

City of Vancouver

Greenhouse Gas Emissions Forecast & Target-Setting Memo

To: Mayor Anne McEnergy-Ogle and City of Vancouver Council Members.

CC: Aaron Lande, City of Vancouver

From: Tristan Smit & P.J. Tillmann, Cascadia Consulting Group

Date: November 17, 2020

Subject: **Greenhouse Gas Emissions (GHG) Forecast & Target-Setting Memo**

EXECUTIVE SUMMARY

The purpose of this memorandum is to support the City of Vancouver in selecting near- and long-term emissions reduction targets for both municipal operations and the community. This memo includes:

- Basic, Stretch, Bold, and Leading Edge target-setting options
- A community business-as-usual (BAU) forecast and an adjusted community BAU (ABAU) forecast

All target-setting options are based on best available science and the GHG inventory results.¹ The Stretch, Bold, and Leading-Edge targets are intended to meet or exceed current and anticipated state policy, as well as current best available science, to reach carbon neutrality by 2050 and keep global average temperature rise below 1.5°C (2.7°F). The **Stretch** target meets State policy while the **Bold** and **Leading Edge** targets exceed State policy. The Leading Edge target achieves the same reductions as the Bold, but with a more aggressive timeline. The **Basic** target is behind new State goals; however, this target aligns with previous science-based targets to achieve 80% emissions reduction by 2050 (i.e., 80x50), which corresponds to keeping global average temperature rise below 2°C (3.6°F). See Table 3 for further comparison of these target options.

Peer cities are pursuing carbon neutrality; some cities that previously adopted the 80x50 target are expected to update their targets to carbon neutrality (Table 2). Many leading cities also choose goals and targets for municipal operations that mirror or exceed their communitywide goals. Some cities that want to “lead by example” choose to adopt more aggressive goals for municipal operations to demonstrate their commitment.

The BAU and ABAU forecasts are based on results from the 2019 community and municipal GHG inventories and the recommended target; a summary of inventory findings is in the attached PowerPoint presentation.

Key Findings

- Vancouver’s past emissions reduction performance suggests **the Bold target is highly feasible**; the Leading Edge target would be challenging. Both targets keep Vancouver ahead of State policy and provide a buffer should the State pursue more aggressive targets.
- The BAU forecast shows GHG emissions are projected to **increase 5% and 22%** by 2050 compared to 2007 (baseline) and 2019 (current) levels, respectively.
- However, the ABAU forecast suggests that, when adjusted for state policy directives such as the Clean Energy Transformation Act (CETA), GHG emissions will **decrease 5% from 2007 baseline levels**.

EMISSIONS REDUCTION TARGET-SETTING OPTIONS

Avoiding the most catastrophic impacts of climate change will require efforts from national, state, and local levels of government, along with the private sector. Until recently, scientists projected that the world would need to hold global average temperature increases to below 2°C (3.6°F) above preindustrial levels to avoid the worst climate impacts. Achieving this would require an 80% reduction in global emissions by 2050. However, in 2018, the **Intergovernmental Panel on Climate Change (IPCC)** released the Special Report on Global Warming of 1.5°C. They concluded **global average temperature rise needs to remain below 1.5°C to avoid the worst climate impacts.**¹ Key findings from this report include:

- Preventing global warming of 1.5°C is only possible if global carbon dioxide (CO₂) emissions start to **decline well before 2030**. Curbing warming to 1.5°C can only be achieved if action is taken to reduce global CO₂ emissions by about **45% from 2010 levels by 2030** and to **'net zero' by around 2050**.
 - The previous 2°C warming threshold outlined that limiting warming required global CO₂ emissions to decline by about **25% from 2010 levels by 2030 and reach 'net zero' by around 2070** – which has now been updated with the more aggressive 1.5°C targets.
 - **Net zero emissions** (also known as carbon neutrality) occurs when the quantity of CO₂ entering the atmosphere is equal to the amount removed (e.g., carbon capture and storage). As long as more CO₂ is added to the atmosphere than is removed, as is currently the case, global temperatures will continue to increase. Emissions prevention and reduction is an important part of achieving net zero emissions.
- **Reaching carbon neutrality (i.e., net zero) by 2050** may keep global temperature rise below 1.5°C.¹ Compared with a 2°C rise in global temperature, keeping global temperatures below 1.5°C means 50% fewer people may experience water scarcity, about 10 million fewer people may suffer from the impacts of rising seas, 2 billion fewer people may be exposed to heatwaves, and 50% fewer U.S. Gross Domestic Product losses can be expected.¹

To slow climate change, the 2020 Washington Legislature revised the emission reduction targets set in 2008 to follow new, more aggressive targets.² The reduction targets specified by the State are consistent with substantial scientific evidence published by the IPCC. **Washington State now has the following targets:**

- By 2030, reduce GHG emissions to 45 percent below 1990 levels
- By 2040, reduce GHG emissions to 70 percent below 1990 levels
- **By 2050, reduce GHG emissions to 95 percent below 1990 levels and achieve net-zero GHG emissions²**

The HB 2311 bill requires state agencies to set a goal of net-zero carbon emissions by the year 2050. However, for City governments, it does not contain explicit policy and is not a required mandate. Nonetheless, we encourage the City of Vancouver to remain consistent with the State as it develops its Climate Strategy and to leverage State initiatives.

Numerous cities in Washington and around the United States have also established emissions reduction targets. These peer cities and municipalities helped inform the recommended emissions reduction targets for the City of Vancouver. Many cities with communitywide greenhouse gas emissions reductions targets also adopt targets for their municipal operations, which are either the same or have a more aggressive timeline than the communitywide target. **Many communities in the Northwest that originally adopted an 80% reduction by 2050 target are now looking to set more aggressive carbon neutrality targets. Table 1 provides a snapshot of current peer community targets.**

Table 1. Greenhouse gas reduction targets set by peer jurisdictions.

							Basic & Stretch								Bold & Leading Edge	
Emission Reduction Targets	30% by 2030		40% by 2030		45% by 2030		50% by 2030		70% by 2040		80% by 2050		Carbon neutral by 2050		Carbon neutral before 2050	
Sector	C	M	C	M	C	M	C	M	C	M	C	M	C	M	C	M
Bellevue, WA (2011 baseline)							C	M			C	M				
Everett, WA (2007 baseline)							C	M			C	M				
Redmond, WA (2007 baseline)							C	M			C	M	*	*		
Seattle, WA (2007 baseline)													C	M		
Spokane, WA (2005 baseline)	C	M														
Tacoma, WA (2007 baseline)													C	M		
King County, WA (2007 baseline) ³							C	M			C	M	*	*		
Washington State (1990 baseline)					C	M			C	M			C	M		
Portland, OR (1990 Baseline)			C	M								M	C	M		
Copenhagen, Denmark (2005 baseline)															C	M
Melbourne, Australia (2006 baseline)																M

*Aspirational target and/or likely to adopt

C = Communitywide Target M = Municipal Target

Vancouver’s Target-Setting Options

The potential targets for the City of Vancouver have been categorized into four options, detailed below (see Table 2):

- **Basic targets** are consistent with the original targets set by many U.S. communities, when the scientific consensus was to keep global average temperature rise below 2°C, corresponding to an 80% emissions reduction by 2050.
- **Stretch targets** place Vancouver on a more aggressive path than historic and current trends, and are consistent with keeping global average temperature rise below 1.5°C. They are consistent with what many peer cities are doing or are expected to do, as well as best practices.
- **Bold targets** are significantly more aggressive than Vancouver’s current pathway, and are consistent with keeping global average temperature rise below 1.5°C. They are consistent with what a few cities are doing, as well as best practices.
- **Leading Edge targets** are the most aggressive option and push Vancouver well ahead of the boldest cities acting on climate change and sustainability. They are consistent with keeping global average temperature rise below 1.5°C.

Cost Tradeoffs Over Time

The timing of climate action incurs cost tradeoffs:

- ▶ **Longer emissions reduction timeframes** provide more time for State & Federal standards to come into play, which typically lead to lower costs at the local level. However, delaying climate action can be more costly than proactive action. The longer the delay, the higher the cost of climate impacts.
- ▶ **Shorter emission reduction timeframes** may require additional local-level investment to implement strategies. The Leading Edge target would require the largest upfront investment and innovative technologies most peer cities have yet to adopt. However, acting more quickly reduces the cost of climate impacts and may result in a greater and quicker realization of co-benefits.

Table 2. Summary of Proposed Targets.

Current	Basic	Stretch	Bold	Leading Edge
Communitywide Targets				
Reduce GHG emissions annually (2007 baseline)	80% reduction by 2050 50% emissions reduction by 2030 (2007 baseline)	Carbon neutrality by 2050 50% emissions reduction by 2030 (2007 baseline)	Carbon neutrality by 2045 80% emissions reduction by 2035 (2007 baseline)	Carbon neutrality by 2040 80% emissions reduction by 2030 (2007 baseline)
Municipal Operations Targets				
Reduce GHG emissions annually (2007 baseline)	80% reduction by 2050 50% emissions reduction by 2030 (2007 baseline)	Carbon neutrality by 2050 50% emissions reduction by 2030 (2007 baseline)	Carbon neutrality by 2040 80% emissions reduction by 2030 (2007 baseline)	Carbon neutrality by 2035 (with an aspiration target of carbon positivity by 2045) 80% emissions reduction by 2025 (2007 baseline)
Pros and Cons				
Pros	<ul style="list-style-type: none"> • Will be easiest to achieve as it is the lowest target option. 	<ul style="list-style-type: none"> • Likely reduces emissions enough to avoid 1.5°C of global warming. 	<ul style="list-style-type: none"> • Very likely to create emissions reductions necessary to avoid 	<ul style="list-style-type: none"> • Extremely likely to create reductions necessary to avoid catastrophic risks

Current	Basic	Stretch	Bold	Leading Edge
	<ul style="list-style-type: none"> Aligns with many U.S. cities and jurisdictions. 	<ul style="list-style-type: none"> Aligns with State goals and many peer cities. 	<ul style="list-style-type: none"> catastrophic risks of climate change. More aggressive than State goals, however, a few cities have similar goals. More ambitious targets for municipal operations are typical and feasible. 	<ul style="list-style-type: none"> and high costs of climate impacts. Climate positive strategies can provide additional co-benefits (e.g., soil enhancement, grid resilience, and closed-loop economy). No other Washington cities with Leading Edge targets, setting Vancouver as a climate leader.
Cons	<ul style="list-style-type: none"> Not enough to avoid 1.5°C of global warming; inconsistent with best available science. Does not align with State reduction goals. Longest timeframe for mitigation and will likely result in the most future costs. 	<ul style="list-style-type: none"> Vancouver’s past performance indicates a more aggressive target is possible. Long for mitigation and will likely result in increased future costs. 	<ul style="list-style-type: none"> Fewer peer cities’ targets align with the Bold target. 	<ul style="list-style-type: none"> Shortest timeframe of all targets – will require the largest amount of upfront investment and new technology. This target will be the most difficult to achieve given the timeline and ambition. It may require purchasing carbon offsets. No other Washington cities with these targets, providing few local learning opportunities.
Example Strategies				
Buildings & Energy	<ul style="list-style-type: none"> Support state-level action to generate electricity with 100% renewable sources Increase energy efficiency of homes and businesses 	<ul style="list-style-type: none"> Support state-level action to generate electricity with 100% renewable sources Increase energy efficiency of homes and businesses Incentivize switching from natural gas to electric in new 	<ul style="list-style-type: none"> Work with Clark PUD to procure renewable energy ahead of CETA mandates Increase energy efficiency of homes and businesses Develop mandates that eliminate natural gas use in new buildings 	<ul style="list-style-type: none"> Rapidly invest in large-scale renewable energy generation and store surplus Develop a mandate that bans natural gas in new and existing buildings Develop zero-carbon and zero-energy buildings and infrastructure

Current	Basic	Stretch	Bold	Leading Edge
		and existing buildings		
Transportation & Land Use	<ul style="list-style-type: none"> Incentivize electric vehicles (EVs) 	<ul style="list-style-type: none"> Incentivize alternative transportation and EVs 	<ul style="list-style-type: none"> Incentivize alternative transportation and EVs Prioritize dense development that reduces vehicle miles traveled (VMT) 	<ul style="list-style-type: none"> Deeply incentivize alternative transportation and EVs; early adoption Implement development codes and policies with specific standards (e.g., for average VMT)
Water & Natural Systems	<ul style="list-style-type: none"> Preserve tree canopy Encourage water and natural resource conservation 	<ul style="list-style-type: none"> Plant trees and preserve tree canopy Encourage water and natural resource conservation 	<ul style="list-style-type: none"> Expand tree canopy May require minimal carbon offsets Promote native landscaping 	<ul style="list-style-type: none"> Expand tree canopy Increase carbon storage in soil May require moderate carbon offsets Promote native landscaping Introduce disincentives for high water usage
Waste & Materials	<ul style="list-style-type: none"> Encourage reuse and recycling 	<ul style="list-style-type: none"> Encourage reuse, recycling, and waste diversion Establish citywide composting program 	<ul style="list-style-type: none"> Encourage reuse and recycling Incentivize and support the reuse and circular economy Establish citywide composting program 	<ul style="list-style-type: none"> Encourage reuse and recycling Incentivize and support the reuse and circular economy Establish citywide composting program Convert atmospheric carbon into durable materials and products

Option 1: Basic

Communitywide Targets

- 50% emissions reduction by 2030 (2007 baseline)
- 80% emissions reduction by 2050

Municipal Operations Targets

- 50% emissions reduction by 2030 (2007 baseline)
- 80% emissions reduction by 2050

The City of Vancouver adopts targets that align with the Paris Agreement and meet the IPCC requirements to limit warming to 2°C. This has typically been the first adopted target by many cities around the U.S. They aim to reduce GHG emissions 50% below baseline levels by 2030 and an 80% reduction by 2050. The City would be able to leverage State policies and programs to achieve reduction, but the City would be behind the State-level target and the IPCC finding that reaching carbon neutrality by 2050 is now needed to avoid the worst impacts of climate change. It is important to note that many of the jurisdictions that have adopted this target are now looking to adopt more aggressive carbon neutrality targets, including King County and the 18 partners included in the King County-Cities Climate Collaboration. Adopting this target could include strategies that **increase energy efficiency and conservation** of homes and businesses; **incentivize renewables** in homes and businesses; shift towards **low-carbon fuels**; make it easier to **telework, bike, walk, and bus**; and **preserve tree canopy**.

Option 2: Stretch

Communitywide Targets

- 50% emissions reduction by 2030 (2007 baseline)
- Carbon neutrality by 2050

Municipal Operations Targets

- 50% emissions reduction by 2030 (2007 baseline)
- Carbon neutrality by 2050

The City of Vancouver adopts targets that align closely with the State's goals set forth in [HB 2311](#) and are consistent with targets set by some peer cities around the Northwest. These targets are the **minimum emissions reduction needed** to avoid 1.5°C of warming. They aim to reduce GHG emissions 50% below baseline levels by 2030 and achieve carbon neutrality by 2050. Additionally, these targets provide the longest timeframe to achieve carbon neutrality. Both targets have been increasingly adopted by other U.S. communities and municipalities because best available science suggests more aggressive targets are required to avoid significant impacts. **The City would be able to leverage State policies and programs to achieve reduction.** Adopting this target could include strategies similar to the Basic target, but would require more aggressive timelines that **transition away from natural gas, increase energy efficiency** of homes and businesses; **incentivize renewables** in homes and businesses; make it easier to **telework, bike, walk, and bus**; and **increase tree canopy**.

Option 3: Bold

Communitywide Targets

- 80% emissions reduction by 2035 (2007 baseline)
- Carbon neutrality by 2045

Municipal Operations Targets

- 80% emissions reduction by 2030 (2007 baseline)
- Carbon neutrality by 2040

The City of Vancouver demonstrates leadership by setting a target in front of State goals. For example, carbon neutrality by 2040 is a realistic goal for some cities that have access to 100% carbon-free and/or renewable electricity. Thus, the implications for Vancouver would be to aggressively **procure carbon-free energy**

in advance of CETA requirements by working with Clark PUD, accelerate adoption of zero-emission transportation modes, and sequester (i.e., store) carbon.

Typically, population and job growth have a significant impact on a city’s ability to reduce its greenhouse gas emissions. From 2007 to 2019, Vancouver’s population grew approximately 16%, however, Vancouver was able to reduce emissions 14%, showing bold reductions are possible under current operations. This trend indicates that **the Bold target is a feasible goal** for both the community and City government. The Bold target would set up Vancouver as a leader in the State and with peer cities, while **aligning with updated scientific understanding** of the reductions necessary to avoid catastrophic risks of climate change.

Option 4: Leading Edge

Communitywide Targets

- 80% emissions reduction by 2030 (2007 baseline)
- Carbon neutrality by 2040

Municipal Operations Targets

- 80% emissions reduction by 2025 (2007 baseline)
- Carbon neutrality by 2035 (with an aspiration target of climate positive)

The City of Vancouver adopts Leading Edge targets that significantly exceed State and peer city targets. By adopting a Leading Edge target, the City can demonstrate that quickly reaching carbon neutrality is possible and pave the way for other cities to follow suit. This would allow the City to be at the forefront of innovative technologies and reduction strategies. This could include **reforestation that captures and stores carbon in soil** (also improves soil health), investing in **buildings and infrastructure that use sustainable resources or achieve zero-carbon and zero-energy**; generating and storing **surplus renewable energy**; **eliminating natural gas usage** in the near-term, and/or **storing carbon in durable materials and products.**

Additionally, we propose an ambitious target of carbon-positivity. This target would go beyond carbon-neutrality by not only generating zero-emissions but utilizing strategies and actions that create an even greater environmental and social benefit by removing additional carbon dioxide from the atmosphere. **The City can be part of building a global climate positive buffer, serving as an “offset” for those who simply cannot reach carbon neutrality.** Currently, there are only a handful of cities across the globe that have set climate-positive targets. This includes South Waterfront EcoDistrict in Portland Oregon; Treasure Island in San Francisco, California; Oberlin, Ohio; The Stockholm Royal Seaport in Sweden; and Barangaroo in Sydney, Australia. The Leading Edge targets would place Vancouver on a shortlist of climate-leading cities. Vancouver’s past performance indicates that this target would be highly aggressive and would be very difficult to achieve without the help of carbon offsets. This is due to the fact that a majority of Vancouver’s emissions stem from the transportation sector, which increased compared to 2007. Given the long lifespan of vehicles, rapid reduction in this sector may be more difficult to realize.

Potential Strategies

This memo can guide the City in identifying a menu of expanded and new emissions reduction strategies for community and municipal operations as part of Vancouver’s Climate Strategy. Strategies are expected to focus on those that provide the city with the greatest emission reduction opportunities, specifically focusing on Vancouver’s two largest emissions sectors: **transportation and energy** (see Table 3).

Table 3. Potential Climate Strategies for the City of Vancouver.

Communitywide Strategies	Municipal Operations Strategies
<ul style="list-style-type: none"> • Energy efficiency and conservation in existing commercial and residential buildings • Purchase renewable energy • Generate onsite renewable energy • Electrify and decarbonize buildings (e.g., incentives or requirements for green building, transition away from natural gas) • Reduce transportation emissions • Increase access and use of transportation alternatives and electric vehicles (EVs) • Reduce waste from residential, commercial, and industrial facilities • Sequester carbon (e.g., ecosystem restoration, carbon capture and storage) • Carbon offsets 	<ul style="list-style-type: none"> • Energy efficiency and conservation in municipal buildings and equipment • Purchase renewable energy • Generate onsite renewable energy • Electrify and decarbonize new and retrofitted buildings • Reduce emissions associated with commute trips and employee travel • Increase access and use of transportation alternatives and EVs for municipal fleet • Reduce waste from City facilities • Carbon offsets

GREENHOUSE GAS EMISSIONS FORECASTS

Cascadia Consulting Group developed two emissions forecasts out to 2050, Business-as-Usual (BAU) and Adjusted Business-as-Usual (ABAU), to show future emissions trends for the City of Vancouver.

- **The BAU** forecast is an estimate of how emissions would change over time without the influence of local or State policies or programs. Population and job growth are the key drivers of this projection.
- **The ABAU** forecast is an estimate of the influence of State policies—the Clean Energy Transformation Act (CETA) and federal fuel efficiency standards—on Vancouver’s projected emissions.

The forecasts are based on changes to the number of people who live, work, and drive in Vancouver.^{1,4,5} If business continues as usual and population and jobs increase, so would we expect increases in energy usage, vehicle miles traveled, solid waste generation, and other activities that produce GHG emissions. We utilized the most recent GHG inventory from 2019 and demographic projections from the City of Vancouver to model future emissions. However, targets and trends will be compared using the baseline 2007 inventory as this is the first complete inventory and distant enough that past progress can be observed and evaluated. **All projections should be considered estimates and are subject to additional revision and finalization.**

Community Emissions: Business-As-Usual (BAU)

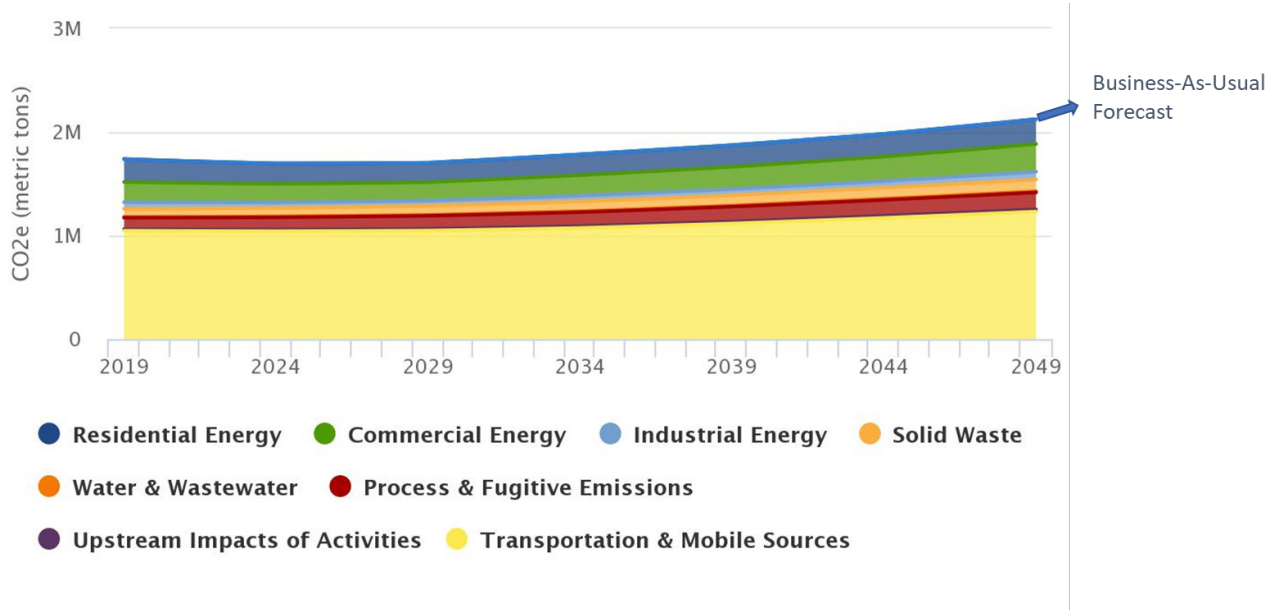
The BAU forecast shows how Vancouver’s communitywide emissions would change over time due to projected growth **without any climate action at the local, State, or Federal levels.** The analysis shows that the community’s BAU emissions are projected to increase from **1.7 million metric tons CO₂e (MTCO₂e) in 2019 to 2.1 million MTCO₂e in 2050, a 22% and 5% increase from 2019 and 2007 levels, respectively.** Major sources of emissions stem from increasing vehicle miles traveled and energy demand as population, jobs, and housing increase.

It is important to note that the BAU forecast may overestimate the GHG emissions from electricity because it assumes a slight decrease in the carbon intensity of Clark Public Utilities energy, without consideration of further reduction from CETA.

The solid blue line, labeled **Business-As-Usual Forecast** in Figure 1 and Figure 2 shows the path that emissions would take following current BAU operations. Below that line are the sector contributions that cumulatively add

up to create Vancouver’s emissions. Figure 1 highlights the amount of emissions, based on a Business-as-Usual scenario, that will need to be avoided through a range of GHG emissions reduction strategies.

Figure 1. Business-As-Usual Forecast for the City of Vancouver Communitywide GHG Emissions.

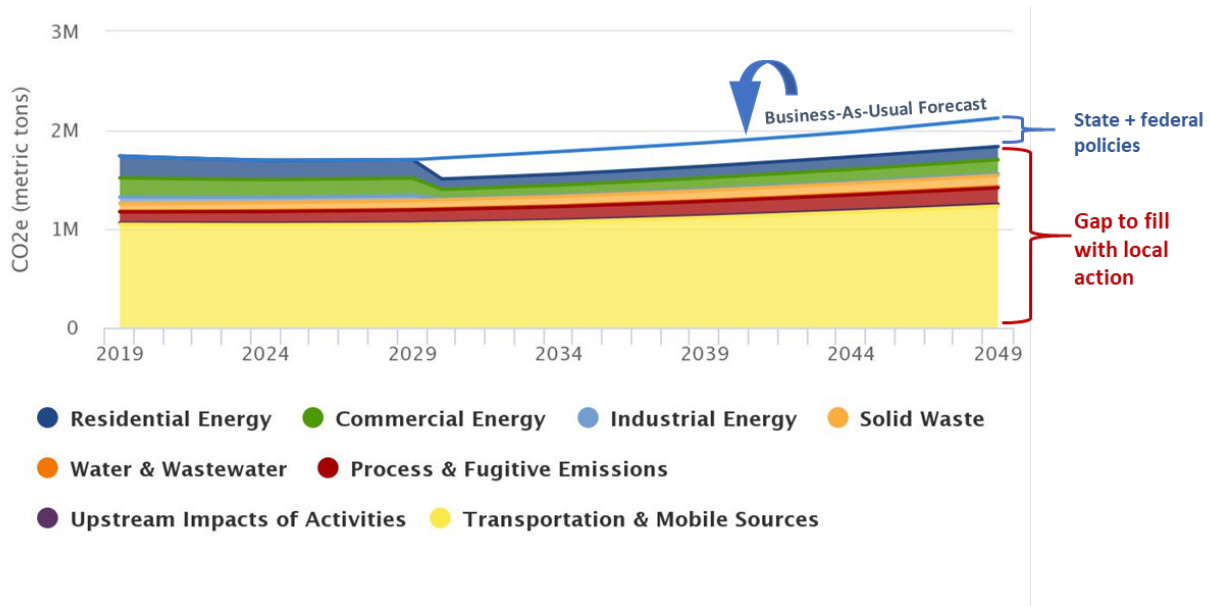


Community Emissions: Adjusted Business-As-Usual (ABAU)

The communitywide ABAU forecast is presented to show how Vancouver’s emissions are anticipated to change accounting for the impacts of adopted State and Federal policies (i.e., CETA, federal vehicle fuel economy standards) if no action is taken at the local level. The figure below begins to show the expected contribution of federal, state, and local action to meeting the city’s greenhouse gas emissions reduction targets. This is illuminated in the white gap between the top “Business As Usual” line and the dark blue “Residential Energy” wedge. Despite projected population and economic growth in Vancouver (BAU scenario), there will be an **anticipated net decrease of GHG emissions of approximately 5%, due largely to state requirements** for electric utilities to become greenhouse gas neutral in 2030 and to phase out all fossil fuels by 2045, **as well as anticipated federal vehicle fuel economy standards** (ABAU Scenario).

As shown by the gap labeled “Gap to fill with local action,” significant emissions reductions remain to achieve carbon neutrality by 2050. For illustration purposes, Figure 2 shows the “Gap to fill with local action” assuming the Bold target is selected. **Local action will still be critical to meeting long-term greenhouse gas emission reduction goals.**

Figure 2. Adjusted-Business-As-Usual Forecast for the City of Vancouver Communitywide GHG Emissions (with State-level reductions applied).



¹ IPCC, 2018. *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.*

² Washington State Legislature. 2020. HB2311. app.leg.wa.gov/billsummary?BillNumber=2311&Initiative=false&Year=2019 (accessed 11/3/2020).

³ King County and 17 partners — Bellevue, Burien, Issaquah, Kenmore, Kent, Kirkland, Lake Forest Park, Mercer Island, Normandy Park, Port of Seattle, Redmond, Renton, Sammamish, Seattle, Shoreline, Snoqualmie, and Tukwila — voted in 2014 to adopt a shared target to reduce countywide sources of GHG emissions, compared to a 2007 baseline, by 25% by 2020, 50% by 2030, and 80% by 2050. <https://your.kingcounty.gov/dnrp/library/dnrp-directors-office/climate/joint-commitments-update-with-signatures-final.pdf> (accessed 11/3/2020).

⁴ Population and housing projections used average annual growth rates between 2010-2020 from the Washington Office of Financial Management. Average annual growth rates projected values through 2050. Between 2017-2020, population and housing estimates removed values from Van Mall annexation and assumed no further annexation through 2050. <https://ofm.wa.gov/> (accessed 11/3/2020).

⁵ Job projections used average annual growth rates between 2008-2020 from the Washington Employee Security Department. Job estimates for 2008-2018 included all jobs covered by unemployment insurance except for private household employers and DSHS COPES employment. Job estimates for 2019 excluded SHSH COPES home health care, household employers, and agricultures (except for logging). The average annual growth rate was modeled through 2050.