strategy](#), serving as a blueprint for regional development with 63 actions for the short term (2020-2025), medium term (2025-2030) and long term (2030-beyond).

Implementing the B.C. Hydrogen Strategy and developing our hydrogen economy will generate more clean economic opportunities, help reduce emissions and contribute to meeting our climate targets. The strategy's immediate priorities include scaling up production of renewable hydrogen, establishing regional hydrogen hubs and deploying medium- and heavy-duty fuel-cell vehicles.

OPENING THE B.C. CENTRE FOR INNOVATION AND CLEAN ENERGY (CICE)

With an initial \$35 million provincial investment leveraging an additional \$70 million from federal and private sources, the Centre for Innovation and Clean Energy will be a member-based, non-profit corporation, independent from government and private entities. The Centre will bring together innovators, industry, governments and academics to accelerate the commercialization and scale-up of B.C. based clean energy technologies. It will also be a catalyst for new partnerships and world-leading innovation to deliver near- and longer-term carbon emission reductions.

The Centre's initial focus areas for funding and project delivery will include:

- Carbon capture, utilization and storage
- Production, use and distribution of low-carbon hydrogen
- Biofuels and synthetic fuels (including marine and aviation fuels)
- Renewable natural gas
- Battery technology, storage and energy management systems.

The Centre will also initiate new technology pathways to accelerate larger reductions on the path to net-zero emissions by 2050.

Indigenous clean energy opportunities review

The actions in the Roadmap will open up a wide range of economic opportunities in B.C.'s low carbon energy sector. The Province is committed to working with First Nations to maximize the benefits for Indigenous communities. As a key step, the Ministry of Energy, Mines and Low Carbon Innovation and the First Nations Leadership Council, through their designate, the BC First Nations Energy and Mining Council, are launching a co-designed and co-led Indigenous Clean Energy Opportunities engagement process. Through the process, the Ministry and the Council will jointly engage First Nations to identify and support clean energy opportunities. They will also seek to collaborate with First Nations rights holders on the development of strategic clean energy policy and legislation, and meaningfully explore and develop policy, regulatory and program support to enable Indigenous participation within the growing and diverse clean energy sector.



2.2 Transportation

Transportation plays a major role in all our lives, connecting us to each other and the world. It's also our largest single source of GHG emissions, accounting for approximately 40% of our annual total in British Columbia. Actions that reduce these emissions have a wide range of benefits, from cleaner air and less congestion to better health, more clean jobs and economic development – benefits we'll see more of as we implement this Roadmap.

What we heard

In the consultations that informed this Roadmap, many groups supported accelerating and expanding zero-emission vehicle targets and enhancing funding and supports for active transportation. People in commercial transportation supported measures to predictably reduce emissions from medium- and heavy-duty fleets. In engagements with Indigenous peoples, we heard suggestions to expand clean transportation supports such as charging infrastructure, electric buses and public transportation, especially in the North.

Where we're starting from

The B.C. market for decarbonizing personal travel is at the early deployment stage. People can choose from more than 50 models of light-duty, zero-emission vehicles (ZEVs). However, these still cost about 20-40% more than equivalent non-ZEVs (before considering government rebates and lower maintenance and fuel costs). And more work is needed to build out the infrastructure for ZEV charging and hydrogen fueling. For active transportation, many communities still have significant gaps to fill to complete their networks for people of all ages and abilities.

The market for commercial travel is in the emergent stage, with ZEV solutions for medium- and heavy-duty vehicles starting to be deployed. Costs remain high and the commercial market is behind the personal market.

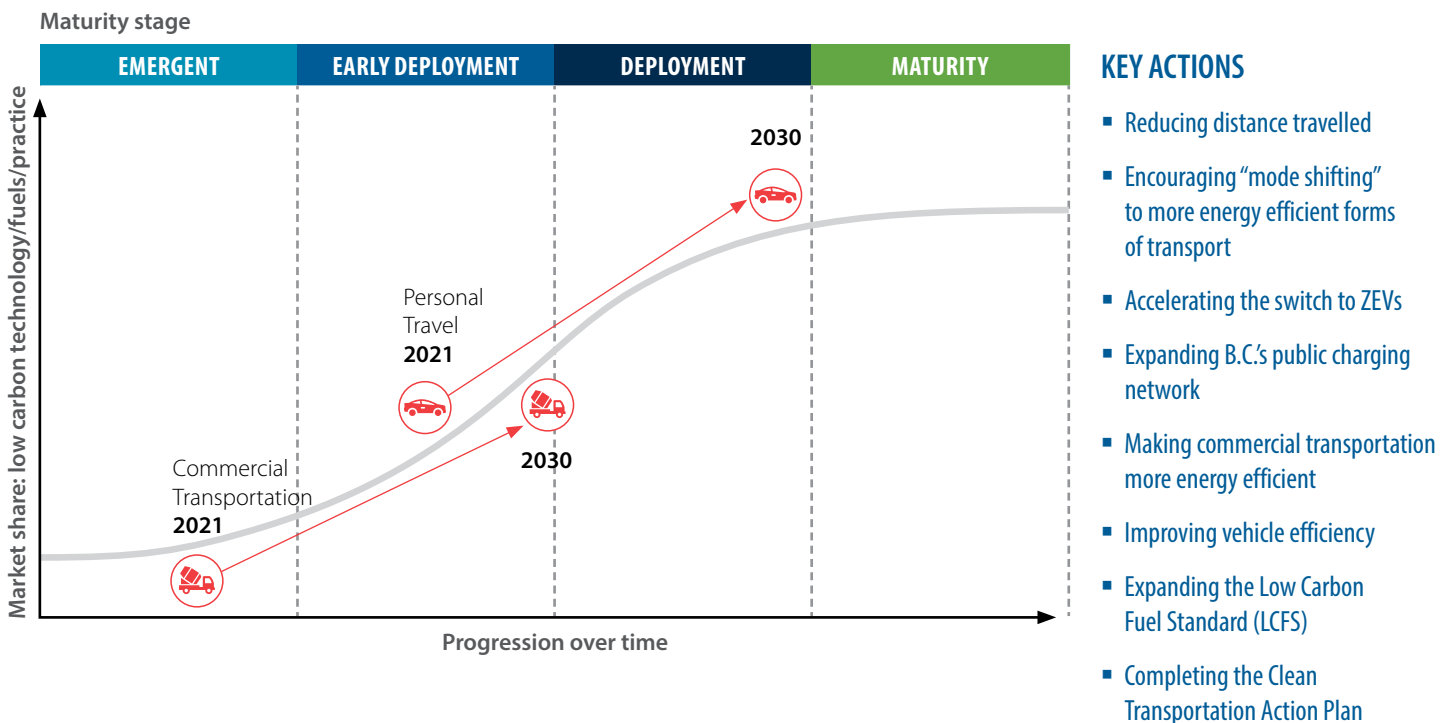
CLEANBC GO ELECTRIC COMMERCIAL VEHICLE PILOTS

The CleanBC Go Electric Commercial Vehicle Pilots program, launched in 2021, supports the switch to zero-emission commercial vehicles of all types, including trains, ships, trucks, construction and agricultural equipment, along with the necessary charging and fueling infrastructure.

The companion CleanBC Go Electric Specialty Use Vehicle Incentive program is supporting the transition for specialty vehicles, such as delivery trucks, passenger shuttles and a variety of other vehicles. Purolator is among the companies using the program to advance cleaner choices, running battery-electric trucks from its facility in Richmond.

More work is also needed to explore opportunities to move more goods by rail and shipping. This includes short sea shipping – using barges and waterways to get goods from ports to regional facilities. Ultimately, we expect there will be no single solution but a range of cleaner options for commercial transportation, reflecting the diversity of needs and opportunities.

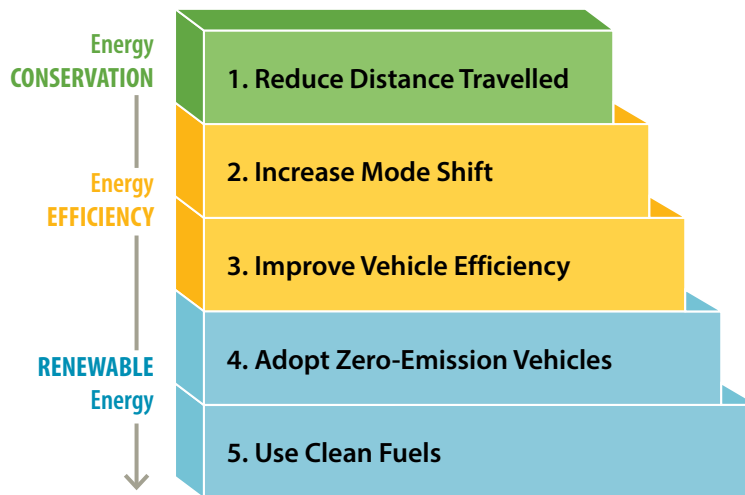
Transportation



THE ROAD TO TRANSFORMATION - 2030 AND BEYOND

Meeting our targets in the transportation sector demands aggressive action in addition to our world-leading ZEV and fuel standards. With this Roadmap, we're working across five areas, from encouraging more walking and cycling to reducing the carbon intensity of fuels. This approach, illustrated below, is based on an efficiency-first model, consistent with energy conservation principles.

In 2023, the actions in this Roadmap will be complemented by a new Clean Transportation Action Plan, setting out our next set of actions to reduce transportation emissions by 27-32% (from 2007) by 2030. Specific actions will be consistent with advice from the Climate Solutions Council.



Reducing distance travelled

As part of this Roadmap, we will work to reduce the distances travelled in light-duty vehicles by 25% by 2030, compared to 2020. This can be achieved in part by supporting more compact urban planning in partnership with municipalities to increase active transportation and public transit. We will also provide continued support for digital access and remote work where feasible, building on the lessons learned during the COVID-19 pandemic. In addition, we will work with ICBC to monitor vehicle kilometres travelled and develop additional ways to bring them down, helping to reduce emissions, transportation costs, collision risk, and wear and tear on our roads.

To help inform future decisions, we'll continue to collect and share transportation data, supporting both provincial goals and planning and analysis by partners, such as local governments and Indigenous communities.



Encouraging “mode shifting” to more energy efficient forms of transport

One of the surest ways to reduce our GHG emissions from transport is to choose the least energy-intensive and polluting ways to get around. For personal travel that generally means walking, cycling or taking transit. For commercial travel, it means moving more goods by rail, water or cargo bike where possible instead of using heavy-duty, on-road vehicles.

To encourage these shifts, we will establish energy intensity targets for personal and commercial transportation and work with key partners to:

- Increase the share of trips (e.g., commuting for work and personal activities) made by walking, cycling, transit to 30% by 2030, 40% by 2040 and 50% by 2050. In a 2019 survey, 24% of people in B.C. said they primarily used sustainable transportation (walking, cycling or public transit) to get to work.
- Reduce the energy intensity of goods movement (tonne-kilometres) by at least 10% by 2030, 30% by 2040, and 50% by 2050, relative to 2020.

Accelerating the switch to ZEVs

B.C.'s Zero-Emission Vehicles Act, passed in 2019, has already helped to transform the marketplace. Thanks in part to government rebates, we're close to achieving our 2025 target, with ZEVs accounting for 9.4% of all new light-duty vehicle sales in 2020. To build on that momentum, we're accelerating our targets in alignment with automakers' published deployment plans. Our new light-duty ZEV sales targets are 26% by 2026, 90% by 2030 and 100% by 2035.

To support these targets, we will bring in "right-to-charge" legislation, allowing more people to install EV charging infrastructure in strata and apartment buildings. We will also introduce new ZEV targets for medium- and heavy-duty vehicles, in consultation with automakers, businesses and industry in alignment with the state of California.

Heavy-duty vehicles account for a large part of transportation emissions and modelling suggests the new targets will have a significant impact. Given the time required for research and engagement, we expect these targets will be in place by 2023.

Making cleaner models more affordable will help get more of them on our roads. And rising demand for cleaner vehicles will act as a further incentive for automakers, driving further improvements in efficiency and generating high-value jobs in ZEV research and development. We will explore other fiscal measures to broaden consumer access to ZEVs, accelerate market transformation and create a more sustainable fiscal framework for the ZEV transition.



Expanding B.C.'s public charging network

We will also ensure it's easy to charge your ZEV, wherever you are in the province. We will work with the private sector, utilities, Indigenous communities, the federal and local governments and others to achieve an overall target of B.C. having 10,000 public EV charging stations by 2030. This will include completing B.C.'s Electric Highway by ensuring broad geographic coverage across the Province for fast-charger EV sites by Summer 2024. BC Transit, TransLink and BC Ferries are also moving increasingly to zero-emission vehicles.

Making commercial transportation more energy efficient



Delivery trucks are getting cleaner – and bikes are sharing the load

Learn more at: CleanBC.gov.bc.ca/success-stories

In partnership with industry and other key stakeholders, we will work to make our commercial transportation systems more competitive while accelerating innovation and driving the adoption of clean B.C. technologies to support and advance climate change goals. As noted above, we're committed to reducing the

energy intensity of goods movements by 10% in 2030, 30% by 2040 and 50% by 2050. We'll also use better data technology to make our transportation systems more efficient, intelligent and competitive.

Having one of the cleanest, greenest transportation networks in the world will add to our competitive advantages, supporting economic growth along with GHG reductions.



Improving vehicle efficiency

When you need to use a vehicle, it makes sense to choose the most efficient one. And this is another place where government can help move the market through regulations, standards and incentives.

To help drive improvements in vehicle efficiency, we'll work with business and industry to encourage faster fleet turnover for the oldest vehicles, work with the federal government to strengthen emissions standards, and develop new equipment regulations for air, rail, marine and off-road vehicles. We'll also identify how the CleanBC Heavy Duty Vehicle Efficiency Program can drive further improvements. For example, the Province could offer higher incentives for tires that reduce fuel consumption on specific types of commercial heavy-duty vehicles and encourage the use of speed-limiting technology and electronic tracking to improve safety while continuing to reduce GHG emissions.

Expanding the Low Carbon Fuel Standard (LCFS)

As noted in the Low Carbon Energy pathway, the Low Carbon Fuel Standard is one of our most successful approaches to reducing GHGs from transportation. It requires fuel suppliers to progressively decrease the average carbon intensity of the fuels they supply to users in B.C.

As part of this Roadmap, we will increase its stringency, consider expanding it to apply to marine and aviation fuels, and consider allowing new compliance options such as negative emissions technologies.

Completing the Clean Transportation Action Plan

In addition to the specific actions in this Roadmap, we will develop a comprehensive Clean Transportation Action Plan in 2023. The Plan will highlight additional steps government will take to reduce emissions in the transportation sector, including ports and airports, to meet our 2030 targets and align with the development of complete, compact, connected communities to reduce vehicle travel.

Electric ferries are the wave of the future

Learn more at: CleanBC.gov.bc.ca/success-stories





2.3 Buildings

Buildings – the places where we live, work, learn and play, and a vital component of B.C.’s economy – account for about 10% of the province’s GHG emissions, mainly from the energy we use to heat them and provide hot water.

Our building sector has been getting steadily cleaner and greener in recent years, but current emissions reductions are not at the scale needed to meet our 2030 targets.

INVESTING IN AFFORDABLE HOUSING ACROSS B.C.

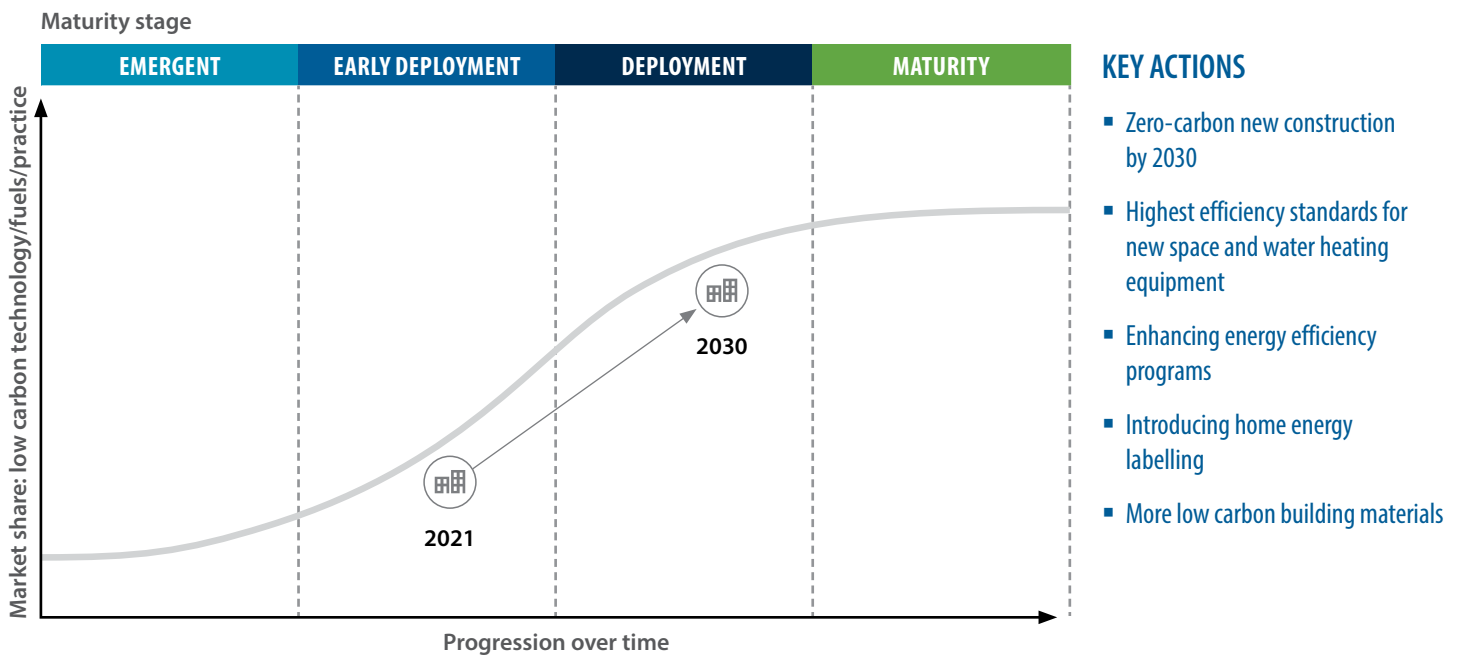
The Province is working to make housing more affordable for everyone in B.C. With \$7 billion dedicated over 10 years, we’re making the largest investment in housing in B.C.’s history. By working with partners, including local governments, we’re delivering 114,000 affordable homes over this time period. In just over three years, more than 30,000 new affordable homes are already complete or underway in more than 100 communities across the province. And we continue to make progress on our plan to retrofit 51,000 units of publicly owned social housing over ten years, making them more energy efficient, less polluting and safer, while significantly reducing heating costs for residents.

Where we're starting from

The decarbonization of buildings is at an early deployment phase. Households and businesses can choose from a range of low carbon solutions and B.C. is already a leader in this space. New construction is steadily moving towards the highest efficiency levels and builders are growing their capacity to make new buildings cleaner, supported by increasing adoption of the Energy Step Code, which sets higher energy-efficiency standards than the base BC Building Code. However, we still rely on fossil fuels to meet more than half our energy needs in buildings.

Low carbon electric technologies like baseboard heaters are commonplace, but not the most efficient options available. Heat pump technologies are more than twice as efficient and cost less to operate. Plus, they double as air conditioners in increasingly hotter summers and can include air filtration, protecting people from wildfire smoke, pollen and pollution. Heat pumps are gaining in market share, with options available for all major building types and climates. However, costs are still a barrier for many households and businesses.

Buildings



What we heard

In the consultations that informed this Roadmap, a wide range of groups including local governments, utilities, Indigenous peoples, professionals and organizations, shared their views on decarbonizing buildings, such as:

- *Regulating carbon as well as energy efficiency in the BC Building Code for new buildings*
 - *Accelerating highest efficiency heating equipment standards for existing buildings*
 - *Addressing affordability impacts especially for those who need it most*
 - *Integrating climate resilience, for example, to address heat waves and air quality issues*
 - *Considering unique Indigenous geographic and cultural needs*
 - *Ensuring program incentives support and align with future building codes and standards.*
-

THE PATH TO TRANSFORMATION – 2030 AND BEYOND

Zero-carbon new construction by 2030

Current requirements for new construction focus on energy efficiency without directly addressing the issue of GHG emissions. Since natural gas is still a dominant, low-cost energy source for buildings, efficiency requirements alone are not enough to meet our climate targets.

That's why we're adding a new carbon pollution standard to the BC Building Code, supporting a transition to zero-carbon new buildings by 2030. We're already working with local governments to develop voluntary carbon pollution standards. Those communities will serve as pilots for future province-wide requirements. The standard will be performance-based, allowing for a variety of options including electrification, low carbon fuels like renewable natural gas, and low carbon district energy.

In 2023, we'll review our progress and, based on what we've learned, we'll start phasing in provincial regulations over time (2024, 2027, 2030). We'll also incorporate energy-efficiency standards for existing buildings into the BC Building Code starting in 2024.

Highest efficiency standards for new space and water heating equipment

Space and water heating are the primary drivers of GHG emissions from buildings. To meet our targets, we need to ensure these functions are super-efficient, improve resilience and, wherever possible, run on clean electricity or other renewable fuels. To help accelerate this transition, we're committing to highest-efficiency standards for new space and water heating equipment by 2030, and earlier where feasible.

After 2030, all new space and water heating equipment sold and installed in B.C. will be at least 100% efficient, significantly reducing emissions compared to current combustion technology. Electric resistance technologies like baseboard and electric water heaters are 100% efficient: they convert all the energy they use into heat. But heat pump technologies exceed 100% efficiency by capturing and moving ambient heat, without having to produce it. The new requirements will encourage more people to install electric heat pumps while continuing to allow the use of electric resistance technologies. They will also allow hybrid electric heat pump gas systems and high-efficiency gas heat pumps.

As building owners, professionals, tradespeople and supply chains prepare for these significant shifts in how we build in B.C., the Province will continue to support market readiness and affordability through CleanBC Better Homes and Better Buildings rebates and financing, innovation funding, technical guidance and ongoing industry training.

CLEANBC BETTER HOMES INCOME QUALIFIED PROGRAM

CleanBC Better Homes is B.C.'s online hub for homeowners to access information, rebates and support to reduce energy use and greenhouse gas emissions in their homes.

The CleanBC Better Homes Income Qualified Program is a new, time limited, efficiency and electrification offer that provides high-value incentives to low- and moderate-income households. It complements existing residential energy efficiency programs to help make life more affordable while improving the quality, comfort and resiliency of homes, saving energy, and reducing GHG emissions.

Enhancing energy efficiency programs

Energy companies like BC Hydro and FortisBC have been working for years to encourage efficiency, offering information, tools and support and partnering with the Province to provide incentives and rebates. Utility-funded programs have been effective in reducing emissions, but like so many aspects of our climate-change response, they need to go further, building on initiatives in CleanBC to support the deep reductions needed to meet our long-term targets.

We'll achieve that, in part, with updated regulations to shift the focus of utility-funded efficiency programs to support market readiness for future standards and codes, place more emphasis on electrification, and to ensure affordability for households and businesses. Instead of seeing incentives for conventional gas-fired heating equipment such as furnaces and boilers, consumers will see more support for building-envelope improvements such as insulation and better windows, and all kinds of high efficiency heat pumps – electric, gas and hybrid. We'll also look for ways to further coordinate and integrate energy efficiency programs to make them more effective and easier to access.

We will proceed with the next steps on a Property Assessed Clean Energy (PACE) program, which is a form of financing for energy retrofits designed to help building owners save on energy costs and reduce greenhouse gas emissions. PACE programs link an energy improvement loan to a specific property through a municipal tax lien. The annual payments for the improvements are tied to the property, not an individual, and paid through local government property taxes. This allows for longer terms, helping to reduce upfront loan repayment costs for building improvements. If the property changes hands to a new owner, the outstanding balance of the PACE loan is also transferred over to the new owner.

Introducing home energy labelling

We've done it for years with appliances and vehicles. Now we're putting tools in place to show people how energy efficient their next home could be. B.C. home sale listings will include an energy efficiency rating or label, letting buyers know what their energy costs and carbon footprint will be. Along with raising public awareness, home energy labelling can motivate owners to invest in retrofits that save energy and cut GHG emissions, knowing it will impact future salability.

As a first step, we will introduce a user-friendly, web-based, virtual home-energy rating tool to let people see how efficient their homes are. The tool will be linked to the Better Homes web hub, helping to make CleanBC and utility program offers more accessible. In-home EnerGuide assessments will continue to play a role where homeowners want a more in-depth evaluation, or where homes are too unique for virtual energy ratings to be accurate.

**Hartley Bay heats up (and cools down)
with energy saving heat pumps**

Learn more at: CleanBC.gov.bc.ca/success-stories



More low carbon building materials

Much of our work to date around cleaner buildings has focused on the amount and types of energy they use. The next bold step is to reduce embodied carbon, which refers to the total GHG emissions created through a building's lifecycle – from material extraction through manufacturing, transportation, construction, maintenance, and end-of-life disposal or reuse.

One approach is to use low carbon building materials, such as mass timber, wood-based insulation, carbon-absorbing concrete, and concrete made with lignin fibres from trees and other plants. Along with reducing embodied carbon, choosing cleaner materials can support a waste-free, circular economy while creating new opportunities in sectors such as forestry where the emphasis is shifting from high-volume to high-value products.

To help build the market for these cleaner materials, we will develop a Low Carbon Building Materials Strategy by 2023 that includes a holistic approach to decarbonizing buildings, initially emphasizing public sector buildings, supporting the development and implementation of embodied carbon targets for public sector buildings by 2030. We're also developing methods for quantifying and analyzing the total embodied carbon of our built environment and identifying pathways to reduce it.





2.4 Communities

B.C.'s local governments play a vital role in meeting provincial climate targets. Along with directly controlling emissions from their own facilities, operations and vehicle fleets, municipalities and regional districts have the capacity to influence about 50% of our GHG emissions through decisions on land use, transportation and infrastructure that affect where people live and work, how they get around, and how their communities grow and change with time.

This puts local governments on the front lines of climate action, where all these policies converge.

Local Government Relative Influence over GHG Emissions

High ← —————→ Low

Municipal infrastructure, buildings and fleet

Transportation network
Land use patterns
Solid waste
Building efficiency standards

Transportation mode share
Residential and business energy efficiency
Food security

Air travel
Industrial energy efficiency
Vehicle standards
Energy utilities

Adapted from: Options to Accelerate Climate Action. Available online: <https://kelownapublishing.escribemeetings.com/filestream.ashx?DocumentId=29429>

What we heard

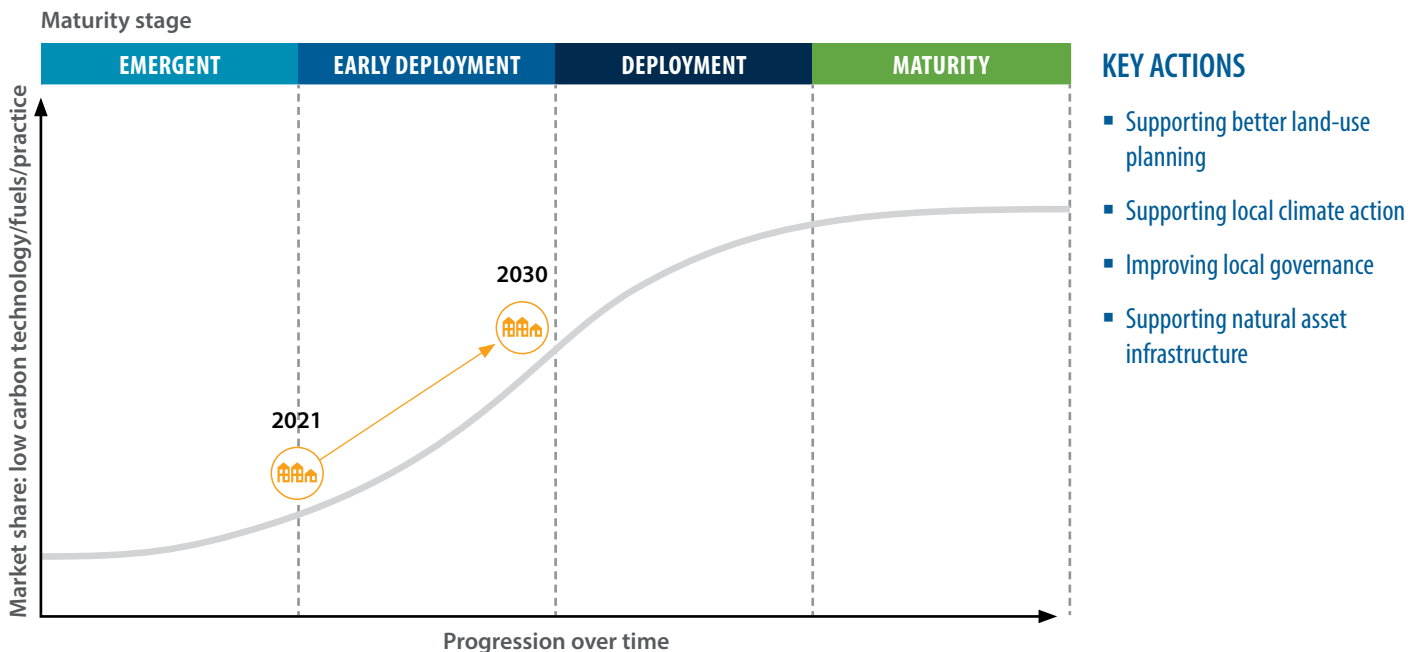
In the consultations that informed this Roadmap, many local governments shared their views regarding the need to:

- Provide sufficient, flexible and guaranteed climate action funding
 - Enable local governments to regulate via opt-in legislation and expanded authority
 - Target capacity constraints through coordination, funding and tailored support
 - Consider legislative changes to better integrate climate action into Official Community Plans and take a more holistic approach to integrate climate resilience
 - Increase ZEV targets, carbon tax and the Low Carbon Fuel Standard.
-

Where we're starting from

Since 2008, virtually all of B.C.'s local governments have signed the B.C. Climate Action Charter, a voluntary agreement to work toward corporate carbon neutrality, measure community-wide emissions and create complete, compact, more energy-efficient rural and urban communities. Many have ambitious targets and much has been achieved. However, within communities – especially in smaller and rural areas – capacity, environment, geography and size can add to the challenges of taking climate action.

Communities



THE PATH TO TRANSFORMATION – 2030 AND BEYOND

Transformation for this sector is closely tied to actions in the other Roadmap pathways, including transportation, buildings and low carbon energy, all of which have significant impacts on communities' GHG emissions and will require local government leadership to implement. In this pathway, our work addresses land-use planning, infrastructure and governance – key elements contributing to the larger climate action picture.

Supporting better land-use planning

Land-use planning links communities to the environment and the economy. It's multi-faceted, complex work that affects people's daily lives and plays a large role in shaping how communities will look, feel and function in the future. As part of this Roadmap, we'll work with municipalities and regional districts to enhance their work on land-use planning by:

- Providing better supports, tools and guidance
- Making data available to help inform decisions and assess progress
- Using a climate lens to review provisions in areas such as Regional Growth Strategies, Official Community Plans and zoning.

INTEGRATING TRANSPORTATION AND LAND-USE PLANNING

The Province is developing an integrated planning approach to better align transportation and land-use planning. The goal is to integrate future transportation investments with local and regional development plans, supporting the seamless movement of people and goods, enabling trade, preparing for future growth, and encouraging the development of diverse, affordable, resilient connected communities that provide the amenities, housing and quality of life people value.

As communities grow, we will support them to better align land-use and transportation planning to build connected, mixed-use communities where more people can live closer to jobs, services and transportation choices, helping to reduce commute times and greenhouse gas emissions. Climate sensitive land-use planning can also reduce emissions from deforestation by reducing urban sprawl.

Supporting local climate action

Local governments are climate action leaders and we want to make sure they maintain their momentum. The Province will partner with local governments to find new ways to support their work. This will include establishing a new program in 2022 to support local government climate actions through flexible, predictable funding. And we will continue to work with federal partners to enable local governments, Indigenous communities and stakeholders to apply a climate and resilience lens for all major infrastructure funding applications. This will help ensure that B.C.'s future infrastructure is clean, low carbon and able to withstand the impacts of a changing climate.



Improving local governance

B.C.'s *Community Charter*, the *Local Government Act* (LGA) and the *Vancouver Charter* define the core authorities of local governments and guide their decision making across a range of areas including land-use planning. Because better land use is essential to climate action, we will evaluate opportunities to strengthen the local government legislative framework – working with municipalities, regional districts, Indigenous communities and other key partners to identify where improvements may be needed.

We're also taking steps to re-invigorate and refresh the Province's partnership with local governments and the Union of BC Municipalities (UBCM) through the Green Communities Committee, established under the Climate Action Charter. Committee members support the development of strategies, actions, supports and incentives to advance climate action in all of our communities. They also work with local governments to build their capacity to plan and implement climate change initiatives.

Other actions in this pathway will include:

- Supporting access to GHG emissions data related to buildings, transportation and waste
- Enhancing the existing Community Energy Emissions Database for local governments and Indigenous communities
- Working to develop regionally specific adaptation and resilience strategies as part of B.C.'s Climate Preparedness and Adaptation Strategy; this includes supporting access to data needed for hazard and land-use risk reduction.

Supporting natural asset infrastructure

Natural assets such as aquifers, forests, streams, wetlands and foreshores provide important environmental services equivalent to those from many engineered assets. When we keep them healthy, they're also inherently resilient and adaptable to climate change. With effective monitoring, maintenance and rehabilitation, natural assets can provide services and add value for decades in ways that many engineered assets cannot match. Supporting natural assets can also reduce deforestation, leading to lower emissions.

As part of this Roadmap, we will support the development of natural asset infrastructure for local governments and Indigenous communities, aligned with local government climate initiatives.



2.5 Industry, Including Oil and Gas

B.C.'s industries are making great strides in low carbon innovation, delivering some of the cleanest industrial products of their kind in the world. Keeping them competitive is both an economic and environmental imperative. We produce resources the world needs, and we can make them with a smaller carbon footprint than most of our competitors, helping to address the impacts of climate change worldwide. If production moves to places with less environmentally friendly practices, the planet will be worse off and so will our economy.

To meet our climate targets, B.C. companies will need to continue investing in low carbon technologies and practices. In some cases, they will need support to further reduce emissions so they can stay competitive, attract new investment and showcase their successes to the world.

Where we're starting from

The market for fully decarbonizing large industry in B.C. is at the emergent stage, with a number of solutions and technologies being piloted or demonstrated. Because each industrial facility is different, there is no one-size-fits-all solution, and some operators are farther along the low carbon continuum.

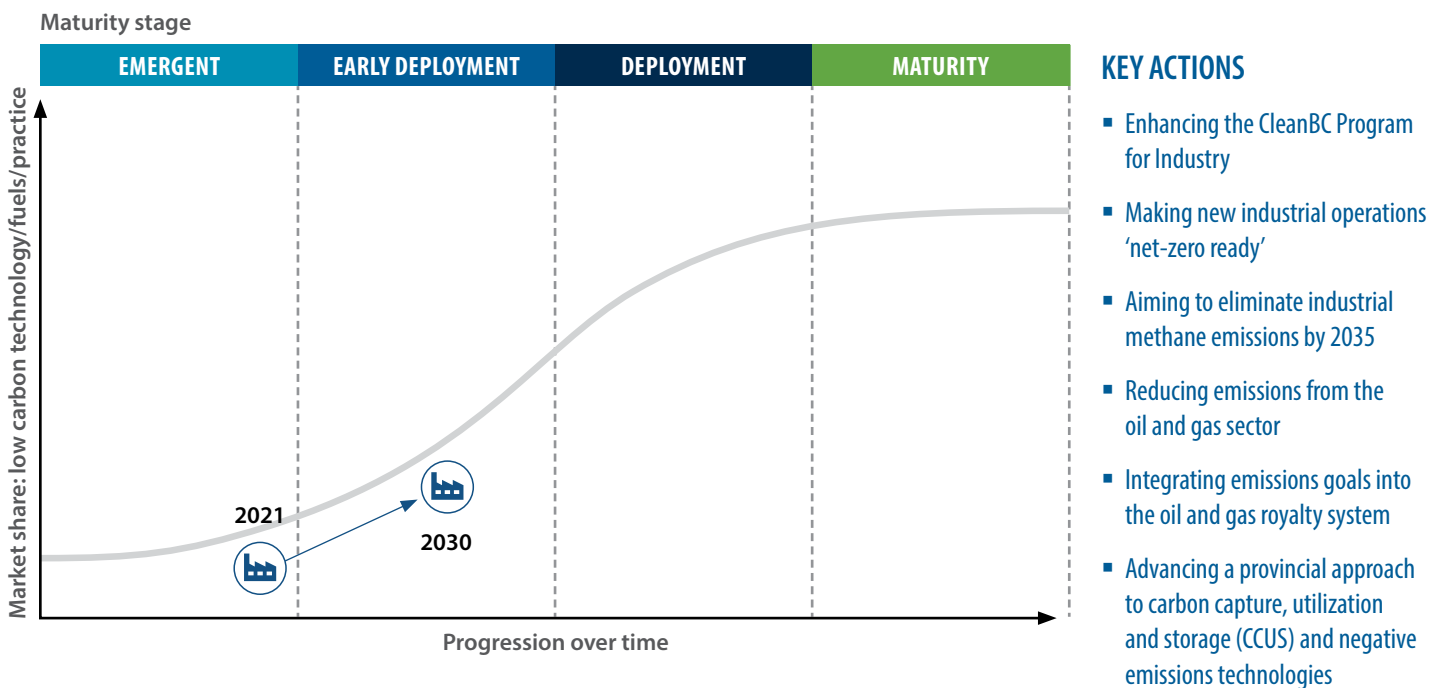
Commercial deployments are also at different stages, largely due to economic factors including cost, scale and regulatory considerations. Promising technologies such as carbon capture and storage are still in early development. And, while we're making progress towards reducing methane emissions in some sectors, we still have work to do on measuring and managing them in others.

What we heard

In the consultations that informed this Roadmap, industry leaders stressed the need to leverage their low carbon advantage while building on our natural resources to create opportunities for low carbon growth, including:

- Providing a predictable and forward-looking policy landscape that allows for long-term emissions reduction planning and investment
- Increasing protection for emissions-intensive trade-exposed industry and considering flexible options, such as offsets or credit generating systems, to help address competitiveness concerns
- Providing clarity on how to advance carbon capture, utilization and storage projects, including through regulatory certainty and fiscal measures
- Tackling major barriers to electrification such as high initial investment and operating costs and timing uncertainty
- Advancing low carbon fuel production and use to fill specific niches within industry.

Industry, Including Oil and Gas



THE PATH TO TRANSFORMATION – 2030 AND BEYOND

To help meet our climate targets and keep B.C. industry at the forefront of low carbon innovation and production, we need to work together to reduce industrial emissions as quickly as possible, including continuing to invest in low carbon technologies and practices and implementing more circular processes.

As part of this Roadmap, we'll encourage more facilities to connect to clean electricity, use more low carbon fuels such as hydrogen, explore how best to capture and safely store or use carbon, and reduce industrial methane emissions. We're also moving forward with a suite of new initiatives to help keep our industries competitive as we move to a net-zero future.

Enhancing the CleanBC Program for Industry

The CleanBC Program for Industry supports GHG reductions and competitiveness by investing carbon tax revenue in projects that reduce emissions and costs across B.C. In 2022, we will work with industry, the Government of Canada and Indigenous peoples to redesign the program to align with new federal carbon pricing rules while continuing to promote a competitive business environment and significant GHG reductions.

Our work will include determining how best to support common infrastructure needs through projects such as transmission grids and access to low carbon fuels. We will also explore ways of structuring projects to include and further benefit Indigenous communities.

Making new industrial operations 'net-zero ready'



Electric fleet reduces costs and improves productivity at this B.C. mine

Learn more at: CleanBC.gov.bc.ca/success-stories

Some of B.C.'s largest industrial operators – accounting for almost 50% of industrial GHG emissions – have already committed to reaching net-zero emissions by 2050. Building on that progress, we're introducing a new requirement: all new large industrial facilities must have a plan to achieve net-zero emissions by 2050. New facilities will also have to show how they align with B.C.'s interim 2030 and 2040 targets.

This means facilities will have to be designed to minimize emissions as much as possible. Where emissions can't be reduced, companies will have to assess the use of new technologies such as carbon capture or consider the purchase of high-quality offsets from projects offering long-term carbon sequestration, such as through the use of negative emissions technologies. New net-zero plans will be required and assessed at different stages of development, subject to review, revision and enforcement over time. Government will work with facility proponents to align new policies and compliance mechanisms to support net-zero-emission plans.



This type of planning will future proof our newest industrial facilities, ensuring they can meet the needs of investors and purchasers adhering to a stringent definition of net zero. This approach will also help to drive investments in new, clean B.C. technologies while providing the certainty industry needs to thrive in a global net-zero economy. Government will work with stakeholders and First Nations as these requirements are further developed.

Aiming to eliminate industrial methane emissions by 2035

Methane is a powerful greenhouse gas, with more than 80 times the warming power of carbon dioxide during its first 20 years in the atmosphere. Clearly, we need to reduce its emissions – but measuring them and identifying where they’re from has long been a major challenge.

New solutions are becoming available and we’re learning more about them, thanks to the work we’ve been doing with research organizations, the oil and gas sector, the federal government and non-profits. Through the BC Methane Emissions Research Collaborative, we’ve demonstrated that methane emissions from oil and gas can be detected, attributed and quantified at specific sites, likely in a more cost-effective way than traditional methods.

With this Roadmap, we are committed to building on that research and applying it across the industrial sector to achieve our goal of zero emissions from methane – or as close to zero as possible – by 2035, and to reduce methane emissions in the oil and gas sector by 75% (compared to 2014) by 2030, consistent with the federal commitment. Methane from industrial wood waste landfills can be converted to less-harmful greenhouse gases through landfill management.

Reducing emissions from the oil and gas sector

Currently responsible for 20% of B.C.’s emissions and 50% of industrial emissions, the oil and gas sector will be required to make a meaningful contribution to BC’s climate targets. B.C. is the first jurisdiction in Canada to set a specific sectoral target for reducing emissions from the oil and gas industry.

The Province will work to implement policies and programs to reduce emissions in line with its sectoral target of a 33-38% reduction below 2007 levels. In addition to strengthening B.C.’s methane regulations and modernizing B.C.’s royalty system, our new industrial climate program, to be released in 2023, will be designed to ensure the oil and gas sectoral target is met.

We will also commit to cleaning up 100% of current orphan wells in B.C. before 2030 through the industry-funded Orphan Site Reclamation Fund.

Integrating emissions goals into the oil and gas royalty system

B.C.'s royalty system was set up nearly 30 years ago in the 1992 Petroleum and Natural Gas Royalty and Freehold Production Tax Regulation. The way natural gas is produced has changed significantly since then, as have market conditions, drilling technology and costs, and global concerns on the need to address climate change.

As part of this Roadmap, the Province will review the rules for oil and gas royalties to ensure they support our goals for economic development, environmental protection and a fair return on the resource for the people of B.C. It's part of our commitment to reduce emissions from oil and gas by 33-38% by 2030, compared to 2007 levels.

The review will examine ways to adjust the royalty system to help meet provincial emission reduction targets and will consider recommendations from the independent panel currently reviewing B.C.'s royalty system. Policy tools will be considered to encourage further emissions reductions from the sector, and to support the other pathways in this Roadmap.

Advancing a provincial approach to carbon capture, utilization and storage and negative emissions technologies

The full decarbonization of B.C. industry will require widespread electrification; the use of low carbon fuels like lignin, renewable gas and hydrogen; and the use of carbon capture, utilization and storage (CCUS) and other negative emissions technologies across different sectors.



The cleanest cement plant in Canada might be right here in B.C.

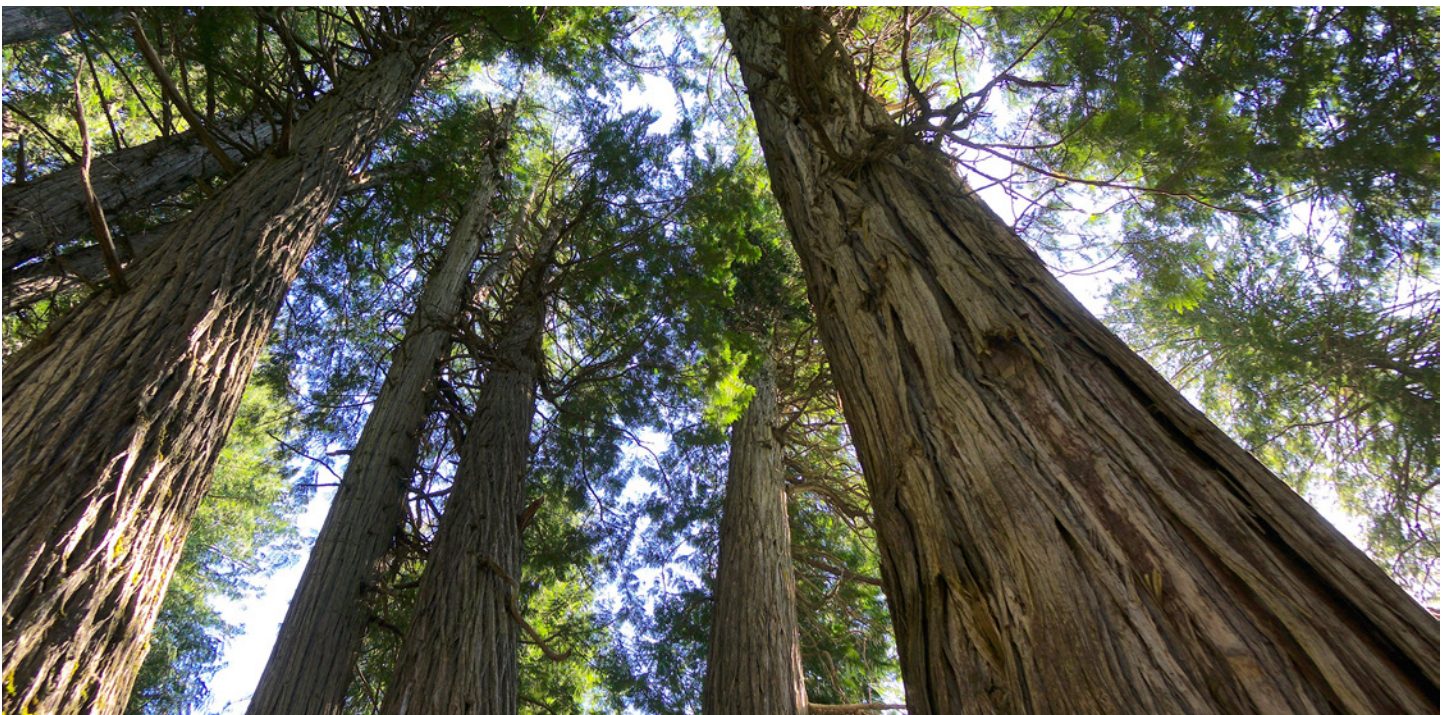
Learn more at: CleanBC.gov.bc.ca/success-stories

CCUS technologies can reduce emissions in hard-to-abate industrial sectors such as oil and gas, pulp and paper, and cement, where emissions associated with chemical processes cannot be eliminated in any other way. Since they are still in the emergent phase, we will develop a coordinated, comprehensive provincial approach to guide their deployment.



2.6 Forest Bioeconomy

B.C.'s expansive forests are central to our bioeconomy – the part of our economy that uses renewable resources to produce things we use every day like textiles and packaging. By using the residuals from conventional forestry, our forest bioeconomy supports the sector's shift from high volume to high value and contributes to a waste-free, circular economy while helping in the fight against climate change.





INDIGENOUS PEOPLES AND FOREST MANAGEMENT

Forests are, and have been, central to many Indigenous communities whose inherent rights are connected to their respective territories. They provide food, shelter, economic opportunities, tools and medicine along with materials for arts, culture and spiritual activities. For example, some Indigenous peoples see cedar as the tree of life, using it for homes, clothing, canoes, baskets and traditional ceremonies.⁶ As the original stewards of the land we now call British Columbia, Indigenous peoples are essential partners in transforming our forest sector from high-volume to high-value, and keeping it sustainable.

What we heard

The Province engages regularly with industry, academia, Indigenous peoples and governments to advance forest sector innovation and build a broader bioeconomy in support of sustainable forest use. Key themes discussed in the consultations informing this Roadmap were:

- *Need for a competitive carbon policy that incentivizes GHG reduction practices and investments in the forest sector*
- *Investments and further engagement to support commercialization of new bioproducts that can replace more GHG intensive products; this includes using lignin in asphalt instead of bitumen and cellulose foams instead of Styrofoam.*

Indigenous peoples we engaged with emphasized the need to balance environmental and economic benefits, noting the alignment between bioeconomy opportunities and their traditional knowledge principles. Some also expressed interest in pursuing carbon offset projects.

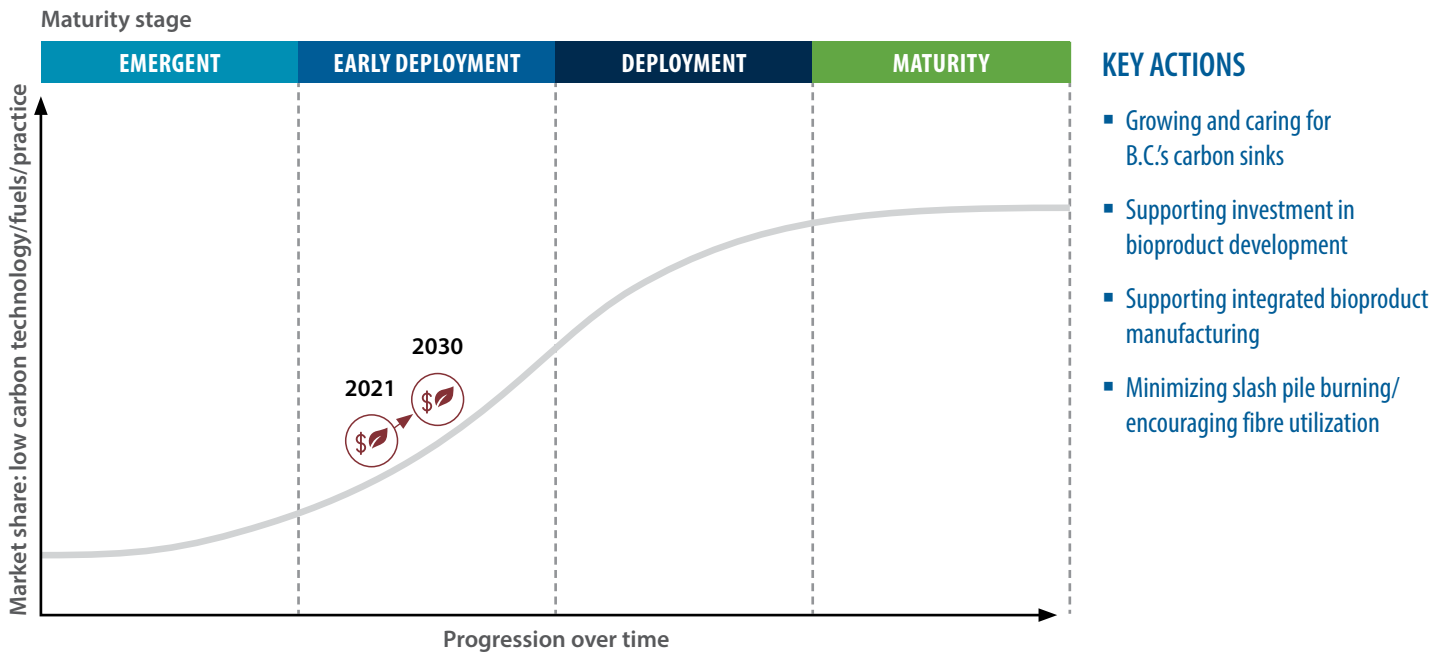
Where we're starting from

The B.C. bioeconomy is currently in early deployment, supported by partnerships with Indigenous peoples and private companies throughout the province. For example, the [Indigenous Forest Bioeconomy Program](#) has supported the production of a wide range of innovative high-value bioproducts – from essential oils extracted from conifer needles, to new health beverages from trees, to biochemicals extracted from bark.

There's also a growing market for forest carbon offsets – tradable credits used to offset or counterbalance greenhouse gas emissions. They provide a pathway to meeting climate targets for sectors whose emissions are particularly tough to abate.

⁶ "The Tree of Life": https://umistapotlatch.ca/enseignants-education/cours_4_partie_2-lesson_4_part_2-eng.php

Forest Bioeconomy



THE PATH TO TRANSFORMATION – 2030 AND BEYOND

The global market for bioproducts is expected to undergo a major transition over the next 10 years, with advanced biomaterials and biochemicals making up the largest market segments.

By 2030, the province should be producing bioproducts at scale and providing high-quality jobs in the bioproducts sector. We'll reach these goals through the following actions.

Old Growth Strategy

Old growth forests – those containing trees that are more than 250 years old – make up nearly one quarter of B.C.'s total forested area. Old growth has a range of benefits, on top of protecting biodiversity, watershed protection and helping the Province adapt to the effects of climate change, they also store large amounts of carbon. Because trees store carbon as they grow, old growth seems like a natural ally in the fight against climate change.

Consistent with the recommendations from the Old Growth Strategic Review, we're integrating climate mitigation into forest management and undertaking research to improve our understanding of old growth forests and their impacts on greenhouse gases. B.C. uses many mitigation options in our forests, including reforestation, fertilization, managing forest health, reducing slash pile burning and using more fibre in longer lived products. Conserving old growth forests as carbon sinks is one of those strategies.

Growing and caring for B.C.'s carbon sinks

B.C. will explore opportunities to partner with the federal government to plant more trees, creating larger carbon sinks and rehabilitating wildfire impacted lands – areas that absorb more carbon than they emit into the atmosphere. We'll also evaluate additional reforestation and forest management activities that sequester carbon and foster climate resilience – including through fertilization, forest health improvements and wildfire mitigation – ensuring opportunities for Indigenous businesses.

A new B.C. Forest Carbon Offset Protocol will expand access to the carbon-offset market for Indigenous communities and forest companies, supporting them to generate revenue while helping others meet their climate commitments. The Protocol will also help to focus attention on the value of non-timber forest benefits, including biodiversity protection and carbon sequestration.

Offset projects will include afforestation (planting trees in areas where there is no forest), reforestation, and improved forest management through practices such as letting trees grow longer before they're harvested. The Province will also explore updating policy and laws to allow the use of Crown land for offset purposes.

Supporting investment in bioproduct development

The Province will partner with Indigenous peoples and industry to build the market for high-value wood products that store carbon or displace products made with fossil fuels. This will include:

- Exploring policy actions, such as biomass content requirements, to increase the use of biomaterials in carbon-intensive products such as concrete, asphalt and plastic components used in finishing cabinets, flooring and other materials
- Encouraging the use of biomaterials in the packaging, consumer goods and biochemical sectors; this could include replacing single-use plastic packaging with biobased materials
- Exploring opportunities to support sector growth through measures such as market and supply chain studies, capacity building, technology assessments and pilot projects for scale-up opportunities
- Advancing mass timber production and use through a Mass Timber Action Plan; work to develop the plan is being guided by a steering committee representing Indigenous communities, industry and government
- Exploring the potential for regional bio-hubs to help ensure communities have access to fibre for diversified manufacturing, and to enhance the number of well-paying forest sector jobs across the province.



Supporting integrated bioproduct manufacturing

One of the potential downsides of forest-based bioproduct manufacturing is having to move material from one site to another. Integrating manufacturing with existing pulp and paper facilities and pellet mills eliminates that issue, creating significant logistical and cost advantages. As part of this Roadmap, we will explore ways to streamline regulations and generate investment for bioproducts facilities at pulp mill sites, allowing producers to make full use of B.C.'s forest resources.

Minimizing slash pile burning and encouraging fibre utilization

Slash piles – the residue from conventional forest harvesting – have long been burned as a way to help reduce the risk of wildfires, and to enhance habitat for wildlife and replanting. The Province will work towards near elimination of slash pile burning by 2030 and will increasingly divert materials away from slash piles and into bioproduct development, reducing both air pollution and GHG emissions while creating new economic opportunities.

In the months ahead, we will partner with forest licensees and Indigenous communities to explore ways to make this feasible, taking into account any impact on wildfire risks. We'll also continue to invest in projects that encourage greater use of forest fibre that would otherwise be burned.



2.7 Agriculture, Aquaculture and Fisheries

The agriculture sector directly accounts for just under 4% of B.C.'s GHG emissions. The largest source is from enteric fermentation, a digestive process of cattle and other ruminants that produces methane, a powerful greenhouse gas. The next largest sources of agricultural emissions are on-farm energy, agricultural soils and manure management.

AGRICULTURE, FISHERIES AND ADAPTATION

Adaptation to climate change has been, and continues to be, a key focus of climate action for agriculture, fisheries and aquaculture. These industries are extremely vulnerable to the impacts of changing weather patterns and severe weather events, including high intensity rainfall, heat waves, drought, wildfire and changing marine conditions. Industry and Indigenous partners are acutely aware that the changing climate affects their productivity and livelihoods, and that building resilience is critical. New measures to support the sector's adaptation will be included in the Climate Preparedness and Adaptation Strategy, due for release in 2022.



What we heard

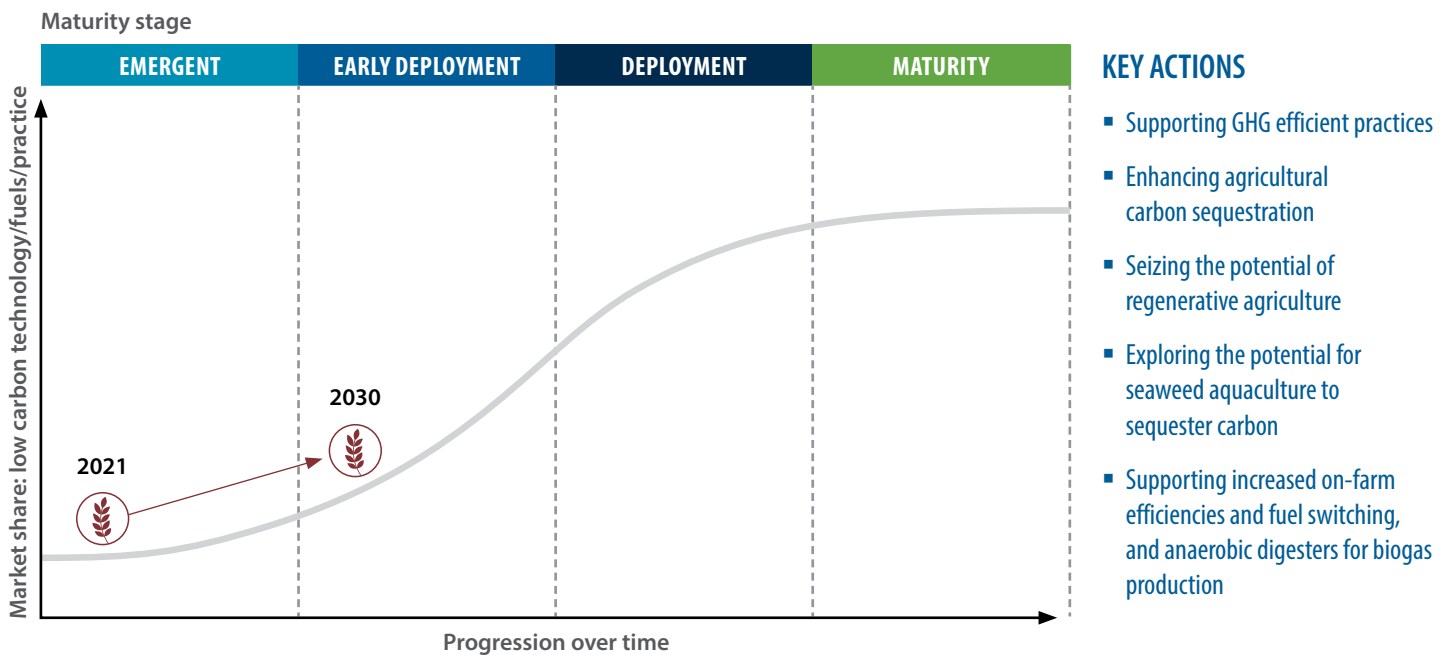
In the consultations that informed this Roadmap, people in the agriculture and aquaculture sectors said they want to continue being informed and consulted as programs and policies are developed and implemented, and want to see their roles and expected contributions more clearly defined. They also highlighted the importance of:

- Providing financial support to help sectors transition practices and technology
- A high-level of buy-in from producers who will readily take up practices that are economically viable
- Undertaking research and development and developing monitoring and measurement frameworks to establish benchmarks and track GHG reductions.

Where we're starting from

The market for decarbonizing agriculture, aquaculture and fisheries is in the emergent phase. Stakeholders have emphasized the need to be realistic about what can be achieved by 2030, noting that cost and economic viability present significant barriers to adopting new solutions.

Agriculture, Aquaculture and Fisheries



THE PATH TO TRANSFORMATION – 2030 AND BEYOND

To help move the market to early deployment by 2030, we're supporting producers to increase GHG efficient practices and exploring several measures to enhance carbon sequestration.

Supporting GHG efficient practices

As part of this Roadmap, the Province will continue to support the transition to technologies and practices that reduce both net GHG emissions and operating costs for producers. This includes encouraging fuel switching and electrification to reduce emissions from equipment in agriculture, aquaculture and fisheries, along with increased efficiency in manure and nutrient management. We'll encourage the development and piloting of new clean solutions such as electric tractors and technologies to further improve energy efficiency in greenhouses. And, we'll encourage more local, sustainable food production, which has the potential to reduce greenhouse gas emissions in B.C.

Waste management will be supported by growing opportunities to capture biogas, turning farm waste into a valuable resource. Pathway strategies related to biogas will contribute to our goal for renewable energy to make up at least 15% of the content of B.C.'s natural gas by 2030.

Enhancing agricultural carbon sequestration

We will work with the agriculture sector to determine beneficial management practices to maximize carbon sequestration and its benefits to biodiversity, soil and water quality, and farm profitability. Our primary focus in this area is supporting research and monitoring to fill in critical knowledge gaps. We will support applied research, explore piloting promising ideas, monitor results and work to improve local technical knowledge of climate adaptation.



Seaweed aquaculture reduces climate pollution

Learn more at: CleanBC.gov.bc.ca/success-stories

We will also encourage producers to implement regenerative agricultural practices and technologies that improve soil health and biodiversity, allowing farmland to store more carbon. And we'll work with Indigenous communities and the aquaculture sector to explore the carbon-storage potential of seaweed cultivation.





2.8 Negative Emissions Technologies

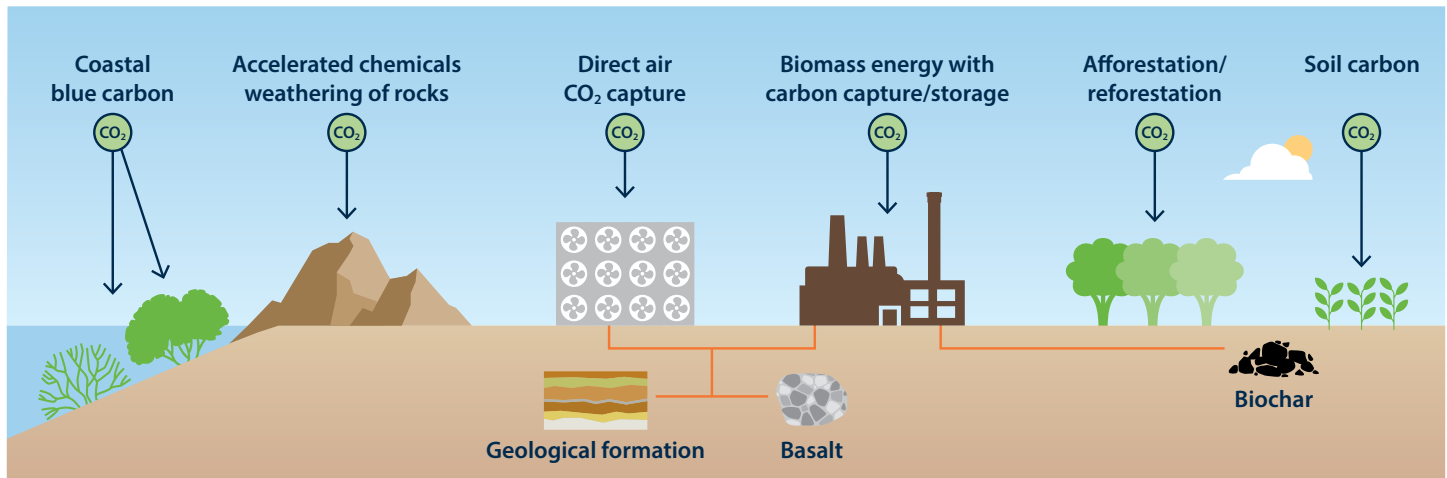
THE NEED FOR NEGATIVE EMISSIONS TECHNOLOGIES

According to the International Energy Agency, almost half the GHG reductions targeted worldwide for 2050 will come from technologies currently in the demonstration phase. Expert groups like the Canadian Institute for Climate Choices agree on the need for high-risk, high-reward technologies, projecting that solutions such as negative emissions technologies (NETs) could deliver two thirds of the reductions needed to meet our 2050 targets.

Negative emissions technologies can play an important role in meeting our climate targets, especially the long-range commitment to reach net-zero by 2050. They remove CO₂ from the atmosphere, offsetting emissions that have already occurred. NETs range from biological options, such as forest and soil ecosystems, to novel engineered technologies. This pathway is focused on the latter.



Negative Emissions Technologies



Adapted from: National Academies of Sciences, Engineering, and Medicine. 2019. *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda*.

Available online: www.nap.edu/download/25259

What we heard

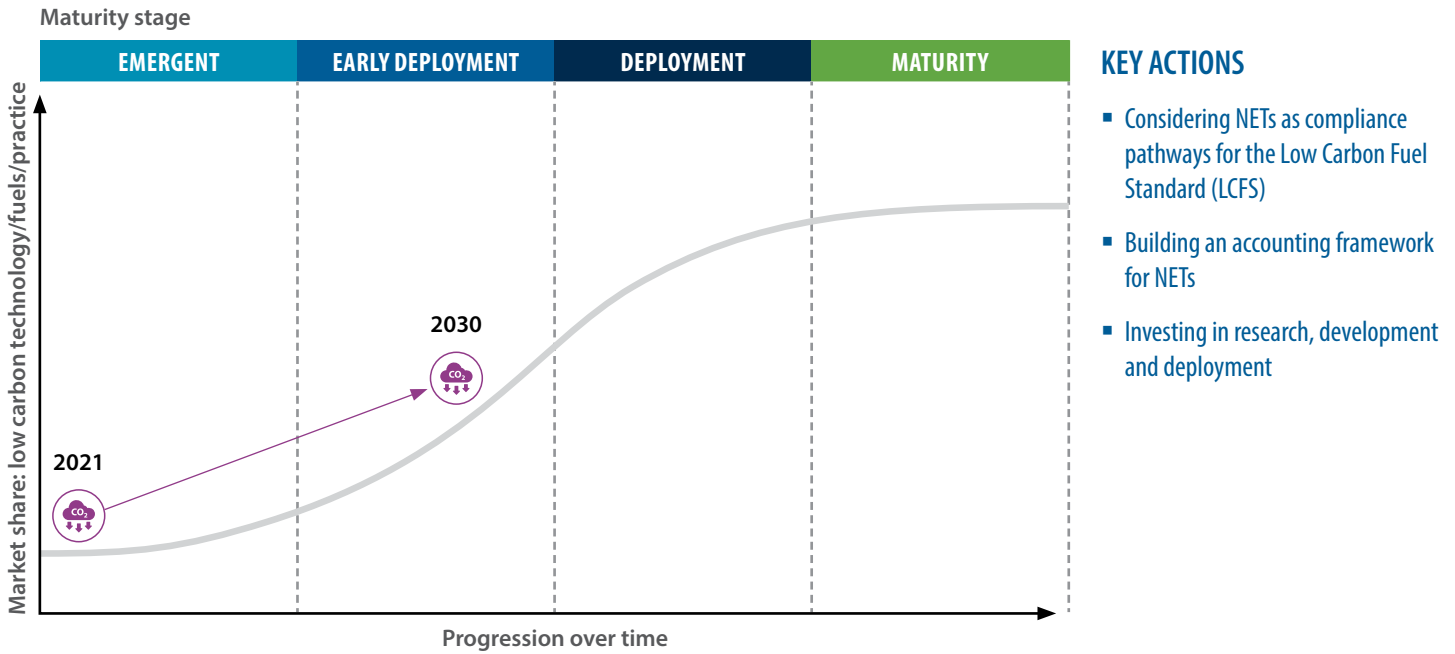
In the consultations that informed this Roadmap, industry, Indigenous peoples, businesses, clean tech companies and others encouraged the Province to explore the potential of NETs. Key themes discussed were:

- Continuing engagement to develop a policy framework including a clear definition of NETs, especially as many technologies are in development or in early stages
- Encouraging NETs as part of a global solution, and considering equity and affordability implications
- Targeting NETs to offset emissions in hard-to-decarbonize industries, not as a replacement for decarbonization
- Providing adequate funding supports for technology development and to scale technologies for adoption

Where we're starting from

The market for NETs is still in the emergent stage but B.C. has the capacity and potential advantage to play a lead role in moving it forward. We're home to a rich ecosystem of innovation and clean tech companies with NET solutions at various stages of development. Because of their novelty and complexity, it will take significant time and investment to determine whether their large-scale deployment is cost-effective and functional.

Negative Emissions Technologies



THE PATH TO TRANSFORMATION – 2030 AND BEYOND

To support the scale-up of NETs by 2030, B.C. needs an enabling environment that supports innovation, incentivizes public-private involvement and is flexible enough to adapt to change. That could include a supportive regulatory and policy climate, economic incentives, measures to reduce costs or new business models to achieve economies of scale.

To achieve these goals and move the market, we will provide investments through InBC to help small- and medium-sized B.C. companies scale up and reach their highest potential. InBC investments will help foster a low carbon economy by anchoring talent, innovation, intellectual property and high-quality, family-supporting jobs throughout the province. We'll also take the following actions.

Considering NETs as compliance pathways for the Low Carbon Fuel Standard (LCFS)

The LCFS requires fuel suppliers to progressively decrease the average carbon intensity of the fuels they supply to users in B.C. By 2030, they'll have to deliver a reduction of more than 20%, with the target continuing to rise in the coming years.

Recognizing the challenges inherent in reducing carbon intensity, we will consider allowing NETs as an option for compliance. This could attract significant new investment to B.C., along with new jobs in clean technology. A final decision on the LCFS will be based on consultations and assessments of recent program changes affecting costs and emissions.

Building an accounting framework for NETs

Currently, our GHG accounting used to measure progress to targets only captures emission reductions from forest-offset projects, since they are the only NET that currently meets our rigorous standards for planning, implementation and monitoring. As more engineered solutions come online, B.C. will build an accounting framework by 2025 to define how other types of NET projects may impact emissions reductions, and how they can be brought into the inventory's scope. This will ensure they're evaluated on a lifecycle basis so we don't adopt technologies that ultimately require more materials and energy, and produce more GHGs, than what they're capturing and storing.

Once we're able to reliably quantify the impacts of NETs, we will clarify their role in carbon offsets. We will also advocate for international collaboration to ensure national inventories can account for NETs consistently.

Investing in research, development and deployment

As noted in the industry pathway, B.C. will develop a comprehensive provincial approach to carbon capture, utilization and storage (CCUS) technologies, leveraging supports such as the federal investment tax credit for CCUS. We'll also consider additional grants and incentives for research and development, pilot projects and commercial scale deployment.



Negative emissions technologies are breathing fresh air into emissions reductions

Learn more at: CleanBC.gov.bc.ca/success-stories

Some of this support will be delivered through the new B.C. Centre for Innovation and Clean Energy. Its mandate is to bring together innovators, industry, academics and government to accelerate the commercialization and scale-up of B.C. based, clean energy technologies. We will also assess the need for new provincial tools to encourage private-sector investment in NETs. And we will assess the potential of research developed through the University of British Columbia and University of Victoria to mineralize CO₂ from the atmosphere to store it in rock and in other materials.



CHAPTER 3: NEXT STEPS AND IMPLEMENTATION

The CleanBC Roadmap to 2030 is designed to be a living document, to be revisited and updated as we move forward to ensure we stay on track to meet our targets. In the months ahead, we will engage with partners and stakeholders to work out the details of major new measures and find the best ways to put them into practice.

Many of the actions in this Roadmap will expand and accelerate CleanBC policies and programs already in place. Others will require close monitoring and adjustments as we learn from experience. Where policies are working, we'll act quickly to ramp up our efforts. Where they're not as effective, we'll change course, in close collaboration with affected sectors.

As we chart our progress, we will continue to provide detailed reporting to the public through the annual [Climate Change Accountability Report](#), which includes progress indicators for CleanBC programs. In future years, we will also report on the following indicators specific to the Roadmap:

- Market share of technologies, reflecting the extent to which low-emission solutions are being adopted
- Cost of transformation for each sector
- Workforce and skills readiness, reflecting our capacity to adopt new approaches
- Economic and social opportunities, pointing to important co-benefits such as reducing inequality and advancing reconciliation with Indigenous peoples.

The work ahead will be challenging. Transforming British Columbia's economy will require determination, particularly as many of these changes will be made in less than a decade. Achieving our targets will demand an unprecedented level of commitment. It will also offer unprecedented opportunities for the future as we work towards net zero by 2050.

Successful implementation of this plan will require a focused, all of government approach. To support this, the Premier has instructed all Ministers, via mandate letters, to ensure their work continues to achieve CleanBC's goals.

Business and industry will have new opportunities to innovate and build on the CleanBC actions and supports, as well as our global reputation as a place for environmental, social and governance investments and net-zero focused business. Local governments will have new opportunities to build more liveable, compact and energy-efficient communities. Indigenous peoples will have new opportunities to advance their self-determination and participate more fully in every sector of our economy. And everyone in B.C. will have the opportunity to look forward to a cleaner, better future.

We're building a British Columbia where no one's left behind; where innovation drives new advances and keeps us competitive; where we all enjoy improvements in our quality of life and prosper along with – not at the expense of – our natural environment. Meeting our climate targets and building a cleaner economy is fundamental to making this future a reality.

APPENDICES

Roadmap to 2030 Greenhouse Gas Reductions by Initiative

Economy-Wide Initiatives

Increase the price of carbon pollution	Meet or exceed the federal benchmark of \$170 by 2030 Revise industrial carbon pricing in 2023
Reduction of GHGs in 2030 for Economy-Wide Initiatives	
Subtotal 2.4	

Low Carbon Energy

Enhance the Low Carbon Fuel Standard	Increase the carbon intensity reduction requirement Expand to include marine and aviation fuel Double production capacity for made-in-B.C. renewable fuels to 1.3bn litres
Increase benefits of electrification	Implement 100% Clean Electricity Delivery Standard
Reduce emissions from natural gas	New GHG cap for natural gas utilities with a variety of compliance options
Reduction of GHGs in 2030 for Low Carbon Energy	
Subtotal 5.0	

Transportation

Accelerate zero-emission vehicle (ZEV) law	By 2030, ZEVs will account for 90% of all new light-duty vehicle sales in the province New ZEV targets for medium- and heavy-duty vehicles to be developed in alignment with California
Reduce light-duty vehicle travel	Reduce distances travelled by vehicle by 25% relative to 2020 Encourage increase in mode shift to walking, cycling and transit to 30% by 2030
Reduce goods movement emissions	Reduce the energy intensity of goods movement by 10% relative to 2020
Reduction of GHGs in 2030 for Transportation	
Subtotal 4.9	

Buildings

New carbon pollution standard in BC Building Code	Carbon pollution standards introduced for new buildings in 2024, with zero-carbon new construction by 2030
Highest efficiency standards	After 2030, all new space and water heating equipment sold and installed in B.C. will be at least 100% efficient (i.e. electric resistance heating, heat pumps, and hybrid electric heat pump-gas systems)
Reduction of GHGs in 2030 for Buildings	
Subtotal 1.3	

Industry

Enhance CleanBC Program for Industry	Enhance industry program to reduce GHGs and support a strong economy
Reduce methane emissions	Near elimination of methane emissions by 2035 in oil and gas, mining, industrial wood waste and other sectors
Make new industrial operations 'net-zero ready'	New large industrial development to submit plans to achieve net-zero emissions by 2050 and show how they align with interim 2030 and 2040 targets
Reduce oil and gas sector emissions	Implement programs and policies so that oil and gas emissions are reduced in line with sectoral targets (reduction of 33-38% by 2030)
Reduction of GHGs in 2030 for Industry	
Subtotal 2.6	

Other Measures Including: reducing agricultural emissions, supporting compact and resilient communities, and aligning with federal, municipal and Crown Corporation plans.

Reduction of GHGs in 2030 for Other Measures		Subtotal 0.9
<i>Note: Individual pathway reductions do not add up to the totals because of interaction effects between policies that target the same emissions</i>		
Roadmap to 2030		16.2 MtCO ₂ e
CleanBC Phase 1		10.5 MtCO ₂ e
Total GHG MtCO₂e reduced by 2030		26.7 MtCO₂e
The legislated target for 2030 is 39.4 MtCO ₂ e (or a reduction of 26.3 MtCO ₂ e from a 2007 baseline), which we are exceeding by 0.4 MtCO ₂ e.		

Roadmap Portfolio of Measures



- Agriculture, Aquaculture and Fisheries
- Buildings
- Industry/Oil and Gas
- Forest Bioeconomy
- Negative Emissions Technologies
- Personal Travel
- Low Carbon Energy
- Commercial Transportation
- Electricity
- Circular Economy
- Communities

The Roadmap is an iterative document subject to change on the basis of emerging technologies and changing social, economic and business environments.



cleanBC
our nature. our power. our future.



Roadmap to 2030

CleanBC.gov.bc.ca