



Business Council of
British Columbia
Est. 1966

Economic Implications of the Provincial Government's CleanBC Roadmap to 2030

Ken Peacock, SVP and Chief Economist &
Denise Mullen, Director, Environment, Sustainability and
Indigenous Relations

October 19, 2023



Visit Our Website
www.bcbc.com





OUTLINE

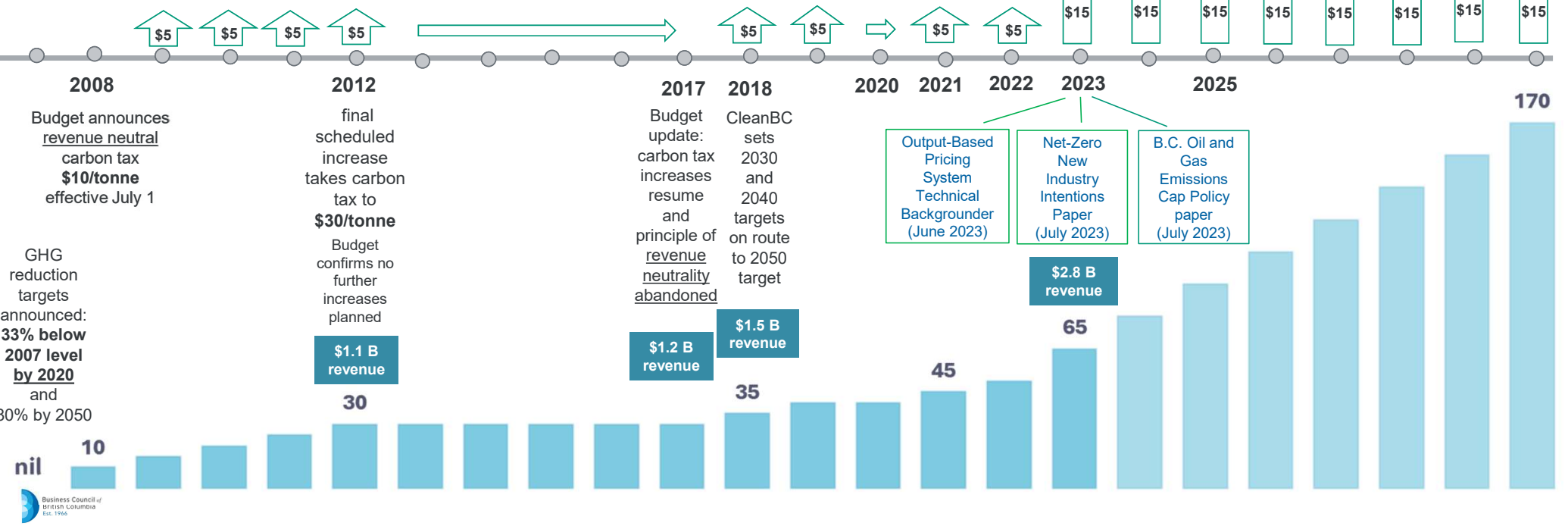
- Surprise
 - economic modelling of CleanBC policies
- Concern
 - implications of the results – prosperity, incomes, jobs, opportunity
- Wait a tick...
 - economic dimensions not widely known
- Summary thoughts
 - additional context and a path forward

B.C.'S CARBON TAX



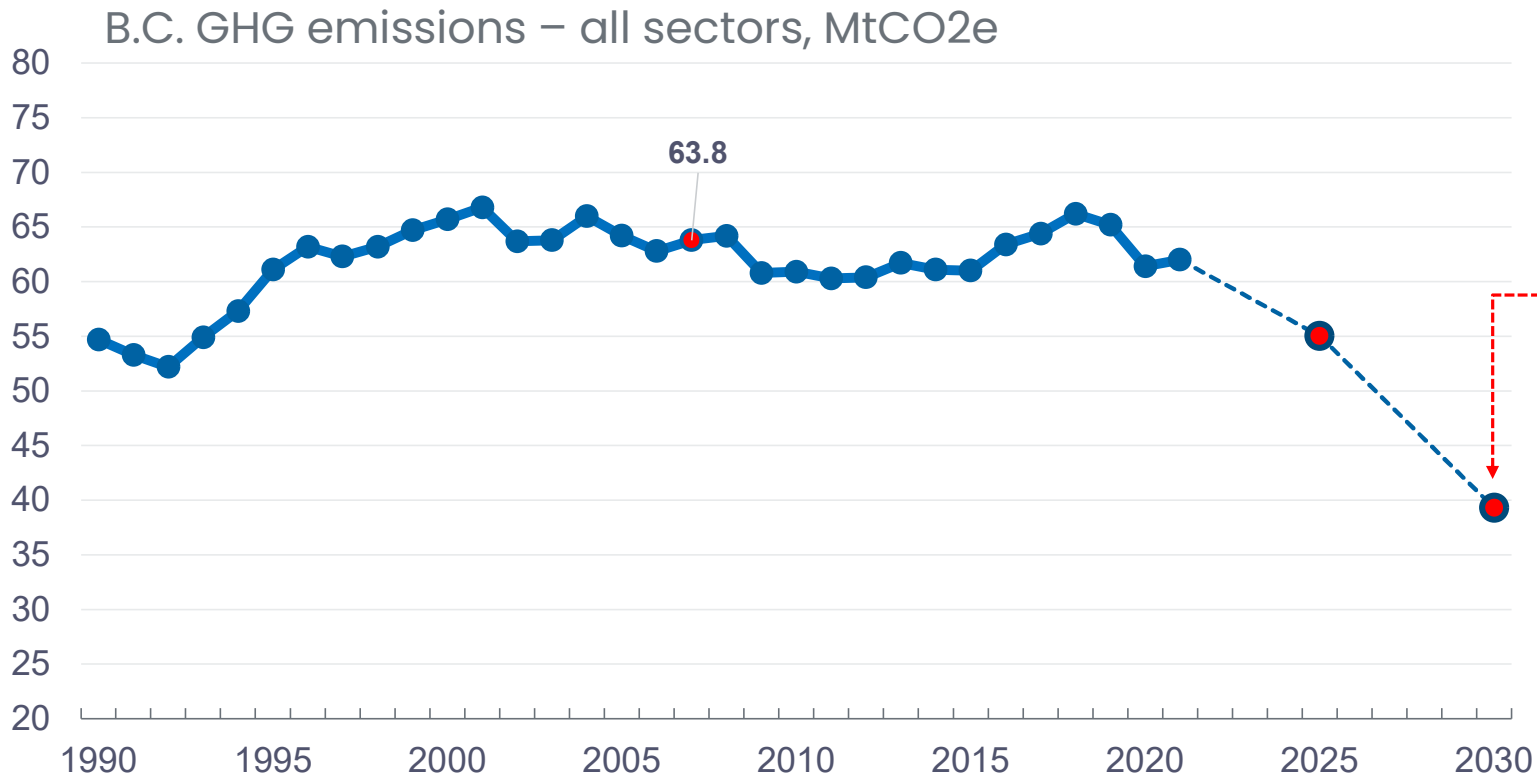
BACKGROUND: B.C.'S REVENUE-NEUTRAL CARBON TAX

On July 1, 2008, when announced by the Legislative Assembly of British Columbia as a fully revenue-neutral carbon tax, the carbon tax was the first in North America. It was designed to be revenue-neutral, meaning that the tax was expected to raise the same amount of revenue as it would cost to implement. The tax was expected to raise \$1 billion in revenue, which would be used to offset other taxes and to fund infrastructure and other programs. The tax was expected to raise \$1 billion in revenue, which would be used to offset other taxes and to fund infrastructure and other programs.



GHG reduction targets announced: 33% below 2007 level by 2020 and 80% by 2050

AMBITIOUS GHG REDUCTION TARGETS



B.C. has legislated targets for reducing greenhouse gas emissions **40% below 2007 levels by 2030, 60% by 2040, and 80% by 2050.**

The government also has an interim target to reduce emissions 16% by 2025.



SURPRISE (AND DISBELIEF)

ECONOMIC MODELLING RESULTS POSTED ON WEBSITE BUT NOT DISCUSSED IN ROADMAP DOCUMENT



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.

ECONOMIC MODELLING RESULTS REFERENCE SCENARIO AND CLEANBC SCENARIO

GDP: Reference Scenario				
Unit: billion 2015 \$	2015	2020	2025	2030
TOTAL¹	233.8	264.1	297.8	317.2
FOSSIL FUEL INDUSTRY	8.4	8.9	15.6	16.5
Coal Production	1.2	1.6	1.7	1.8
Upstream Oil and Gas	5.4	4.8	9.8	10.0

GHG_Policies GDP_Ref GDP_CBC Energy_Ref

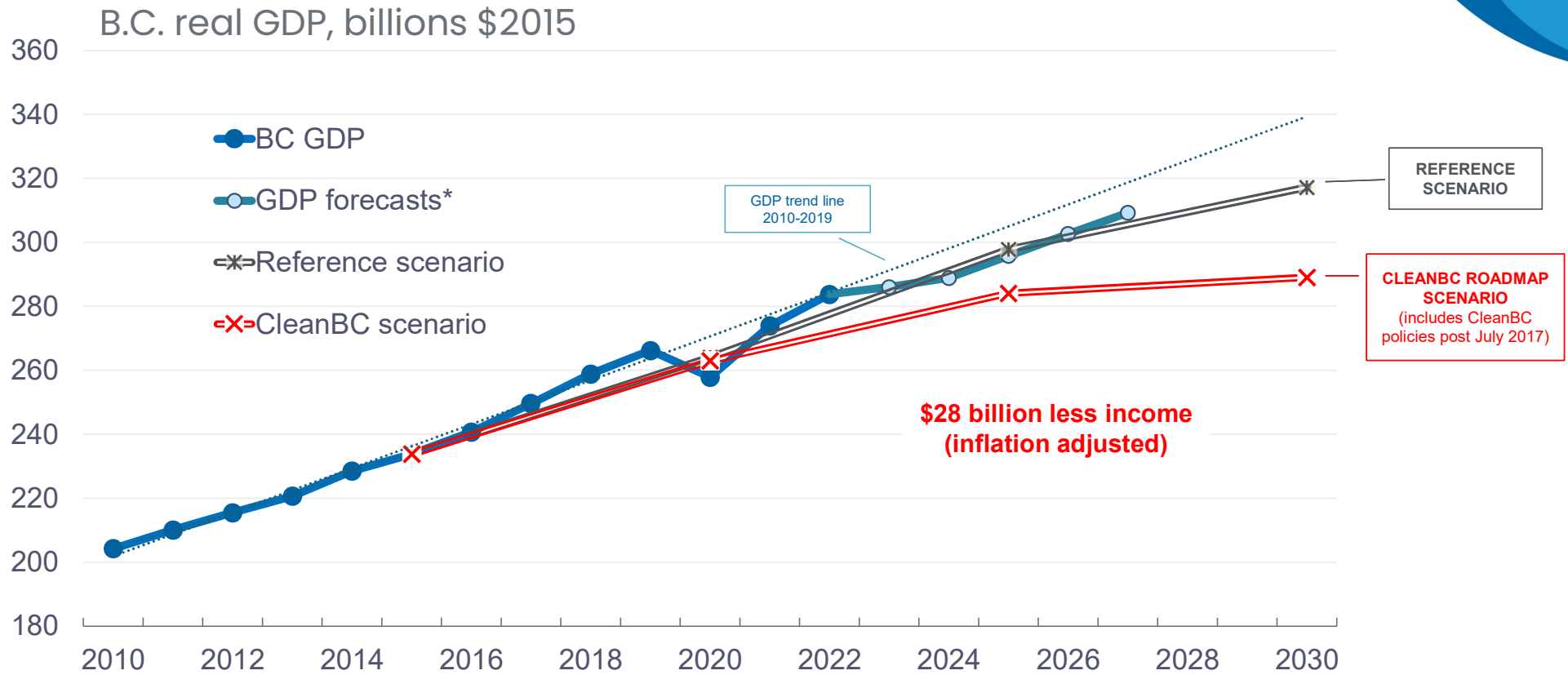
GDP: CleanBC Scenario				
Unit: billion 2015 \$	2015	2020	2025	2030
TOTAL^{1,2}	233.8	263.0	284.1	289.1
FOSSIL FUEL INDUSTRY	8.4	8.8	14.6	13.8
Coal Production	1.2	1.6	1.6	1.5
Upstream Oil and Gas	5.4	4.7	9.3	8.5

GDP_Ref GDP_CBC Energy_Ref Energy_CBC Elec_F

Difference	
2025	2030
-13.7	-28.1
-1.0	-2.9
-0.1	-0.3
-0.5	-1.4

GDP_Ref GDP_CBC

CLEANBC POLICIES EXPECTED TO SHRINK B.C.'S ECONOMY BY \$28 BILLION



GDP at factor prices rebased to \$2015 to align with Modelling CleanBC data; *2023-2024 forecasts are bank consensus projections and 2025-2027 based on expenditure-based GDP growth from BC Budget 2023 p.105. GDP history: Statistics Canada, Table: 36-10-0402-01.

ECONOMY-WIDE INCOME (GDP) REDUCTIONS

Difference: CleanBC less Reference scenario \$2015

Unit: billion 2015 \$	2030
TOTAL^{1,2}	-28.1
FOSSIL FUEL INDUSTRY	-2.9
Coal Production	-0.3
Upstream Oil and Gas	-1.4
Natural Gas Production and Processing	-1.5
Conventional Oil Production	0.0
Oil, Natural Gas, and CO ₂ Transmission	0.1
Downstream Oil and Gas	-1.1
Petroleum Refining	-0.3
Natural Gas Distribution	-0.3
Liquefied Natural Gas	-0.5
Oil and Gas Services	-0.1
ELECTRICITY	0.8
Electricity Generation	0.7
Electricity Distribution	0.1
TRANSPORT	-3.5
Transit	-0.2
Air	-0.3
Truck	-1.0
Rail	-1.0
Other Transport	-1.0

Difference: CleanBC less Reference scenario \$2015

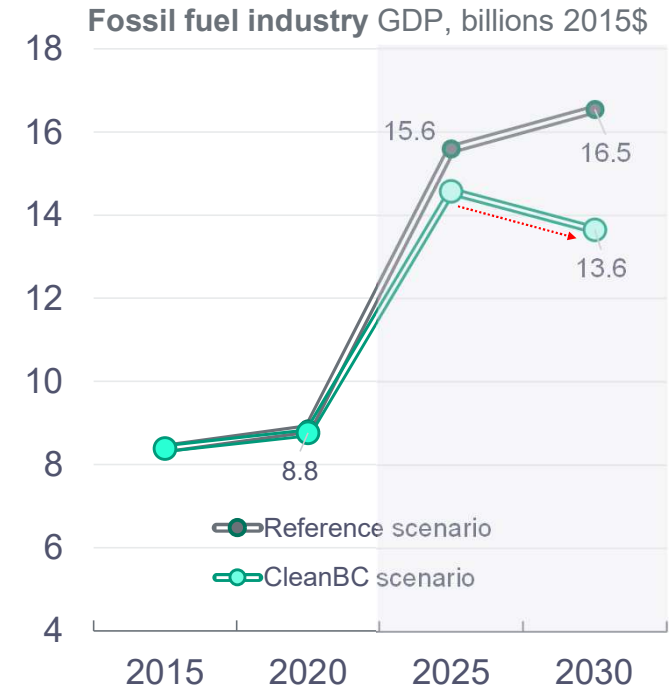
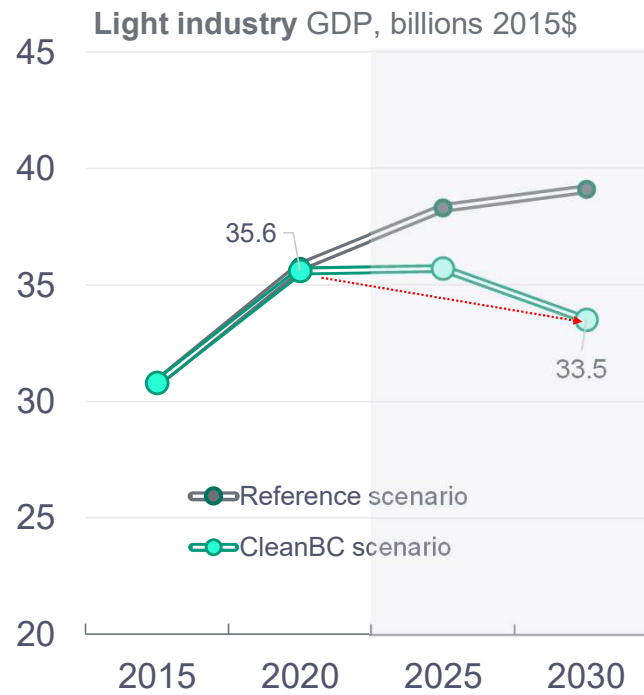
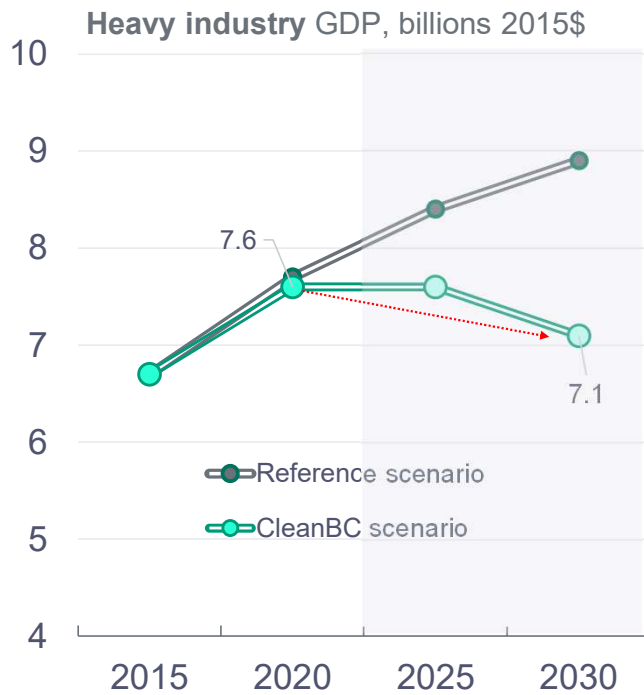
Unit: billion 2015 \$	2030
HEAVY INDUSTRY	-1.7
Mining	-0.3
Metals	-0.1
Pulp and Paper	-1.0
Non-Metallic Minerals	-0.1
Chemicals and Fertilizers	-0.2
BUILDINGS	-15.1
Service Industry	-15.1
Residential	-
AGRICULTURE	-0.2
Agriculture	-0.2
WASTE	-
Waste	-
LIGHT INDUSTRY	-5.6
Light Manufacturing	-3.2
Construction	-1.9
Forest Resources	-0.5

<https://www2.gov.bc.ca/gov/content/environment/climate-change/data/provincial-forecast>

1. Values are outputs of Navius' gTech model and may differ from historic values published elsewhere.
2. The GDP projection under CleanBC is significantly affected by policies still being designed and may be different in future modelling

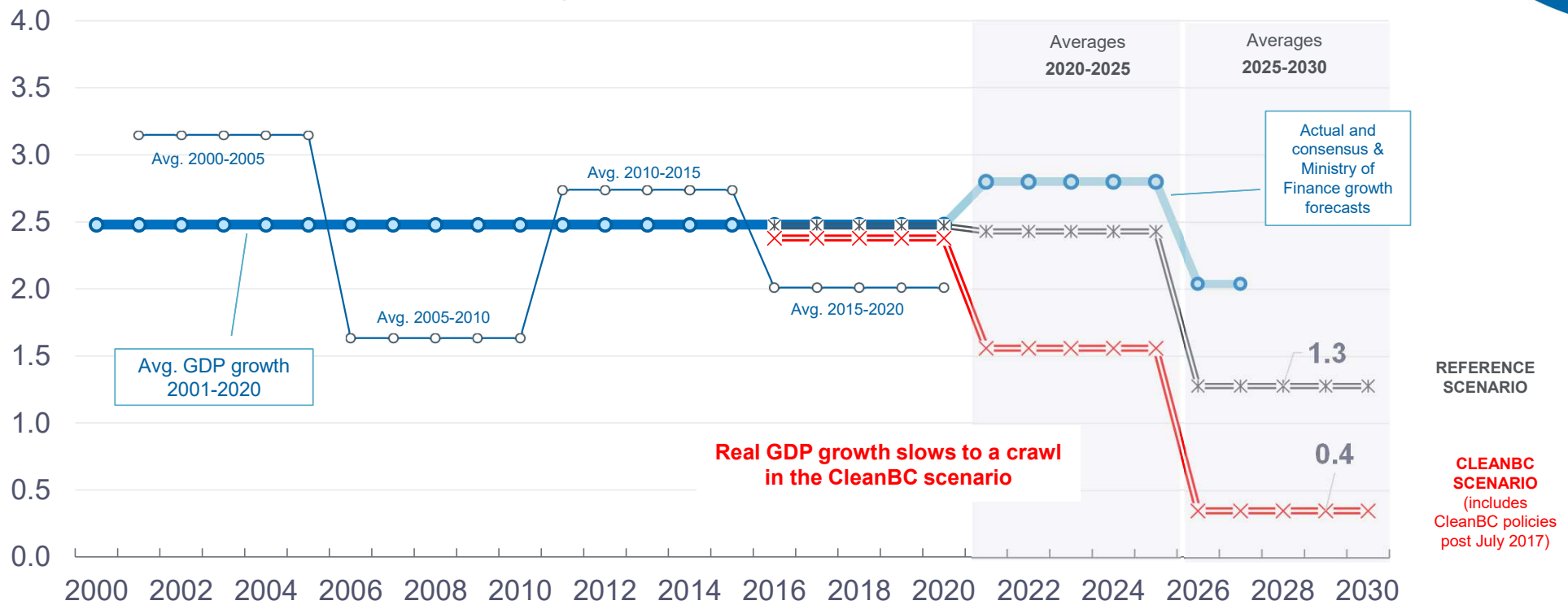
CLEANBC POLICIES REDUCE INCOME (GDP) BELOW 2020 LEVELS IN B.C.'S FOUNDATIONAL SECTORS

GDP Reference scenarios and CleanBC scenarios



B.C.'S AVERAGE ANNUAL ECONOMIC GROWTH SLOWS TO JUST 0.4% IN THE SECOND HALF OF THE DECADE

B.C. avg. annual real GDP growth over periods shown, %



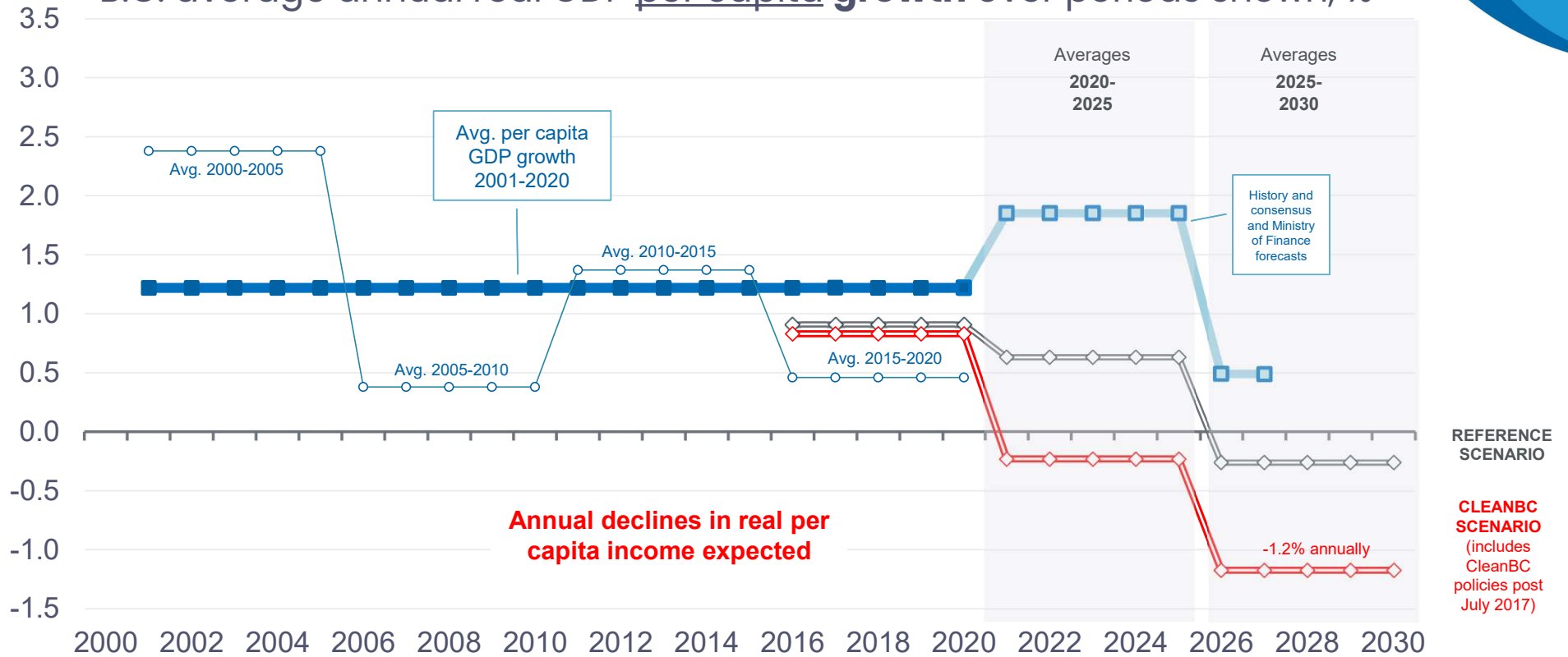
2020-2025 average based on actual 2021 and 2022 growth, 2023 and 2024 are bank consensus forecasts; 2025-2027 Ministry of Finance forecasts, BC Budget 2023 p.105. GDP at factor prices. Statistics Canada, Table: 36-10-0402-01.



CONCERN (INCOMES, JOBS, PROSPERITY...?)

SECOND HALF OF DECADE WILL SEE REAL PER CAPITA INCOMES DECLINE BY MORE THAN 1% ANNUALLY

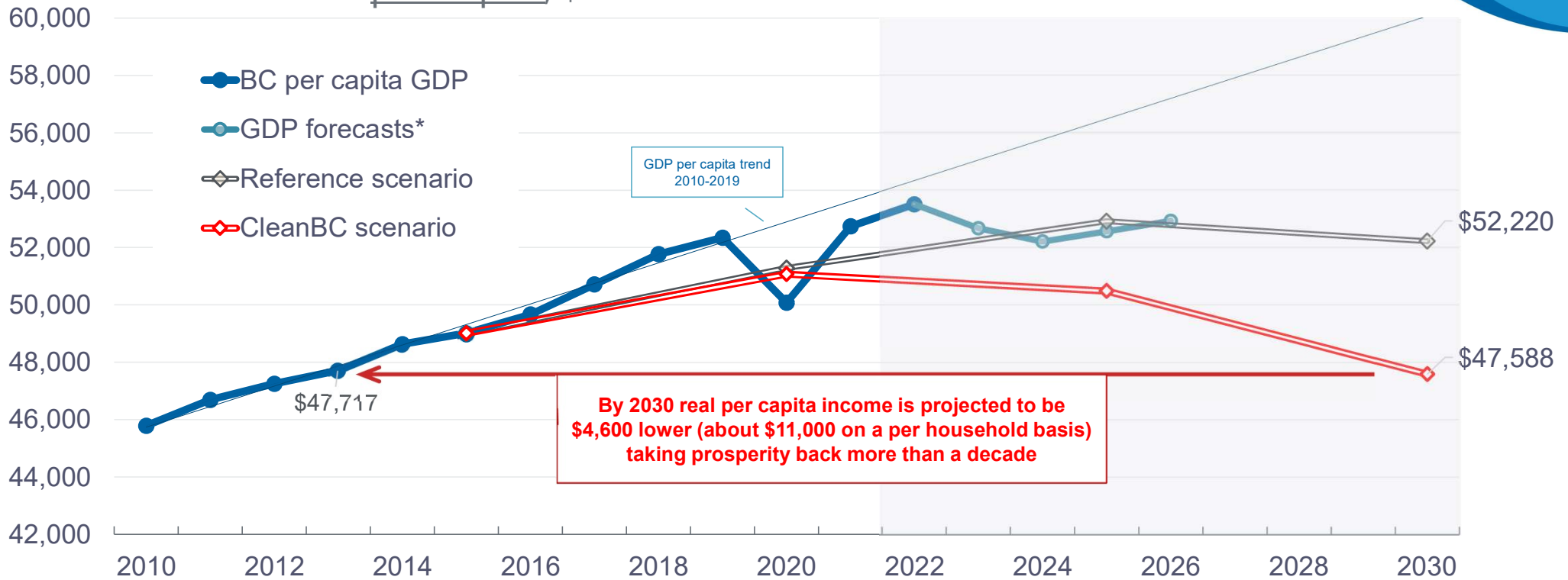
B.C. average annual real GDP per capita **growth** over periods shown, %



GDP at factor prices. 2020 average based on actual 2021 and 2022 growth, 2023 BCBC forecast, and 2024 and 2025 Ministry forecasts. 2025-2027 Ministry forecasts, BC Budget 2023 p.105. Population growth forecasts 2023-2027 from BC Budget 2023, 2028-2030 assumed to be 1.5%. Statistics Canada, Table: 36-10-0402-01.

CLEANBC POLICIES TAKE PROSPERITY BACK TO LEVELS CIRCA 2013

B.C. real GDP per capita, \$2015



GDP at factor prices rebased to \$2015 to align with Modelling CleanBC data; 2023-2024 *forecasts are bank consensus and 2025-2027 based on expenditure-based GDP growth from BC Budget 2023 p.105. Population growth forecasts 2023-2027 from BC Budget 2023, 2028-2030 assumed to be 1.5%. Statistics Canada, Table: 36-10-0402-01.

WHAT HAPPENS TO JOB GROWTH WHEN GDP GROWTH SLOWS TO JUST 0.4% PER ANNUM?

B.C. avg. annual real GDP and employment **growth** over periods shown, %



2020-2025 average based on actual 2021 and 2022 growth, 2023 BCBC forecast, and 2024 and 2025 Ministry of Finance forecasts; 2025-2027 Ministry of Finance forecasts, BC Budget 2023 p.105. GDP at factor prices. Statistics Canada, Table: 36-10-0402-01.

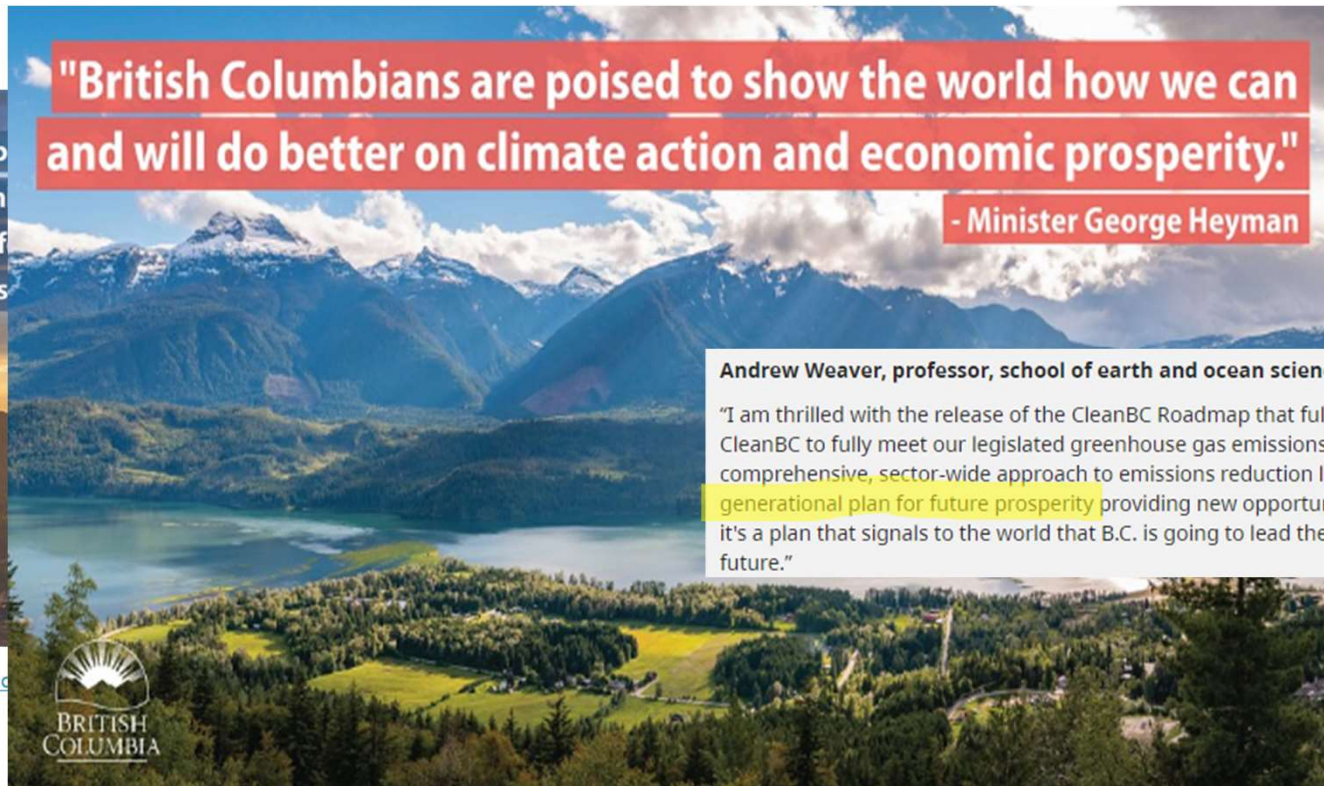


WAIT A TICK...

PUBLIC COMMUNICATIONS FRAME THE CLEANBC ROADMAP AS GOOD FOR INVESTMENT AND ECONOMIC PROSPERITY



<https://news.gov.bc.ca>



Andrew Weaver, professor, school of earth and ocean sciences, University of Victoria -
"I am thrilled with the release of the CleanBC Roadmap that fulfils our original commitment in CleanBC to fully meet our legislated greenhouse gas emissions target for 2030. The roadmap's comprehensive, sector-wide approach to emissions reduction leaves no stone unturned. It is a generational plan for future prosperity providing new opportunities for people and businesses. And it's a plan that signals to the world that B.C. is going to lead the way in the transition to a low-carbon future."

<https://news.gov.bc.ca/factsheets/clearing-the-path-to-a-new-climate-strategy>

GOVERNMENT'S PUBLIC FACING ROADMAP DOCUMENT CONTAINS ONLY A CURSORY DISCUSSION OF ECONOMIC IMPACTS



1 of 66 pages discusses jobs and GDP impacts

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.

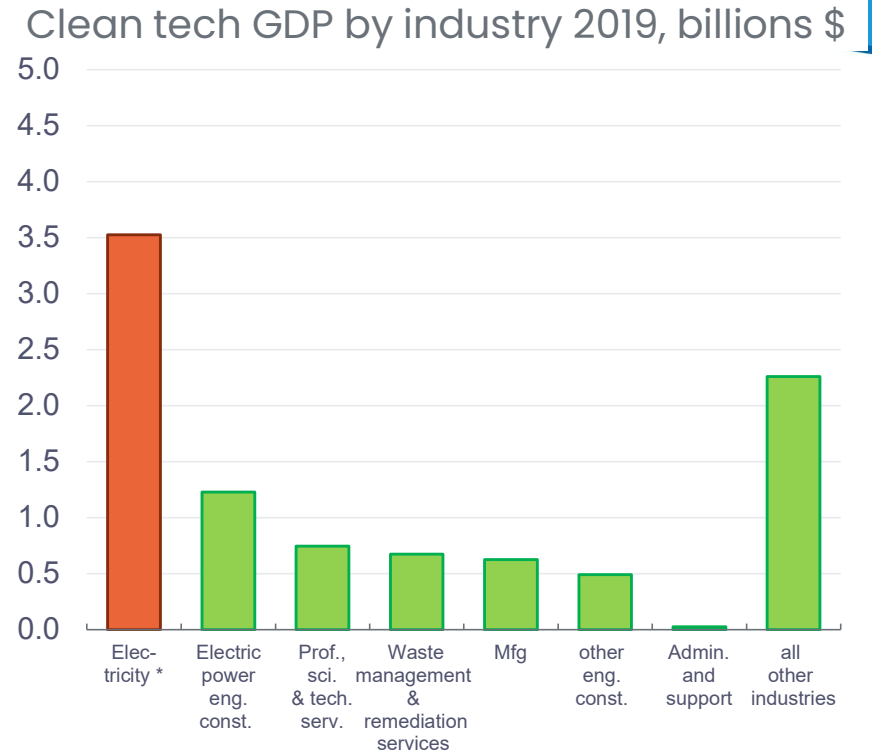
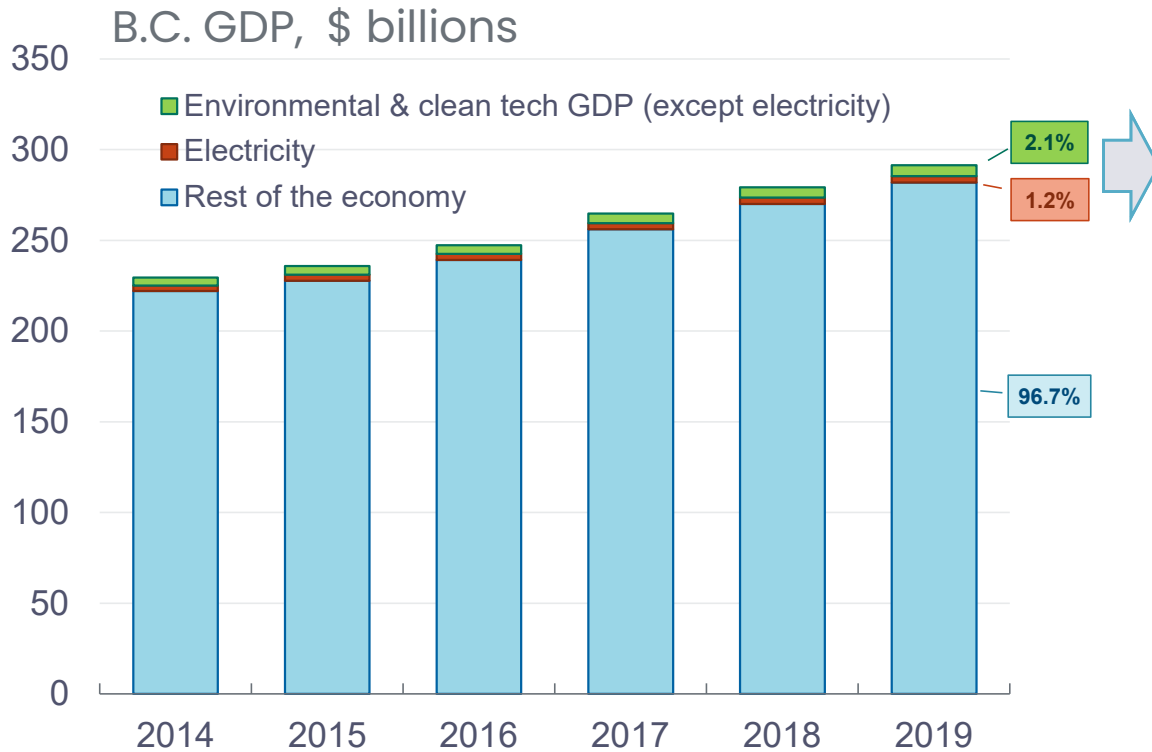
Based on provincial data, we **expect investment in Roadmap initiatives to generate approximately 18,000 direct and spinoff jobs** with:

- 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

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.

(emphasis added)

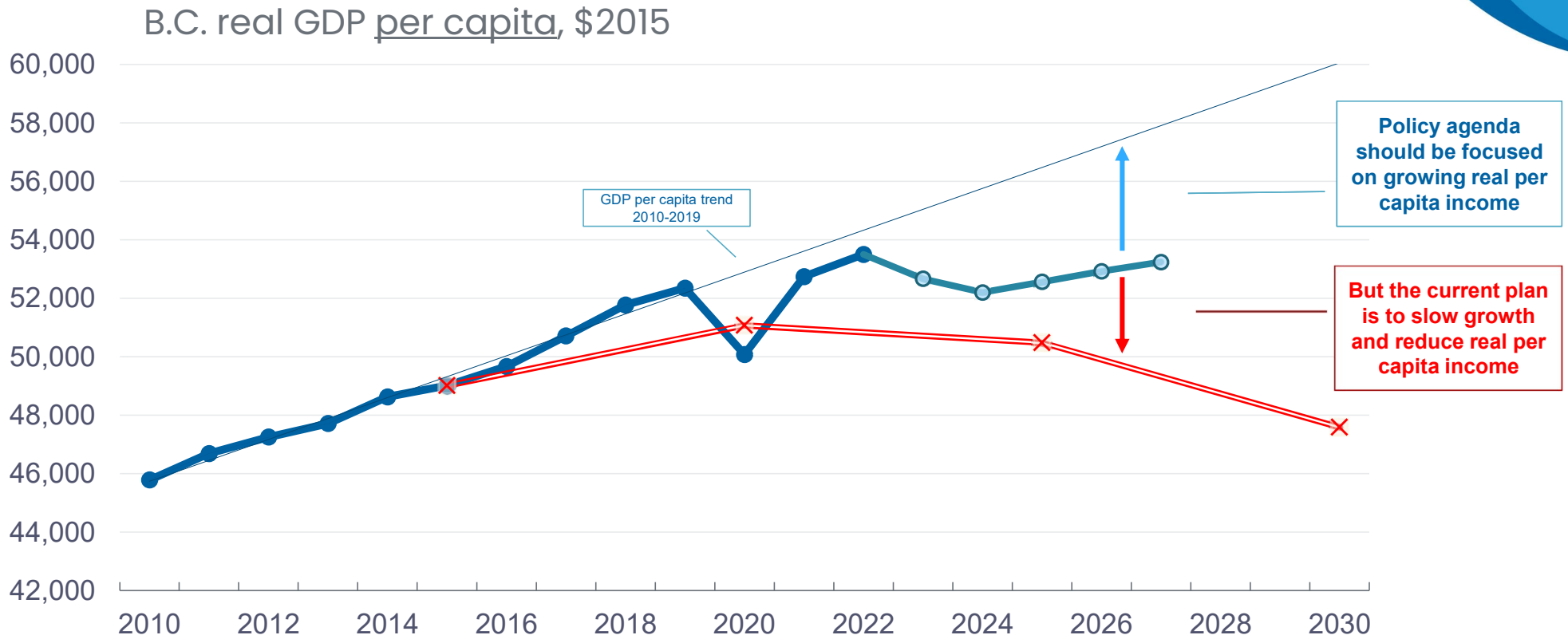
ENVIRONMENTAL AND CLEAN TECHNOLOGY SECTOR ACCOUNTS FOR 3.3% OF THE ECONOMY






FURTHER REFLECTIONS

KEY TAKE AWAY



 GDP at factor prices rebased to \$2015 to align with Modelling CleanBC data; *2023-2024 forecasts are bank consensus projections and 2025-2027 based on expenditure-based GDP growth from BC Budget 2023 p.105. Population growth forecasts 2023-2027 from BC Budget 2023, 2028-2030 assumed to be 1.5%. Statistics Canada, Table: 36-10-0402-01.



AS THE POLICY IMPLEMENTATION BEGINS THE IMPACT ON INDUSTRY IS BEING IDENTIFIED



In addition to the proposed OBPS, there are two other policy proposals that seek to accelerate decarbonization for heavy industry in the Province of British Columbia, including the Net-Zero New Industry (feedback due August 15) and the B.C. Oil and Gas Emissions Cap Policy Paper (feedback due later this fall). We would classify these policy items as being adjacent and redundant to the proposed OBPS, which could have compounding impacts on industry as they face similar challenges in achieving either. We summarize these proposals at a high level below. While on its own the OBPS is not materially different from the estimated obligations under CIIP, when applied in combination with these other policies, the financial implications, complexities, and regulatory burden could make further development in the Province of British Columbia potentially uneconomic for much of industry. This is especially the case for operators who can simply shift capital and operations to other jurisdictions, such as Alberta or the U.S. In a sense, we believe these policies could act as an indirect production cap for industry in BC.

BMO Capital Markets, *Carbon Innovation* September 5, 2023.




THE LOST OUTPUT (INCOME) FROM B.C. ADOPTING THE CLEANBC POLICY AGENDA WILL BE PRODUCED IN OTHER JURISDICTIONS

Putting a price on carbon can be an effective way to encourage investments in key transition technologies to accelerate decarbonization. However, when applied unevenly across jurisdictions, imbalances are created, causing a phenomenon known as carbon leakage. This is where high emissions intensive activities shift to more lenient jurisdictions. If this were to occur en masse, the jurisdictional source of emissions would change but no net global reduction would be realized, and in certain instances, where production shifts to jurisdictions that do not prioritize any part of ESG, there may even be an increase in emissions. Carbon leakage can be more pronounced in circumstances where solutions are unobtainable, due to financial or logistical reasons, and the costs of the associated program cannot be passed along to consumers, which is the case in global commodity markets. That said, each individual jurisdiction will have its own emissions aspirations and will implement policies to help achieve those goals while attempting to balance competitiveness issues. As such, we believe that carbon pricing will continue to increase, both in terms of price and coverage, and we view it as a minor but growing liability for much of heavy industry.

BMO Capital Markets, *Carbon Innovation* September 5, 2023.



A PATH FORWARD

- Retain net zero 2050 targets and recalibrate Roadmap 2030 targets and policy timelines in consultation with the public, business, First Nations and local governments
 - Adopt “the world needs more B.C.” mindset
- 

REALITY OF A SHORT TIMELINE PROMPTED RECALIBRATION IN THE UK



ALJAZEERA

News ▾ Ukraine war Features Economy Opinion Video

News | Climate

Sunak announces U-turn on several UK net zero policies

UK Prime Minister Rishi Sunak pushes back the ban on the sale of new petrol and diesel cars in the UK from 2030 to 2035.



20 Sep 2023

The UK will water down policies aimed at achieving net zero carbon emissions by 2050 and instead pursue a “pragmatic” approach to hitting the target, Prime Minister Rishi Sunak has said.

The United Kingdom's Rishi Sunak announced an easing of energy efficiency targets for rental properties and backtracked on plans to make homeowners replace gas boilers with heat pumps [File: Kin Cheung/AP Photo]



Jack Mintz: U.K. shifting to 'pragmatic' environment policies – Canada should, too

Rishi Sunak pulling back on Boris Johnson's aggressive phaseouts of natural gas boilers and gas-powered cars

Jack M. Mintz

Published Aug 11, 2023 • 4 minute read

10 Comments

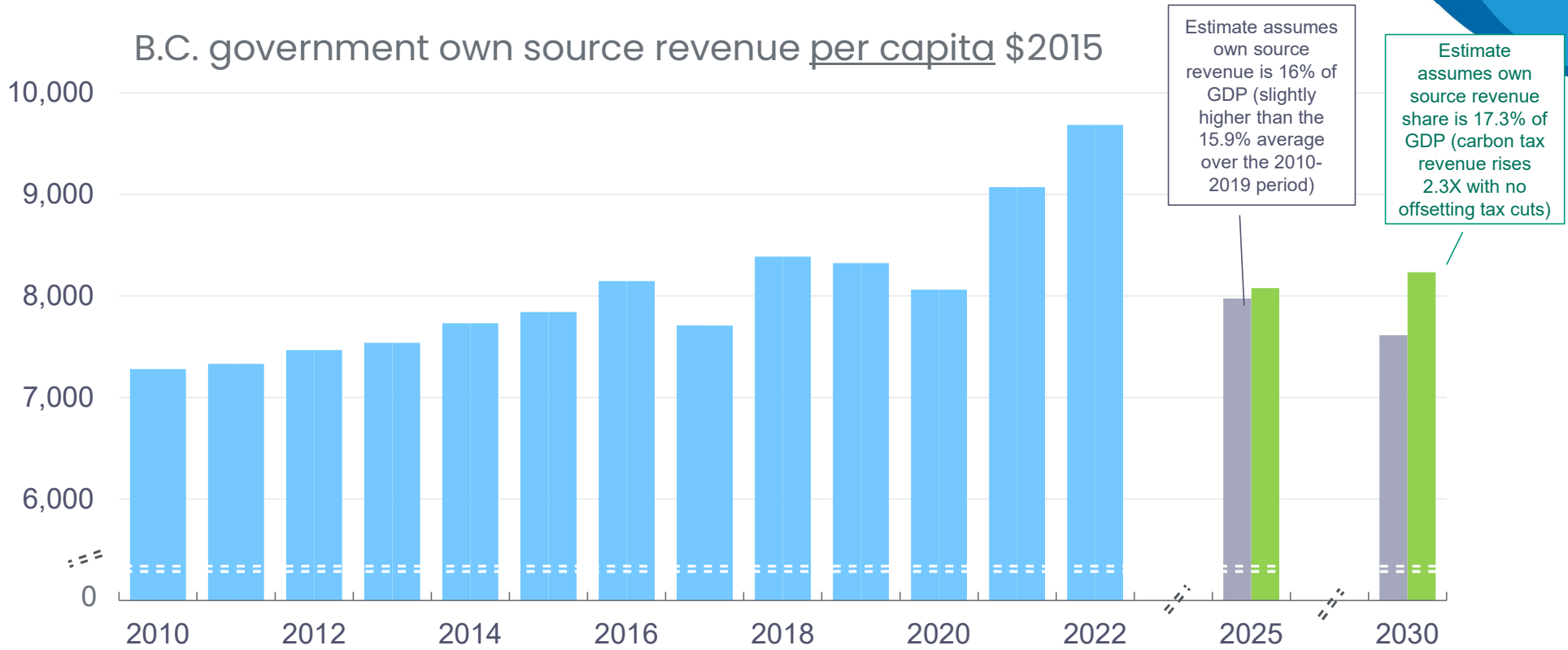


A sign indicating the ultra-low emission zone is pictured near Hanger Lane in west London on July 22, 2023. PHOTO BY JUSTIN TALLIS/AFP VIA GETTY IMAGES



APPENDIX

LESS INCOME (GDP) MEANS LESS GOVERNMENT REVENUE



B.C. own government revenue is estimated using shares of own government revenue as shown Table A9 of BC Budgets. The projected per capita values are based on the shares of own source revenue shown in the right panel and the 2025 and 2030 GDP CleanBC scenario.

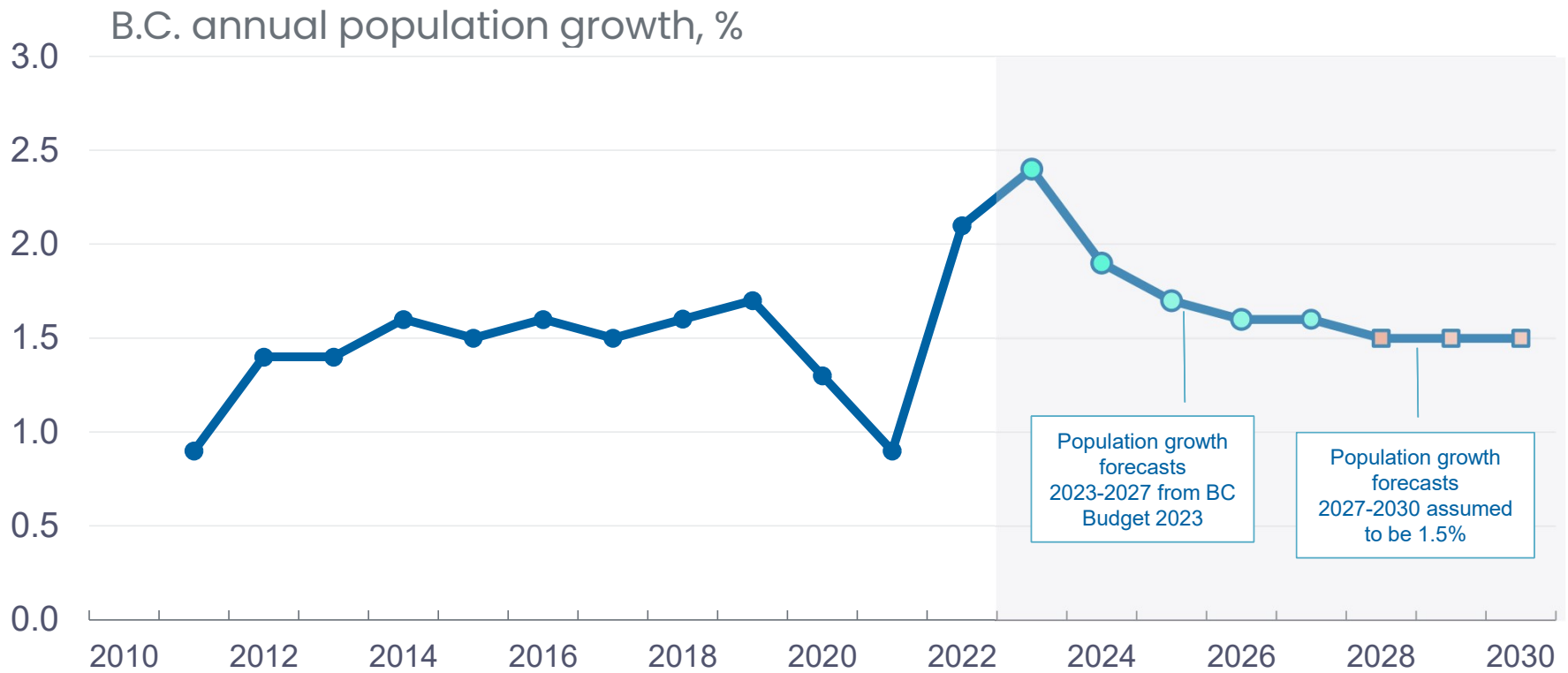
ECONOMY-WIDE INCOME (GPD) LOSSES

Unit: billion 2015 \$	GDP: Reference Scenario					growth %	GDP: CleanBC Scenario					growth %	Difference: CleanBC less Reference scenario \$2015			% difference: CleanBC vs Reference scenario		
	2015	2020	2025	2030	2020-30		2015	2020	2025	2030	2020-30		2020	2025	2030	2020	2025	2030
TOTAL^{1,2}	233.8	264.1	297.8	317.2	20.1		233.8	263.0	284.1	289.1	9.9		-1.1	-13.7	-28.1	-0.4	-4.6	-8.9
FOSSIL FUEL INDUSTRY	8.4	8.9	15.6	16.5	86.7		8.4	8.8	14.6	13.6	55.7		-0.1	-1.0	-2.9	-1.0	-6.5	-17.5
Coal Production	1.2	1.6	1.7	1.8	9.5		1.2	1.6	1.6	1.5	-7.0		0.0	-0.1	-0.3	-0.4	-6.1	-15.4
Upstream Oil and Gas	5.4	4.8	9.8	10.0	107.5		5.4	4.7	9.3	8.5	80.7		-0.1	-0.5	-1.4	-1.7	-5.1	-14.4
Natural Gas Production and Processing	4.0	3.3	8.2	8.3	152.5		4.0	3.2	7.6	6.8	113.4		-0.1	-0.5	-1.5	-3.4	-6.4	-18.3
Conventional Oil Production	0.3	0.2	0.3	0.2	-12.4		0.3	0.2	0.2	0.2	-10.6		0.0	0.0	0.0	-0.7	-2.8	1.4
Oil, Natural Gas, and CO ₂ Transmission	1.1	1.3	1.4	1.5	12.0		1.1	1.4	1.4	1.6	16.0		0.0	0.0	0.1	2.2	2.0	5.8
Downstream Oil and Gas	1.4	2.0	3.6	4.4	119.1		1.4	2.0	3.2	3.3	63.9		0.0	-0.4	-1.1	0.0	-10.2	-25.2
Petroleum Refining	0.7	1.0	0.6	0.7	-27.1		0.7	1.0	0.4	0.4	-61.2		0.0	-0.1	-0.3	0.3	-24.7	-46.5
Natural Gas Distribution	0.8	1.0	1.0	1.0	2.2		0.8	1.0	0.9	0.7	-26.8		0.0	-0.1	-0.3	-0.3	-10.8	-28.6
Liquefied Natural Gas	-	-	2.0	2.6	-		-	-	1.9	2.2	-		-	-0.1	-0.5	-	-5.6	-17.9
Oil and Gas Services	0.4	0.4	0.5	0.4	-1.8		0.4	0.4	0.5	0.3	-20.1		0.0	-0.1	-0.1	-0.8	-10.3	-19.3
ELECTRICITY	3.9	4.6	5.4	5.7	25.0		3.9	4.7	5.6	6.5	38.4		0.1	0.2	0.8	2.6	3.5	13.7
Electricity Generation	3.3	4.0	4.8	5.1	27.2		3.3	4.1	4.9	5.8	40.9		0.1	0.2	0.7	2.8	3.2	13.9
Electricity Distribution	0.6	0.6	0.7	0.7	10.8		0.6	0.6	0.7	0.8	22.6		0.0	0.0	0.1	1.4	5.5	12.3
TRANSPORT	16.6	19.2	21.2	22.1	14.8		16.6	19.0	19.4	18.6	-2.4		-0.2	-1.8	-3.5	-0.9	-8.4	-15.8
Transit	0.3	0.3	0.4	0.4	31.8		0.3	0.3	0.3	0.2	-44.1		0.0	-0.1	-0.2	1.0	-16.5	-57.2
Air	2.2	2.4	2.8	3.1	25.2		2.2	2.4	2.7	2.7	13.0		0.0	-0.1	-0.3	-0.7	-4.7	-10.4
Truck	7.1	8.4	9.3	9.6	14.0		7.1	8.4	8.9	8.6	2.8		0.0	-0.5	-1.0	-0.5	-5.2	-10.2
Rail	1.7	1.9	2.2	2.7	39.3		1.7	1.9	1.7	1.7	-9.0		-0.1	-0.5	-1.0	-3.4	-22.7	-36.9
Other Transport	5.4	6.1	6.4	6.3	3.4		5.4	6.1	5.8	5.4	-11.7		-0.1	-0.6	-1.0	-0.9	-9.3	-15.3
HEAVY INDUSTRY	6.7	7.7	8.4	8.9	15.1		6.7	7.6	7.6	7.1	-6.5		-0.1	-0.7	-1.7	-0.8	-8.6	-19.4
Mining	2.4	2.8	3.3	3.5	22.4		2.4	2.8	3.2	3.2	11.7		0.0	-0.1	-0.3	-0.7	-4.4	-9.3
Metals	0.4	0.7	0.6	0.7	-1.3		0.4	0.7	0.6	0.6	-8.5		0.0	0.0	-0.1	-1.2	-3.9	-8.4
Pulp and Paper	2.5	2.5	2.5	2.7	7.7		2.5	2.5	2.1	1.7	-32.6		0.0	-0.4	-1.0	-0.5	-15.9	-37.8
Non-Metallic Minerals	0.7	0.9	1.1	1.0	10.8		0.7	0.9	1.0	0.9	1.4		0.0	-0.1	-0.1	-1.4	-5.2	-9.8
Chemicals and Fertilizers	0.7	0.7	0.8	1.0	32.8		0.7	0.7	0.7	0.7	5.1		0.0	-0.1	-0.2	-1.3	-11.0	-21.9
BUILDINGS	165.6	186.1	206.8	222.4	19.5		165.6	185.5	199.1	207.4	11.8		-0.6	-7.7	-15.1	-0.3	-3.7	-6.8
Service Industry	165.6	186.1	206.8	222.4	19.5		165.6	185.5	199.1	207.4	11.8		-0.6	-7.7	-15.1	-0.3	-3.7	-6.8
Residential	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-	-
AGRICULTURE	1.8	1.8	2.1	2.5	41.3		1.8	1.7	2.0	2.3	32.8		0.0	-0.1	-0.2	-0.7	-5.6	-6.7
Agriculture	1.8	1.8	2.1	2.5	41.3		1.8	1.7	2.0	2.3	32.8		0.0	-0.1	-0.2	-0.7	-5.6	-6.7
WASTE	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-	-
Waste	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-	-
LIGHT INDUSTRY	30.8	35.8	38.3	39.1	9.1		30.8	35.6	35.7	33.5	-5.9		-0.2	-2.6	-5.6	-0.7	-6.7	-14.3
Light Manufacturing	10.8	12.9	14.9	16.7	29.5		10.8	12.8	13.5	13.5	5.8		-0.1	-1.4	-3.2	-1.0	-9.6	-19.2
Construction	16.7	20.8	21.1	20.0	-3.7		16.7	20.7	20.3	18.1	-12.5		-0.1	-0.8	-1.9	-0.4	-4.0	-9.6
Forest Resources	3.4	2.1	2.3	2.4	10.9		3.4	2.1	2.0	1.9	-11.0		0.0	-0.3	-0.5	-0.7	-13.3	-20.3

B.C. Ministry of Environment.

1. Values are outputs of Navius' gTech model and may differ from historic values published elsewhere.
2. The GDP projection under CleanBC is significantly affected by policies still being designed and may be different in future modelling

MODERATE POPULATION GROWTH ASSUMPTIONS USED TO ESTIMATE PER CAPITA VALUES



MACROECONOMIC MODELS ARE USEFUL FOR ESTIMATING POLICY IMPACTS



“To forecast the impacts of our climate actions, B.C. follows well-established best practices, using the best available data and sophisticated computer modeling.” p.21

Modelling CleanBC: 2022 Methodology Report

Understanding the macroeconomic impacts of policy

As a full macroeconomic model (specifically, a CGE model), gTech provides insight about how policies affect the economy at large. The key macroeconomic dynamics captured by gTech are summarised in Table 6.

p.11

The uncertainties in modelling mean that all models will err in their forecasts of the future. However, some models are more correct than others. The analysis of CleanBC employs highly sophisticated models that provide powerful insights into the effects of the plan. Further, at a future date, the uncertainties inherent in the forecast could be examined in much greater detail.

p.20

Emission reductions and other policy impacts are calculated relative to a reference scenario representing business-as-usual with only policies announced as of July 2017. Policies are grouped and simulated as packages to quantify total reductions, accounting for potential interaction or overlapping of individual policies.

Table 6: Macroeconomic dynamics captured by gTech

Dynamic	Description
Comprehensive coverage of economic activity	gTech accounts for all economic activity in BC as measured by Statistics Canada national accounts ³⁰ . Specifically, it captures all sector activity, all GDP, all trade of goods and services and a large number of transactions that occur between households, firms, government, and people/firms outside of BC. As such, the model provides a forecast of how government policy affects many different economic indicators, including GDP, investment, household income, etc.
Full equilibrium dynamics	gTech ensures that all markets in the model return to equilibrium (i.e. that the supply for a good or service is equal to its demand). This means that a decision made in one sector is likely to have ripple effects throughout the entire economy. For example, greater demand for electricity in BC requires greater electricity production in BC. In turn, greater production necessitates greater investment and demand for goods and services from the electricity sector, increasing demand for labour in construction services and finally leading to higher wages.
Sector detail	gTech provides a detailed accounting of sectors in BC. In total, gTech simulates how policies affect over 80 sectors of the economy. Each of these sectors produces a unique good or service (e.g. the natural gas sector produces natural gas, while the services sector produces services) and requires specific inputs into production. Of these inputs, some are not directly related to energy consumption or GHG emissions (e.g. the demand by the natural gas sector for services or labour requirements) but other inputs are classified as “energy end-uses”. Covered energy end-uses (along with sectors and fuels) are listed in Appendix A: “Covered sectors, fuels, end-uses”.

p.11

CLEANBC POLICIES IN THE MODEL

Table 2: Summary of CleanBC policies and their representation in the model

Policy	Description
Multi-sector	
Strengthened carbon tax	The analysis assumes a continued increase of the carbon tax until it reaches \$50/tCO ₂ e in 2022 and \$170/tCO ₂ e in 2030. The modelling follows the adjusted COVID-19 carbon price schedule, in which the rate remained constant at \$40/tCO ₂ e in 2020, rather than increasing to \$45/tCO ₂ e. Revenue collected from the tax increase is recycled towards general revenue, as well as to fund transfers to households and to achieve additional industrial emissions reductions under the CleanBC Program for Industry, described below.
Strengthened clean electricity mandate	The analysis assumes that by 2030, 100% of electricity produced in BC is required to be clean.
Household fuel PST exemption	From 2019, the modelling assumes that all residential fuels and electricity consumed by commercial and industrial users are exempt from the PST.
BC Hydro's electrification plan	BC Hydro's 2021 electrification plan proposes new programs and incentives to advance the switch from fossil fuels to clean electricity in buildings, vehicles, businesses, and industry. The modelling includes nearly \$160 million to promote electrification in these sectors. Although the BC Hydro plan outlines additional resources for public education and plan implementation, no further funding is modelled because 1) impacts from funding public education are very uncertain, and 2) the BC Hydro plan does not give sufficient details to model the funding of plan implementation.
Natural gas utility GHG reduction standard	From 2030, allowed annual emissions from the combustion of natural gas and propane by utility building and industry customers (excluding transportation, LNG and upstream oil and gas) is capped at 6.0 MtCO ₂ e.
Federal climate funding	The modelling includes funding for various federal climate initiatives announced in plans such as "A Healthy Environment and a Healthy Economy" and the "2030 Emissions Reduction Plan".

Industry	Description
CleanBC Industrial Incentive Program (CIIP)	The analysis assumes that an additional incentive is provided for industrial large final emitters to reduce GHG emissions by returning an increasing portion of carbon tax revenue above \$30/tCO ₂ e to facilities that reduce their emissions relative to a world-leading emissions intensity benchmark.
CleanBC Industry Fund (CIF)	The CIF provides funding to support the adoption of low-carbon technologies by businesses covered by the CIIP. The modelling assumes a portion of carbon tax paid above \$30/tCO ₂ e by industrial large final emitters is invested in low-carbon technologies.
Industrial electrification	The analysis assumes increased electricity consumption in the upstream natural gas sector. The modelling implicitly includes the connection to the DCAT and PRES transmission lines.
Oil and gas sector methane regulations	The analysis assumes that all oil and gas facilities adopt technologies in keeping with regulated best practices for reducing methane venting and leaks by 45% in 2025 and 75% in 2030.
Oil and gas sectoral target	The modeling requires that the oil and gas sector reduces its emissions by 33% from 2007 by 2030.

CLEANBC POLICIES IN THE MODEL

Transport	
Light-duty ZEV sales mandate	The modelling assumes that a fraction of new light-duty vehicles sold in BC are low to zero-emissions, requiring 26% zero-emissions vehicle sales by 2026, and 90% by 2030.
Heavy-duty ZEV sales mandate	The analysis requires that by 2030 44% of on-road heavy-duty and 23% of medium-duty vehicles sold in BC are zero-emissions. The modelling assumes 60% of these vehicles are battery electric and 40% are hydrogen fuel cell.
Heavy-duty ZEV stock mandate	The modeling requires that from 2030 onwards, 19% of on-road heavy-duty vehicles in use are zero-emissions. The modelling assumes 60% of these vehicles are battery electric and 40% are hydrogen fuel-cell.
Zero-emissions bus mandate	The analysis requires 100% of new buses sold be zero-emissions by 2029, with 41% of buses in use zero-emissions by 2030. The modelling assumes 60% of these ZEVs are battery electric and 40% are hydrogen fuel cell.
Strengthened ZEV incentives	The analysis assumes provincial incentives for the purchase of low- to zero- emissions vehicles of \$52 million in 2019, \$25 million in 2020, and \$93 million per year beginning in 2021. Additionally, the modelling includes the Federal iZEV incentive program targeting low- to zero-emissions vehicles.
Strengthened Low-Carbon Fuel Standard (LCFS)	The analysis assumes that on average fuel suppliers reduce the life-cycle emissions intensity of transport fuel pools by 18.3% in 2025, and 30% in 2030 from 2010 levels. Aviation and marine fuels receive an additional separate requirement to reduce life-cycle emissions intensity by 0.5% by 2025 and 5.0% by 2030 from 2010 levels.
Strengthened light-duty vehicle emissions standards	The analysis assumes that tailpipe emissions standards for new light-duty vehicles sold are strengthened such that the emissions intensity of new light-duty vehicles sold in Canada declines to 119 grams per kilometer in 2025 and 107 grams per kilometer in 2030.

Strengthened heavy-duty vehicle emissions standards	The analysis assumes that new medium- and heavy-duty vehicles sold in Canada must meet seller fleet-wide GHG emissions standards. The standards are modelled as a reduction in the average emissions intensity of medium- and heavy-duty vehicles of 20% by 2025 and 24% by 2030, relative to 2015.
Light-duty vehicle travel reduction	The analysis requires total vehicle kilometers travelled to decline by 25% by 2030, relative to 2020 levels. Policies able to achieve this reduction are in development. The aim of these policies is to increase walking, cycling, and transit use.
Freight energy intensity reduction	The analysis requires the emissions intensity of freight (in tCO ₂ e/tkm) to be reduced 10% by 2030 relative to 2020 levels. Policies able to achieve this reduction are in development.

Buildings and communities	
Strengthened BC Building Code	The analysis assumes that starting in 2030, all new buildings are required to meet zero-emissions standards.
Heating equipment standards	The analysis assumes that starting in 2030, new space and water heating equipment must be supplied by heat pumps or electric resistance.
Building retrofit code	Requires the improvement of heat load demand when buildings are retrofit. This policy is currently under development by the BC government
Building incentives	The analysis includes the provincial Better Homes and Better Buildings incentives.
Organic waste diversion	The analysis assumes an increase of the organic waste diversion rate from municipal, agricultural, and industrial solid waste to 95% by 2025.