

CASCADIA 2050 VISION:

# Moving to Climate Action

SEPTEMBER 2022



Cascadia  
Innovation  
Corridor

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The Cascadia mega-region, running from Portland through Seattle to Vancouver, British Columbia, has become synonymous with building a better future. Home to so many natural assets and incredible innovation and talent – one of our greatest strengths is partnership. Now is the time to partner to address one of the greatest challenges of our time: the threat of climate change to the region and the world.

With 51 billion tons of greenhouse gases emitted annually across the globe, Cascadia alone can't solve the urgent and massive climate challenge, but we can and must do our part by becoming the first sustainable mega-region. As we realize our 2050 vision of a mega-region with affordable housing, high quality clean transportation, and environmental stewardship, we can be a model to others.

Serving as co-chairs of the Cascadia Innovation Corridor, we have seen first-hand what Cascadians are capable of when they come together to solve problems, from finding cures to cancer to fighting the COVID-19 pandemic. **As one, we can test, fail, learn, iterate, implement, and scale what works more quickly than we could do alone. Partnerships are what and who we are, and we believe they are the best path to faster and greater success.**

Our public sector—federal, state, Tribal and First Nation leaders, local officials, and legislative bodies—should set collaborative policy with defined goals, invest in research and development, create incentives, and ensure the regulatory system modernizes to meet our climate goals and breakdown barriers. Our private sector should continue to innovate, create technology solutions, execute on their own goals, and drive ambitious investments in solutions. The two sectors must work together, be aligned on goals, supportive of each other, and committed to doing this right for the long term and acting in the short term. Each must ensure transparency, accountability, and equity with particular attention to those communities most adversely impacted by climate.

It will take all of us—the public and private sectors must work with non-profits, academia, and the residents of Cascadia. We are seeing new partnerships emerge across the corridor like ultra-high speed ground transportation and our three international airports. We must seize the opportunity for even more new partnerships to address significant challenges like wildfires.

Many of our recommendations are not new, but they are the right solutions; and after years of waiting, help is finally on the way. Generational investments at the local, state, provincial, and federal levels have been made available while advancements in technology have and continue to progress.

The climate challenge and new opportunities invite us to chart the course for a great future together. Let's make it happen.



### **Chris Gregoire & Greg D'Avignon**

Co-Chairs, Cascadia Innovation Corridor

[www.connectcascadia.com](http://www.connectcascadia.com)

*We want to thank BCG and the dozens of stakeholders across government, business, academia, and non-profits who made this report possible.*

# Executive Summary

## **During the summer of 2020, headlines called the wildfires apocalyptic, unprecedented, and a wake-up call.**

In all, wildfires burned over 1 million acres of land across Cascadia, destroying 6,000 structures and razing the places people live, learn, and work. In Malden, WA, 85% of the homes burned to the ground.<sup>1</sup> In September 2020, each of Cascadia's metro areas—Portland, Seattle, and Vancouver—shockingly topped the list of cities with the worst air quality in the world. With the smoke came an increased likelihood of respiratory problems, heightening the risk of complications and hospitalization for vulnerable members of our community.<sup>2</sup>

Our vision for Cascadia is to become the world's first sustainable mega-region by 2050. In this future state, housing is affordable, mass transit is accessible, and we meet the Paris Agreement goals. Realizing this vision requires us to address the urgent and massive climate challenge head on, taking action to reduce our greenhouse gas (GHG) emissions here and abroad while adapting to the effects of climate change that are here and now. In doing so, we can ensure a more equitable and prosperous reality, with thriving businesses, healthy communities, and a brighter future for Cascadia.

From our spirit of innovation to our shared values and natural environment, we are gifted with inherent strengths as a mega-region that position us to be leaders in the climate response. In the Cascadia Innovation Corridor, our trademark approach for tackling the biggest challenges of our time has always been collaboration through partnerships. Experience has shown us that we can do more and go farther together. We firmly believe a partnership approach represents our greatest asset and holds the greatest promise for addressing the climate crisis as a mega-region.

In recent years, Cascadia has seen important commitments to manage GHG emissions and efforts by both the public and private sectors. To further accelerate our climate efforts and adapt to the adverse impacts of climate change in Cascadia, we have prioritized five areas for partnership and action: transportation, buildings, energy, carbon removal, and wildfires. These are places where directed efforts can lead to significant emissions reductions, drive economic prosperity, improve resiliency, and ensure an equitable and just transition in Cascadia. Within each, we identify high-impact opportunities for action through public-private partnerships (PPPs), emphasizing best practices from our community and around the globe to inform our efforts.

Even with the efforts of recent years, we are not achieving our goals—in part because of the lack of funding and advancements in technology. But, today, we can accelerate our goals into action, equipped with transformative technologies and generational investments, such as the Inflation Reduction Act.

**The barriers that once stood in our way are being broken down, creating opportunities for action—and we must now respond with the urgency this moment requires. As we act today, we also must prepare for tomorrow, building the foundation of policy, planning, and human capital required to enable our long-term success. We have the strengths, the know-how, and the vision to create a brighter future.**

1. KUOW, 2021

2. KING5, 2020

## SECTION 1

# Climate Change Here & Now in Cascadia

In 2021, Cascadia continued to be impacted by wildfire smoke and faced two additional large-scale natural disasters: a heat dome and drought throughout the mega-region and flooding across British Columbia and northern Washington.

During the heat dome, at least 800 people died with hundreds more hospitalized as temperatures soared to 116 degrees in Portland and smashed heat records in cities and towns across the region.<sup>3</sup> Some small businesses were forced to close their doors, farmers had significant losses—an estimated 1 billion fish and shellfish were killed in overheated waters<sup>4</sup> and one-fifth of Washington's cherry crop was destroyed.<sup>5</sup>



The floods that occurred in November 2021 were one of the worst natural disasters in Canadian history. 20,000 people were forced to leave their homes. Across the agricultural sector, 1,100 farms were destroyed and hundreds of thousands of livestock were lost to the floods.<sup>6</sup>

**These disasters caused significant levels of devastation. They compromised the health and safety of our community, destroyed small businesses, and substantially impacted the supply of exports we depend on. Both disasters were made more likely and more intense because of climate change.<sup>7</sup>**

## Economic Data on Regional Disasters<sup>8</sup>

**2021 Floods:  
\$9 Billion+**

**2021 Heat Dome:  
\$600 Million+**

**2020 Wildfires:  
\$2.25 Billion+**

3. [BC Coroners Service, 2022](#); [WA DOH, 2021](#); [Oregon Public Broadcasting, 2021](#); [NY Times, 2021](#); [KUOW, 2021](#)

4. [LiveScience, 2021](#)

5. [NBC News, 2022](#)

6. [CBC, 2022](#)

7. [Bloomberg, 2021](#); [The Globe and Mail, 2022](#)

8. [NOAA, 2022](#); [The Globe and Mail, 2022](#)

Data shows that unless we act, this trend will continue. For example, global inaction means the number of days with temperatures above 90 degrees Fahrenheit each year will increase. In 2020, the air was unsafe to breathe in all three of our major metro areas, and scientists expect wildfires smoke to grow worse with particulate pollution to double or triple by the end of the century in the Pacific Northwest. As sea levels rise, the risk of coastal floods increases year over year; by 2050, experts inform us that some communities along the shores of Oregon, Washington, and British Columbia are expected to be inundated by high tide and storm surges.<sup>10</sup>

**We are not alone. Climate change is a world-wide challenge.**

Of all global risks, including pandemics and interstate conflict, climate change events, such as natural disasters and access to water, are the most likely to occur and are devastating.<sup>11</sup> As the pace and intensity of natural disasters increases, so will the economic toll they take. Between 2017-2020, 2,300 extreme weather events resulted in \$660 billion in overall and insured losses around the world.<sup>12</sup> On our current course, the amount of climate change-related losses will reach tens of trillions of dollars annually.<sup>13</sup>

**Top 5 Cities Worst Air Quality (AQI) in the World<sup>9</sup> Sept. 2020**



**Vancouver AQI: 194**



**Portland AQI: 194**



**Seattle AQI: 181**



**San Francisco AQI: 160**



**Los Angeles AQI: 157**

**Global Impact & Risk<sup>14</sup>**

**Trillions of dollars in GDP risk:**

Global reduction in GDP could reach trillions by 2050, with the U.S. facing at least hundreds of billions of GDP risk by 2050

**Disaster risks continue to grow:**

Disasters already kill 115 people and \$202 million *per day*, with \$1 trillion in impact in the U.S. alone over the last five years—and the risks will continue to grow

**Vulnerable face the worst impacts**

Climate change will hit developing countries the hardest, as they experience both higher and more variable temperatures than other countries

9. IQAir, 2020

10. Climate Central Coastal Risk Screening Tool, 2022

11. World Economic Forum, 2020

12. Munich RE, 2022

13. Swiss Re Institute, 2021

14. Stanford, 2019; IMF, 2019; Swiss Re Institute, 2021; UN, 2021; The Economist, 2018

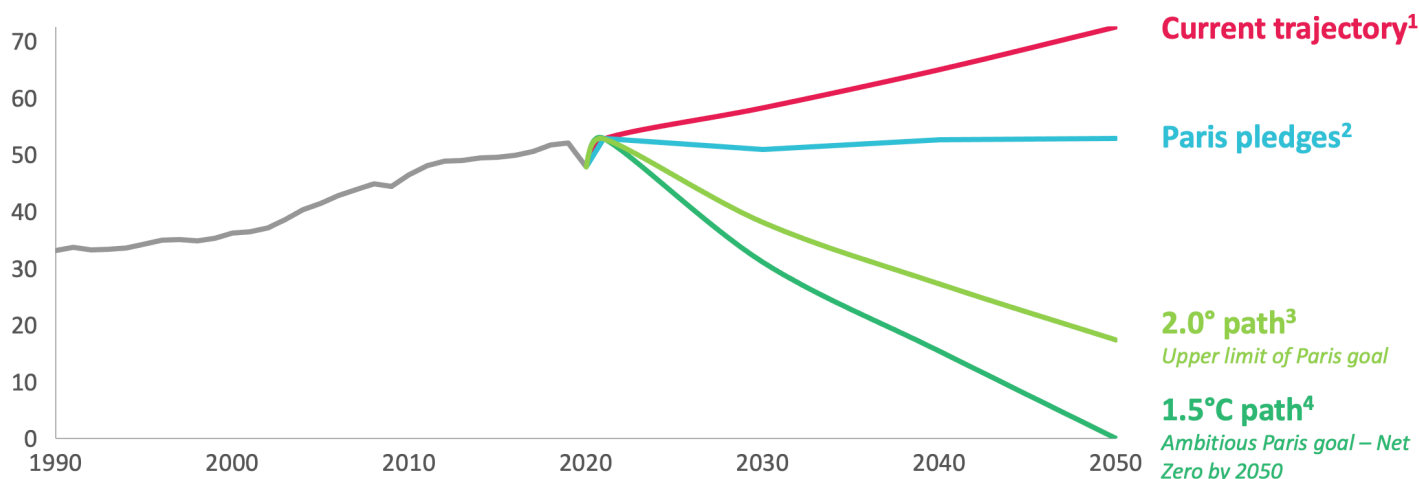
## Action is happening at every level to mitigate the impacts of climate change.

As a global community, we have rallied behind the Paris Agreement to limit global warming to 2 degrees Celsius—with an ideal state of not exceeding 1.5 degrees Celsius—compared to pre-industrial levels. Despite the progress that has been made, we are off course.

In the last few years, new commitments made by other countries to the Paris Agreement and new legislation like the Inflation Reduction Act will improve our trajectory, but current projections place us at warming well above the 2-degree mark.

**We need a massive change in emissions trajectory to mitigate the worst effects of climate change**

## Global Greenhouse Gas Emissions (billions tons of CO<sub>2</sub>-equivalent<sup>15</sup>)

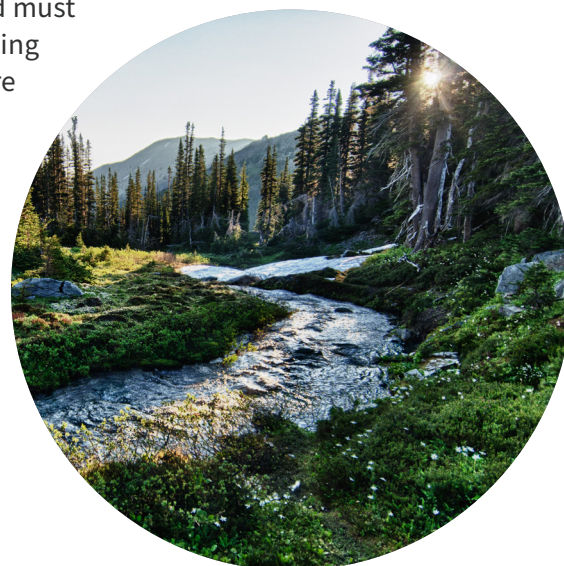


Note: These figures exclude land use, land-use change, and forestry.

1. Assumes GHG emissions grow from 2018 at the same rate as the current policies scenario in UNEP 2019 Gap report to 2050 (1.1% CAGR). 2. Assumes countries decarbonize further at the same annual rate required to achieve their INDCs between 2020 and 2030. 3. Assumes 25% reduction by 2030 and net-zero by 2070. 4. Assumes 45% reduction by 2030 and net-zero by 2050. Source: EDGAR 5.0, FAO, PRIMAP-hist v2.1, Global Carbon Project, IPCC, UNEP Emissions Gap Report, WRI, BCG analysis.

To address the global and local impacts of climate change, we can and must bring our energy and spirit of collaboration to the climate crisis -focusing on both mitigation and adaption. Mitigation means reducing our future GHGs emissions while adaption means addressing our current and future vulnerabilities such as flooding and water access.

**Guided by a vision to be the first sustainable mega-region, we believe we are up to the task.**



15. Office of the EU, 2019; IPCC, 2021; UNEP, 2019; Global Carbon Budget Data, 2022; European Commission, 2022; World Resources Institute, 2022; BCG Analysis, 2022

## SECTION 2

# Cascadia Innovation Corridor: Our 2050 Vision

Our 2050 vision is a roadmap for our shared future, as well as a response to the population growth our mega-region has and will continue to experience. Our goal is to address the challenges that come with an increasing population, such as prohibitive housing costs and congestion, by seizing the opportunity to plan for and become the world's first sustainable mega-region.

To achieve a bright, prosperous, and healthy future, we are focused on three pillars: housing, transportation, and environmental stewardship. We have already proposed and are planning for a bold approach to connect our community: clean-powered ultra-high-speed ground transportation that runs along the Corridor.

We know that our 2050 vision depends on us coming together as a region. To become the first sustainable mega-region, we must reduce our emissions by nearly 80% to do our fair share to meet the Paris Agreement, while making our infrastructure energy-efficient, housing affordable, renewable-powered transportation accessible, and welcoming at least three million new residents to the region.

With our inherent strengths, we can uniquely turn our goals into climate action.

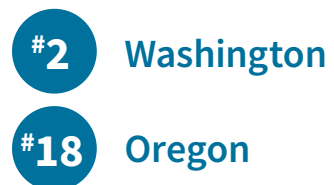
## The Strengths of Cascadia

Examining other mega-regions across the world, Cascadia is a globally recognized leader in innovation and human capital. Matched with our natural environment, clean energy grid, and shared values, we are well-positioned to become the world's first sustainable mega-region and to take the climate action this moment requires.

### Innovation ecosystem & an entrepreneurial spirit:

From Microsoft to Nike, to an innumerable number of ventures spun out from our titans of industry, our region is home to innovators who have changed the ways we live, work, and interact. In 2022, Seattle was ninth in the global startup ecosystem rankings due to its talent, thriving accelerators, and venture capital investments.<sup>16</sup>

### 2022 Top States for Business<sup>17</sup>



### Human capital and talent:

People are a fundamental driver of economic growth and success. Seattle, Vancouver, and Portland are home to highly skilled workers in science and engineering, business, finance, education, law, and knowledge-based fields. In 2022, Portland - Vancouver, WA ranked #17 and the Greater Seattle area ranked #9 on a list of most educated areas in the country.<sup>18</sup> In 2022, Washington ranked as #3 for green jobs.<sup>19</sup>

### Top Cities for Tech Talent<sup>20</sup>



16. [Startup Genome, 2022](#)

17. [CNBC, 2022](#)

18. [WalletHub, 2022](#)

19. [CBRE, 2022](#)

20. [PromoLeaf, 2022](#)



### **Academic excellence:**

Cascadia is home to world-class research universities and colleges, including two of the top 50 global universities: the University of British Columbia and the University of Washington.<sup>21</sup> Universities up and down the Corridor are bringing rigorous research to address climate change: academics at Portland State University are better understanding wildfires, a team at the University of Washington is studying seawater carbon capture technologies, and the University of British Columbia is evaluating new construction standards and implementable solutions for BC municipalities to reduce GHG emissions.

### **Clean electric grid:**

Electricity in the region is “clean” when it runs on renewable sources of energy, such as hydro, solar, and wind. A clean grid is a backbone and pre-requisite for realizing a Net Zero future. WA and OR are ranked fourth and sixth respectively in the US for renewable energy production.<sup>22</sup>

**British Columbia is a leader in generating a significant share of their electricity from clean, carbon-free sources at 95% in 2020.**

### **Natural environment:**

From our forests to mountain ranges, what brings many people to Cascadia is the splendor of our geography. Our forests can and do play an important role in removing carbon from the atmosphere. WA, OR, and CA together store over a third of US forest carbon, and forests cover two thirds of B.C.<sup>23</sup>

### **Shared values around climate change and action:**

Our residents, businesses, and governments are prioritizing action on climate. More than 70% of adults in Pacific states recognize the impacts of climate change—the highest of any area in the United States—and businesses of all sizes are leading the way by integrating a sustainability mindset across their business.<sup>24</sup> In alignment with the majority of residents, the governments of OR, WA, & B.C. all have climate action plans, which are reinforced and complemented by climate mitigation and adaptation strategies implemented by local governments.

**Indigenous and First Nation communities have a legacy of leadership in protecting the environment, and in 2022, the BC First Nations Leadership Council released a comprehensive climate action strategy.**

### **Infrastructure:**

Cascadia has two of the top ten seaports in North America, which provide approximately 10% of imports.<sup>25</sup> The Vancouver International Airport is the second busiest airport in Canada in terms of air cargo and passengers. Seattle-Tacoma International Airport ranks in the top 10 busiest airports in America.<sup>26</sup>

### **Partnership:**

Collaboration between countries, sectors, and communities has always been at the core of our approach to problem-solving as the Cascadia Innovation Corridor. This is how we make significant progress on the toughest challenges of our region.

21. [U.S. News and World Report, 2022](#)

22. [Statistics Canada, 2022](#); [U.S. Energy Information Administration, 2022](#)

23. [US Forest Service; Cascadia Department of Bioregion, 2022](#)

24. [Yale, 2021](#)

25. [Journal of Commerce, 2021](#)

26. [ACI, 2022](#); [Statista, 2021](#)

## SECTION 3

# The Power of Partnership

With all these Cascadia strengths, climate action in Cascadia is occurring at all levels of government, business, academia, non-profits, and within our neighborhoods. Each are writing their own plans to meet their Net Zero climate ambitions by 2050 or sooner, and these actions can have a positive multiplier effect.

To make greater and faster progress to tackle the crisis, we must continue to break down the siloes that exist across borders, sectors, and industries. **In addressing the impacts of the climate challenge, we believe our culture of partnership is the force we must embrace to drive impactful change.** Looking specifically at partnerships between public and private entities, we have identified some of the highest impact areas and actions that can be taken across Cascadia in collaboration with residents, academia, and non-profits each playing a role.

Across the world, there have been thousands of successful—and many unsuccessful—public-private partnerships (PPPs) focused on infrastructure projects, the development and revitalization of communities, and healthcare.

### Some of the emerging key principles of successful climate PPPs from Cascadia:

#### Shared vision and specific focus:

All too often public-private partnerships are too broad. Strong partnerships are based on finding the right alignment of interests, understanding that without a government champion, PPPs rarely succeed. Establishing the focus and vision ensures the right stakeholders, leadership, and governance structure are in place for clear and consistent decision making. Across WA, OR, and B.C., we see public-private collaboration already occurring in areas, such as Sustainable Aviation Fuels (SAF).

#### Financing:

Climate solutions are expensive, and one of the barriers to climate action has been the lack of funding for research, development, and implementation. With new resources across federal, provincial and state governments, and commitments by our mega-region's businesses and non-profits, there is a generational opportunity to leverage and coordinate investments toward shared solutions and technology. For example, Breakthrough Energy and the U.S. Department of Energy (DOE) announced in 2021 a first-of-its-kind public-private collaboration to catalyze up to \$15 billion in investments for the large-scale projects necessary to bring innovative climate technologies to market.

#### Cross-disciplinary expertise and resources:

Success comes from leveraging the varied strengths of the group, as each jurisdiction brings unique workforce talents, manufacturing and industrial expertise, and trade opportunities. The policies, scale, and reach of the public sector paired with the ingenuity and entrepreneurial spirit of the private sector is the way to bring big and bold solutions to fruition. In both British Columbia and Washington state, we have seen the creation of new public-private partnerships focused on the opportunity for green hydrogen. Hydrogen is a scalable solution to decarbonize difficult industries while driving regional economic growth.

#### Transparency, accountability, and engagement:

From the outset in developing a public-private partnership, businesses, non-profit, and governments together should establish accountability measures and transparency in reporting.



## Catalyzing Change: Electrifying Transportation in Los Angeles Ahead of the 2028 Olympics

Founded as an economic development initiative by the City of Los Angeles, the Los Angeles Cleantech Incubator (LACI) is a PPP focused on supporting clean energy pilots like the first-in-nation Zero Emissions Delivery Zone in Santa Monica, innovative startups, and delivering on the Transportation Electrification Plan for Greater Los Angeles. The PPP now includes more than 150 government agencies, corporations, automakers, startup companies, labor organizations, utilities, academic institutions, community organizations, and other non-profits.

### Goals:

In preparation for the 2028 Olympics, LACI established broader emissions reduction and sector-specific targets by 2028 including: 84,000 public and workplace chargers, 30% of all light duty vehicles on the road electric, and 100% electrification of shared vehicles. The partnership also outlined policy changes across local and state government including waiving permitting fees, reducing barriers for installation in permitting, and income-based incentives and feebate programs for EV adoption and charging.<sup>27</sup>

### Progress:

As of March 2022, the four-county region now has approximately 20,000 chargers, half of which are public. In 2022, LACI has accessed new local and federal funding, created a new green loan program leveraging private funding, and amplified innovative programs from partners towards the shared goals.<sup>28</sup>



<sup>27</sup>. [Los Angeles Clean Tech Incubator, 2022](#)

<sup>28</sup>. [California Energy Commission, 2022](#)

## SECTION 4

# Opportunities for Action

Climate experts have reached a general consensus about the greatest sources of GHG emissions and the key opportunities for adaptation. Each of these complex areas and priorities—buildings, transportation, and energy—have multiple opportunities for action across the public and private sectors. They also intersect, with opportunities for action cutting across several areas at once such as workforce development.

For the purposes of this report, we refer to these complex climate areas as “systems” to ensure that we acknowledge and address their interconnected nature. All of these systems are disproportionately impacting communities of color, low-income neighborhoods, and adults over 65 who are exposed to the highest impacts of climate change and too often are left behind in the new opportunities for climate action.<sup>29</sup>

## Climate Systems



Agriculture



Flooding



Nature & Biodiversity



Buildings



Food Security



Transportation



Carbon Removal



Health & Wellbeing



Waste Management



Cities & Infrastructure



Heat & Drought



Water Access



Energy



Industrial Processes



Wildfires

Fifteen systems were examined to reduce our emissions (mitigation) and to reduce our vulnerability (adaptation/resilience). Progress and action are important across all these systems. For example, agriculture, forestry, and the industrial, construction, and manufacturing sectors are all essential to our region, and link to the systems below.

**While there is progress to-date and action to be taken across all systems, we have prioritized five: transportation, buildings, energy, carbon removal, and wildfires.**

These systems have the greatest potential for GHG emissions reduction, economic prosperity, improved resiliency, and an equitable and just transition in Cascadia.

We then identified 14 high impact actions across these systems based on our Cascadia assets, the greatest threats, and opportunities for success through partnerships. There is much to celebrate and learn from the efforts in Cascadia and around the globe. Whenever possible, we have identified best practices.

29. U.S. Environmental Protection Agency, 2021

## Selected Systems and Actions: Potential for Public Private Partnerships (PPP)



### Transportation

- Accelerate the adoption and rollout of medium to heavy duty EVs
- Standardize and expand light duty EV charging infrastructure
- Convene stakeholders across the hydrogen value chain to develop green hydrogen economy
- Expand port partnership including green corridors and electrification of operation
- Partner across sustainable aviation fuel ( SAF ) value chain to turn regional feedstocks into economic assets



### Energy

- Identify and build new renewable energy sources while effectively addressing siting concerns
- Co invest to accelerate R&D and deployment of innovative storage solutions
- Establish cost sharing programs to support shared infrastructure development such as transmission
- Expand mechanisms to increase on site renewable energy generation and storage



### Buildings

- Equitably increase access to cost effective energy solutions for manufacturing, residential, and commercial buildings, including heat pumps and other retrofits
- Reduce peak demand through innovative and optimized demand response strategies in industrial, residential, and commercial buildings



### Carbon Removal

- Invest in and scale proven and promising engineered and nature-based carbon removal solutions



### Wildfires

- Use data driven, low intensity prescribed burns to reduce wildfire fuel loads
- Coordinate data and AI usage across private and public sectors to improve wildfire response effectiveness (e.g., firefighting, evacuation)

**In the following sections, we highlight each of the prioritized systems, state our goal, describe in depth one recommended action for partnership, and provide an example of best practices. In the Appendix, you will find more detail on each of the recommended actions and potential for funding opportunities.**

## SECTION 5

# Time for Action: Transportation



**Representing 42% of Cascadia's GHGs,<sup>30</sup> transportation is our largest contributor to emissions,** and in turn, represents the biggest opportunity for emissions reduction. Within the transportation system, significant emissions come from light, medium, and heavy-duty vehicles, aviation, and sea vessels.

Due to their proximity to air and maritime ports, **neighborhoods, especially low-income communities, are disproportionately impacted by poor air quality**—a negative consequence of the use of carbon-based fuels, such as oil and gas, in transporting goods and people.<sup>31</sup> Switching to clean energy sources would both cut our emissions and contribute to the overall health of historically impacted communities.

The transit system presents near- and long-term economic opportunities. **Every dollar invested in public transit generates five dollars for the local economy.**<sup>32</sup> Looking ahead, sustainable aviation fuel—a priority focus for the airports and airlines in our mega-region—is projected to be a \$450 billion industry by 2050.<sup>33</sup>

Our state, provincial, and local governments have demonstrated their leadership in expanding access to and reducing emissions from public transportation. Through PPPs, there is a unique opportunity in Cascadia to scale access to new technologies, clean fuels, and enabling infrastructure to complement governments' efforts and accelerate progress in specific areas including heavy-duty vehicles, green hydrogen, and sustainable aviation fuels.



### Our Goal:

**Accessible public transit and a less carbon-intensive transportation network connecting the mega-region, and reliably and affordably moving people and goods.**

### Recommendation for Action:

**Standardize and expand passenger and light-duty EV charging infrastructure.**

Laws in WA, OR, and B.C. require all new light-duty vehicle sales to be zero emission by 2035. In 2022, Oregon reached 50,000 electric vehicles (EVs) on the road.<sup>34</sup> Meanwhile, WA reached 100,000 EVs—the second largest EV market share in the U.S.<sup>35</sup>—and B.C. leads all Canadian provinces and territories in EV adoption.<sup>36</sup>

To support an increasing share of electrified passenger cars, we need accessible charging infrastructure. Reliability is key: to drive widespread EV adoption, individuals need to be able to charge their vehicles anywhere they go, just as they have with gas-powered cars historically. This means charging stations need to be readily available, functional, and compatible across EV makes and models.

30. [Government of British Columbia, 2019; Oregon DEQ, 2019; WA Department of Ecology, 2018; BCG Analysis](#)

31. [Air Pollution, Health, and Racial Disparities: Evidence from Ports, 2021](#)

32. [American Public Transportation Association, 2020](#)

33. [IATA, 2022](#)

34. [Portland Business Journal, 2022](#)

35. [Bellingham Herald, 2022](#)

36. [S&P Global Mobility, 2022](#)

Through PPPs, there is an opportunity to collaborate across the EV supply chain to standardize and expand the charging network for light-duty EVs across the mega-region. As of August 2022, OR and WA have applied for \$120 million in funding for the expansion of electric charging infrastructure, which will catalyze a quicker rollout for EV travel on highways and interstates.<sup>37</sup> Through PPPs, stakeholders could align on standards for compatible charging infrastructure across vehicles, coordinate more localized plans to ensure EV chargers are placed with accessibility and equity in mind, identify public and private lands (e.g., in a shopping mall parking lot) for EV placement, and together, maximize the incentives available to consumers to encourage adoption.

Large-scale funding opportunities are available through the Inflation Reduction Act. Through the legislation, individuals can access \$7,500 for new EV purchases and \$4,000 for used EVs, \$2 billion is set aside for domestic EV manufacturing, an additional \$20 billion is available for domestic clean vehicle manufacturing.

British Columbia's CleanBC Go Electric Passenger Vehicle Rebate Program is available on an income-tested basis for households earning less than \$165,000 and provides a maximum rebate of \$4,000 on battery electric and long-range plug-in hybrids. The Government of Canada's rebate program provides a rebate up to \$5,000.

## Spotlight on a Successful Public-Private Partnership (PPP) →

### Smart Columbus

From 2016-2020, the Smart Columbus PPP raised \$270 million to bring innovative and accessible mobility options to the city of Columbus, Ohio. With over 100+ partners, the PPP focuses on several strategies, including catalyzing EV adoption. Businesses provided education on and financial incentives for EV purchases for employees and offered on-site test drives during work hours, and teams worked across sectors to transition public and private vehicle fleets. In the background, partners worked with the local utility to modernize the grid and install hundreds of charging stations. In a matter of years, **Columbus saw a 500% increase in EV adoption and an 1186% increase in the number of charging stations city-wide.**<sup>38</sup>



37. [Oregon DOT, 2022](#); [Washington DOT, 2022](#)

38. [Smart Columbus Playbook, 2022](#)

## SECTION 6

# Time for Action: Energy



Decarbonizing the energy system is a critical component to achieving carbon neutral and negative goals across sectors. While 81% of Cascadia's energy is generated from low-carbon sources (e.g., hydropower)<sup>39</sup>, **energy generation is the second largest driver of emissions in Cascadia.**<sup>40</sup> As we reduce greenhouse gasses and embrace electrification, the need for clean energy is only increasing at a time that the mega-region is facing real challenges on planning and siting of transmission and renewable generation projects to create additional capacity. Fortunately, technology continues to advance to incorporate new long-term and short-term storage to optimize renewable energy capacity.

Ambitious clean energy targets at the state, provincial, and local levels are strong drivers of change, and utilities across Cascadia are leading the way in the energy transition. To complement the efforts underway, PPPs can drive innovation in energy generation and storage, while accelerating the timeline to bring more renewable energy capacity.



### Our Goal:

**100% clean and affordable energy reliably meets increasing demand from population growth and large-scale electrification efforts.**

### Recommendation for Action:

**Identify and build new renewable energy sources while effectively addressing siting concerns.**

As our population grows and the need for electricity also increases, we need a greater supply of on-demand clean, flexible energy. Through a PPP, there is an opportunity to increase the amount of availability of renewable energy through private-sector investment (e.g., purchasing agreements, opting in renewable energy programs through a utility), and for the public sector to provide the regulations, permitting, siting, and financing—including funding available through the Inflation Reduction Act and Canada's various funding sources and incentives. Where limitations exist, the PPP can identify and finance innovative solutions and share their learnings for the benefit of the global climate action community.

39. [Statistics Canada, 2022; U.S. Energy Information Administration, 2022.](#)

40. [Government of British Columbia, 2019; Oregon DEQ, 2019; WA Department of Ecology, 2018; BCG Analysis](#)



## The Danish Government's Climate Partnerships

The Danish government has one of the most ambitious climate goals in the world: by 2030, they aim to reduce their GHGs by 70%. The government has formed 14 public-private partnerships to drive toward this goal, each tasked with outlining how they can contribute to the emissions reduction goal. The partnership focused on energy and utilities has identified recommendations for increasing the creation of renewable energy, ensuring a green transformation in Danish society, and enabling the work of the other partnerships. Among their recommendations is building a roadmap to expand the available renewable generation sources and the transmission infrastructure to support it. One of their big, bold ideas—the creation of energy islands in the windy North and Baltic Seas powered by offshore turbines—is now under exploration. If successful, one energy island could power five million households.<sup>41</sup>



41. [Danish Ministry of Climate, Energy, and Utilities, 2022; Danish Energy Agency, 2022](#)

## SECTION 7

# Time for Action: Buildings



**Buildings represent 15% of Cascadia’s emissions —the third highest emissions impact across systems; 70% of building emissions come from their operations (e.g., cooling, lighting).<sup>42</sup>**

Across Cascadia, governments have enacted some of the strongest energy-efficiency building codes, providing the roadmaps and guidelines needed to decarbonize the building sector.<sup>43</sup> We are building the world's most sustainable commercial and residential buildings<sup>44</sup> and are leading in innovative, green construction such as cross-laminated timber.<sup>45</sup> Canada ranks second in the world for LEED Certified buildings<sup>44</sup> while Washington ranks #2 and Oregon #8 for LEED buildings in the United States.<sup>46</sup>

Energy efficiency retrofits and technologies have the potential for long-term cost savings both in residential homes and businesses. On average, high-efficiency heat pumps can reduce a household heating bill by at least \$780 per year in Oregon and Washington.<sup>47</sup>

Energy efficiency retrofits represent a significant employment opportunity for the region. Washington alone would need to expand its energy efficiency construction workforce by 30,000 individuals to retrofit all residential homes with energy efficient systems in the next decade.<sup>48</sup>

As temperatures change in Cascadia, ensuring equitable access to indoor cooling and heating is essential for preventing premature death among vulnerable residents. During the 2021 heat dome, only 1 of the 54 individuals who died in Multnomah County had access to air conditioning.<sup>49</sup>

At present, some of the energy-efficiency technologies and retrofits are prohibitively expensive for wide-scale adoption. Through PPPs, there is an opportunity to take these options to scale, equitably distributing access to accelerate the adoption and installation of energy-saving and efficiency measures across all building types, industries, and communities.



**Our Goal:**  
**Renewable-powered, energy-efficient commercial and residential buildings are affordable for all.**

**Recommendation for Action:**  
**Equitably increase access to cost-effective energy efficiency solutions for manufacturing, residential, and commercial buildings including heat pumps and other retrofits.**

42. [RMI, 2022](#); [RMI, 2022](#)

43. [The Urbanist, 2021](#)

44. [New York Times, 2022](#)

45. [CA Environmental Journal, 2022](#)

46. [US Green Building Council Top 10 2021](#)

47. [National Renewable Energy Lab, 2017](#)

48. [E4 the Future, 2021](#)

49. [Oregon Public Broadcasting, 2021](#)

While we have the proven technology and innovative building materials needed to reduce emissions, retrofit our buildings to keep us cool during heat waves, and achieve our emissions reduction goals for buildings, many home and commercial building owners are not aware these options exist, and often they are cost-prohibitive to install. For example, heat pumps are electricity-powered dual-heating and cooling systems—a proven, efficient, and effective way to transition a building to clean energy sources, reduce emissions, and achieve thermal comfort for tenants. But for many, installing them is out of reach: in 2022, the average cost of installing a heat pump ranged from \$4,000 to \$7,500 with the U.S. national average around \$5,500.<sup>51</sup>

## Number of Days Above 90 degrees in Seattle<sup>50</sup>

<b>0 Days</b>	<b>2000</b>
<b>2 Days</b>	<b>2010</b>
<b>16 Days</b>	<b>2022</b>
<b>22 Days</b>	<b>2035</b>
<b>30 Days</b>	<b>2050</b>
<b>64 Days</b>	<b>2100</b>

There is an opportunity for new PPPs to develop and implement financing models, from rebate programs to tax credits, to incentivize and offset the costs of heat pump purchases and other energy efficiency retrofits (e.g., installing windows that provide better insulation, induction stoves), making these innovations accessible to all home and building owners. A PPP could build consumer awareness of the available options and benefits to installing energy efficiency solutions in their homes (e.g., long-term reduction in monthly energy bills), centering equity and providing the resources needed for individuals to make smart decisions and purchases that fit their circumstances. For example, while making comprehensive changes would maximize the energy efficiency of a home, there may be a single measure that maximizes an individual's investment while remaining financially feasible.

In addition to existing programs across utility providers and governments, a PPP should leverage the new funding available through the Inflation Reduction Act to accelerate these efforts. Within the legislation, there are \$9 billion in rebates for home electrification and energy efficiency and \$1 billion for improved efficiency in affordable housing.

Rebates and tax incentives are also available for British Columbians to purchase greenhouse gas emissions-reducing equipment and technology, including heat pumps and other home retrofits.

## Spotlight on a Successful Public-Private Partnership (PPP) →

### Bloc Power

In 26 cities, Bloc Power is a leader in implementing energy-efficient building measures at scale, while achieving best-in-class environmental and economic outcomes and lowering construction time and cost. Backed by private investors and spurred by an investment from the U.S. Department of Energy, Bloc Power identifies buildings in underserved areas that would benefit from green retrofits and provides access to no-money-down upgrades for consumers. The retrofits, including heat pumps, are paid for through energy cost savings over time. Through this program, customers see a 20-40% reduction in their energy bill each year. With equity at the forefront of their work, Bloc Power also partners with cities to train and connect worker to jobs in green construction, in turn creating economic opportunities in the communities where they operate. For example, in NYC, they are training 1,500 workers.<sup>52</sup>



50. [NOAA, 2021](#)

51. [Forbes, 2022](#)

52. [BlocPower, 2021](#); [BlocPower, 2022](#)

## SECTION 8

# Time for Action: Carbon Removal



**While removing emissions is absolutely critical, engineered carbon removal has the potential to be an important lever for managing GHG emissions and putting us on the path toward the Paris Agreement goals.** In April 2022, the U.N. Intergovernmental Panel on Climate Change (IPCC) recognized that the deployment of carbon dioxide removal to counterbalance hard-to-abate emissions as “unavoidable.”<sup>53</sup>

Nature-based carbon removal such as restoring forests or conserving wetlands has positive environmental and human impacts, including habitat preservation for native species and improved air, soil, and water quality.<sup>54</sup>

**Some of Cascadia’s greatest natural strengths, including forests, basalt rock formations, and sea water, provide inherent assets for both nature-based and potentially engineered carbon removal.** As we look to these assets, we need to research and understand any potential unintended consequences for new pathways and technologies.

Cascadia's strength of innovation is also an asset to lead the world. The Pacific Northwest National Laboratory is a leader in developing carbon capture technologies that are improving the efficiency, costs, and feasibility of direct air capture. Breakthrough Energy, created by Bill Gates and headquartered in Cascadia, is working to scale technology and speed innovation from lab to market, including a focus on carbon removal. Across innovative start-ups, governments, and academia in Cascadia, new technologies are being developed and solutions are beginning to be deployed more widely. **In the Seattle area, non-profits and companies have committed billions to innovative climate solutions, including carbon removal.**<sup>55</sup>

Use of removed carbon has the potential to be reused by other sectors, which could reduce the carbon footprint of those sectors (e.g., cement production).



### Our Goal:

**Carbon removal slows greenhouse gas emissions, creates economic opportunity locally, and enables the achievement of our 2050 vision.**

### Recommendation for Action:

**Invest in and scale proven and promising engineered and nature-based carbon removal solutions.**

53. [IPCC, 2021](#)

54. [U.S. Forest Service, 2012](#)

55. [Microsoft Climate Innovation Fund, 2022](#); [Amazon's The Climate Pledge, 2022](#); [Breakthrough Energy, 2022](#); [Department of Energy, 2022](#); [Stripe and Frontier, 2022](#)


Carbon removal holds immense promise for removing historical emissions. From proven approaches that are ready to scale, to moonshot ideas seeking demonstration funding, the common roadblock in this system is cost. In 2022, costs ranged \$200-\$600 to remove one ton of carbon dioxide through a technologically mature direct air capture solution; however, the new Inflation Reduction Act creates tax credits for \$180 per ton for projects that capture as little as 1,000 tons of CO<sub>2</sub> per year.<sup>56</sup> For sense of magnitude, we need to remove 10 billion tons of carbon per year by 2050 to make a meaningful dent in addressing GHG through carbon removal, which is why we must focus on reducing emissions first and foremost.<sup>57</sup>

For carbon removal to be viable, we need to invest in what works to achieve economies of scale, while continuing to explore the possibility of other carbon removal approaches that can maximize cost and effectiveness long-term. Coordinating deeper public-private partnerships across the region could leverage pooled funds to take what we know works to scale, while de-risking investments in early-stage technology and attracting additional investment. There is an opportunity to learn from the path to economies of scale that renewables took in recent decades and applying it to this sector.

## Spotlight on a Successful Public-Private Partnership (PPP)

### Merritt E-Fuels

In British Columbia, Huron Clean Energy, Carbon Engineering, Nicola Banda, and Oxy Low Carbon Ventures are designing a commercial-scale carbon removal facility. Captured carbon will be used to produce transportation e-fuels for aircraft, ships, and cars. Powered by clean hydroelectricity, if successful the technology is an option to help reduce emissions in the transportation sector. The Province of British Columbia contributed \$2 million to the design process, and construction is scheduled to begin in 2023.<sup>58</sup>



## E-Fuels innovation in BC turns regional hydro assets into clean aviation fuel

Merritt E-Fuels plant in BC will use water and hydropower to create H<sub>2</sub>, captured carbon is then added to produce synthetic SAF to be blended into traditional jet fuel; partnership between Huron Clean Energy, Carbon Engineering, and BC Province

Partners:



56. [Carbon Capture Coalition on Inflation Reduction Act, 2022](#)

57. [World Resources Institute, 2022](#)

58. [Carbon Engineering, 2021; Government of British Columbia, 2021](#)

## SECTION 9

# Time for Action: Wildfires

**Wildfires comprise 5%-20% of global emissions.**<sup>59</sup> While data is not available specifically for Cascadia, we can reasonably assume wildfires contribute a similar amount. For example, in B.C. in 2018, emissions from wildfires were three times the total provincial emissions from other sources, and in 2020, emissions from wildfires in Oregon were greater than the state's emissions from transportation and energy systems combined.<sup>60</sup>



**Wildfires are threats to Cascadia's infrastructure, economy, and the health of our community.** In 2020, nearly 38 million people in Cascadia were exposed to unhealthy air caused by wildfire smoke; and across the Western United States, wildfire damages were upwards of \$10 billion in 2021.<sup>61</sup> Forest fires not only are damaging to our livelihoods, economy, and environment, but wildfires also eliminate the ability to capture carbon dioxide. In fact, when forests are burned all the stored carbon dioxide is released.

**Cascadia's state and provincial governments are national leaders in wildfire response and prevention and are addressing the intersection of wildfire disasters and forest health.** While we have a strong foundation of wildfire mitigation strategies, the devastation caused by recent wildfires underscores urgency and a need to accelerate the implementation of action plans and adaptation strategies.



### Our Goal:

Through improved detection, response, and management, we build our resiliency to and reduce the impacts of wildfires and smoke.

### Recommendation for Action:

Coordinate data and AI usage across private and public sectors to improve wildfire response effectiveness (e.g., detection, firefighting, evacuation).

Together, PPPs could harness the skills and expertise of the tech sector, academia's research on wildfire patterns, and the public sector's coordination role in wildfire responses to improve wildfire detection and response. By centralizing and building enhanced data collection capacities, and deploying sophisticated modeling technology and AI, we can more accurately and effectively deploy evacuation support, coordinate fire-fighting responses, monitor forest health, and detect and contain fires faster to save lives.

**A recent Microsoft AI for Good Research Lab study demonstrated that machine learning and satellite data can help decision-makers take timely, strategic and effective actions to prevent, detect and suppress wildfires especially if there is deep collaboration between stakeholders.**<sup>62</sup>

59. [Atmospheric Monitoring System, 2021](#); [International Energy Agency, 2022](#); [BBC, 2018](#)

60. [Stanford, 2022](#)

61. [AP, 2020](#); [NOAA, 2022](#)

62. [Microsoft AI for Good Research Lab, 2021](#)

## Spotlight on a Successful Public-Private Partnership (PPP) →

### WIFIRE

Through the WIFIRE project, the U.S. Forest Service, researchers from UC San Diego and Los Alamos National Lab, the County of Los Angeles, the Pyregence Consortium, local utilities, and Salo Sciences have built a sophisticated data storage, management, and visualization platform for fire monitoring and response. Their application can account for wide-reaching factors, from wind-speed to the presence of vegetation near the fire, to more accurately model wildfire events, and to predict, map, and visualize wildfire behavior.<sup>63</sup>



63. WIFIRE, 2022

## SECTION 10

# Actions that Will Place Us on a Better, Brighter Course

The opportunities above are real, tangible actions we can take today—actions that will place us on a better, brighter course for the future.

And, as we make headway, we cannot lose sight of what we must prioritize for the future. To achieve our 2050 vision and a Net Zero reality, we must anticipate the challenges that lie ahead, build the enabling systems and structures to ensure our long-term success, and continue moving toward the big and bold ideas that cannot be implemented overnight.

### We can do this by:

#### **Enacting supportive policies and regulations:**

Public sector legislation, regulations, and action provide direction for climate progress across sectors and in the lives of individual residents. In making new investments and advancing significant policy changes, we must change decades of regulatory frameworks, modernizing them to enable the rapid progress this moment demands, while considering culture changes towards supporting new solutions and technologies. **We need to do it right because well planned implementation can avoid unintended consequences.**



**B.C. placed a price on carbon in 2008, which is broadly supported by economists as the most efficient way to encourage change in energy consumption over time.**

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#### **Bringing more clean, flexible power online:**

From EVs to energy-efficient buildings, access to increased clean electricity is the backbone for our vision of a renewable-powered future. While our electric grid is largely powered by clean, renewable energy sources, we do not have the capacity to meet the dramatic increase in demand that will come with population growth and mass electrification across the transportation and building systems. We must build additional generation, transmission, and storage capacity to enable a future with more electrification.

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#### **Building the green jobs workforce:**

From heat pump technicians to electricians, a clean, renewable-powered future requires new and expanded talent pipelines for building, maintaining, and sustaining our new infrastructure. Partnerships between industry, academia, and the public sector can plan for the workforce of tomorrow. Clean energy and clean tech jobs provide living wages, pathways to upward mobility, and can play an important role in building an equitable, sustainable mega-region.



## Planning for growth, including large-scale projects:

Achieving our 2050 vision requires us to look and plan for a longer time horizon, taking steps today toward big, bold ideas that will take decades to realize and account for the projected mega-regional growth. Action to add renewable energy, build affordable housing across the corridor, and actualize bold multimodal transportation and transit projects like ultra-high-speed ground transportation underscore this point. All of these goals are inextricably intertwined with meeting our climate goals. As we are already doing with ultra-high-speed ground transportation, we must lay the groundwork today, securing funding and conducting feasibility studies, to bring transformative infrastructure to our mega-region and achieve our 2050 vision.



**While we must act today, we must also plan for tomorrow. The priorities above are not exhaustive, but a roadmap for where we must continue to focus in the days, weeks, and years ahead to reach our climate goals.**

## SECTION 11

# There's a Role for Everyone

**Across all climate systems and actions, there is a role for everyone to make impact. As we examined actions across key systems, we found opportunities most ripe for public-private partnership from every stakeholder. From issues like transportation electrification and the installation of heat pumps, we could expedite progress by working together instead of siloes.**

**Academia** can innovate new solutions, conduct actionable research, share expertise, prepare the green workforce, and foster collaboration.

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**Businesses** can accelerate progress to become more energy efficient and mitigate the climate impact of their operations, bring greater rigor to measurement and disclosure, and drive innovation through their work, investments, and procurement.

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**Governments** should invite all stakeholders to modernize policy and regulation that works to achieve the Paris Agreement through guidance, support, and incentives. First Nations and Tribal governments have been leaders and partners in developing strategies and policies, restoring ecosystems, and building resiliency in their communities.

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**Investors** can finance climate projects that are explicit about GHG management and push companies to disclose risks, take abatement action, and build resilience.

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**Individuals** can lead change through their individual actions and as consumers, voters, and leaders.

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**Non-profits, philanthropy, and environmental organizations** can advocate for policy and regulations to advance our work on climate and protect our most vulnerable.



## SECTION 12

# A Call to Action

**Cascadia governments and businesses have long been leaders in setting bold and ambitious climate targets. However, in Cascadia and worldwide, we are falling behind on many of our short-term goals.**

Today, we are at a critical juncture with a necessity for action—and some of the largest barriers that once stood in our way are being removed to create the change we seek. The outlook for funding and advancement of technology have radically changed in the last year. For wind and solar technology, expectations have been exceeded by exponentially bringing down the costs and rapidly deploying energy capacity. We expect similar gains with electrification, new technology across renewable energy, battery storage, buildings, and carbon removal. Once a significant barrier to climate action, the signing of the Inflation Reduction Act—the largest climate investment in the Western World—and the significant federal investments signal the start of a transformative time for bold action. Paired with local, state, provincial, and private funding, the resources for change are available now.

The future we envision for Cascadia is within our grasp. It will take planning, persistence, and importantly, partnership. It will take all of us moving together—individuals and organizations—to address the climate crisis. We are confident that Cascadia is up to the task. Through collective action, the bedrock of who we are as a mega-region, we can address the climate crisis locally while thinking globally. We can envision a future where everyone shares in new, and eventually commonplace, experiences: 100% renewable homes and buildings, ultra-high-speed transportation connected with accessible public transit, and smoke-free summers.

The moment is urgent, but the crisis is solvable. We have new emerging technology—it is a matter of harnessing and scaling it, while continuing to innovate and imagine what might be possible ahead. We have the funding, with once-in-a-generation investments on the table to accelerate action. And importantly, we have the willpower, the ingenuity, and the proven potential.

From creating the modern airplane to launching the future of the personal computer and online shopping, historical precedent tells us that in Cascadia we make the seemingly impossible possible—and we can and will achieve our goal to become the first sustainable mega region in the world through partnerships.



## APPENDIX

# Overview of Recommendations for Highest Impact Actions & Roadmap for Funding & Scaling Public-Private Partnerships

The report highlighted five key areas of focus for Cascadia and 14 recommended high-impact actions across these systems for climate action based on our Cascadia assets, the greatest threats, and opportunities for success through partnerships. While the report looked deeper at five of the high-impact actions, below is a summary of each of the recommendations along with examples of ongoing actions in Cascadia.

Understanding financing has been a significant barrier to scale these specific recommendations, we identified a roadmap for new funding opportunities available through state, provincial, and federal sources. There is a range of opportunities for residents, businesses, academia, utilities, and local governments, which makes public-private partnerships an ideal opportunity to fully leverage funding.

In B.C., two of the largest funding sources that exist are Canada's Infrastructure Bank, which is prioritizing green infrastructure, clean power, public transit, trade and transportation and broadband infrastructure,<sup>1</sup> and CleanBC,<sup>2</sup> which provides a roadmap and funding across many climate initiatives.

In 2021, the U.S. Congress passed the Infrastructure Investment and Jobs Act (IIJA), and in 2022, Congress passed the Inflation Reduction Act (IRA)—both have significant components to support new climate investments. A recent report<sup>3</sup> analyzing the Inflation Reduction Act from the Center for American Progress, C40, and Evergreen Action highlighted many of the funding opportunities for state and local governments under these pieces of legislation.

## Transportation

### Recommendation: Accelerate the adoption and rollout of medium-to-heavy duty electric vehicles

**Summary:** Nationwide, medium- and heavy-duty vehicles account for less than 5% of the vehicles on the road but produce over 20% of the emissions from the transportation sector, which currently accounts for more than one-third of U.S. green-house gas emissions.<sup>4</sup> Efforts should be coordinated across policymakers, public utilities, EV manufacturers, and purchasers across the public and private sector, to use medium-to-heavy duty EVs, build associated infrastructure, and share best practices. The private sector can coordinate technology use cases to standardize charger specs, and form buying clubs to decrease the collective costs.

**Ongoing Actions in Cascadia:** Washington and Oregon have adopted the Advanced Clean Trucks Rule, which will increase the number of zero-emission medium and heavy-duty vehicles.<sup>5</sup> Across all jurisdictions, partnerships are forming to create new opportunities for scaling the use of medium-to-heavy-duty vehicles, which present more challenges than light duty vehicles. King County recently announced its first battery-electric heavy-duty truck manufactured at Kenworth's assembly plant in Renton, WA.<sup>6</sup> In B.C., the CleanBC Go Electric Advanced Research and Commercialization (ARC) program is investing in companies that are creating components for heavy duty zero emission vehicles.<sup>7</sup>

**Key Funding Opportunities:** In B.C., the CleanBC Heavy Duty Vehicle Program, funded by the Province of British Columbia, offers rebates of up to 50% of costs for eligible equipment, to a maximum of \$15,000 per vehicle or \$100,000 per fleet.<sup>8</sup> The IRA provides \$1 billion in grants and rebates for states and municipalities up to 100 percent of the cost of purchasing eligible zero-emission heavy-duty vehicles and infrastructure to charge, fuel, or maintain those vehicles.<sup>9</sup> The IIJA provided \$5.6 billion for funding to state and local governments for the purchase or lease of zero-emission and low-emission transit buses.

1. [Canadian Infrastructure Bank, 2022](#)

2. [CleanBC, 2022](#)

3. [Center for American Progress, 2022](#)

4. [Department of Energy, 2022](#)

5. [Washington Department of Ecology, 2021; Heavy Duty Trucking, 2022](#)

6. [King County, 2022](#)

7. [Government of British Columbia, 2022](#)

8. [BC Trucking Association, 2022](#)

9. [RMI, 2022](#)

## Recommendation: Standardize and expand light-duty electric vehicle charging infrastructure (See Page 14 in the report)

**Summary:** Collaborate across the supply chain with charger and vehicle manufacturers to standardize and expand regional EV charging networks for light-duty EVs, working to establish consistent technology with appropriate regulation. Effective implementation includes engaging with the public sector to identify key rollout coordination opportunities such as the equitable deployments across public spaces, worksites, or destinations, education on consumer incentives, consistent charging infrastructure, and an equitable implementation of funds.

**Ongoing Actions in Cascadia:** Laws in WA, OR, and B.C. require all new light duty vehicle sales to be zero emission by 2035. In 2022, Oregon reached 50,000 electric vehicles (EVs) on the road.<sup>10</sup> Meanwhile, WA reached 100,000 EVs—the second largest EV market share in the U.S.<sup>11</sup>—and B.C. leads all Canadian provinces and territories in EV adoption.<sup>12</sup>

**Key Funding Opportunities:** As of August 2022, OR and WA have applied for \$120 million in funding for the expansion of electric charging infrastructure, which will catalyze a quicker rollout for EV travel on highways and interstates.<sup>13</sup> Large-scale funding opportunities are available through the Inflation Reduction Act. Through the legislation, individuals can access \$7,500 for new EV purchases and \$4,000 for used EVs, \$2 billion is set aside for domestic EV manufacturing, and additional \$20 billion is available for domestic clean vehicle manufacturing.

In B.C., the federal government is offering up to \$5,000<sup>14</sup> and the province offers up to \$4,000 towards electric vehicles.<sup>15</sup> The provincial and federal governments also offer rebates for the installation of electric vehicle charging infrastructure in single-family and multi-family dwellings as well as business locations.

## Recommendation: Convene stakeholders across the hydrogen value-chain to develop green hydrogen economy

**Summary:** Renewable hydrogen offers a unique opportunity to address the challenges of climate change while creating good-paying jobs across Cascadia. Stakeholders should convene across the value chain to develop a green hydrogen economy from production to final use as advanced fuels in industries such as maritime and aviation industries. Research and development are a key space for public and private support and funding, with a need for coordination across the value chain.

**Ongoing Actions in Cascadia:** All three jurisdictions are poised for collaboration on green hydrogen. In 2021, BC became the first province in Canada to release a comprehensive hydrogen strategy which includes 63 actions for government, industry, and innovators to scale up production, create regional hubs, and deploy fuel cell vehicles.<sup>16</sup>

In 2022, Washington and Oregon began collaborating on the Pacific Northwest Hydrogen Association, which is a public-private, regional non-profit organization. Formed to pursue the US Department of Energy's (DOE) hydrogen hubs funding opportunity, the goal is to create a Pacific Northwest focused hydrogen hub to usher in a clean hydrogen economy and develop the infrastructure required to underlie the clean energy transition.<sup>17</sup>

**Key Funding Opportunities:** BC is supporting at least \$10 million in investments over the next three years to develop policy to advance the hydrogen economy. With \$105 million in seed funding from governments and the private sector, the B.C. Centre for Innovation and Clean Energy is investing in multiple clean energy projects and innovations, including efforts to develop low-carbon hydrogen in British Columbia. The IJA included a \$8 billion competitive program to develop a limited number of regional clean hydrogen hubs (H2Hubs) across America. Hubs will create networks of hydrogen producers, consumers, and local connective infrastructure to accelerate the use of clean hydrogen, including innovative uses in the industrial sector.<sup>18</sup>

10. [Portland Business Journal, 2022](#)

11. [Bellingham Herald, 2022](#)

12. [S&P Global, 2022](#)

13. [Oregon DOT, 2022; WSDOT, 2022](#)

14. [Government of Canada, 2022](#)

15. [CleanBC, 2022](#)

16. [Government of British Columbia, 2021](#)

17. [Pacific Northwest Hydrogen Hub, 2022](#)

18. [Department of Energy, 2022](#)

## Recommendation: Expand port partnership including green corridors and electrification of operation

**Summary:** Shipping, maritime, and aviation are difficult industries to decarbonize. However, our Ports are collaborating to share best practices for emerging technology, create green shipping corridors, and engage the private sector for emissions data sharing. There is additional opportunity for port operators to invest in electrification of cargo-handling equipment and for ship operators to track and share GHG emission data at scale.

**Ongoing Actions in Cascadia:** Across WA, OR, and B.C., the major maritime ports and airports have long collaborated on sustainability efforts and have detailed action plans toward reaching net zero across their operations. In 2022, the Port of Seattle, Vancouver Fraser Port Authority, and leading global cruise lines, along with other partner organizations others announced a new commitment to explore the feasibility of the world's first cruise-led green corridor.<sup>19</sup>

**Key Funding Opportunities:** The IRA includes \$3 billion for a new grant program to install electrified equipment and reduce emission at ports, and the IIJA broadly invests \$17 billion in port infrastructure and \$25 billion in airports to address repair and maintenance backlogs, reduce congestion and emissions near ports and airports, and drive electrification and other low-carbon technologies. The Investing in Canada plan, launched in 2016, is a \$180 billion 12-year investment initiative expanding infrastructure across Canada, including those which reduce GHG emissions and advance sustainability. Canada's \$4.6 billion National Trade Corridors Fund helps fund infrastructure projects across the country, including at airports, ports, railways, and transportation facilities.

## Recommendation: Partner across sustainable aviation fuel (SAF) value chain to turn regional feedstocks into economic assets

**Summary:** Nationally, aviation makes up 9-12% US Transportation GHG emissions,<sup>20</sup> and our region has an opportunity to develop new SAF pathways. Through many of the ongoing partnerships in Cascadia, stakeholders across supply chain and mega-region should convene to aggregate demand at airports, coordinate supply, and increase capacity through turning local forestry waste and municipal solid waste into economic assets.

**Ongoing Actions in Cascadia:** Cascadia has many SAF partnerships in-flight focused on research, operations, and implementation. Research includes Washington State University, which co-leads the FAA Center of Excellence for Alternative Jet Fuels and Environment (ASCENT), and the Port of Seattle and King County announced a new partnership to focus on the feasibility of converting municipal waste to renewable fuels.<sup>21</sup>

More partnerships and action plans are emerging as well. In 2022, the Canadian Council for Sustainable Aviation Fuels launched, which includes Alaska Airlines, Air Canada, Boeing, Vancouver Airport Authority, University of British Columbia, Carbon Engineering, and many other British Columbia-based businesses,<sup>22</sup> and a roadmap for scaling SAF in Canada has been developed.<sup>23</sup>

**Key Funding Opportunities:** The IRA created a new Alternative Fuel and Low-Emission Aviation Technology competitive grant program, which is the first-ever large-scale grant program dedicated to scaling up the production of SAF in the United States. The IRA allocates \$297 million over five years to the program and addresses some of the largest barriers to SAF deployment, including the need for investments in new production and blending facilities, expanded feedstock production, and ramping up fuel certification. In addition, the IRA Creates tax credits starting at \$1.25 per gallon for blenders that supply SAF with 50 percent or greater lifecycle emissions reductions compared to conventional jet fuel.<sup>24 25</sup>

19. [Port of Seattle, 2022](#)

20. [Department of Energy, 2022](#)

21. [Port of Seattle and King County, 2021](#)

22. [Canadian Council for Sustainable Aviation Fuels, 2022](#)

23. [Deloitte, 2022](#)

24. [Third Way, 2022](#)

25. [U.S. Commerce Committee, 2022](#)

### Recommendation: Identify and build new renewable energy sources while effectively addressing siting concerns (See Page 16 in the report)

**Summary:** As the need for electricity increases to meet the demand from additional electrified systems and growth, we need a greater supply of on-demand clean, flexible energy. There is an opportunity to increase the availability of renewable energy through private-sector investment, such as purchasing agreements or opting into renewable energy programs through a utility provider. At the same time, the public sector must provide the regulations, permitting, siting, and financial incentives.

**Ongoing Actions in Cascadia:** As new technology is developed, additional large-scale wind and solar projects continue to come online across Cascadia. For example, one of the largest solar energy facilities in Oregon received final approval in 2022 after years of legal battles and would be among the seven approved in the state since 2017.<sup>26</sup> British Columbia's Site C Clean Energy Project is on track to be completed in 2024 and will provide enough energy to power the equivalent of about 450,000 homes per year in B.C.

**Key Funding Opportunities:** One of the largest opportunities of the IRA are the new investments in renewable opportunities. The IRA offers tens of billions of tax credits for deploying solar panels, wind turbines, and qualified storage facilities; more than \$10 billion in tax credits to build new clean technology facilities; and roughly \$30 billion in targeted grant and loan programs for states and electric utilities to accelerate the transition to clean electricity. The Canada Infrastructure Bank, through their low-cost financing and risk balancing, support large scale renewables, district energy systems, and energy storage projects to help grow the availability of clean, reliable energy. Canada's Low Carbon Economy Fund invests in projects that generate clean growth, reduce greenhouse gas emissions, support climate action, and energy efficiency.

### Recommendation: Co-invest to accelerate R&D and deployment of innovative storage solutions

**Summary:** A key to matching a higher level of renewable energy is storage capabilities. Long duration energy storage—defined as systems that can store energy for more than 10 hours at a time—would support a low-cost, reliable, carbon-free electric grid. Cheaper and more efficient storage will make it easier to capture and store clean energy for use when energy generation is unavailable or lower than demand.

**Ongoing Actions in Cascadia:** In 2013, BC Hydro launched the first of its kind in Canada battery energy storage project. In recent years across Cascadia, additional energy storage projects of all sizes are coming online and in the planning stages.

**Key Funding Opportunities:** One of the largest opportunities across the Canadian Infrastructure Bank, the IRA, and IJJA are the new investments in renewable opportunities, including long-duration energy storage. The IJJA included \$505 million for the long duration energy storage initiative.<sup>27</sup> The IRA offers tens of billions of tax credits for deploying solar panels, wind turbines, and qualified storage facilities; more than \$10 billion in tax credits to build new clean technology facilities; and roughly \$30 billion in targeted grant and loan programs for states and electric utilities to accelerate the transition to clean electricity. Another key program is the \$3 billion expansion of the Smart Grid Investment Matching Grant Program, focuses on actions like deploying energy storage.

In 2021, the Governments of Canada and the B.C. government along with Shell invested \$35 million each to create a public-private partnership to focus on battery technology, carbon capture, distribution of hydrogen, biofuels (marine and aviation), and many other areas.

<sup>26</sup>. [Oregon Capital Chronicle, 2022](#)

<sup>27</sup>. [Department of Energy, 2022](#)

The Strategic Innovation Fund aims to spur Canadian innovation by providing funding for large projects and national innovation ecosystems. SIF provides funding for business innovation and growth, as well as collaborations and networks, including partnerships between academic, non-profit organizations and the private sector. Current investment priorities include projects that support Canada's greenhouse gas emissions reduction targets and its 2050 net zero emissions goals.

Low Carbon Economy Fund invests in projects that generate clean growth, reduce greenhouse gas emissions, support climate action, and energy efficiency.

## Recommendation: Establish cost sharing programs to support shared infrastructure development such as transmission

**Summary:** Electricity transmission is key to our decarbonization efforts by creating the infrastructure to distribute clean energy. The transmission system in Cascadia must be expanded to integrate new renewable energy resources and protect against operational, environmental, and cyber threats to reliability. The National Academies of Science estimates American transmission capacity needs to grow by 60 percent this decade to put the country on track for net-zero emissions by midcentury.<sup>28</sup> Industry and the private sector at large should deepen their collaboration on contribute to major infrastructure development projects, including improvements to electric transmission capacity.

**Ongoing Actions in Cascadia:** The BC Hydro North Montney Region transmission line project is one example that allowed industry in the North Montney region to make collective contributions to the cost of extending transmission lines to bring clean hydroelectricity to the area, which would allow industry in the area to decarbonize.<sup>29</sup>

**Key Funding Opportunities:** Under IIJA, DOE created a \$2.5 billion Transmission Facilitation Program for DOE to help develop nationally significant transmission lines, increase resilience by connecting regions of the country, and improve access to cheaper clean energy sources, and expanded by \$3 billion upgrades to existing transmission and distribution systems.

## Recommendation: Expand mechanisms to increase on-site renewable energy generation and storage

**Summary:** With more sustainable buildings being created in Cascadia, we can create more on-site renewable energy that powers individual buildings or even blocks. While connected to the larger energy grid, it provides an opportunity to operate on its own using local energy generation at peak demand or in times of crisis like storms or power outages.

**Ongoing Actions in Cascadia:** Across Cascadia, more industrial, commercial, and multi-family buildings are being created or retrofitted with on-site renewable energy and storage capabilities.

In Spokane, a cross-industry team connected a series of buildings in the South Landing “Eco-District” where energy is generated through rooftop solar panels, and batteries and thermal energy storage devices manage the energy across buildings with thousands of sensors and next-generation technologies.<sup>30</sup>

Individual buildings are also seeing new on-site generation. Seattle City Light created a microgrid installation at a community center with a battery energy storage system, solar panels, and microgrid controls, which will provide power to keep the center's services and communications operational in an emergency.<sup>31</sup> In B.C., the First Nations Clean Energy Business Fund supported a series of renewable energy projects including a new solar project at a health center.<sup>32</sup>

28. [National Academies of Sciences, Engineering, and Medicine, 2021](#)

29. [BC Hydro, 2022](#)

30. [Catalyst Spokane, 2022](#)

31. [City of Seattle, 2022](#)

32. [Government of BC, 2022](#)



### **Recommendation: Equitably increase access to cost effective energy solutions for manufacturing, residential, and commercial buildings, including heat pumps and other retrofits (See Page 18 in the report)**

**Summary:** Energy efficiency retrofits and technologies have the potential for long-term cost savings for residential homes, businesses, and in manufacturing. A new study found that the Pacific region would benefit most from heat pump systems with emission reductions forecasted to be 76–81% for CO<sub>2</sub>.<sup>33</sup> On average, more efficient, electricity-powered heating systems can reduce a household heating bill by \$350 per year. At present, some of the energy-efficiency technologies and retrofits are prohibitively expensive for wide-scale adoption.

**Ongoing Actions in Cascadia:** Nearly every utility offers energy efficiency programs; however, new rebate and incentives programs are being created across levels of local, regional, state and provincial government. For example, after the 2020 and 2021 heat waves, Oregon created a new grant and rebate program in 2022.<sup>34</sup>

**Key Funding Opportunities:** Within the IRA, there is \$4.3 billion for home energy performance-based, whole-house rebates, \$4.5 billion for the high-efficiency home electric rebate program in formula grants, including \$4.275 billion to states and \$225 million to tribes. The IRA also provides \$145.5 million for tribal electrification through the U.S. Bureau of Indian Affairs, which may be used for repairs, retrofits, energy transition, and electrification of tribal homes into zero-emissions energy systems.<sup>35</sup> To assist small businesses, commercial building owners can receive a tax credit up to \$5 per square foot to support energy efficiency improvements that deliver lower utility bills.<sup>36</sup>

In British Columbia, CleanBC Building Innovation Fund provides incentives to B.C. manufacturers and technology developers to commercialize and demonstrate new energy-efficient and low-carbon building technologies, designs, and practices. The CleanBC Commercial Express program provides support to building owners and operators in their efforts to reduce GHG emissions in their existing commercial buildings with incentives up to \$100,000. Rebates and tax incentives are also available for British Columbians to purchase greenhouse gas emissions-reducing equipment and technology, including heat pumps, home retrofits, home charging stations and electric vehicles. Canada's Infrastructure Bank, through their Building Retrofits Initiative provides financing for energy retrofit projects.

### **Recommendation: Reduce peak demand through innovative and optimized demand response strategies in industrial, residential, and commercial buildings**

**Summary:** Demand response technology provides an opportunity for consumers and/or utilities to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage during peak periods. In Cascadia, the private sector is developing demand response technology, partnering with utilities and energy companies to implement and scale usage across their customers. Government can also provide financial incentives or policies to aid programs.

**Ongoing Actions in Cascadia:** Utilities across the region have created pilots to manage electricity peaks across the region. For example, Portland General Electric (PGE) partners with Google's Rush Hour Rewards Program to provide customers will low-cost Nest Thermostat via a rebate program.. PGE predicts peak hours during which Nest Thermostats automatically adjust temperatures to reduce demand. FortisBC has created a new Peak Saver Pilot to adjust thermostats, water heaters, or electric vehicles chargers when energy consumption is the highest.<sup>37</sup>

<sup>33</sup>. [Science Direct, 2022](#)

<sup>34</sup>. [Oregon Department of Energy, 2022](#)

<sup>35</sup>. [Center for American Progress, 2022](#)

<sup>36</sup>. [White House, 2022](#)

<sup>37</sup>. [FortisBC, 2022](#)

## Carbon Removal

### Recommendation: Invest in and scale proven and promising engineered and nature-based carbon removal solutions (See Page 22 in the report)

**Summary:** At scale, engineered carbon removal has the potential to be an important lever for managing greenhouse gas emissions and putting us on the path toward the Paris Agreement goals. Some of Cascadia's greatest natural strengths, including forests, basalt rock formations, and sea water, provide inherent assets for both nature-based and engineered carbon removal. Forests along the West Coast house a third of all stored carbon storage in the U.S.

**Ongoing Actions in Cascadia:** Across Cascadia, there are ongoing efforts to research and scale carbon removal. Innovative research efforts across major universities have been ongoing and entities like Pacific Northwest National Laboratory began its work more than a decade ago to expand expertise and investments in point source capture technologies including direct air capture. Breakthrough Energy—based in Kirkland, WA— is working to scale technology and speed innovation from lab to market, including a focus on carbon removal.

In British Columbia, Huron Clean Energy, Carbon Engineering, Nicola Banda, and Oxy Low Carbon Ventures are designing a commercial-scale carbon removal facility. Captured carbon will be used to produce transportation e-fuels for aircraft, ships, and cars.

**Key Funding Opportunities:** In 2022, costs ranged from \$200-\$600 to remove one ton of carbon dioxide through technologically mature direct air capture solutions; however, the IRA creates tax credits for \$180 per ton for projects that capture as little as 1,000 tons of CO<sub>2</sub> per year.<sup>38</sup> The IIJA also provided more than \$10 billion for carbon capture and direct air capture and industrial emission reduction.<sup>39</sup>

At the British Columbia Center for Innovation and Clean Energy, one of the focuses of the public-private partnership is carbon capture.

38. [Carbon Capture Coalition on Inflation Reduction Act, 2022](#)

39. [Department of Energy, 2021](#)

## Wildfires

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### **Recommendation: Use data-driven, low-intensity prescribed burns to reduce wildfire fuel loads**

**Summary:** Controlled fires are set by forest services and large private landowners to clear dead and dying forestry with the goal to build resilience. The private sector can share data and technology to identify vulnerable forest land and favorable weather conditions, and coordinate burns on public land. Furthermore, government can establish guidelines & approve process for private sector-led burns, similar to California's Vegetation Management Program (VMP).

**Ongoing Actions in Cascadia:** B.C., Oregon, and Washington have restarted prescribed burns to manage fuel loads.

**Key Funding Opportunities:** Washington and Oregon will receive approximately \$39 million each through the IIJA to reduce the risk of wildfires. To reduce wildfires in higher-risk communities, the B.C. government is providing \$25 million in new funding to the Forest Enhancement Society of BC (FESBC), which is a component of a new historic investment of \$359 million to protect the province from wildfires including prescribed burns.<sup>40</sup>

### **Recommendation: Coordinate data and AI usage across private and public sectors to improve wildfire response effectiveness e.g., firefighting, detection, evacuation (See Page 22 in the report)**

**Summary:** By centralizing and building enhanced data collection capacities, and deploying sophisticated modeling technology and AI, we can more accurately and effectively deploy evacuation support, coordinate fire-fighting responses, monitor forest health, and detect and contain fires faster to save lives.

**Key Funding Opportunities:** The IIJA included \$30 million in funding for wildfire detection including real time monitoring equipment and satellite program for detection.

<sup>40</sup>. [Government of British Columbia, 2022](#)