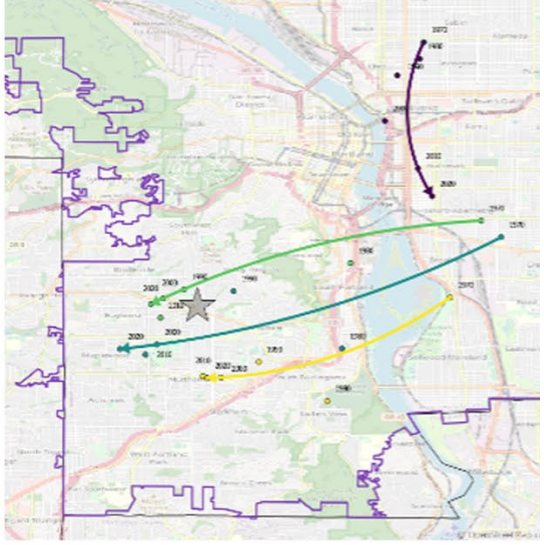

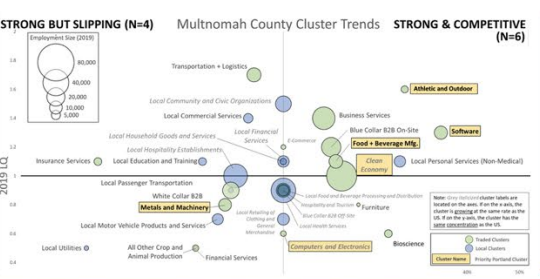

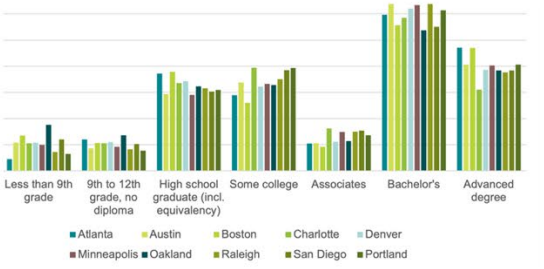

Portland's Inclusive Economic Growth Plan

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Hundreds of people and organizations contributed to the creation of this Plan. Please see the separate Appendix for Acknowledgments.

This document and the plans expressed in it are intended to be consistent with applicable local, state, and federal laws, and should be read and interpreted accordingly. Nothing in this document should be understood to require or permit Prosper Portland to take any action in conflict with applicable law.

I. EXECUTIVE SUMMARY

We live in rapidly changing times: the Fourth Industrial Revolution, the pressures of climate change, growing inequality, the effects of the pandemic. Portland led the way into the first phases of the next economy, prospering but also suffering unintended consequences of growth. It has remarkable assets from which to build, but has now arrived at a critical juncture: it must chart a new vision and course to navigate the changing dynamics of economic growth.

"Portland's Inclusive Economic Growth Plan" presents an ambitious plan for Portland to develop into a next generation model for inclusive and sustainable economic growth in the emerging economy. Before proposing a set of strategies to do so, the report first summarizes a market analysis of Portland's industries, human capital, innovation activities, built environment and institutions. Key market analysis findings include:

- Portland's institutional infrastructure is highly politicized, partisan and fragmented. There is a need to reset the table, to rebuild cross-sector networks[1] that enable the flow of ideas and deals. For the private sector, this means growing business leadership and engagement in 21st century (as distinct from traditional) economic development. For the public sector, charter reform has created an opportunity to build new cross-sector relationships across the region, as well as to better conceive, coordinate and manage new economic development initiatives.
- There is opportunity to build upon legacy industry strengths to pursue new high-growth opportunities. Portland's legacy "green" services strengths can be leveraged to make Portland the place where new green products are invented and commercialized – ranging from low-carbon materials, to products to support the smart grid and EVs, to products created from recyclables and waste, to sustainable food product R&D.[2]
- There is also opportunity to scale existing programs to accelerate industry growth, some of which are working well but are under-resourced or under-connected. This could include, for example, scaling training programs for clean economy manufacturing;[3] accelerating innovation at the intersection of athletic apparel and tech;[4] and deepening resources provided to scale small businesses.[5]
- BIPOC and underserved communities are not efficiently matched with high-growth career pathways. Solutions range from improving the alignment of employer and trainer/educator practices, developing employer-led workforce initiatives around specific sectors, or improving employer hiring and training practices.
- While many resources are in place to support a culture of innovation and entrepreneurship, there is no large-scale research university or innovation hub systematically and strategically focused, at scale, on major innovation opportunities, and helping provide navigation and coordination functions among existing resources. There is opportunity to significantly scale university research outputs (and their commercialization), or to support collaborative innovation efforts underway such as the Clean Industry Hub. Entrepreneurship can be scaled, including with more targeted, culturally-specific support for BIPOC entrepreneurs and small businesses.
- The distribution of jobs and workers has been widening across the region (particularly for Black residents), and the center of economic activity has been shifting away from downtown Portland and towards growing economic hubs in nearby suburbs. Efforts to close this distribution include

[1] That are inclusive, cross-sector, both formal and informal.
[2] And, the region's strong software workforce has the potential to be re-deployed to support innovation within these emerging industries.
[3] e.g., OMIC Training Center
[4] e.g., Oregon Bioscience Incubator
[5] E.g., Inclusive Business Resource Network

targeting cluster-based business growth and job creation near high-access locations, and locating major economic investments near underserved areas.

The externalities associated with under-managed growth – particularly increased wealth inequity, air pollution, carbon emissions, houselessness and crime – aggravated by COVID, present fundamental short- and long-term challenges, and have severely undermined downtown. But given Portland's changing role in the region, there is an opportunity to reimagine the downtown area and its place in the broader region.

Building from the market analysis of Portland's industries, human capital, innovation activities, built environment and institutions, the report articulates a vision (see box) and set of high-level objectives for the region.

VISION

Portland will become a model 21st century city which targets and manages growth well, aligning economic growth with equity and climate resiliency to provide a prosperous, vibrant, healthy place for all Portland residents and businesses. It will support and attract companies that are leading the way in long term, stakeholder, value creation approaches which encompass inclusion, sustainability and broader corporate engagement. It will be a national leader in the invention and commercialization of "green" products, as well as in their use.

This report identifies strategic opportunities to align regional economic growth with – indeed drive growth through – inclusion and climate action; aims to inform and adjust the complementary roles of markets and government towards "democratic" capitalism; focuses on the need to target and manage growth more deliberately, particularly to avoid unintended negative effects; and highlights the need to "reset the table" and create more and different, cross-sector institutional governance capacity. Strategic opportunities to do this include:

1. Growing "good" businesses in the region
2. Engaging the private sector in developing and implementing economic development initiatives
3. Developing next-economy education, training and hiring systems
4. Providing stage- and industry-specific scale-up support for businesses
5. Complementing this support with industry-specific financial products
6. Growing the region's production of "green" products and services
7. Building the region's R&D and commercialization strengths, particularly as they relate to materials innovation
8. Inclusively growing high-growth-potential industries
9. Revitalizing downtown
10. Growing the export potential for locally produced products and services, particularly those that have the ability to address climate change

Implementing these mutually-reinforcing strategies to execute upon the vision is, of course, more easily said than done. However, Portland has been a "first mover" in the past and, if it can reset the table and discussion, has the critical pieces in place from which to realize its vision of a prosperous, sustainable, inclusive 21st century city.

II. INTRODUCTION

Project Approach

Purpose and Scope

This document presents an ambitious economic growth plan for Portland.[6] The plan envisions Portland becoming a model 21st century city which targets and manages growth well, aligning economic growth with equity and climate action[7] to provide a healthy, vibrant, prosperous place for Portland residents and businesses. Building from analysis of the region's current assets, challenges and opportunities, the plan suggests an array of complementary strategies for moving towards realization of this vision.

As an **economic growth** plan, it does *not* address many of the other challenges that Portland is facing today – as important as they are.[8] For instance, the plan does not address preconditions to growth, such as public safety or quality K-12 education. Nor does it address near-term crises such as mental health and houselessness.[9] Rather, the plan focuses on another fundamental subject – including to addressing these and other challenges – **the economics**. You must get the economics right in order to have jobs for the people receiving job training; business opportunities to create wealth for entrepreneurs; and income and wealth to support home ownership, demand for retail and other amenities, personal stakes in communities, public goods and quality of life.

The focus on ***economic growth*** also means there will be areas of equity and climate action which are beyond the scope of the plan. While this is not a comprehensive equity nor climate change plan, it is a plan that seeks to promote economic growth which is driven by inclusion and achieves greater climate resiliency – presenting a new path forward for 21st century cities.

Why Growth?

Given the seemingly anti-growth sentiments of some Portland constituencies, it is worth stepping back to assess why cities should aim for economic growth as a goal at all.

Fundamentally, economic growth creates the goods, services, and resources that provide quality of life. Successful businesses, good jobs, appreciating real estate and other vehicles for income and wealth creation enable individual choice and growth, as well as resources to address challenges and provide public goods. Growth, particularly inclusive growth, also provides the best pathway for addressing poverty,[10] and will be necessary to provide the resources to transition to climate sustainability and address climate change impacts. At a more intuitive level, few people or businesses prefer to be *less* prosperous.

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[6] *"Greater Portland" or "Portland MSA" refers to the entire metro area, and "City of Portland" or "Portland" refers to the City throughout the report; "regions" refer to metropolitan regions.*

[7] *"Climate action" and "climate resiliency" are used as shorthand throughout to refer to both climate mitigation (as in reducing causes of climate change) and adaptation (as in addressing effects). "Climate-centered growth" is used to refer to the alignment of climate action/resiliency and economic growth.*

[8] While the plan does not itself seek to address these challenges, it does highlight their importance and the need for coordinated remedies.

[9] These issues are touched on in this report only to the extent that the interventions have direct ties to growth interventions. In addition, the report emphasizes the importance of collaborating with other agencies to address these in tandem with implementation of growth strategies.

[10] See, Weissbourd and Bodini, "Market-Based Community Economic Development." March 2005. http://rw-ventures.com/wp-content/uploads/2017/01/Market-Based-Development.pdf.

Furthermore, as dynamic systems, economies are always in motion: people and businesses continuously arrive and die, come and go. Particularly in this economy, a period of dramatic "creative destruction" is underway, causing major disruption in labor and business markets, but also leading to enormous new value creation and economic opportunity.[11] "Standing still" is not an option (or, put differently, even simply to "stand still" requires the constant development of new people and businesses).

Not only can't regions stand still, but those places that fail to deliberately plan for next economy growth will fall further behind – will shrink. As next economy assets benefit from concentrating in metropolitan regions, those who deliberately nurture and build upon these assets are pulling further ahead. Places that were behind tended to naturally catch up in the industrial economy (as labor and capital hit diminishing returns in successful places and looked for new markets), but now divergence is occurring as the places that get ahead tend to move further ahead (since knowledge assets do not have the same diminishing return characteristics).[12] The changing dynamics of growth mean that growth no longer takes care of itself; it must be deliberately managed.

> "The perception of people in most city agencies and in community associations is that profit is amoral."
>
> *- Real estate professional*

Digging deeper into anti-growth sentiments, the opposition to economic growth is often not an issue with growth itself but with the negative effects that can accompany growth. The opposition reflects observations – which historically have often been true – that economic growth and equity, or economic growth and climate resiliency, are at odds. Or opposition reflects observations that growth has not been managed well to prevent negative effects (e.g., unaffordability, inequality, crime, air pollution, climate change). This plan suggests that whether or not achieving growth and equity once required trade-offs, that is no longer the case.[13] While the complete alignment of growth and climate resiliency is still a work-in-progress, the plan suggests major steps in this direction; indeed, that Portland become one model for this alignment. Finally, Portland of course needs to better manage the negative effects of growth it is now experiencing, while charting a growth trajectory that prevents those effects from recurring.[14]

[11] Paul C Brophy, Robert Weissbourd, and Andy Beideman, Transformative Economies: Emerging Practices for Aligning Growth and Inclusion, Federal Reserve Bank of Philadelphia, October 2017. http://rw-ventures.com/wp-content/uploads/2017/12/Transformative_Economies_Philadelphia_Fed_final.pdf

[12] Weissbourd, Robert and Christopher Berry, *The Changing Dynamics of Urban America*, Online Publication: 2004. http://rw-ventures.com/wp-content/uploads/2017/01/Changing-Dynamics-report.pdf

[13] Paul C Brophy, Robert Weissbourd, and Andy Beideman, Transformative Economies: Emerging Practices for Aligning Growth and Inclusion, Federal Reserve Bank of Philadelphia, October 2017 http://rw-ventures.com/wp-content/uploads/2017/12/Transformative_Economies_Philadelphia_Fed_final.pdf

[14] Note that, particularly in this economy, economic growth, or income growth, occurs independently of population growth. A place can grow prosperous without increasing population – and many of the negative effects of growth are really related to population growth, not income growth. See, Weissbourd, Robert and Christopher Berry, *The Changing Dynamics of Urban America*, Online Publication: 2004. http://rw-ventures.com/wp-content/uploads/2017/01/Changing-Dynamics-report.pdf.

What Kind of Growth?

The issue is therefore not whether to grow the economy – but what kind of growth to aspire to, and how to manage against possible negative effects. Portland has the opportunity to define what kind of place it wants to become – what types of businesses and communities it wants to grow, attract and support; how it will achieve prosperity aligned with equity, climate and overall quality of life. Following a thorough analysis of Portland's economy, this document proposes a vision for Portland's growth and a practical plan to achieve this growth (while minimizing negative effects).

To get there, this document undertakes an asset- and market-based analysis of Portland's economy, in order to identify potential growth challenges and opportunities, and formulate mutually reinforcing strategies to develop towards the vision of a model 21st century prosperous, fair and healthy city. This analysis is grounded in the following basic understanding of markets and development.[15]

- **What is an economy?** An economy is a collection of individuals with varied needs and desires (for example, for housing, food, health services), a set of resources (labor, capital, land, natural resources), and the process by which the resources are converted to goods and services that meet people's needs. The core problem of economics is how to most efficiently *deploy and allocate* the resources.
- **What are, and why markets?** Virtually all economic activity—which resources are developed, into which products, and for whom—relies on markets. Markets express the desires of consumers and enable businesses to meet them; they are the mechanism through which goods and services are exchanged.[16] When markets are performing well, resources are *fully developed and efficiently deployed* to serve the purposes most highly valued by consumers.
- **Market imperfections.** As might be expected, markets are highly imperfect. For instance, irrational biases (most notably, racism) lead to valuable assets – human capital, businesses, real estate, other market opportunities – going unrecognized and underutilized.[17] Markets don't inherently take all costs into account (e.g., cost of pollution); ignoring these externalities results in imperfect allocation of resources. Markets also can suffer from information imperfections and asymmetries resulting in misallocation, favoritism or inequities. As a final example, markets are subject to monopolization, reducing efficiency and more.[18]
- **Government and markets.** At least in the modern era, there are no "free" markets. Government *enables* markets (through everything from legal systems enabling enforcement of contracts to public goods like infrastructure) and *shapes* them (through regulation like anti-trust laws as well as incentives like tax credits). Government can address market limitations by providing the institutions, legal infrastructure, and specific policies needed to make markets work. Government also provides public goods not most efficiently provided (if at all) by private markets. Finding the

[15] The more nuanced economics underlying the approach are much further developed in Section II: Economic Framing, and applied throughout the plan. This description of the high-level approach to developing the plan is partly meant to address the small but vocal anti-capitalist constituency in Portland. Similar to the discussion of growth, above, the issue is not whether markets are a critical mechanism for investing in assets to create goods, services and prosperity; nor whether government plays a critical role in shaping markets and providing public goods (better not determined by market forces); but how to mesh the two towards creating the aligned economic growth Portland seeks. In effect, Portland is grappling with the increasingly prevalent re-examination of capitalism in the context of the next economy, and will hopefully be modeling an approach to 21st century "enlightened" capitalism, "neo-capitalism," or "democratic" capitalism. Examples range from the work of Michael Sandel, such as What Money Can't Buy: The Moral Limits of Markets, to https://www.nytimes.com/2022/11/28/business/business-school-social-justice.html, to https://www.theguardian.com/commentisfree/2023/feb/06/joe-biden-democratic-capitalism-changed-economic-paradigm-reagan-free-market.

[16] Markets are the collection of transactions by a range of entities (individuals, firms, and intermediaries) through which all types and levels of goods and services (for example, from raw materials to finished consumer goods) are exchanged. Markets are the primary vehicle for realizing value from assets, for wealth creation, in the economy.

[17] Weissbourd and Bodini, "Market-Based Community Economic Development." March 2005. http://rw-ventures.com/wp-content/uploads/2017/01/Market-Based-Development.pdf and "Using Information Resources to Enhance Urban Markets." March 2005. http://rw-ventures.com/wp-content/uploads/2017/01/Using-Information-Resources.pdf.

[18] https://newgrowth.org/wp-content/uploads/2018/11/2018-NGIN-Convening-opening-remarks.pdf

right combination of government and market activity constitutes a critical piece of the challenge in managing growth to align inclusion and climate action – while also managing against negative externalities.

- **Asset and Market-Based Development.** For some time, much of the economic development field has been shifting to asset and market-based development. This entails focusing on the assets of a place, and analyzing the market and other dynamics that influence their development. Markets are the primary vehicle for realizing value from assets -- for wealth creation. With respect to equity goals, wealth is created in low-income and BIPOC communities just as it is anywhere else: by identifying and investing in assets. The broad goal of the plan is to realize the value of ALL of the human capital, business, real estate, community and other assets[19] of Portland through enabling and managing markets.
- **"Metropolitan Business Planning."**[20] Undertaking market analysis of key assets, dynamics, challenges and opportunities in order to inform a mission or vision; then developing specialized strategies to realize the vision; then specify products, services and initiatives to implement the strategies; followed by addressing operational and financial implications -- is exactly what the discipline of business planning does. The approach of this plan adapts the discipline of business planning to regional growth planning (though at this stage stopping short of operations and finances). This process allows a region to identify and develop its unique assets, to realize a vision for the place it wants to become.

In short, this report aims to figure out what Portland will be good at and known for – what human capital, business, institutional and other assets it can deliberately build from to become *the* place where certain targeted industries and populations will be most productive.[21] It does this by undertaking a comprehensive market analysis to understand Portland's challenges and opportunities; articulates the region's vision for its next economy role; and identifies concrete strategies based on the market analysis that will move towards realizing the vision. In a further phase of the work, initiatives, products, services and programs will be designed to implement the strategies; and ultimately specific business and implementation plans will be developed to address the operations, finance and institutional management for each initiative.

REPORT OUTLINE

The sections of the report:

- Present the economic framework underlying the market analysis and strategy development (Section II)
- Provide a brief overview of Portland's economic history (Section III)
- Articulate the market analysis assessing Portland's unique assets (Section IV)
- Define a vision for the region's growth, along with objectives and metrics (Section V)
- Propose a set of strategies to execute upon the vision and manage growth in the 21st century (Section VI)

Each strategy provides illustrative initiatives/actions for future consideration. By *implementing* deliberate, inclusive and sustainable economic growth initiatives, Portland will create widely shared prosperity – and will develop a leading model and practice for driving and managing growth for 21st century cities that is aligned with inclusion and climate action.

[19] Particularly those that have been historically undervalued.
[20] See, Weissbourd, Robert and Mark Muro, *Metropolitan Business Plans: A New Approach to Economic Growth*: 2011. http://rw-ventures.com/wp-content/uploads/2017/01/mpp_policy_brief_Web_PDF.pdf
[21] "Productive" refers to economic production - which will be aligned with equity and climate action, as discussed in more detail later in the report.

III. ECONOMIC FRAMEWORK

The Economics

This section summarizes the dynamics, drivers and principles of economic growth which inform the subsequent market analysis and strategy development undertaken in this report.[22]

Next Economy Dynamics

The global economy is undergoing a technological transformation that is fundamentally changing the drivers of growth. Knowledge assets embedded in technology and people are redefining how products are made, moved and sold across all sectors (not just "knowledge industries"). The Third Industrial Revolution (also known as the Digital Revolution) brought advances in electronic and information technologies that further heightened the value of knowledge assets, opening up new markets with the development of digital platforms that facilitate virtual commerce, exchange of information, and knowledge generation. The Fourth Industrial Revolution dramatically accelerates these trends, with technology breakthroughs in artificial intelligence, biotechnology, quantum computing, internet of things and more.

In this increasingly dynamic, knowledge-driven economy, "creative destruction" is disrupting industries, occupations and places; while new products, firms, industries and markets are rapidly emerging, leading to enormous new wealth creation.[23] As a result, the economy places a premium on continuous innovation, which in turn heightens the importance of rich, flexible cross-sector networks efficiently deploying and connecting human capital, business, technology and other assets. As discussed below, these benefits of concentrating and creating synergies between complementary assets explain the rapid growth and increasing productivity of people and firms in metropolitan regions.

As knowledge assets increasingly concentrate, they build upon themselves and generate increasing rather than diminishing returns. This drives a self-reinforcing growth cycle and, as a result, high-performing regions now tend to pull further ahead of their competitors.[24] This leads to two important economic development principles, further elaborated below. First, deliberate strategies are particularly important: the economy no longer "takes care of itself." Second, these strategies must be tailored to the particular assets of a given place, and designed to create synergies between them, enhancing their deployment and productivity. Regions which build from the inside out, concentrating on their *unique* assets, identifying their competitive advantages and then designing and launching market-based, targeted, integrated growth strategies that seize upon and strengthen those assets will be most successful.

[22] For much more detailed examination of the economic framework, literature review and examples of applications, see: see: http://rw-ventures.com/wp-content/uploads/2017/01/Surdna-Final-Paper-Combined-112111.pdf; http://rw-ventures.com/wp-content/uploads/2017/01/mpp_policy_brief_Web_PDF.pdf

[23] Brophy, Paul, Weissbourd, Robert, and Andy Beideman, Transformative Economies: Emerging Practices for Aligning Growth and Inclusion, Federal Reserve Bank of Philadelphia: 2017.

[24] In the past, underperforming regions tended to "catch up" with their higher-performing peers over time. In the next economy, this dynamic has changed. See generally: Joseph Cortright, "New Growth Theory, Technology and Learning: A Practitioner's Guide," Reviews of Economic Development Literature and Practice, 4: 2001; Weissbourd, Robert and Christopher Berry, *The Changing Dynamics of Urban America*, Online Publication: 2004; see also, https://www.brookings.edu/research/growth-centers-how-to-spread-tech-innovation-across-america/

Metropolitan Regions and Cities

People and firms are more productive and profitable when located near similar people and firms.[25] They benefit from lowered transaction costs, shared inputs and labor pools, and knowledge spillovers.[26] These synergies, savings, and increased productivity from geographic concentration are collectively known as "agglomeration economies."

This economic value of concentrating people and firms has driven the growth of metropolitan regions over at least the past century.[27] As of 2017, Over 85% of the U.S. population now concentrates in metropolitan areas, where they are disproportionately productive, generating over 90% of U.S. economic outputs.[28] In the next economy, as discussed above, the value of agglomeration economies has only increased, given the heightened innovation and other benefits which flow from concentrating and enabling fluid interaction between knowledge assets embedded in firms, human capital and technology.

As a result, metropolitan regions have become a key geographic unit of economic analysis. The economy does not follow political boundaries. Rather, metropolitan areas are literally defined with reference to economic variables (particularly labor sheds). The economic growth of neighborhoods, cities and regions are deeply linked, because these places are largely parts of the same economy. They share labor pools and housing markets; business-to-business relationships and supply chains; physical, virtual and institutional infrastructure; cultural, recreational, retail, and other amenities; and anchor institutions, such as hospitals and universities. Metropolitan regions are dynamic, flexible and complex systems that nurture unique economies, which arise from an area's distinctive blend of industries, human capital, technologies, institutions and the built environment.

Accordingly, this plan analyzes the assets and drivers of the Portland metropolitan area. It ultimately identifies strategies particular to the city of Portland, but in the context of the regional economy. Portland does not have an economy independent of the region and, as shall become clear in the market analysis, plays particular roles within the regional economy on which it can build.

GEOGRAPHIC FOCUS OF REPORT

As discussed, the relevant geography for the economy is primarily the metropolitan area – and therefore the market analysis is largely *regional* in scope. It includes analysis of the City of Portland's shifting role in the regional economy. When turning to strategies, the Plan focuses on strategies for developing the City's assets and role in the region, in the context of driving overall metropolitan growth.

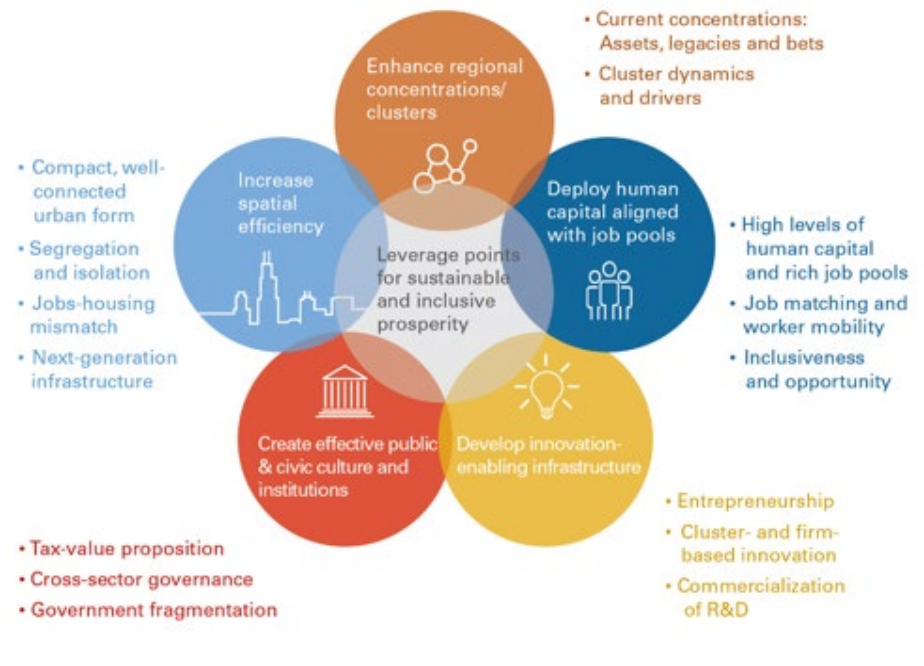
[25] https://www.brookings.edu/wp-content/uploads/2016/06/20060313_Clusters.pdf
[26] "Knowledge spillovers" refers to the fact that technical knowledge can more easily circulate among firms that operate in the same economic and geographic space. http://rw-ventures.com/wp-content/uploads/2017/01/Changing-Dynamics-report.pdf
[27] https://www.nber.org/system/files/working_papers/w28287/w28287.pdf
[28] http://www.usmayors.org/wp-content/uploads/2018/06/Metro-Economies-GMP-June-2018.pdf; see also, *http://rw-ventures.com/wp-content/uploads/2017/01/cities-and-economic-prosperity.pdf*

Drivers of Growth

In the next economy, five market levers (listed below and diagrammed in Figure 1) interact to account for the efficiency and productivity of regional economies and drive the extent to which complementary, concentrated assets are achieving synergies.

- **Clusters:** Industry-based concentrations of firms and related institutions that are more efficient and productive when co-located, due to lower transaction costs among buyers, suppliers and customers; shared labor pools and other common inputs; enhanced knowledge exchange; and increased innovative capacity.
- **Human Capital Development and Deployment:** Human capital is the most important asset in today's knowledge economy, but only if matched with and deployed into rich job pools through well-functioning labor markets.
- **Innovation and Entrepreneurship:** The ability to innovate is the core driver of increasing productivity. In a more competitive, fast-paced, knowledge-based economy, continual innovation, commercialization and business creation is crucial for economic success.
- **Spatial Efficiency:** The relative location of businesses, suppliers, workers and consumers within a region (and the physical and virtual infrastructure that connects them) greatly influences efficiency and productivity. Co-location and connecting infrastructure determine the costs for moving goods, people and ideas, in turn enhancing or diminishing many economic benefits of agglomeration.
- **Governance:** Not to be confused with government, governance encompasses all of the institutions that foster economic networks, innovation and other activity. The increasingly dynamic economy places a premium on rich formal and informal networks that enable exchange of ideas and facilitate relationships, transactions and coordination across the public, private and civic sectors. While government plays a key role – shaping and enabling market activity and providing the public goods that enhance productivity and efficiency – a broad range of civic, private-sector and cross-sector institutions are central to establishing an environment conducive to economic growth and fostering open, adaptive and flexible cross-sector networks.

FIGURE 1: 5 MARKET LEVERS, OR DRIVERS OF GROWTH



These market levers influence each other. In essence, the point is to understand, based on a particular place's assets, where the key intersections of firms (clusters), people (human capital) and technology (innovation) are that – with the right built and virtual environment (spatial efficiency) and institutional environment (governance) to connect them – will create the synergies to make the place most productive and so competitive for certain industries, firms and people.

THE ROLE OF AMENITIES IN ECONOMIC GROWTH

A healthy debate exists about the causal relationship between the development of a region's quality of life amenities and the growth of its industries and jobs. One school of thought argues that improved retail, cultural, recreational and other quality of life amenities will attract a stronger talent pool, which in turn will attract companies. An alternative view is that strong industries, firms and jobs attract talent and generate income and wealth, which in turn provide demand for quality of life amenities.

The reality is that both are important, and iterate, as people seek jobs, firms seek talent and both care about quality of life. However, most often firms and people move to places where they can be most productive, seeking concentrations of similar labor pools and jobs, and this economic growth drives improvement in quality of life amenities.[29] Because this plan is focused on economic growth, and since amenities tend to follow rather than lead growth, amenities are not significantly addressed in this document.

As discussed below, Portland is rich in natural amenities and has invested in quality of life amenities, and should continue to do so, particularly as these have relevance to the health of neighborhoods. Yet lack of amenities is not what is holding Portland back, nor will providing more amenities drive transition to next economy firms, jobs and talent driving inclusive growth.

A New Approach to Economic Growth

The transformative nature of the next economy has major implications for the practice of regional economic development (see Figure 2). Traditional strategies are no longer well-suited to today's economic opportunities. Regions need a new approach, moving away from consumption-driven growth (e.g., retail, housing) and from deal-by-deal, opportunistic firm attraction efforts based primarily on lowering costs for companies.

Instead, regions must try to create production-driven economies that compete by adding value, building on their unique assets, strengths and opportunities. To do this, regions must concentrate on increasing productivity.[30] Successful regions are developing and implementing comprehensive, integrated and inclusive strategies across the five market levers (discussed above) that determine productivity.[31]

[29] Berry, Christopher, Bodini, Riccardo and Robert Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location*, Online Publication: 2005, available at http://rw-ventures.com/wp-content/uploads/2017/01/Grads-and-Fads-Paper-Final.pdf

[30] As discussed in the sections that follow, this will be done while aligning equity and climate resiliency but minimizing the negative effects of growth (e.g., inequality or increased carbon emission).

[31] Examples of metropolitan business planning, and the implementation of these plans, from the past several years include:

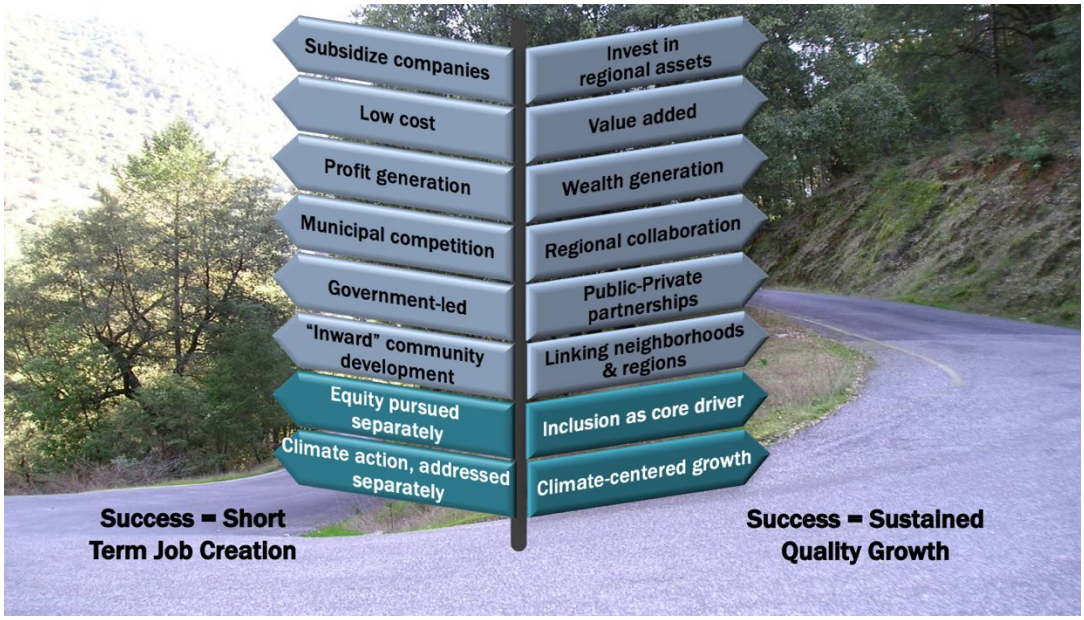
- Milwaukee Metropolitan Business Plan; see: http://www.mmac.org/uploads/3/7/9/6/37962993/mke7frameworkforecongrowth04_14.pdf
- Minneapolis - St. Paul Metropolitan Business Plan; see progress report from 2012: https://minnesota.uli.org/wp-content/uploads/sites/51/2012/08/MetropolitanBusinessPlan-v06_print-single-page.pdf
- Phoenix Metropolitan Business Plan; see executive summary at https://www.brookings.edu/wp-content/uploads/2016/07/VelocityExecutiveSummary.pdf

At a high-level, the shift is from business development to economic development, from opportunistic deals to improving the economic system (which enables doing better deals). New practices emphasize:

- Competing on value added, instead of low-cost – the goal is to become the place that firms and people are more productive because of better human capital, infrastructure, complementary firms, governance, and so forth – this makes the place "sticky" and serves to continually attract more firms and people;
- Identifying unique assets and "building from the inside out" – building productive concentrations of complementary economic assets starts with existing assets: most net growth comes from existing firms, followed by start-ups and only then by firms moving in;[32]
- Acting strategically, employing contextualized, integrated solutions, rather than delivering disconnected, siloed programs (or chasing isolated, "big deals");
- Focusing on quality growth – this entails looking for long term value and wealth creation rather than short term profit extraction, monopoly rent seeking, financialization and other unsustainable economic growth models.[21] A fundamental tenet of quality growth – developing and deploying ALL assets – is inclusive growth, discussed below.

As stated above: regions which build from the inside out, concentrating on their unique assets, identifying their competitive advantages and then designing and launching market-based, targeted, integrated growth strategies that seize upon and strengthen those assets will be most successful in creating economies and communities that are attractive to firms and residents, resulting in more sustainable growth.

FIGURE 2: OLD ECONOMY PRACTICES (LEFT) VS NEW ECONOMY PRACTICES (RIGHT)



[32] Firm attraction still becomes relevant (and easier) as a tactic to fill-in and build from existing assets, but it's the tail, not the dog, of economic development. Combined with the first principle, this means that rather than chasing random firms with deep cash incentives, after which they can move to the next low-cost place, initiatives start with strengthening existing firms and industries and the assets which support them. Individual firm attraction instead plays an important role as a tactic employed to implement strategies tailored to the assets and characteristics of the region – e.g., targeting particular types of firms to fill out a strong local cluster. In these circumstances, the case that is made to attract the targeted firm is also different – less focused on direct financial incentives (cost reduction) and more on adding value through infrastructure, human capital and other programs that improve the region for the entire industry and make the attracted firms "stickier" (less likely to leave for the next, lower-cost location).

Two other principles inform economic development strategy in the next economy, and are particularly pertinent to Portland: inclusive growth and climate-centered growth.

Inclusive Growth

Growth, when not managed well, can lead to rising levels of inequality. Indeed, the next economy particularly presents a challenging "inclusive growth paradox." [33] On the one hand, in the short term, growth in this economy is disrupting (and in some cases, wiping out) legacy industries and labor markets, contributing to the disappearance of the middle class and creating unprecedented wealth inequality (in large part because returns to capital are increasing much faster than returns to labor). On the other hand, in the long term, it is increasingly clear that the regions with less inequity grow more over time. They utilize the talent of more of their workers and companies, are more efficient and productive and reduce the costs associated with poverty. A central challenge – and opportunity – for new economic development practice then, is aligning inclusion and growth. Equity and growth may have conflicted in the industrial economy; regardless, they can and must be two sides of the same coin in the next economy.

New approaches to inclusive growth emphasize inclusion as a core *driver* of growth. Rather than let growth occur and then ask how the people and places left out can get a set-aside, redistribution or limited participation, inclusive growth is a different approach to all growth, seeking to *fundamentally reposition* historically marginalized people and places, particularly communities of color, as drivers and beneficiaries of the enormous growth opportunities in the next economy. A central challenge - and opportunity - for the new economic development practice then is how to align inclusion and growth. As we seize new market and value creation opportunities, how do we do so in ways that successfully use all of our people, firms, and places? Understanding and addressing the barriers to inclusion must become an integral part of every growth opportunity and strategy.

Inclusion generally occurs across four dimensions:

- **Employment** – improving the functioning of labor markets so that workers of all skill levels and backgrounds are efficiently prepared, matched and upskilled for quality jobs with strong career ladders;
- **Ownership** – growing company ownership by people of color to generate wealth creation and capture, especially by finding opportunities in high growth industries, as well as real estate ownership in residential, commercial and industrial development;
- **Location** – siting and supporting firms in places that are readily accessible to historically marginalized populations (through co-location or transportation infrastructure); and
- **Participation** – ensuring diverse representation at the relevant private, public and civic sector "tables" where growth strategies and economic policies are shaped.

Quality, inclusive growth practices that increase the employment, ownership, access and participation of communities of color in the city's emerging economic opportunities are essential to achieving lasting economic growth.[34]

[33] Paul C Brophy, Robert Weissbourd, and Andy Beideman, Transformative Economies: Emerging Practices for Aligning Growth and Inclusion, Federal Reserve Bank of Philadelphia, October 2017.

[34] While the inclusive growth approach aligns economic growth with equity goals – assuring that future growth promotes equity rather than exacerbating inequality – it does not address, nor obviate the need for, a wide range of other equity work (e.g. addressing housing discrimination, segregation, unequal resources and public goods, and so forth). For that reason, as mentioned, this economic growth plan addresses equity with respect to growth, but is not a comprehensive equity plan.

Climate-Centered Growth

An emerging economic growth planning principle focuses on aligning economic growth with climate concerns. While achieving growth and equity goals can be almost completely aligned in next economy practice, the practice of aligning growth and climate action is less developed (and, in some instances, seems to present greater challenges, at least in the shorter term). Portland is well positioned, particularly given its existing climate related assets, to lead innovation in this area, and to model climate-centered economic growth.

Addressing climate change occurs through:[35]

- **Mitigation strategies** – preventing further climate change by increasing energy efficiency and reducing the use of fossil-fuel based power sources,[36] primarily through increasing renewable, zero-carbon energy production and more efficient energy use, reducing the flow of heat-trapping GHGs into the atmosphere.[37]
- **Adaptation strategies** – addressing the impacts of climate change through changes in processes, practices, and structures to reduce and/or eliminate risks and/or to benefit from opportunities associated with climate change (e.g., building sea walls, increasing urban vegetation to reduce heat, developing early warning systems for flooding, planting drought-tolerant crops).[38]

Broadly, mitigation strategies envision fundamentally changing both the demand and supply systems and infrastructure for energy use.[39] This requires production of renewable energy (e.g. wind and solar); next generation grid technologies, enabling distributed production and storage; and new, more efficient products and services that reduce energy demand across the economy (e.g. buildings, transportation, manufacturing). Adaptation similarly creates demand for new products and services.

In the past, climate change mitigation actions were viewed primarily as cost-centers (i.e. the opposite of economic growth opportunities and alignment), while climate change adaptation actions were designed to prevent costs of disasters in the future.[40] New practices recognize the economic growth opportunity and potential alignment – both immediate opportunities to produce the products and services demanded by emerging climate related industries and that, longer term, "smart action against climate change doesn't only stop bad things happening, it leads to increased efficiency, drives new technology, and lowers risk," which in turn "stimulates investment and generates jobs," creating healthier economies.[41]

As a step towards developing a climate centered growth strategy, following are possible ways addressing climate issues aligns with economic growth:

- **Producing new products and services** – whole new emerging industries, and a vast array of associated products and services, are in growing demand in the context of addressing climate change – from advanced batteries to "green" architectural services to hydrogen electrolyzers.[42] Producing the goods and services that will drive the green economy offers one possible alignment of economic growth and climate objectives. Note also the associated job creation -- for

[35] https://www.climaterealityproject.org/blog/climate-adaptation-vs-mitigation-why-does-it-matter
[36] Portland's goal is to eliminate fossil fuels by 2050. https://www.portland.gov/bps/climate-action/pathways
[37] Enhancing the carbon sequestration potential of natural carbon sinks (oceans, forests, and soils) is also a valuable mitigation measure that removes GHGs from the atmosphere.
[38] United Nations Framework Convention on Climate Change (UNFCCC) see, https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction
[39] See, e.g., Electrify: https://mitpress.mit.edu/9780262545044/electrify/
[40] See, https://www.imf.org/en/Publications/fandd/issues/2021/09/bezos-earth-fund-climate-change-innovation-levin.
[41] https://www.imf.org/en/Publications/fandd/issues/2021/09/bezos-earth-fund-climate-change-innovation-levin
[42] It will be important to keep the very long-term in focus as we invent the new green products of the future, designing and manufacturing with the full product life cycle of development to end of use, then next reuse, top of mind.

instance, to meet a net zero emissions by 2050 goal, another 26 million workers would be employed in clean energy and related sectors by 2030.[43]

- **Innovation -** The need for new technologies and related innovations to slow climate change[44] is driving increasing climate-focused investment from businesses and governments around the world.[45] Venture Capital (VC) investment in climate tech increased more than five times over the last six years.[46] Closely related to the economic growth opportunity to produce the new products and services, innovation is critical to achieving both economic growth and climate goals (and contributes to the innovation ecosystem and market lever more broadly).
- **Reducing energy and related costs for firms –** Economic growth *with* low carbon energy and technological innovation to reduce the energy input needed in the first place is a way to fuel continued and sustainable growth.[47] As a result of developing next generation energy production, distribution and efficiencies, a region becomes better for business when it offers access to more efficient, resilient, and cost-effective energy sources and support to increase efficiency in the built environment and throughout business operations.
- **Improving spatial efficiency –** Addressing climate change demands greater density and greater efficiency in transit connections. This increased efficiency also serves to reduce the costs of moving goods and people, including better connecting residents with jobs, thus driving economic growth as well.
- **Reducing government costs –** Addressing climate change should reduce its negative impacts, and thus reduce the ensuing costs to government to address them (freeing government resources to invest in economic growth).
- **Improving quality of life –** Reducing climate change impacts that lead to more extreme weather events, wildfires, extreme heat, and flooding will reduce the risks and economic impacts associated with these events, a factor in retaining and attracting firms and workforce. Vastly improved health outcomes[48] associated with better indoor and outdoor air quality and more stable temperatures, increased urban vegetation and active transportation options, is also a key quality of life benefit.

Note that these opportunities for alignment envision a place that can become both a major producer of the products and services in increasing demand to address climate change – and a leader in addressing climate change, creating the demand conditions for the new products and services, as well as the efficiencies for business and government.

"The transition to a low-carbon economy is potentially a powerful, attractive, and sustainable growth story, marked by higher resilience, more innovation, more livable cities, robust agriculture, and stronger ecosystems."[49] "Climate policies, if well designed and implemented, are consistent with growth, development, and poverty reduction." [50] The economic growth opportunities are enormous for cities that are forward-looking, aligning growth initiatives with a climate imperative.

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[43] https://www.weforum.org/agenda/2022/01/global-clean-energy-economy-how-to-finance/
[44] In particular, to meet the goal of avoiding catastrophic climate impacts by limiting global temperature rise to 1.5 degrees Celsius above pre-industrial levels. See, https://commonslibrary.parliament.uk/what-was-agreed-at-cop27/
[45]Not only do we need to invent the next generation of products that are tackling climate change, but also need continuous energy (and upgrades to the grid) to support deployment of these products (e.g., advanced batteries for more energy storage, increased automation for outage response, decentralized energy points contributing to power flow). https://worldgbc.org/advancing-net-zero/embodied-carbon/)
[46] "The Future of Climate Tech Report | Silicon Valley Bank," accessed May 27, 2022, https://www.svb.com/trends-insights/reports/future-of-climate-tech.
[47] https://www.lse.ac.uk/granthaminstitute/explainers/can-we-have-economic-growth-and-tackle-climate-change-at-the-same-time/
[48] See, https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health
[49] *Joseph Stiglitz Fighting the climate crisis need not mean halting economic growth, December 9, 2019, The Guardian* https://www.theguardian.com/business/2019/dec/09/climate-crisis-economic-growth-green-economy
[50] *Joseph Stiglitz Fighting the climate crisis need not mean halting economic growth, December 9, 2019, The Guardian* https://www.theguardian.com/business/2019/dec/09/climate-crisis-economic-growth-green-economy

Of course, there is also strong alignment between inclusion and climate – both because BIPOC communities have been disproportionately impacted by climate change,[51] and because the enormous economic growth opportunities demanded by climate change present an opportunity for investment in BIPOC-owned clean tech businesses and scaling BIPOC workforce opportunities.[52] These opportunities should be afforded to the very communities that have been most impacted by pollution, flooding, etc.

In short, there are major opportunities to align economic growth with climate action, which need to be translated to economic development practice in the context of particular places. Portland is well positioned to become the model "green" city, both creating the demand conditions for many of the products and services, and becoming a global leader in providing some of them. Portland already has strong demand conditions as well as key production activities (e.g. green architecture consulting services) to build upon.

Negative Effects of Growth

So far, this section has articulated the key drivers and principles informing development of an economic growth plan. Before applying these principles to produce a market analysis and strategies for Portland, one further point particularly relevant to Portland deserves attention: the importance of managing to prevent the potential negative effects of growth.

While there are many benefits of agglomeration, as metropolitan regions grow, the increasing concentration of people and firms can also generate negative effects that undermine economic security and quality of life. Particularly where economic growth is accompanied by population growth,[53] demand for housing, land, services and amenities increases. Examples of potential negative effects include:

Unaffordable housing

If demand for housing increases without a sufficient increase in housing supply, housing prices will rise. In many cities, housing policies, construction costs and local sentiments about development projects constrain the supply of housing. Lack of affordable housing is challenging for households across the income spectrum but especially for low-income households, contributing to increases in houselessness. The lack of affordable housing also affects the decisions of prospective residents looking to move to the region.

Widening economic inequities

As noted above (see discussion of "inclusive growth paradox"), next economy growth tends to aggravate inequity (if growth is not managed inclusively). If the economy grows, but with increasing inequity, costs of living often increase (particularly the cost of housing) while the lowest-income households become further stressed, reducing their participation and productivity, and increasing the costs of addressing poverty.

[51] https://www.nrdc.org/stories/environmental-justice-movement;
[52] https://tpinsights.com/investors-see-growth-opportunity-and-returns-in-sustainability-tech-funding/
[53] Often, economic success attracts population: as a place becomes more prosperous, more people want to live there.

Increase in crime

Low levels of economic security can create conditions for crime. Cards are stacked against individuals with limited prospects and few pathways to a better standard of life. Reducing inequality and concentrated disadvantage reduces violence and crime.[54]

Increase in congestion

Without adequate growth management, increases in population and business activity can lead to inefficient spatial patterns. As jobs tend to concentrate in certain areas of the city, a higher number of daily commuters on the roads leads to congestion. Public transportation can help alleviate congestion issues. Addressing spatial mismatch and making jobs accessible in economically depressed areas can also reduce congestion.

Negative environmental impacts

Growing cities face a range of negative environmental effects that have to be kept in check. Congestion can lead to worsening air quality, and industry growth often leads to increased carbon emissions. Heavy industrial use can contaminate sites, constraining the supply of land for other uses. Firms and residents may choose to leave the region for a better quality of life.

Without adequate growth management, demand can outpace the supply of housing, land, services and amenities - and diminish their quality. These potential negative effects of growth weaken synergies between assets, ultimately impacting the productivity and efficiency of the regional economy.

Regions not only need to identify their unique assets and build from them, but also address past negative effects from poorly managed growth, and implement new growth management practices to prevent possible future negative effects of growth. There are few, if any, regions that are doing this well (particularly managing the negative effects of growth) – presenting an opportunity for Portland to lead the way.[55]

CLIMATE AND EQUITY LENS

The market analysis and strategies in this document have been developed with the above framework woven throughout. As this plan has been developed, and as potential strategies move towards implementation, two guidance documents have been developed by Estolano Advisors, the Bureau of Planning and Sustainability, the IEDS Steering Committee, and Prosper Portland to ensure decisions made are in line with climate and equity goals. Please see the Climate and Equity Lens.

[54] https://blogs.worldbank.org/sustainablecities/how-reducing-inequality-will-make-our-cities-safer; https://onlinelibrary.wiley.com/doi/pdf/10.1111/cico.12348

[55] See "Vision, Objectives, and Metrics" section for high-level suggestions on how this might be done; and the report's "Strategies" section for Portland-specific recommendations.

IV. HISTORY AND ECONOMIC OVERVIEW

Economic History

Pre-1800s: Native Communities

For thousands of years, more than 60 tribes lived throughout what is known today as Oregon. At least 18 languages were spoken across hundreds of villages. The Portland region was settled by tribes and bands including the Multnomah, Kathlamet, Clackamas, Chinook, Tualatin Kalapuya, and Molalla – with the Columbia and Willamette Rivers as central resources.[56] Celilo Falls, located on the Columbia River, was a highly active Indian center of commerce for thousands of years that brought in people from as far as Alaska and the Southwest. The Oregon Donation Land Act, passed in 1850, offered 320-acre parcels to thousands of white immigrants. In five years' time, white settlers claimed 2.8 million acres of Indian land.[57]

1800s: Railroads, Farming, Mining, Logging

The Portland region became a western hub for transportation and natural resources – including maritime, rail, forestry, timber and agricultural industries. Portland developed a major port, taking advantage of its location on the Columbia-Willamette River [CWR] system, which is currently the world's third largest exporter of wheat.

In the late 1800s, the economy struggled until rail construction brought the ability to transport goods more effortlessly – most notably, wood to build midwestern centers of Denver, Omaha, and St. Louis. During this period Cantonese-Chinese immigration, which initially began as migratory workers sought mining opportunities, increased to assist with the building of Portland's railroads, farming, mining, and logging – with many becoming longtime residents. Soon after Japanese immigration followed, and more people of color came seeking industrial jobs.[58]

Early-Mid 1900s: Hydropower, Shipbuilding, Tech

The early-mid 1900s were characterized by significant population growth and the increased availability of cheap power, particularly hydropower. The deep-water port connection to the Northern Pacific transcontinental railroad lines (coupled with cheap hydroelectric power) empowered the city to become a major shipbuilding center - including major federal contracts to build Liberty ships and aircraft carrier escorts.

The seeds of today's high-technology industry were planted with the establishment of the U.S. Forest Service Radio Lab in Portland in the 1930s. Team leaders of this outfit would in the subsequent decades found Electro-Scientific Industries (maker of impedance bridges) and Tektronix (maker of oscilloscopes). While the Great Depression resulted in a withered construction industry and defunct shipyards, construction of highways, roads, bridges, and Portland's airport grew through federal programs (CCC and WPA).

Portland's prowess in natural resources and transportation also fueled growth of 1940s wartime production, and the growth of industrial jobs attracted a burgeoning Black population (particularly in the Vanport neighborhood, close to transit and jobs). In 1944, close to 40,000 people lived in Vanport,

[56] https://www.travelportland.com/culture/native-american/
[57] https://www.opb.org/artsandlife/series/brokentreaties/oregon-tribes-oral-history-broken-treaties/
[58] https://www.oregonencyclopedia.org/articles/chinese_americans_in_oregon/#.YyTZBOzMJJU_

including 6,000 African Americans, three times as many as had lived in all of Portland two years before. The Vanport Flood in 1948 wiped out the then-largest public housing project in the United States.[59]

Nearly 140,000 defense workers lived in the Portland Metro working in factories. The war also resulted in a shortage of labor in other industries, which was filled by emergency labor programs (e.g., Mexican migrants arrived via the Bracero Program for agricultural work).[60] Post-war, Oregon Health and Science University (OHSU) and Portland State University, initially located in Vanport, [61] served to educate veterans (however, they received significantly less federal research dollars than nearby Washington).

In 1957, The Dalles Dam was completed and closed off the Celilo Falls, previously a center of commerce for the Native American community. While the US Government compensated tribes for flooding their fishing sites, it did not purchase their fishing rights and the dam removed the tribes' economic base.[62]

During this time Portland continued nurturing the seeds of becoming a tech powerhouse and diversifying its industries.[63] At the same time, urban renewal projects displaced many people of color, creating barriers to accessing benefits of the region's job growth.[64]

1970s-1980s: Tech Growth and Economic Diversification

Together with ESI and Floating Point Systems (founded in 1970 in Beaverton), and later Intel (with the opening of their major R&D facility in 1976), the burgeoning tech nexus led to the creation of a significant number of spin-offs and startups – establishing what today is known as the Silicon Forest hub.

Chip manufacturing began in earnest with Intel in the mid-70s – brought on by cheap water and electricity, land and construction costs being low, and a stable and relatively well-educated workforce. In 1984 the unitary tax was abolished, bringing several Japanese firms to Oregon in the 1980s. This growth attracted skilled high-tech workers, even more firms, and infrastructural support organizations (materials suppliers, legal and public relations specialists, etc). This, in turn, attracted other tech companies.

In the 1980s, meanwhile, Portland's economy was becoming much more diversified – Multnomah County's leading industrial group was food products (reflecting in part the region's connection to ag and exports), followed by printing and publishing, primary metals, fabricated metals, non-electrical machinery, and transportation equipment. This variation helped Portland avoid the overall economic difficulties many other communities in Oregon felt in the 1980s.

1990s: In-Migration - and, Growth of Design, Apparel, and the "Creative Class"

In the 1990s Portland saw an influx of people in their 20s and 30s (both artist and tech-focused) during the dot-com bubble. They were drawn by ample access to nature, affordable rents, and opportunities to work in graphic design and tech.[65] These more affluent newcomers were drawn to the North and Northeast Portland's proximity to downtown. This trend, coupled with city reinvestment in the area, sent

[59] Source: Oregon History Project
[60] https://ir.library.oregonstate.edu/downloads/5138jf91j
[61] https://www.pdx.edu/portland-state-university-history#:~:text=We%20first%20opened%20in%201946,heart%20of%20downtown%20Portland%2C%20Oregon
[62] Source: CRITFC
[63] Tektronix and Electro Scientific Industries (ESI) moved to nearby Washington County to newly developed sites designed to attract other tech companies. In a precursor to the apparel hub Portland is today, by 1950 the Portland Woolen Mills Company had become the largest wool manufacturer west of Cleveland, Ohio. It was also during this decade the Army Corps of Engineers continued to invest massive new dam building projects along the Columbia and Willamette Rivers – opening the door further to cheap power (but simultaneously impacting industries significant to local tribes, e.g., fishing).
[64] https://www.portland.gov/bps/planning/adap/history-racist-planning-portland
[65] Even more creatives arrived with the promise of a lower cost of living than Seattle and San Francisco. The DIY core cultural sentimentality of Portland at this time brought the affordable re-use of vacant light-industrial spaces.

housing and rental prices skyrocketing. New restaurants, boutiques and bars began to displace longtime (oftentimes BIPOC) businesses. When this economic bubble burst, the city was left with a large creative sector (over 10k artists alone according to the 2020 census), tech sector (nearly 73k in 2001), and rising cost of living.

The 1990s also brought the establishment of the outdoor apparel industry to Portland. Its thriving sports culture (runners, cyclists, and nature enthusiasts) created ample opportunities for companies to test technologies across varied terrain. And with the city's growing port and access to Asian markets Portland is well situated for easy sourcing and manufacturing. In 1993 Columbia Sportswear established itself in town and Adidas moved most of its design, global, and creative operations and development to the city. Nike, the largest manufacturer of athletic shoes, established its design center just outside the city. Under Armour, the nation's 2nd largest athletic manufacturer, opened a Portland design office in 2013. More nascent and established athletic and major performance shoe companies have followed suit (Keen, Lululemon, On Running, and Danner Boots to name a few).

2000s - present

After the dot-com and housing bubbles burst between 2000 and 2008, another influx of creatives came to the city between 2010 and 2020. With easy access to nature, continued investment in amenities, high per capita income growth, high employment in knowledge occupations, and nearly 50% higher growth than the national average in college grads - more knowledge-based workers moved to the city to work for the major tech and design firms, and for the startup scene. Portland's legacy industries also continue to provide a backbone to the city's economy. Portland specializes in food distribution and service activities clustered around major highways as well as freight centers and food processors in industrial areas. Between 2010 and 2012, against this ag backdrop, grocery stores, restaurants, and certain food manufacturing – including coffee roasting – experienced faster job growth in Portland than nationally.

Today, Metro Portland is a trade hub – the 7-county Portland MSA is one of America's most export-oriented and globally integrated economies with 18%+ of GRP from exports (3rd-highest export intensity in US & 2nd-fastest growing among largest 100 metros).

However, due to rapid growth largely driven by attraction, other challenges have arisen. Since 2000, Portland home prices have risen faster than in all but five of the nation's 40 largest metro areas.[66] Nearly 2/3 of Portland residents pay more than the recommended threshold of 45% of their income on transportation and housing,[67] and 46% of renters are cost-burdened. In 2020, every census tract east of 82nd Avenue, largely BIPOC, was considered at risk of displacement.[68]

Portland is grappling with marked houselessness, drug addiction, gun violence, and mental health issues. Of the 30 largest urban areas in the country, Multnomah County has the 4th highest number of people experiencing homelessness each night.[69] Alongside this, climate impacts are worsening; City Council declared a climate emergency in 2020 as recent heat waves, wildfires and floods have been disproportionately impacting Portland's most vulnerable populations.[70] Against the backdrop of this growing disparity, the COVID-19 pandemic hit Portland especially hard.

[66] Case-Schiller index
[67] H+T Index
[68] City of Portland Bureau of Planning and Sustainability
[69] 2019, with 5 per 1,000 people without a home. Source: https://www.kgw.com/article/news/local/homeless/new-study-housing-market-root-cause-homelessness/283-819457a7-9606-42c6-9cb3-. Today, it is estimated more than 6,600 adults and children are homeless in Portland . https://heretogetheroregon.org/understanding-homelessness/
[70] https://www.portland.gov/bps/climate-action/climate-emergency/documents/climate-emergency-workplan-2022-2025/download

Although the city's economy is expected to fully recover - as of June 2022, Portland has recovered 96% of jobs lost[71] - the pandemic highlighted Portland's need to rebuild its economic foundation and redefine its economic trajectory.

RACIAL HISTORY

One of the most critical historical themes contributing to Portland's economic trajectory is its racist history. Portland and Oregon originated as a "white utopia" in the 1800s; the Oregon Territory passed laws *both* banning slavery and requiring all African Americans in the state to leave. After Oregon became a state (1859), it became illegal for Black people to enter, visit, or even own property. It wasn't until the mid-20th Century that the State of Oregon finally formally ratified the 13th (1959) and 14th (1973) amendments of the US Constitution abolishing slavery and providing equal protections of the law for all persons. Significant discrimination was also faced by Chinese and Japanese immigrants. Federally, the Chinese Exclusion Act of 1882 prevented Chinese from entering the United States; in Oregon, mobs drove Chinese immigrants from neighborhoods. The Alien Land Law (1923) in Oregon prevented first-generation Japanese Americans from owning or leasing land.

Growth of industrial jobs in the 1940s attracted a growing Black population to Portland, centering in the Vanport neighborhood (a temporary city built on a flood plain). Despite the success of African Americans in supporting the war effort and the growth of Portland's economy, much of the personal wealth and progress achieved by this community was decimated in 1948 when the Vanport Flood virtually wiped-out Oregon's second largest (albeit unincorporated) city. Much of the newly houseless black population had to start over. Many were forced to move to the Albina neighborhood due to redlining (as the descendants of white immigrants moved to wealthier neighborhoods). But disinvestment from the city and predatory practices from lenders and appraisers suppressed land values in subsequent decades in Albina, which meant property owners gained little wealth from their investment.

This population suffered yet again in the 1970s, as alongside a construction boom, urban renewal projects were completed. The urban renewal projects razed 1,000 mainly Black-owned homes in Albina (+ businesses, institutions, etc.). This significantly destroyed Black families' wealth – further relegating this already disenfranchised population to the outer rim of the city (where there was a lack of jobs, transit, and commercial corridors). And while the tech industry was beginning to boom, black and minority poverty persisted – leaving many without the social networks and means to plug in to the "new" economy Portland was fostering.

Today, Portland still faces deep-rooted civil rights issues. Portland is still one of the whitest major cities the United States, although this is changing. The population is becoming more diverse – the share of Portland's population that is racially or ethnically diverse increased the most among its peers (a 32% increase from 2010 to 2020). Looking forward, Multnomah County is expected to be over half BIPOC in 30 years, largely due to growing Hispanic/Latino and Asian populations.

Data Source: Woods and Poole, https://www.portlandoregon.gov/civic/article/516558

[71] https://portlandalliance.com/assets/images/2022-SOTE-Cost-of-Living/2022-VOJ-State-of-Economy-WEB.pdf

Economic Overview

State of the Regional Economy

In 2020, the Portland metro area employed 1.09 million workers in 71,060 firms and generated $148 billion in gross regional product ("GRP;" see Table 1). Looking more closely at individual counties, Multnomah County and Washington County in particular are important economic engines of the regional economy. Multnomah generates almost 40% of the metro's GRP and about $11,784 more per person compared to the Portland metro area. Washington County generates almost 32% of the region's GRP and about $18,816 more per person.

TABLE 1: MULTNOMAH COUNTY AS COMPARED TO SURROUNDING COUNTIES, PORTLAND MSA, AND US

County or Region	Population (2020)[72]	Total Business Establishments (2020)[73]	Total Regional Employment (2020)[74]	Real GRP (2020)[75]	Real GRP Per Capita (2020)[76]
Multnomah	815,637	27,656	460,467	$57,848,205,000	$70,924
Washington	603,514	15,865	293,095	$47,047,566,000	$77,956
Clackamas	421,596	12,209	147,405	$19,207,370,000	$45,559
Clark	496,865	11,566	151,442	$19,525,979,000	$39,298
Portland MSA	2,510,259	71,060	1,094,892	$148,455,652,000	$59,140
USA	331,761,000	8,000,178	134,163,349	$18.3 trillion	$55,415

Portland's strong regional economy has outperformed national trends. Gross regional product has outpaced US growth over the last 20 years (2.85% vs. 1.73%). The region's household income and employment growth are all higher than the US – for both Multnomah County and the MSA (see The region's highly educated workforce is above national averages. Table 2). The region's highly educated workforce is above national averages.

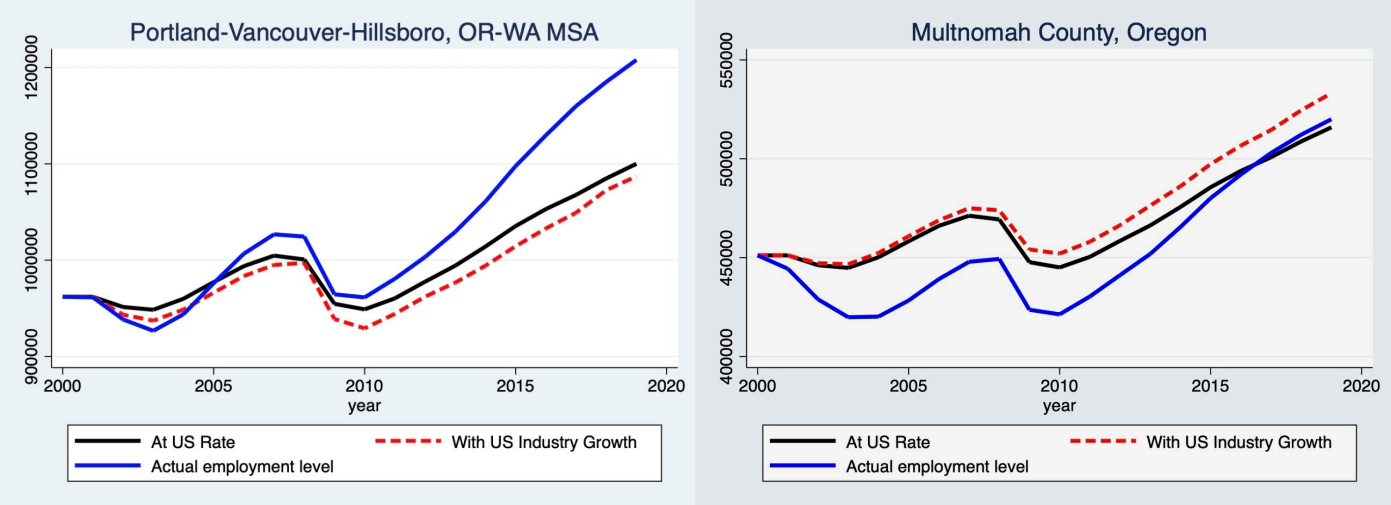
TABLE 2: MULTNOMAH COUNTY AS COMPARED TO PORTLAND MSA, AND US

	Real GRP Growth CAGR (2001-20)	Real GRP Growth CAGR (2015-20)	Median Household (HH) Income (2020)	Median HH Income CAGR (2010-20)	Emp. Growth (2010-2020) CAGR	Total Unemp. 2020	BIPOC Unemp. 2020	Poverty 2020	BIPOC Poverty 2020	% BIPOC 2020	% Bachelor's + 2020
Multnomah County	1.46%	2.07%	$71,425	1.92%	1.37%	5.2%	7.0%	13.2%	19.6%	31%	47%
Portland MSA	2.85%	2.56%	$77,511	1.47%	1.59%	4.8%	6.2%	10.1%	14.2%	28%	40%
USA	1.73%	1.12%	$64,994	0.50%	0.99%	5.4%	7.5%	12.8%	18.2%	40%	33%

[72] BEA
[73] County Business Patterns
[74] County Business Patterns
[75] BEA (Real GDP in chained 2012 dollars)
[76] BEA (Real GDP in chained 2012 dollars)

Portland MSA employment has also grown significantly more than the US rate (and more than would be expected, based on its industry mix). However, Multnomah County's employment growth rate has not kept up with what would be expected (see Figure 3).

FIGURE 3: EMPLOYMENT LEVEL PREDICTIONS, 2000 – 2020 (PORTLAND MSA AND MULTNOMAH COUNTY AS COMPARED TO US RATE)

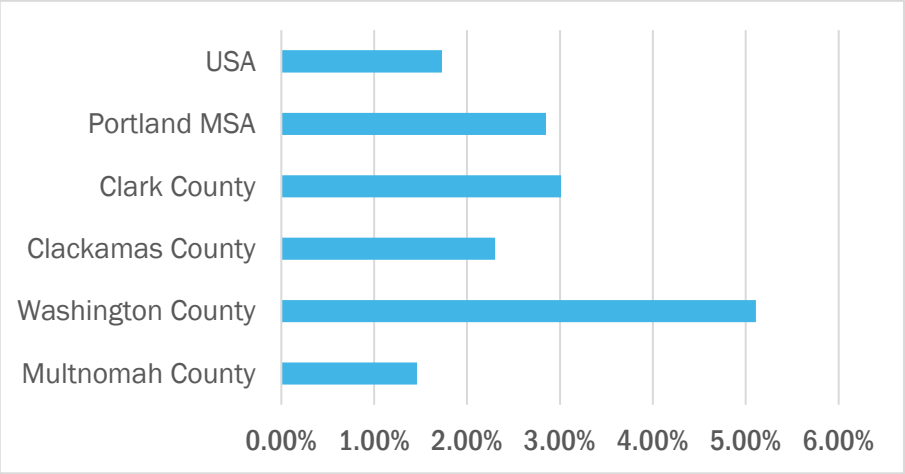


Source: Prof. Chris Berry, University of Chicago, Harris School of Public Policy

Until recently, the region exhibited exceptional economic growth, reflecting high performing industries and levels of human capital. However, Multnomah County's role as the "economic engine" of the region has been shifting over time - and may even be declining. While Multnomah County does generate most of the region's GRP (40%), this share has declined since 2000 (44%) and 1990 (~50%). In the last 20 years, GRP growth has been primarily driven by collar counties (see Figure 4).[77] Job growth trends are similar. The impact of the Great Recession can be observed in "Decade 1" (see Table 3). During this time period, the nation saw a decline in job growth while the Portland metro area saw no growth. Multnomah County was the only county in the 4-county region that saw a decline in job growth. In "Decade 2", the national economy rebounded. Job growth for the Portland metro area was almost double that of the nation. Multnomah County also rebounded but its recovery was modest compared to the surrounding counties. In the last five years, job growth in Multnomah County has slipped, and job growth in the Portland metro area has been driven by the other counties.

[77] Part of this can be attributed to manufacturing moving out of the city (to collar counties, overseas).

FIGURE 4: GRP GROWTH, 2001 - 2020



Source: Source: US Census data as prepared by Woods & Poole

TABLE 3: JOB GROWTH, 2001 - 2020

	Decade 1 Job Growth (2001-2010)[78]	**Decade 2** Job Growth (2010-2020) [79]	**Last 5 Years** Job Growth (2015-2020)[80]
Multnomah	-5.2%	13.3%	-0.6%
Washington	2.7%	21.8%	4.0%
Clackamas	2.0%	16.3%	5.1%
Clark	10.5%	23.3%	8.2%
Portland MSA	0.0%	17.2%	2.6%
USA	-1.4%	8.8%	-0.3%

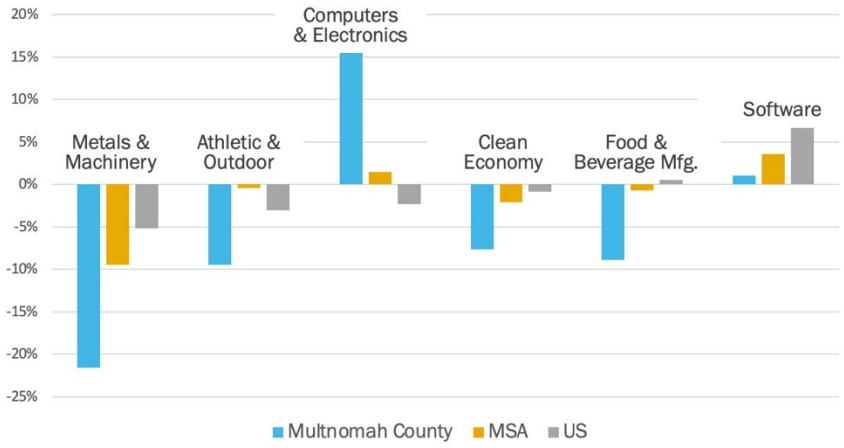
[78] EMSI, QCEW Employees
[79] EMSI, QCEW Employees
[80] EMSI, QCEW Employees

TABLE 4: INCOME, HOUSING VALUE, RENT COMPARISONS, 2010 - 2020

	2010-2020 Median Household Income Compound Annual Growth Rate	**2010-2020** Housing Value Compound Annual Growth Rate	**2010-2020** Median Gross Rent Compound Annual Growth Rate
Multnomah	1.92%	2.05%	3.00%
Washington	1.52%	1.35%	3.16%
Clackamas	1.17%	0.66%	2.59%
Clark	1.07%	1.35%	2.65%
Portland MSA	1.47%	1.41%	2.86%
US	0.50%	0.24%	0.91%

These trends in the last couple of decades indicate that parts of the economic engine are stalling and are particularly susceptible to economic downturns compared to the rest of the region. This became evident during the most recent COVID-19 pandemic and subsequent economic recession. The Portland MSA lost more employees over the first 18 months of the pandemic compared to the nation; Multnomah County lost an even higher share. Computers & Electronics cluster *grew in employment* within the County, unlike US trends (see Figure 5).

FIGURE 5: EMPLOYMENT CHANGE BY CLUSTER, MARCH 2020 – SEPTEMBER 2021



Source: data-Fab QCEW (6D NAICS 2017 vintage, privately-owned); data-Fab QWI (4D NAICS 2017 vintage, privately-owned)

In addition to declining growth and shifts in the regional economy, some of the negative effects of growth have become more apparent in recent years. BIPOC participation in growth has been limited, and the County's poverty rates are higher than the US average. Although poverty rates have improved since 2010 (except for American Indian and Alaska Natives, for whom the rate increased from 16.4% to 25.8%), there is still a significant differential in poverty levels between white and Black residents (9.9% and 30.7% respectively – see Table 5). A similar differential occurs for median household income ($77,513 and $36,783 respectively).

TABLE 5: MULTNOMAH COUNTY: RACE, POVERTY LEVEL, AND INCOME

	Population	% below Poverty Level		Median household income	
	2020	2010	2020	2010	2020
White alone	605,373	14.5%	11.2%	$50,689	$75,656
Black or African American alone	43,242	48.7%	30.7%	$25,400	$36,783
American Indian and Alaska Native alone	7,043	16.4%	25.8%	$31,759	$52,188
Asian alone	61,869	18.0%	15.3%	$54,393	$71,484
Native Hawaiian and Other Pacific Islander alone	5,194	*no data (sample size too small)*	13.0%	$43,861	$69,891
Some other race alone	20,677	38.6%	21.5%	$35,236	$51,580
Two or more races	52,010	19.9%	14.7%	$33,337	$58,908
Hispanic or Latino origin (of any race)	93,496	33.8%	22.3%	$36,653	$51,320
White alone, not Hispanic or Latino	549,020	13.3%	9.9%	$51,385	$77,513

Source: ACS Table S1701 (poverty; race); Table S1903 (income; race)

The region is experiencing rising crime, houselessness and food insecurity:

- Property crimes are up 26% compared to the 12 months leading up to COVID-19
- Multnomah County's unhoused population is estimated to be up 30% since 2019
- After spiking to 13.1%, unemployment in the MSA (3.6%) is below the national rate (3.7%)
- Housing prices have risen faster than all but 5 of nation's 40 largest metro areas

Strong and Emerging Industries

The diagrams below examine industry strengths in Multnomah County (see

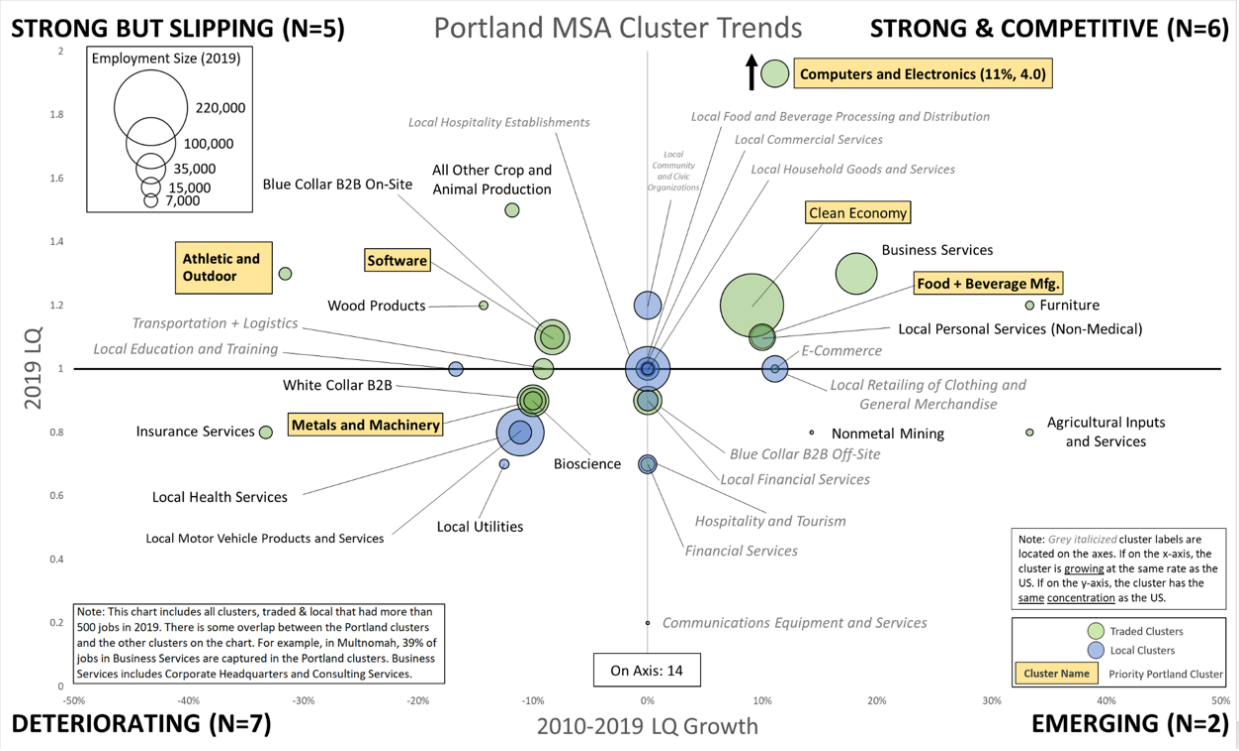
Figure 6) and in the MSA (see Figure 7). Both local and traded[81] clusters are plotted; those that are both strong (LQ greater than 1) and growing, as compared to the nation, are in the upper right quadrants ("strong and competitive") while those that are weaker (LQ less than 1) but experiencing growth are in the lower right quadrants ("emerging"). Those that have been experiencing declining growth are either in the upper left quadrants ("strong but slipping") or lower left ("deteriorating").

Multnomah County has several strong and competitive traded clusters, which will continue to drive economic growth.[82] Many of these traded clusters are comprised of information, professional services,

[81] Traded clusters sell goods and services in markets outside the region – and are the primary focus of this report.
[82] Note that while Metals and Machinery appears to be deteriorating, this is because of the inclusion of transportation equipment manufacturing – see Clusters section for analysis of the sub-clusters within Metals and Machinery that are in fact strong and competitive.

and headquarters functions – and over time, the City of Portland's role is shifting as these industries grow. Transportation & Warehousing, Information, and Professional Services have become more concentrated in Multnomah County in the last decade and have higher LQs than the MSA.[83] Management of Companies & Enterprises became more concentrated at the MSA level in the last decade.[84]

FIGURE 6: PORTLAND MSA CLUSTER TRENDS

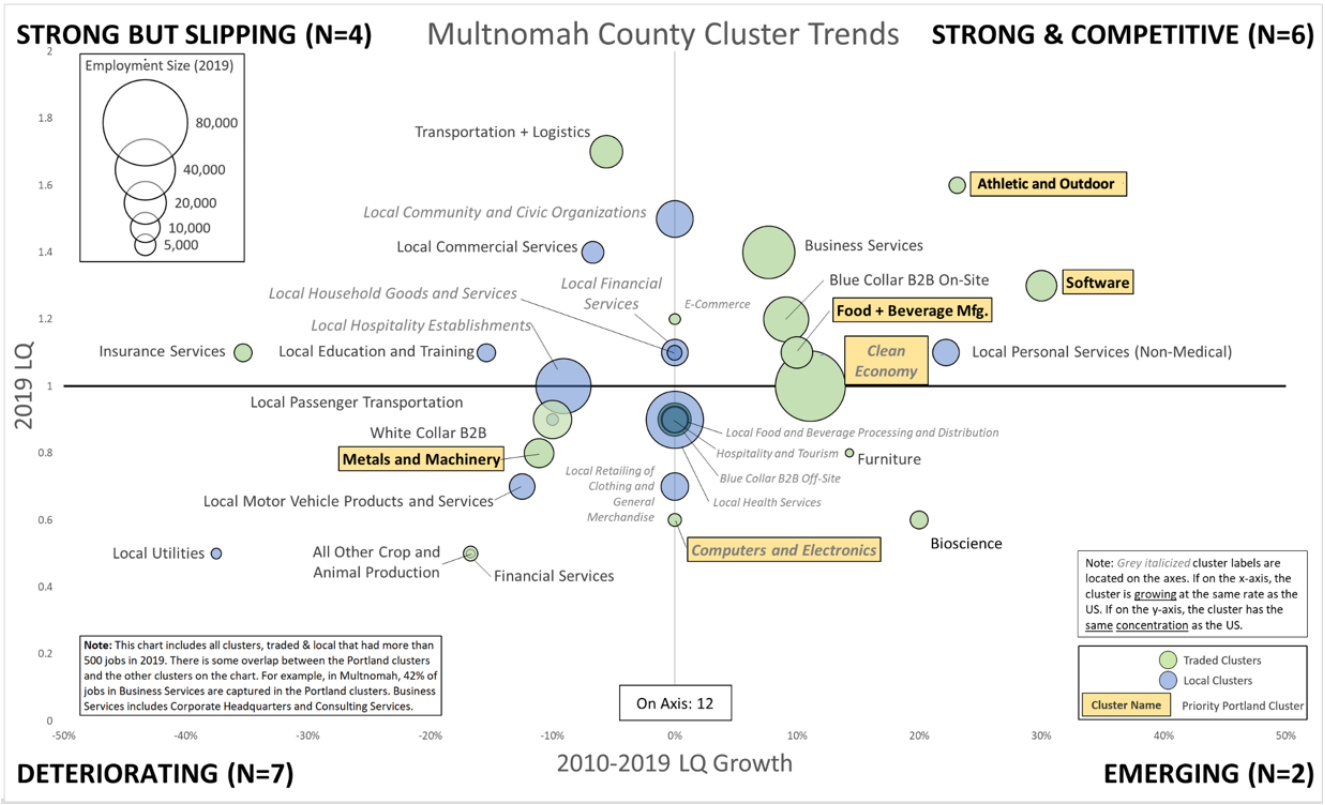


[83] Subindustries that became more concentrated include:

- Warehousing and Storage
- Data Processing
- Computer Systems Design Services
- Management, Scientific, and Technical Consulting Services
- Architectural, Engineering, and Related Services

[84] The industry is highly concentrated in Multnomah County as well but due to lower job growth relative to the MSA and the US in the last decade, its concentration slipped.

FIGURE 7: MULTNOMAH COUNTY CLUSTER TRENDS



Exports/FDI

As mentioned, the Portland MSA is one of America's most export-oriented and globally integrated economies with 18%+ of GRP from exports (3rd-highest export intensity in US & 2nd-fastest growing among largest 100 metros).[85] Most of this is comprised of chip exports and, as a result, Washington County (where Intel is located) has the highest proportion of jobs directly supported by international exports (10.9%, 2017). By comparison, 2.7% of Multnomah County's jobs are supported by exports – there is potential to increase this by supporting high-growth export industries (e.g., agriculture, educational and medical services, metals and machinery, food manufacturing).[86]

The region's exports have grown in the past decade; in 2017, the Greater Portland's exports comprised around 12.6% of its GDP and had remained at that level since 2003 (12.5%).[87] As of 2017, the top 5 industries by exports include semiconductors ($7.9B) precision instruments ($1.5B), computers & electronics ($1.5B), industrial machinery ($620M), and computer equipment ($450M).[88] The top goods exported from Greater Portland's port facilities support growth in several of the clusters analyzed in this report (either directly or via supply chain):[89]

[85] And, looking statewide - Oregon exports were at 19% in 2021. https://www.oregonlive.com/silicon-forest/2022/03/oregon-exports-soared-last-year-with-one-industry-leading-the-way.html
[86] https://portlandalliance.com/advocacy/2019-international-trade-report.html
[87] https://www.brookings.edu/research/export-monitor-2018/
[88] https://www.brookings.edu/research/export-monitor-2018/
[89] https://www.portlandoregon.gov/transportation/article/743005

- Food & Beverage Manufacturing (wheat & meslin; soybeans; corn)
- Athletic & Outdoor (parts of footwear)
- Metals & Machinery (motor cars and vehicles; aircraft engines and parts; copper ores; ferrous scrap; carbonates)
- Computers & Electronics (circuits)

With respect to Foreign Direct Investment (FDI): within the clusters explored in this report, the Clean Economy likely presents the most opportunity for FDI growth, as foreign companies are interested in Portland's energy generation potential. More broadly, Portland has the opportunity to leverage its "green" brand and associated industry strengths to grow FDI in a variety of industries – for instance, Athletic & Outdoor products.

The "Strategies" section of the report explores exports and FDI tactics in more detail; for instance:

- To grow opportunities for the products and services listed above – and others not yet exported – many firms (particularly small- and mid-sized) will need assistance in building specific product-industry relationships to be connected with global markets.
- Growing FDI particularly flows from supporting foreign-owned firms currently located in the Portland region (which in turn attracts more FDI).

Peer Cities

Comparing Portland to peer cities – Atlanta, Austin, Boston, Charlotte, Denver, Minneapolis, Oakland, Raleigh, San Diego – may provide further insights into Portland's economic trends. These cities have been selected as peers due to having comparable economic assets as well as some core output and descriptive variables (occupational mix, education level, household income, job growth, population size; see Table 6 and

Table 7 for all of these stats, except population, at both the MSA and City level). Note that because peers have been selected based on key economic similarities, comparisons across the selection variables, like educational attainment or income, will yield limited insights. Instead, examining variables that are quite different (e.g., racial composition, transportation infrastructure, housing values, occupational distribution, investment) – or, are outcomes of the key economic similarities (e.g., educational attainment may lead to increased GRP, more PhDs may lead to increased commercialization of R&D) – is potentially revealing.

TABLE 6: PEER CITIES: KEY ECONOMIC SIMILARITIES (COMPARED AT MSA LEVEL)

MSA	% College Graduates (2021)[90]	Employment Growth (2011 – 2021)[91]	Median HH income (2021)[92]	% Knowledge Occupations (2021)[93]	Knowledge Occupation Growth (2011-2021)[94]
Atlanta	40.4%	21.3%	$75,267	39.9%	36.6%
Austin	47.4%	40.4%	$85,398	45.1%	62.1%
Boston	49.7%	13.7%	$99,039	47.6%	29.8%
Charlotte	37.1%	57.7%	$69,559	38.3%	75.8%
Denver	46.2%	24.8%	$88,512	43.1%	45.6%
Minneapolis	43.5%	15.0%	$87,397	42.2%	29.2%
Oakland	51.4%	16.9%	$118,547	47.9%	36.8%
Portland	**41.0%**	19.6%	**$82,901**	40.0%	37.7%
Raleigh	48.6%	29.9%	$83,581	47.3%	45.6%
San Diego	40.3%	13.7%	$88,240	40.2%	26.6%
US	33.7%	11.1%	$69,021	36.5%	26.0%

[90] 2021 US Census, ACS 5-Year, Table S1501 (Population 25 years and older)
[91] 2021 US Census, ACS 5-Year, Table DP03 (Population 16 years and over)
[92] 2021 US Census, ACS 5-Year, Table DP03 (Households)
[93] 2021 US Census, ACS 5-Year, Table S2401
[94] 2021 US Census, ACS 5-Year, Table S2401

TABLE 7: PEER CITIES: KEY ECONOMIC SIMILARITIES (COMPARED AT CITY LEVEL)

City	% College Graduates (2021)[95]	Employment Growth (2011 – 2021)[96]	Median HH income (2021)[97]	% Knowledge Occupations (2021)[98]	Knowledge Occupation Growth (2011-2021)[99]
Atlanta	55.6%	28.7%	$69,164	50.8%	53.1%
Austin	55.1%	29.7%	$78,965	48.3%	60.0%
Boston	52.1%	17.3%	$81,744	48.5%	40.8%
Charlotte	45.7%	28.4%	$68,367	41.0%	46.0%
Denver	52.5%	32.8%	$78,177	46.5%	68.7%
Minneapolis	52.6%	18.0%	$70,099	46.6%	42.5%
Oakland	47.3%	27.4%	$85,628	42.8%	54.9%
Portland	**51.9%**	**21.8%**	**$78,476**	**44.6%**	**46.0%**
Raleigh	52.4%	23.1%	$72,996	45.8%	35.6%
San Diego	47.6%	13.4%	$89,457	45.9%	27.8%
US	33.7%	11.1%	$69,021	36.5%	26.0%

Compared to its peer cities across other variables, Portland has the following ranks at both the MSA (Table 8) and City (Table 9) levels, unless otherwise indicated:

- 1st in Cost Burdened Low-Mid Income Households
- 3rd in Livability (measured at City level only)
- 3rd in Per Capita Income Growth (4th at City level)
- 5th in Median Home Value (4th at City level)
- 5th in Growth of College Grads
- 7th in GRP growth
- 9th in Median Earnings for Bachelor Degree Holders (10th at City level)

For each of these metrics, Portland is above the US average; though, it should be noted that most of the peer cities are as well. In general, Portland's GRP growth falls slightly below that of its peers, and wages (earnings) for Bachelor Degree Holders fall well below most peers. This contributes to the affordability crisis, and results in a much greater share of cost burdened households than peer cities.

[95] 2021 US Census, ACS 5-Year, Table S1501 (Population 25 years and older)
[96] 2021 US Census, ACS 5-Year, Table DP03 (Population 16 years and over)
[97] 2021 US Census, ACS 5-Year, Table DP03 (Households)
[98] 2021 US Census, ACS 5-Year, Table S2401
[99] 2021 US Census, ACS 5-Year, Table S2401

TABLE 8: PEER CITY COMPARISONS (AT MSA LEVEL)

MSA	% Real GRP Growth (2011-2021)[100]	% Rate of Change College Grads (2011-2021)[101]	% Per Capita Income Growth (2011-2021)[102]	Median Home Value (2021)[103]	% Cost-Burdened Low-Mid Income Households (2021)[104]	Median Earnings for Bachelor Degree Holders (2021)[105]
Atlanta	38.6%	39.5%	13.8%	$260,900	5.4%	$62,863
Austin	70.0%	69.2%	22.2%	$332,200	4.3%	$63,416
Boston	27.4%	31.0%	18.0%	$490,600	3.8%	$73,006
Charlotte	35.7%	79.4%	11.4%	$254,500	4.9%	$61,522
Denver	42.5%	48.5%	20.0%	$447,800	4.8%	$66,199
Minneapolis	20.7%	33.3%	13.6%	$291,800	4.5%	$66,704
Oakland	71.1%	34.4%	28.1%	$944,800	3.3%	$85,483
Portland	**35.0%**	**43.7%**	**21.6%**	**$425,900**	**5.4%**	**$62,199**
Raleigh	59.8%	52.0%	15.6%	$296,000	4.2%	$65,227
San Diego	27.4%	34.0%	16.1%	$638,600	4.4%	$66,835
US	24.0%	33.1%	13.5%	$268,800	5.1%	$59,717

[100] 2011-2021, US Bureau of Economic Analysis
[101]2021, 2011 US Census, ACS, Table S1501 (Population 25 years and older)
[102]2021 US Census, ACS 5-Year, Table DP03
[103] 2021, US Census, ACS 5-Year, Table S2506
[104] 2021, US Census, ACS 5-Year, Table S2506
Households making $35k-$50K spending 30% or more on housing costs
[105] 2021 US Census, ACS 5-Year, Table S2001

TABLE 9: PEER CITY COMPARISONS (AT CITY LEVEL)

City	% Real GRP Growth at the County-Level (2011-2021)[106]	% Rate of Change College Grads (2011-2021)[107]	% Per Capita Income Growth (2011-2021)[108]	Median Home Value (2021)[109]	% Cost-Burdened Low-Mid Income Households (2021)[110]	Median Earnings for Bachelor Degree Holders (2021)[111]	Livability Index[112]
Atlanta	46.3%	47.6%	27.8%	$370,300	3.6%	$70,044	52
Austin	76.3%	65.5%	31.1%	$386,700	3.9%	$62,022	53
Boston	34.6%	45.9%	27.8%	$607,900	4.2%	$68,925	62
Charlotte	36.9%	43.9%	14.5%	$263,100	5.6%	$61,257	52
Denver	52.9%	62.4%	33.0%	$463,700	4.9%	$64,567	61
Minneapolis	21.5%	33.9%	20.5%	$289,200	5.1%	$58,244	66
Oakland	40.0%	51.9%	32.8%	$787,600	4.3%	$74,419	60
Portland	35.0%	46.8%	30.0%	$467,300	5.7%	**$57,093**	**62**
Raleigh	62.5%	39.0%	18.2%	$280,000	4.2%	$59,383	57
San Diego	27.4%	32.2%	18.0%	$666,100	4.2%	$67,387	53
US	23.4%	33.1%	13.5%	$268,800	5.1%	$59,717	

[106] 2011-2021, US Bureau of Economic Analysis
[107]2021, 2011 US Census, ACS, Table S1501 (Population 25 years and older)
[108]2021 US Census, ACS 5-Year, Table DP03
[109] 2021, US Census, ACS 5-Year, Table S2506
[110] 2021, US Census, ACS 5-Year, Table S2506
Households making $35k-$50K spending 30% or more on housing costs
[111] 2021 US Census, ACS 5-Year, Table S2001
[112] https://livabilityindex.aarp.org/

V. MARKET ANALYSIS

Developing an asset- and market-based business plan for inclusively and sustainably growing Portland's economy requires in-depth analysis of Portland's assets and of the market levers which influence how well they are being developed and deployed. The sections below provide that deeper analysis across:

1. Clusters
2. Human Capital
3. Innovation & Entrepreneurship
4. Governance
5. Spatial Efficiency

It should be noted that economic growth (in the sense of increasing gross regional product) is inherently equivalent to business growth, since it is the outputs of businesses (setting aside the role of government growth). Net regional business growth occurs primarily through growth of existing businesses, secondarily through entrepreneurship, and finally through business attraction. This means that cluster and firm performance is particularly important, and each of the other four market levers (human capital, innovation and entrepreneurship, governance, spatial efficiency) can be understood as affecting the creation and performance of firms, particularly of clusters.

Clusters

Overview

Clusters are industry-based concentrations of firms and related economic actors and institutions that, because of their proximity and close interactions, experience greater efficiency and productivity. This is due to reduced transaction costs, shared labor pools and other inputs, knowledge exchange and similar benefits. Even if not explicitly organized, clusters exist naturally in the economy: certain firms and related actors co-locate because of these benefits. Formally identifying and analyzing clusters enables targeting the most promising ones and designing initiatives to deliberately strengthening them through addressing cluster-specific challenges and seizing opportunities.

The cluster assessment first started with a broad scan of clusters across Portland's economy (see Bubble charts, Figure 6 and Figure 7, in Economic Overview section), and narrowed to traded clusters – clusters that sell goods and services in markets outside the region – that met key criteria to provide an economic growth opportunity, inclusion impact, and climate impact (see Table 10).

TABLE 10: KEY CRITERIA THAT AID IN THE SELECTION OF CLUSTERS

Impact Type	Key Criteria
Economic Growth Opportunity: Cluster Strength & Growth Potential	Builds from strong, underlying regional assets • Exhibits a large employment and firm base • Exhibits above-average concentration of employment or gross product • Preferably already growing/concentrating • Leverages institutional and other assets Exhibits potential for economic growth: • Market expectations to grow nationally or globally • Export potential • High employment multiplier
Inclusion Impact: Alignment of Cluster with Inclusion Opportunities	Presents opportunities for BIPOC firms & entrepreneurs • Existing BIPOC presence in the cluster (and its institutions); • BIPOC presence in related businesses that could transition to cluster • Opportunities lend themselves to participation by BIPOC entrepreneurs: lower barriers to entry, etc. Presents opportunities for BIPOC employment: • Jobs for which BIPOC labor force are qualified or can be upskilled; good career ladders • Provide living wages and other benefits • Accessible (nearby or by reasonable transit) Other Community and Economic Development Impacts: • Facilities locations • Product impacts
Climate Impact: Alignment of Cluster with Climate Action	Adds to Portland's leadership in addressing climate change: • By producing goods/services that contribute to climate mitigation and adaptation (essentially, are in the Clean Economy/Green Cities cluster as described below) • Are in related industries acting as suppliers to or purchasers from the Clean Economy/Green Cities cluster firms • Operations of firms within the cluster have limited negative climate impacts, and firms are "greening" *See "Climate-Centered Growth" section for additional considerations.*
Other Criteria:	Exhibits a high degree of existing organization and leadership Exhibits opportunities for and challenges to growth that are amenable to strategic intervention Has unusual externalities justifying philanthropic and public investment

In addition, prior reports for the city of Portland and the broader region[113] were assessed to confirm priority clusters by reviewing some of the existing assets within each cluster (see Table 11):

1. Clean Economy / Green Cities
2. Athletic & Outdoor
3. Computers & Electronics
4. Food & Beverage Manufacturing
5. Metals & Machinery
6. Software

TABLE 11: DATA FOR KEY CRITERIA ACROSS EACH OF THE SIX HIGH-GROWTH-POTENTIAL CLUSTERS

	Economic Growth Opportunity		Inclusion Impact			Climate Impact
Sector	LQ, MSA (10 yr growth)	LQ, County (10 yr growth) green = strong growth	Wages ($) green = > $67K MSA avg	% BIPOC green = >= 27% MSA avg	% < Bachelor's green = >= 60% (lower barrier to entry)	Opportunities to meet criteria outlined in *Table 10*[114]
Athletic & Outdoor	1.3, (-35%)	1.6, (10%)	82,700	30%	71%	**X**
Metals & Machinery	0.9, (11%)	0.8, (-5%)	74,700	27%	76%	**X**
Computers & Electronics	4.0, (18%)	0.7, (19%)	139,600	39%	56%	**X**
Clean Economy	1.2, (35%)	1.0, (35%)	93,800	25%	67%	**X**
Food & Beverage Manufacturing	1.1, (28%)	1.0, (23%)	58,000	32%	77%	**X**
Software	1.1, (69%)	1.3, (117%)	129,100	23%	51%	**X**

Source: dataFab and RW Ventures, LLC analysis of data from QCEW and QWI

Ahead of deep dives into each cluster, an overall picture of the region's existing strengths has been generated by parsing the six priority clusters into their primary sub-clusters and plotting their 2019 location quotient[115] (LQ) – by employment – against the growth in LQ from 2010 to 2019. Figure 8 graphs five of the sub-clusters across the Portland MSA, while Figure 9 shows five of the sub-clusters across Multnomah County. The Clean Economy cluster is diagrammed separately, due to the number of sub-clusters within it (see Figure 10 for Clean Economy / Green Cities in the Portland MSA and Figure 11 for Clean Economy / Green Cities in Multnomah County). Sub-clusters that are both strong (LQ greater than 1) and growing, as compared to the nation, are in the upper right quadrant ("strong and competitive") while those that are weaker (LQ less than 1) but experiencing growth are in the lower right quadrants ("emerging"). Those that have been experiencing declining growth are either in the upper left quadrant

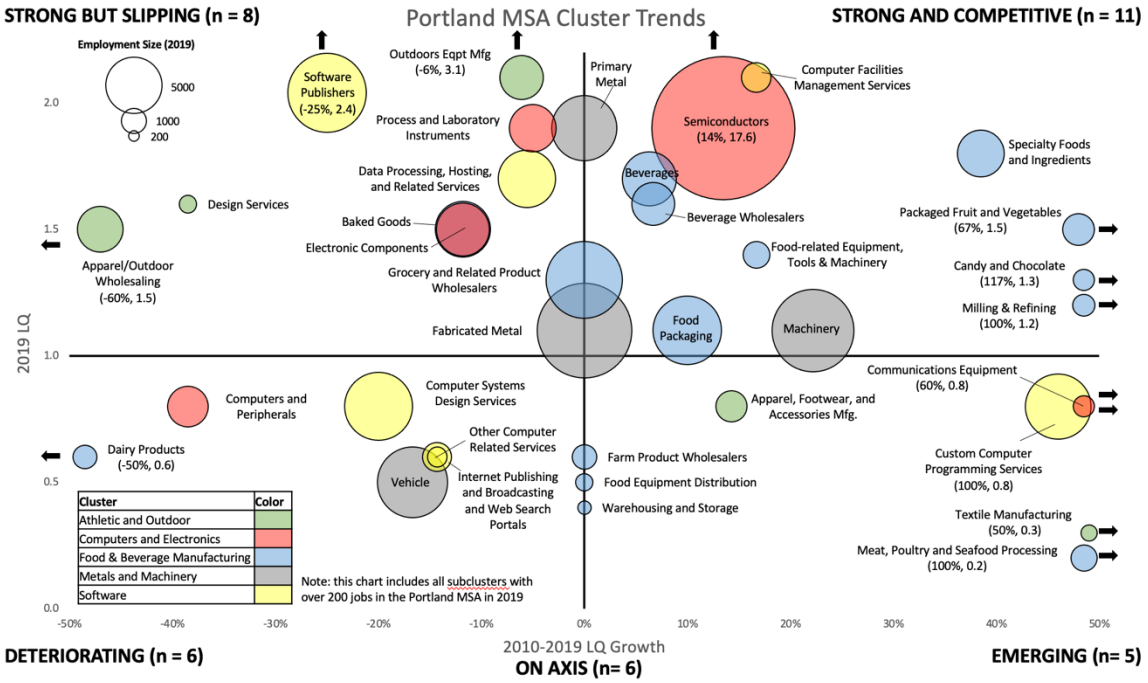
[113] https://prosperportland.us/wp-content/uploads/2016/07/PDC-Strategic-Plan.pd; https://prosperportland.us/portfolio_category/industry-clusters/; https://www.greaterportlandinc.com/media/userfiles/subsite_214/files/ceds-final-document.pdf

[114] See each of the cluster sub-sections for more detail about the specific climate impact opportunities.

[115] A location quotient (LQ) measures a region's industry specialization relative to the US. For example, an LQ of 1.0 in mining means that the region and the nation are equally specialized in mining; while an LQ of 1.8 means that the region has a higher concentration in mining than the nation. See: https://www.bea.gov/help/faq/478#:~:text=A%20location%20quotient%20(LQ)%20is,area%2C%20employment%2C%20etc.

("strong but slipping") or lower left ("deteriorating"). These diagrams will be referenced throughout each cluster section.[116]

FIGURE 8: PORTLAND MSA: FIVE ANALYZED CLUSTERS AND THEIR ASSOCIATED SUB-CLUSTERS; 2019 LQ VS 2010-2019 LQ



[116] These are meant to provide initial guidance only; all data observations are further vetted through stakeholder interviews and literature reviews. The bubble charts display industry strengths according to the 6D NAICS by which they are defined (listed in Appendix), but these definitions are often rough approximations of what combination of firms is actually benefitting from clustering. Note also that several of the largest firms in the apparel and outdoor industry are instead classified in NAICS as corporate headquarters, so are not reflected in the apparel "bubbles" in these charts, substantially understating the presence of that cluster.

FIGURE 9: MULTNOMAH COUNTY: FIVE ANALYZED CLUSTERS AND THEIR ASSOCIATED SUB-CLUSTERS; 2019 LQ VS 2010-2019 LQ

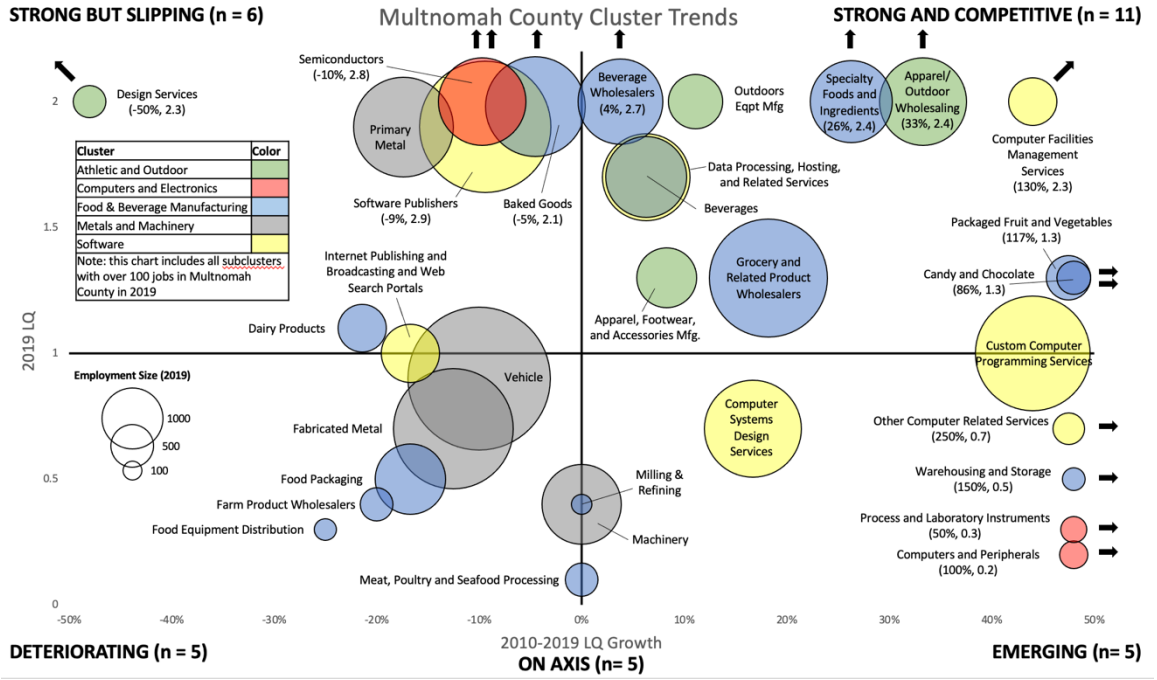


FIGURE 10: PORTLAND MSA: CLEAN ECONOMY / GREEN CITIES CLUSTER AND ITS ASSOCIATED SUB-CLUSTERS; 2019 LQ VS 2010-2019 LQ

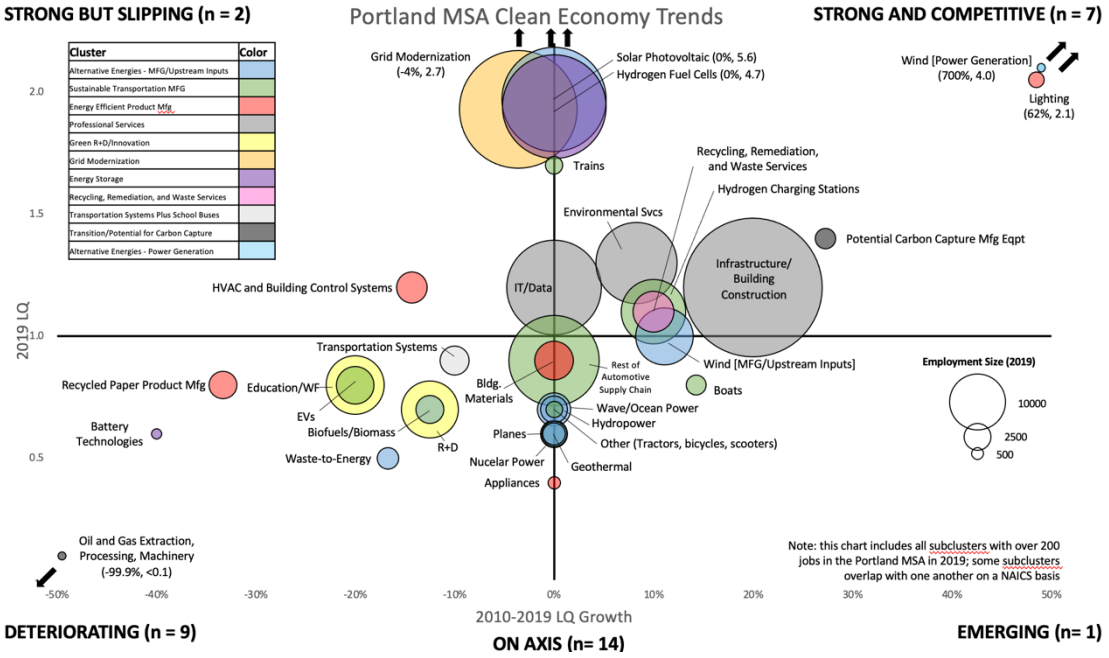
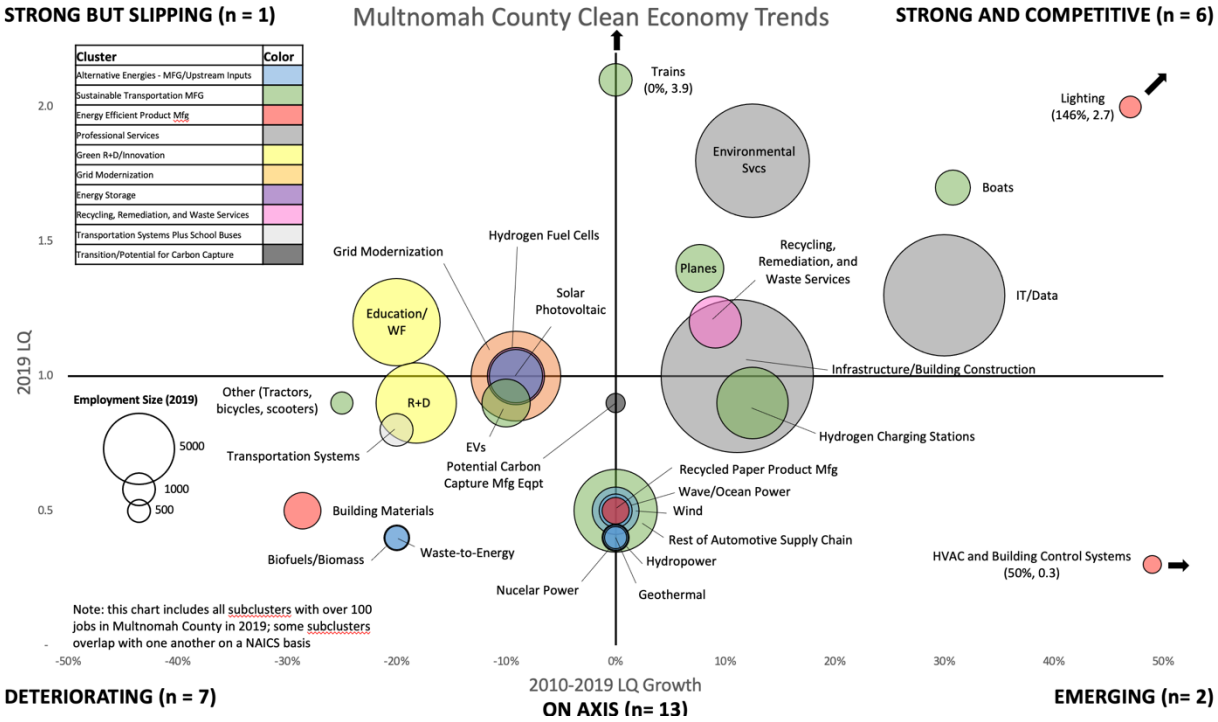


FIGURE 11: MULTNOMAH COUNTY: CLEAN ECONOMY/ GREEN CITIES CLUSTER AND ITS ASSOCIATED SUB-CLUSTERS; 2019 LQ VS 2010-2019 LQ.



Each cluster's analysis is organized into four parts:

- **Cluster Definition** - A high-level description of what companies and activities constitute the cluster. (See Appendix for the specific NAICS codes used for quantitative analysis.)
- **Market Observations** – Global and national trends, opportunities and challenges.
- **Portland's Assets and Market Position** – Portland's unique assets that can be leveraged to grow the cluster or sub-cluster(s) into a globally competitive sector.
- **Assessment: Portland's Opportunities** – The potential products, services, programs and initiatives relevant to the cluster's opportunities in Portland.

KEY TAKEAWAYS: CLUSTERS

Portland has many promising industry clusters, including: Clean Economy, Athletic & Outdoor, Metals & Machinery, Computers & Electronics, Food & Beverage Manufacturing, and Software – and, it also has a functional cluster around headquarters and professional services (that intersects with many of the other clusters, particularly green industries).

These clusters offer major growth opportunities - some in established, growing industries (e.g., Athletic & Outdoor, Software), and others more emergent (e.g., Clean Economy innovations around grid modernization). Several growth opportunities result from cross-cluster intersections.

Portland's legacy "green" services strengths can be leveraged to make Portland the place where new green products are invented and commercialized – ranging from low-carbon materials, to products to support the smart grid and EVs, to products created from recyclables and waste, to sustainable food product R&D. The region's strong software workforce has the potential to be re-deployed to support innovation within these emerging industries.

Capitalizing on cluster growth opportunities -- and particularly pivoting towards growth models that incent and support inclusive and sustainable companies, industries and economic growth – must be private sector informed and led. Greater private sector collaboration, within and across clusters, on talent, innovation, infrastructure, market development and related issues and opportunities can translate these growth opportunities into long term prosperity for Portland.

Clean Economy / Green Cities

Cluster Definition

The expansive, emerging Clean Economy is "economic activity… that produces goods and services with an environmental benefit or adds value to such products using skills or technologies that are uniquely applied to those products."[117] Broadly, this encompasses companies providing products and services in two categories:[118]

- **Mitigation strategies** – preventing further climate change, primarily through alternative energy production and more efficient energy use, reducing the flow of heat-trapping GHGs into the atmosphere; and
- **Adaptation strategies** – addressing the impacts of climate change (e.g., building sea walls, planting drought-tolerant crops).

The Clean Economy represents a variety of industries and is not considered a cluster itself; it employs over 2.7 million workers, spread across diverse industries.[119] It is inclusive of Prosper Portland's Green Cities sector[120] and is comprised of several sectors (e.g., Brookings identifies 39),[121] each representing an area that, with the right synergies, can begin to develop into a promising cluster.

[117] Muro, Mark, Rothwell, Jonathan, and Devashree Saha, Sizing the Clean Economy: A National and Regional Green Jobs Assessment, Online Publication: The Brookings Institution, 2011.
[118] https://www.climaterealityproject.org/blog/climate-adaptation-vs-mitigation-why-does-it-matter
[119] Muro, Mark, Rothwell, Jonathan, and Devashree Saha, Sizing the Clean Economy: A National and Regional Green Jobs Assessment, Online Publication: The Brookings Institution, 2011.; Muro, Mark, Tomer, Adie, Shivaram, Ranjitha, and Joseph Kane, Advancing Inclusion through Clean Energy Jobs, Online Publication: The Brookings Institution, 2019.
[120] Lisa Norwood, "Green Cities," *Prosper Portland* (blog), accessed May 25, 2022, https://prosperportland.us/portfolio-items/green-cities/
[121] Muro et al., Sizing the Clean Economy.

While established, universal definitions for the Clean Economy and the segments that comprise it do not exist, various methodologies[122] have been used to segment the Clean Economy into different categories. This analysis segments it into:

- **Alternative Energies – Power Generation** – industries that generate: biofuels/biomass, geothermal, hydropower, solar PV, waste-to-energy, wave/ocean power, nuclear power, wind
- **Alternative Energies – Manufacturing/Upstream Inputs** – industries that manufacture components that are used (or could be used) to produce equipment for the generation of: biofuels/biomass, geothermal, hydropower, solar PV, waste-to-energy, wave/ocean power, nuclear power, wind[123]
- **Energy Storage** – battery technologies, hydrogen fuel cells
- **Sustainable Transportation Manufacturing** – EVs, hydrogen charging stations, automotive, planes, boats, trains, Other (tractors, bicycles, scooters)
- **Energy Efficient Product Manufacturing** – lighting, appliances, HVAC and building control systems, building materials, recycled paper manufacturing
- **Professional Services** – environmental services (including architecture), IT/data, infrastructure/building construction
- **Grid Modernization**– advanced metering infrastructure, distribution, support services, utility-scale energy storage
- **Transportation Systems** – train, bus, vehicle, rail and mixed mode transit systems
- **Recycling, Remediation, and Waste Services** – collection, treatment, recovery and disposal facilities
- **Transition/Potential for Carbon Capture** – coal mining, fossil fuel electric power, oil and gas extraction/processing/machinery, pipeline transportation, potential carbon capture manufacturing equipment

National and Global Market Observations

As indicated by the list of segments above, the Clean Economy encompasses an extraordinarily large global market. No market report fully captures its size, but assessments of sub-markets indicate its enormous potential:[124]

- **Clean Energy Technologies Market,** which includes hydropower, wind, clean coal, and solar technology – $423.7 billion by 2026 (CAGR 6.9%, 2020 – 2026)[125]
- **Environmental Consulting Services,** which includes auditing, compliance, monitoring and testing - $93.6 billion by 2026 (CAGR 10.7%, 2021-2026)[126]

[122] This analysis builds upon categorizations identified in prior work – but updates these studies to account for emerging industries in the clean economy. http://rw-ventures.com/wp-content/uploads/2017/01/The-Chicago-Regions-Green-Economic-Opportunities.pdf; https://www.brookings.edu/wp-content/uploads/2016/06/0713_clean_economy.pdf; https://www.pewtrusts.org/~/media/legacy/uploadedfiles/peg/publications/report/clean20energy20economypdf.pdf]
[123] This segment comprises 54 manufacturing industries that are capable of producing equipment for the generation of alternative energy; some are quite broad and supply many industries outside of the clean economy. Examples include: organic chemical manufacturing, electronic connector manufacturing, machine shops.
[124] These sub-markets each encompass several of the Clean Economy categories segmented above; Clean Energy Technologies is predominantly Alternative Energies (both generation and manufacturing) and Energy Storage; Environmental Consulting Services is predominantly Professional Services; and Clean Economy manufacturing is predominantly Alternative Energy (manufacturing), Energy Storage, Sustainable Transportation Manufacturing, Energy Efficient Product Manufacturing.
[125] https://www.globenewswire.com/news-release/2021/08/10/2277874/0/en/Global-Clean-Energy-Technologies-Market-Size-Expected-to-Grow-to-USD-423-7-Billion-by-2026-Facts-Factors.html
[126] https://www.globenewswire.com/news-release/2022/08/22/2501914/28124/en/Global-Environmental-Consulting-Services-Market-Report-2022-2026-2031-Implementation-Of-AI-ML-and-Robotics-Consolidation-of-Companies-Use-Of-Drones-For-Environment-Monitoring.html

- **Clean Economy Manufacturing,** which includes manufacturing of wind turbines, solar panels, lithium-ion batteries, electrolyzers and fuel cells (see Figure 12) - could be a $27 trillion market opportunity if the world were on track for net zero emissions by 2050.[127]

Despite the uncertainty of its pace and scale, the net-zero transition is underway. Expanded climate policies and regulations, significant federal funding (e.g., Inflation Reduction Act; Bipartisan Infrastructure Law), rapid technological advancements and fast-changing societal attitudes are all driving growth across many sectors of the clean economy.[128] For instance, in the green building industry, goals have shifted from simply reducing energy consumption to creating net-zero/net-positive buildings, reflecting that innovations to achieve carbon neutrality are a necessary step in minimizing the impacts of climate change.[129]

Trends that are expected to drive growth in the clean economy include:

- **Emergence and adoption of low-carbon products** – new emerging industries and a vast array of associated products and services are in growing demand in the context of addressing climate change – from advanced batteries to "green" architectural services to hydrogen electrolyzers.[130] Large corporations are committing to piloting new technologies, driving demand for and supporting development of low-carbon products that are needed to achieve net-zero emissions; for example, over 30 major companies, joining in the First Movers Coalition, have committed to jump-start demand for these technologies to get to market within a decade.[131]
- **Convergence of digital technology and energy technology** – Innovative technology companies are providing timely energy data, optimizing customer interfaces with energy management, and enabling intelligent and more reliable distribution systems.[132] The energy industry will benefit from using connected devices to manage and respond to changes in demand (and pressure on the grid).[133]
- **New regulations** – New regulations with carbon-reduction targets and green legislation are being created at various levels (federal, state, local), which are driving growth of clean tech markets.[134]
- **Increased investments and funding** - The need for new technologies and related innovations to save the planet is driving increasing climate-focused investment from businesses and governments around the world.[135] For instance, as clean energy sources continue to replace fossil fuels, a number of related investments will occur in transmission and storage facilities and digital technologies that run energy systems.[136] In addition, federal funding availability is driving growth (e.g., the Inflation Reduction Act includes tax incentives for the manufacture of US-sourced clean tech materials like batteries, carbon capture systems, clean hydrogen).

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[127] https://iea.blob.core.windows.net/assets/4ed140c1-c3f3-4fd9-acae-789a4e14a23c/WorldEnergyOutlook2021.pdf
[128] https://www.blackrock.com/corporate/literature/whitepaper/bii-managing-the-net-zero-transition-february-2022.pdf
[129] "USGBC Partners with Dodge Data to Release World Green Building Trends 2021 Report | U.S. Green Building Council," accessed May 27, 2022, https://www.usgbc.org/articles/usgbc-partners-dodge-data-release-world-green-building-trends-2021-report.
[130] It will be important to keep the very long-term in focus as we invent the new green products of the future, designing and manufacturing with the full product life cycle from development to end of use, then next reuse.
[131] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/big-corporations-to-drive-demand-for-low-carbon-technologies-like-hydrogen-67865506
[132] Internet of Things (IoT) devices help customers use energy more efficiently (e.g., smart thermostats that respond to weather trends; smart home appliances that only run off-peak when there is renewable energy available). In addition, see: https://www.nytimes.com/2023/01/30/technology/recession-resilient-climate-start-ups-shine-in-tech-downturn.html?smid=nytcore-ios-share&referringSource=articleShare
[133] "3 Digital Trends Which Will Transform the Energy Industry | IEF."
[134] https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-eri-decarbonization-report.pdf
[135]Not only do we need to invent the next generation of products that are tackling climate change, but also need continuous energy (and upgrades to the grid) to support deployment of these products (e.g., advanced batteries for more energy storage, increased automation for outage response, decentralized energy points contributing to power flow). https://worldgbc.org/advancing-net-zero/embodied-carbon/)
[136] https://www.weforum.org/agenda/2022/01/global-clean-energy-economy-how-to-finance/

Innovative low-carbon products and clean economy technologies are emerging across many of the sectors listed above. The market potential of some of these products are displayed in Figure 12.

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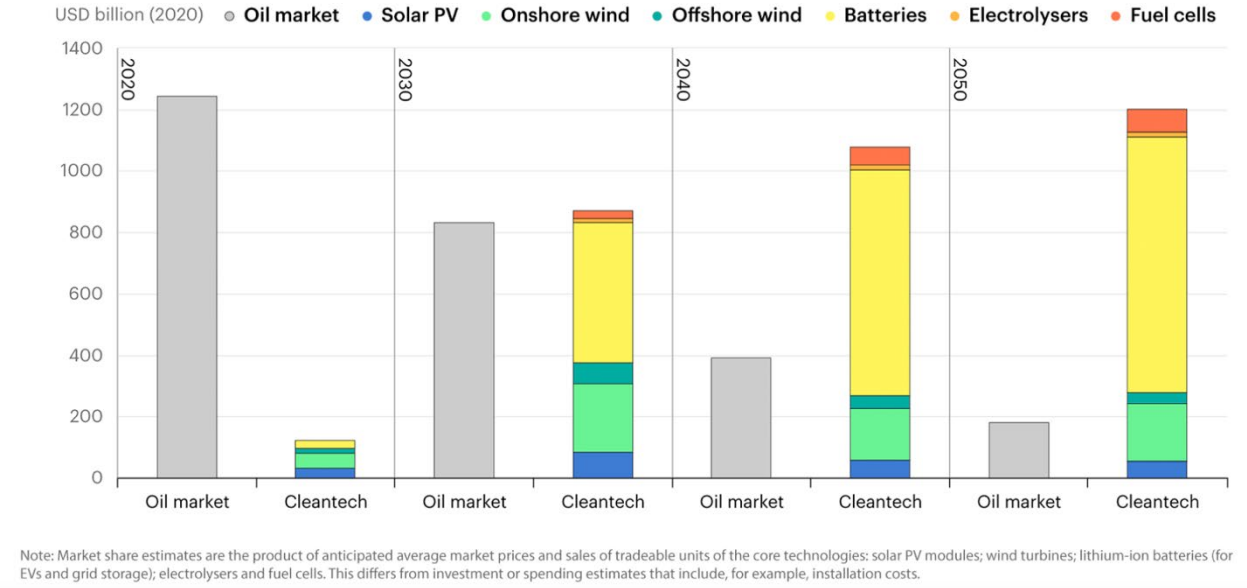
FIGURE 12: ESTIMATED MARKET SIZES OF CLEAN ENERGY TECHNOLOGIES IN RELATION TO OIL MARKET (IN A NET ZERO BY 2050 SCENARIO)



Source: https://www.weforum.org/agenda/2022/01/global-clean-energy-economy-how-to-finance/

Alongside, and as important as, these innovations, many of which involve alternative energies and storage (e.g., lithium-ion battery technologies, flow batteries, electrolyzers, fuel cells),[137] a next generation grid infrastructure which supports the distributed production, storage and use of energy will emerge.[138] Grid modernization is critical to ensure the seamless adoption of distributed energy resource (DER) technologies, and to provide monitoring and control capabilities to enable markets. In addition, fast-paced growth in electric vehicles, partially driven by local and state legislation,[139] puts increased pressure on the grid – requiring grid modernization solutions (e.g., microgrids), allowing EVs to be charged with on-site renewable energy.[140] Growing a strong domestic supply chain for utility-scale battery storage will be key to the integration of renewable energy into the grid, as will addressing challenges with integrated circuits and electronic components (and associated shipping/logistics challenges).[141]

[137] Electrolyzers produces hydrogen by splitting water with electricity; fuel cells generate electricity from hydrogen. https://www.nationalgrid.com/stories/energy-explained/what-is-battery-storage; https://www.science.org/content/article/new-fuel-cell-could-help-fix-renewable-energy-storage-problem

[138] Julio Romero Agüero et al., "Grid Modernization: Challenges and Opportunities," *The Electricity Journal* 30, no. 4 (May 2017): 1–6, https://doi.org/10.1016/j.tej.2017.03.008 (emphasizing "the need to build an intelligent grid that can be monitored and controlled in real-time to provide a reliable, safe, and secure service and empower customers to actively participate and benefit from greater and more diverse market opportunities and services.").

[139] In addition to federal incentives

[140] https://microgridknowledge.com/evs-smart-microgrids-siemens/; More broadly, microgrids enable an integration of different sources of power (i.e. renewables https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid/role-microgrids-helping; Microgrids provide less than 0.2 percent of US electricity but their capacity is expected to more than double in the next three years https://www.c2es.org/content/microgrids/

[141] Estolano Advisors, Climate Memo

The associated workforce needed for clean economy growth is substantial. To meet a net zero emissions by 2050 goal, another 26 million workers would be employed in clean energy and related sectors by 2030 – ranging from jobs in renewables to building retrofits to manufacturing efficient appliances.[142] Although clean economy jobs are growing nationally, they are unequally distributed; for instance, when looking at energy efficiency and solar jobs, women account for about 25%, African Americans account for 7-8% ,[143] with executive-level positions on average 88% white and 80% men.[144] Established networks are one barrier to inclusion.[145]

However, workers in clean energy earn higher wages than other industries by 8 to 19%, and in general these jobs have lower educational requirements (but greater science/technical skills) than other industries nationally.[146] This indicates potential for greater inclusivity in a sector with good-paying jobs. A significant portion of jobs within the clean economy are in manufacturing (in 2010, the clean economy workforce was estimated to be about 26% manufacturing, in comparison to 9% in the broader economy),[147] a sector which also typically has lower barriers to entry for employment and often provides on-the-job training, or relies on credentialing for hiring rather than two- or four-year degrees.

In addition, there is opportunity for increased entrepreneurship in a sector that is driven by continuous innovation (and often has new entrants). VC fundraising increased nearly 3x and VC investment increased more than 5x over the last six years, reaching $56 billion in the US.[148] Ten percent of clean tech companies have at least one founder coming straight from academia – and therefore, alongside increased entrepreneurship, increased commercialization of R&D will also be important.[149]

Portland's Assets and Market Position

Firm Presence and Sector Strengths

The Clean Economy encompasses about 18% of all of Multnomah County's jobs, largely due to the expansive list of industries considered part of the Clean Economy. From 2010-2020, employment grew much faster in the Portland MSA and Multnomah County than in the US. The sector has slightly lower education requirements, a more diverse workforce, and higher average wages than the U.S. sector overall (see Table 12).

[142] https://www.weforum.org/agenda/2022/01/global-clean-energy-economy-how-to-finance/
[143] Ribeiro, David, Samarripas, Stefen, Tanabe, Kate, Bastian, Hannah, Cooper, Emma, Drehobl, Ariel, Vaidyanathan, Shruti, Jarrah, Alexander and Mary Shoemaker, *The 2019 City Clean Energy Scorecard*, Online Publication: ACEEE, 2019.
[144] The Solar Foundation and SEIA, "US Solar Industry Diversity Study 2019," https://www.thesolarfoundation.org/wp-content/uploads/2019/05/Solar-Industry-Diversity-Study-2019-2.pdf
[145] Surveys indicate that women, particularly women of color, feel that the established networks within the industry are a barrier to inclusion and would value informal and formal mentorship (only offered by 37% of firms) to navigate the solar industry. The Solar Foundation and SEIA, "US Solar Industry Diversity Study 2019," accessed November 8, 2019, https://www.thesolarfoundation.org/wp-content/uploads/2019/05/Solar-Industry-Diversity-Study-2019-2.pdf; IEA, "Commentary: Addressing the diversity challenge in energy sector recruitment,"
[146] Muro et al., *Advancing Inclusion through Clean Energy Jobs*.
[147] Muro, Mark, Rothwell, Jonathan, and Devashree Saha, Sizing the Clean Economy: A National and Regional Green Jobs Assessment, Online Publication: The Brookings Institution, 2011.

[148] "The Future of Climate Tech Report | Silicon Valley Bank," accessed May 27, 2022, https://www.svb.com/trends-insights/reports/future-of-climate-tech.
[149] "The Future of Climate Tech Report | Silicon Valley Bank."

TABLE 12: CLEAN ECONOMY EMPLOYMENT DATA SUMMARY

Statistics for 2020, unless otherwise noted

Clean Economy	US	Portland MSA	Multnomah County
Establishments	1,597,033	16,661	5,894
Employment	21,239,475	209,068	73,697
Emp. % Change (2010-20)	18.7%	35.2%	34.8%
LQ	1.0	1.2	1.0
LQ % Change (2010-20)	--	9.1%	11.1%
Average wage ($000)	$87.4	$93.8	$89.6
% BIPOC	32%	25%	21%
% Female	28%	27%	30%
% <Bachelor's degree (25+)	71%	67%	67%

Source: dataFab and RW Ventures, LLC analysis of data from QCEW and QWI

Looking at the entire Clean Economy, the LQ is fairly average,[150] but Portland shows concentrations and strengths in certain sectors (see Figure 11 and Table 13). Portland has long been known for its strengths in environmental consulting and in green building, both of which are still strengths today. Portland's strengths in IT/data could be applied to clean economy growth, as many clean tech innovations continually demand more data intensity. Both grid modernization and recycling strengths need additional research to identify the specific related products that can be scaled to grow each. Note that Table 13 does not include some sectors with high LQs because of their very low employment.[151]

TABLE 13: MULTNOMAH COUNTY CLEAN ECONOMY SECTORS WITH HIGHEST LQS

Statistics for 2020, unless otherwise noted. Subclusters with LQs over 1.0 and with % of cluster employment greater than 1% are included.

Subcluster	Establishments	Employees	% of Cluster Employment	Employment Growth (2010-20)	LQ	LQ Change (2010-20)	Average wage ($k)
Environmental Svcs	1,474	12,220	5.8%	43%	1.9	19%	$91
IT/Data	1,779	13,798	6.6%	114%	1.3	30%	$136
Infrastructure/ Building Construction	1,647	21,343	10.2%	68%	1.1	22%	$86
Grid Modernization	218	7,295	3.5%	24%	1.1	0%	$92
Recycling, Remediation, and Waste Services	114	2,320	1.1%	21%	1.1	0%	$62

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

[150] This reflects that the broad definition encompasses many sectors in which Portland does not compete.
[151] These are: trains, planes, boats, lighting.

The Portland MSA has several large companies innovating in the Clean Economy, many that could support growth in grid modernization. These include[152] ESS, Inc. (long-duration energy storage solutions for commercial and industrial, utility, microgrid and off-grid applications), Powin (battery energy storage systems), Nuscale Power (nuclear technology for production of electricity, heat and clean water), Avangrid Renewables (onshore and offshore wind and solar), and Vestas (onshore and offshore wind turbines, made with recycled material[153]). Most of these focus on innovation, R&D and piloting products (not on mass production); most manufacture outside the region. This is also true for electric vehicles; companies like Jaguar Land Rover conduct R&D in EVs and autonomous vehicles, focused on engineering the customer-facing experience in vehicles. Grid modernization includes not just innovation in energy sources and storage solutions but also in electronic components and software/communications. There may be opportunity to leverage strengths of existing components manufacturers to create new products to support growth of grid modernization (e.g., Veris produces energy and environmental sensors for commercial applications).

> "Clean economy opportunities include decarbonizing buildings, material innovations like mass timber, energy storage, manufacturing high-tech energy components."
>
> *- Business leader*

Interviewees further confirmed Portland's strengths in the Clean Economy, echoing the region's capacity to lead in the environmental services industry (and suggesting opportunities to grow consulting opportunities in residential energy retrofits, district energy resources and decarbonizing manufacturing). Specific grid modernization strengths noted in interviews include development of next-generation energy infrastructure (supported by OSU and UO research on rare earth metals that enable electrolyzers or fuel cells). Building on the recycled material strengths shown in the data, there may be opportunity to increase innovative use of recycled products to create low embodied carbon materials (e.g., recycled steel, hemp-based concrete, bioplastics, recycled fabrics).[154]

Human Capital

The demand for clean economy workforce is projected to significantly grow nationally, as new products and services emerge to work towards a net-zero economy. Many local regulations will further impact future workforce needs; for instance, transportation electrification is expected to grow demand for electricians and increase the need for on-the-job training specific to EV products.[155] Interviewees noted difficulty in finding qualified engineers in software, hardware and renewables to support growth in energy storage product development. With 67% of jobs requiring an Associate's degree or less, there are relatively low barriers to entry for underserved populations to access careers in the Clean Economy. There is opportunity to scale regional training programs to meet employer needs for the future clean economy workforce – and in addition, to create stronger career pathways (specifically to increase diversity in executive level positions).[156]

[152] Golden Shovel Agency www.goldenshovelagency.com, "Climate Tech in Greater Portland," accessed May 27, 2022, https://www.greaterportlandinc.com/industries/climate-tech.
[153] Their turbines are currently 85% recyclable and aim to be at 100% by 2030; https://www.bain.com/insights/great-retooling-for-sustainability-is-a-huge-opportunity-global-machinery-and-equipment-report-2022/.
[154]This could leverage the region's EDA Build Back Better Regional Challenge grant for cross-laminated timber. https://www.merkley.senate.gov/news/in-the-news/oregon-mass-timber-coalition-lands-41m-to-boost-forest-products-industry; https://eda.gov/arpa/build-back-better/finalists/
[155] https://worksystems.org/sites/default/files/Transportation%20Electrification%20Workforce%20Market%20Study.pdf
[156] Also, as mentioned earlier in the report – BIPOC communities have been the most impacted by climate change, making it all the more critical for this same population to benefit from wealth creation opportunities in the clean economy.

Innovation and Entrepreneurship

Small business and entrepreneurship support exists to scale clean tech companies (e.g., VertueLab; NW Xcelerator; Cascadia CleanTech Accelerator) and, in addition, Prosper Portland provides support for small businesses in clean tech – particularly in accessing new markets and accessing capital. However, there are few climate-specific funds (although there are investors interested in supporting this sector). In addition, many firms require very targeted, specialized assistance to scale (e.g., access to spaces to prototype/test products, assistance navigating regulations and certifications).

Nearly 10% of climate tech founders come from academia, and additional support is needed to aid in commercialization of their research. In addition, there are university and institutional programs innovating in the Clean Economy (e.g., PSU's environmental sensing and monitoring research;[157] PNNL's hydropower focus[158]) – and also within private sector firms (e.g., Vigor is producing tidal energy devices) but there is room for collaborative public-private innovation models to further accelerate the region's Clean Economy innovation capacity.

Other Assets

The Portland region has a range of additional assets that will accelerate Green Economy growth, including trade associations[159] and leading-edge public policy and strategy. Policies include clean electricity requirements of HB 2021[160] and the city's 100% Renewable Energy Resolution. Policy goals and initiatives include: reducing carbon emissions (50% by 2030, net-zero by 2050); 100% renewable energy by 2050; 100% clean electricity; 100% clean natural gas; Climate Action Plan to reduce emissions by 80% in 2050;[161] the Portland Clean Energy Community Benefits Fund (PCEF),[162] and broad support for electric vehicles.

Portland's "green brand" drives additional demand for growth of Clean Economy sectors. The region carries an international reputation for sustainability, clean living, the outdoors, and innovation. For instance, Portland was ranked as the 10th greenest city in the US in 2018.[163] It is a longtime leader in climate strategy as the first US city to adopt a carbon reduction strategy in 1993, which has helped to foster demand for "green" products and services.[164] The city has embraced its role as a first adopter of clean tech innovations and supports efforts to accelerate consumer adoption (e.g., commercial energy retrofit program).

[157] https://www.pdx.edu/electrical-computer-engineering/environmental-sensing-and-monitoring-focus
[158] https://www.pnnl.gov/hydrowires/technology-innovation
[159] Trade associations include:
- Pacific Ocean Energy Trust – supports marine renewable wave energy
- Oregon Solar and Storage Industries Association (OSSIA) – a trade association promoting solar technologies
- Renewable Hydrogen Alliance – a trade association promoting renewable electricity to produce hydrogen
- NW Environmental Business Council – a trade association promoting the environment, largely through policy recommendations and knowledge-sharing
- Grid Forward – an industry association promoting electric grid modernization
- Forth – promoting equitable access to electric transportation

[160] Requires retail electricity providers to reduce greenhouse gas emissions associated with electricity sold to Oregon consumers to 80 percent below baseline emissions levels by 2030, 90 percent below baseline emissions levels by 2035 and 100 percent below baseline emissions levels by 2040,
[161] https://www.portlandoregon.gov/transportation/79497
[162] invests in clean energy projects, regenerative agriculture, green infrastructure and clean energy
[163] https://www.oregonlive.com/environment/2018/10/portland_ranked_10th_greenest.html
[164] https://www.portlandoregon.gov/transportation/79497

Assessment: Portland's Opportunities

Greater Portland's key challenges and opportunities:

- **Materials innovation** – Building on R&D strengths in material composition, both in private-sector (e.g., recycled wind turbines; repurposing trash for non-structural building materials) and at universities (e.g., metal variations for electrolyzers), there is opportunity to develop and commercialize innovative low-carbon products (e.g., cross laminated timber, low-carbon steel, using recycled materials for products like structural steel or batteries).
- **Grid modernization software and hardware products –** Portland has strong R&D capacity in both renewables and storage solutions. Grid modernization involves scaling grid infrastructure (e.g., capacitors, inverters, specialized semiconductors, transmission systems, switches, etc.), creating smaller-scale batteries and units to enable distributed generation, as well as developing software solutions that enable better communication between energy generation, storage and distribution. Portland has a strong tech workforce, many of which can be retrained to develop software solutions.[165]
- **Environmental consulting specialties** – Portland's strongest sub-cluster can be leveraged to provide specialty consulting in areas like decarbonizing manufacturing[166] – both in Portland and across the country.

There is also opportunity to leverage an initiative already underway: The Clean Industry Hub -- whose "purpose is to accelerate reductions of carbon, pollution, and waste from the largest stationary sources in Portland and facilitate the transition to a circular, clean, and inclusive economy" -- is in design and development by the Bureau of Planning and Sustainability. The Hub plans to closely involve the business community in its development, presenting many opportunities for employer-driven economic development initiatives (further explored in the "Strategies" section).

Food & Beverage Manufacturing

Cluster Definition

The food and beverage manufacturing cluster occupies the middle section of the value chain that provides consumers with the products they eat and drink (for conceptual diagram of entire value chain – see

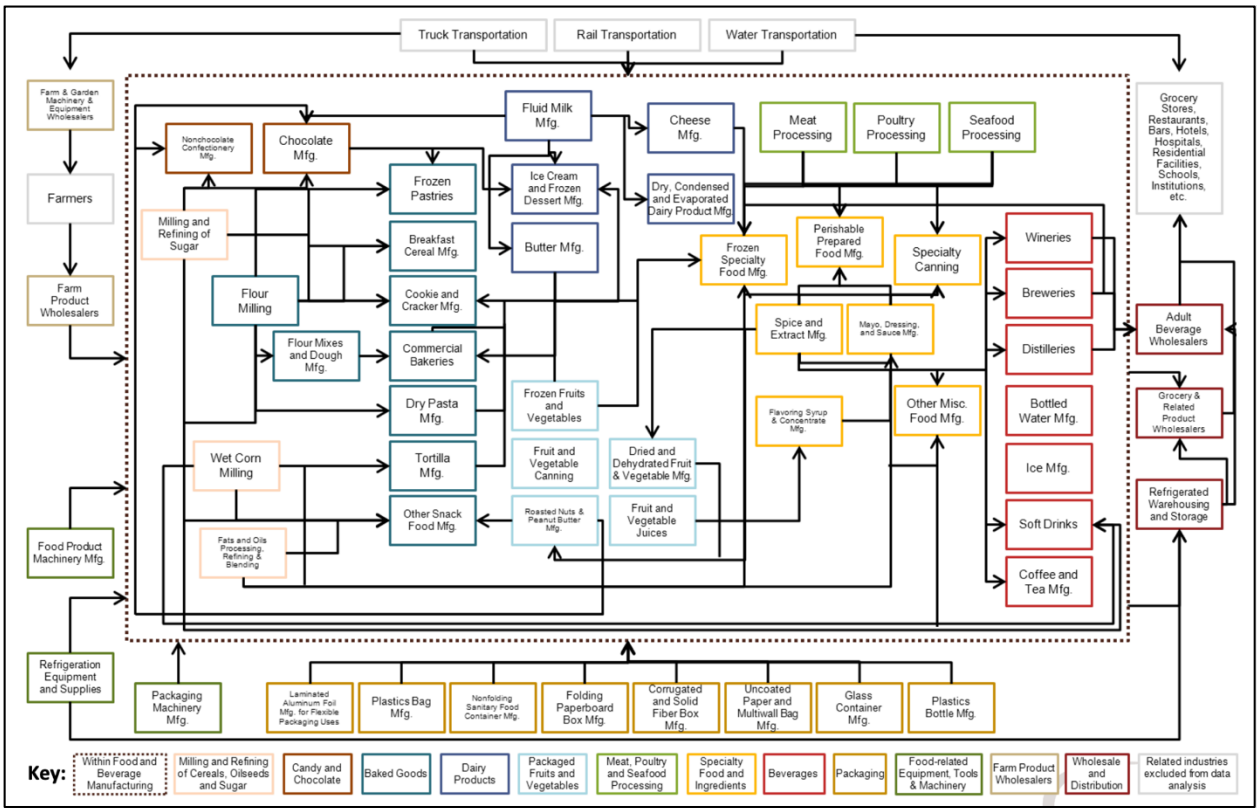
Figure 13). This system begins with agriculture production – farms and ranches as well as their inputs (seeds, fertilizers, equipment). The raw agricultural outputs funnel into the food and beverage manufacturing and packaging cluster, which creates and packages processed products. Finally, the finished goods reach consumers through food retail and restaurants. The cluster examined here excludes agriculture production and retail/restaurants, focusing on the traded cluster within this system that provides the most opportunities for innovation and productivity growth and the highest paying and quality jobs.

Food and beverage manufacturing and packaging can be broken down further into sub-clusters that group common products and activities.[167] The main subclusters are 1) food manufacturing, 2) beverage

[165] https://www.nytimes.com/2023/01/30/technology/recession-resilient-climate-start-ups-shine-in-tech-downturn.html?smid=nytcore-ios-share&referringSource=articleShare
[166] This is an area of significant opportunity already in development by the Bureau of Planning and Sustainability (BPS).
[167] See Appendix for the cluster definition used in this section; this definition was developed through a multi-year analysis of the food and beverage manufacturing and packaging cluster in the Chicago region (see Chicagoland FOOD Report: http://rw-ventures.com/wp-content/uploads/2017/01/Chicagoland-FOOD-Report_Final.pdf).

manufacturing, 3) packaging, 4) wholesaling, and 5) equipment and machinery. Food and beverage manufacturing is further subdivided into its primary product types: dairy products, meat, frozen foods, alcoholic beverages, etc.

FIGURE 13: FOOD CLUSTER MAP



Source: http://rw-ventures.com/wp-content/uploads/2017/01/Chicagoland-FOOD-Report_Final.pdf

National and Global Market Observations

Industry analysts predict the food and beverages global market will experience between 9 and 10% CAGR over the next several years, growing to $8.9 trillion by 2026. In the U.S., those projections are closer to 5%,[168] with certain subsectors predicted to experience more significant expansion, as discussed below. Overall, the industry, like many others, is going through rapid adjustments during the COVID-19 pandemic. For food and beverage production, the resurgence in grocery and retail purchases motivated renewed investment in new production facilities and products, infusing capital into an industry that had been focused primarily on consolidation and cost-cutting in the prior decade.[169] Those investments will ripple through the industry even as spending patterns have begun to regress to their traditional patterns and are now close to the pre-pandemic projected sales trend lines for both on- and off-premises

[168] https://www.grandviewresearch.com/industry-analysis/us-packaged-food-market, https://www.reportlinker.com/p06284446/Food-And-Beverages-Global-Market-Report.html.
[169] https://www.fooddive.com/news/construction-food-and-beverage-2021/607331/

consumption.[170] Climate change is further impacting the industry, disrupting growing seasons[171] and causing reduced yields and higher prices, globally.[172]

For several years, consumers' interest in and demand for food and beverage products has been changing dramatically and rapidly. Some of those trends have been accelerated by the pandemic and have produced growing markets such as:

- **Plant-Based Foods –** Food and agriculture have a tremendous environmental impact; global meat and dairy production alone generates as much GHG as the entire U.S. economy.[173] With consumers' increased awareness of these impacts, there is a move toward plant-based foods and away from meat or dairy. Sales of plant-based food alternatives are projected to increase more than 5x from 2020 to 2030, up to $162B in annual sales.[174] This trend is driving considerable innovation in meat replacements in particular,[175] such as better simulating mouth feel and textures (e.g., recreating the tearing in fiber-like patterns of real chicken).[176]
- **Locally Sourced Ingredients –** Consumers are growing more aware of how far certain products and ingredients must travel to reach factories, and many are seeking options with smaller carbon footprints. These effects are combining to push companies to re-shore and make supply chains as local as possible.[177] This trend is accelerated by the impacts of COVID-19 on global supply chains and the war in Ukraine and its food-related effects (especially on the world's wheat supply); both are prompting producers to adjust their ingredient sourcing.
- **Free-from Products –** The increased awareness of food allergies and the resulting dietary restrictions have greatly expanded markets for options that do not contain gluten, dairy, or other allergens. This portion of the industry is projected to have 9% CAGR from 2020 to 2030, keeping pace with the overall expansion of the global market noted above.[178]
- **Functional Foods –** Products that promise or provide benefits beyond pure sustenance are experiencing increased demand. Much of this growing demand is among younger consumers, who want food to provide distinct physical benefits (energy, mood, focus) on top of nutrition.[179]
- **Indulgent Foods –** While the pandemic has increased consumers' interest in healthy and functional foods, it has also at times prompted consumers to choose more indulgent products, as they've justified those purchases as ways to cope with pandemic stress.[180]
- **Greening agriculture –** Investors are increasingly interested in green agriculture solutions, particularly important given that agriculture generates 19-29% of GHG emissions.[181]

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[170] https://rsmus.com/insights/industries/food-beverage/food-beverage-outlook.html
[171] Oborne, A., Buck, M., & Gwin, L. (2015). *Oregon Food Infrastructure Gap Analysis* (Where Could Investment Catalyze Regional Food System Growth and Development). https://ecotrust.org/wp-content/uploads/Food-Infrastructure-Gap-Report1.pdf
[172] Brown, M.E., J.M. Antle, P. Backlund, E.R. Carr, W.E. Easterling, M.K. Walsh, C. Ammann, W. Attavanich, C.B. Barrett, M.F. Bellemare, V. Dancheck, C. Funk, K. Grace, J.S.I. Ingram, H. Jiang, H. Maletta, T. Mata, A. Murray, M. Ngugi, D. Ojima, B. O'Neill, and C. Tebaldi. 2015. Climate Change, Global Food Security, and the U.S. Food System. 146 pages. Available online at http://www.usda.gov/oce/climatechange/FoodSecurity2015Assessment/FullAssessment.pdf.
[173] https://www.mckinsey.com/industries/agriculture/our-insights/agriculture-plays-a-critical-role-in-limiting-the-impact-of-climate-change
[174] https://www.foodmanufacturing.com/consumer-trends/blog/22081182/the-top-food-industry-trends-to-expect-in-2022.
[175] See 'Climate Change Risks, Vulnerabilities, and Opportunities by Cluster' memo by Estolano Advisors for more detail. Demand for meat alternatives spiked during the pandemic, reaching 200 percent growth during spring 2020. Though growth rates in retail sales are slowing down (33% increase in 2020 overall compared to a 17% increase in 2021), forecasts still show significant future growth, with one 2020 estimate as high as 140 billion by 2030. See: Sorvino, C. (2022, June 18). Lifeless Market For Meatless Meat. *Forbes.* https://www.forbes.com/sites/chloesorvino/2022/06/18/lifeless-market-for-meatless-meat/?sh=75084ff08f24; Yu, D. (2020, January 19). Plant-Based Foods Are Hot, And They're Only Getting Hotter. Forbes. https://www.forbes.com/sites/douglasyu/2020/01/19/plant-based-foods-are-hot-now-they-just-got-hotter/?sh=5e1c013a214c
[176] https://www.fooddive.com/news/6-trends-shaping-food-and-beverage-growth-in-2022/616457/.
[177] https://www.fooddive.com/news/6-trends-shaping-food-and-beverage-growth-in-2022/616457/.
[178] https://www.prnewswire.com/news-releases/demand-for-plant-based--allergen-free-foods-are-expected-to-rise-as-consumers-seek-healthier-alternatives-301494678.html
[179] https://www.fooddive.com/news/6-trends-shaping-food-and-beverage-growth-in-2022/616457/
[180] https://www.newfoodmagazine.com/article/160769/food-and-beverage-trends-2022/
[181] https://www.worldbank.org/en/topic/climate-smart-agriculture#:~:text=Agriculture%20is%20a%20major%20part,is%20either%20lost%20or%20wasted.

Examples include soil quality improvement and alternatives to dairy and animal-based products (e.g., fungi-based proteins).[182]

- **Specialty foods** – In addition to plant-based foods and free-from products (mentioned above), the market for other specialty foods – those that are made from high-quality ingredients in small quantities – is growing. This is partially due to rising demand for nutritious, healthy meals and accelerated by COVID-19's increase of at-home meals.[183]

As manufacturers try to address these various opportunities and industry changes, they are also coping with workforce challenges. Pre-pandemic, manufacturers of all stripes were managing an aging workforce that was beginning to enter retirement age, without a sufficient pipeline of new employees. Though industry wages for production positions have increased substantially – in some cases close to 15% above pre-pandemic pay – employment has only grown slightly. With many plants designed around near-constant production over three shifts, staffing disruptions are limiting product supply and companies' ability to increase productivity.[184] That said, sizeable industry investments spurred by COVID-19 impacts have created new job opportunities as new facilities begin to come online.[185] Along with having more modern, cleaner factories to work in, workers are now being lured to food and beverage jobs with not just higher salaries but also better benefits, including deeper support for on- and off-site training.[186]

There is still much room for innovation in food and beverage products as well as processing technology and equipment. This industry tends to lag others in incorporating more advanced and automated manufacturing options but certain trends, like the labor pressures mentioned above, are prompting companies to become more aggressive in their efforts to automate and innovate. Several technologies are emerging that improve processing results; for example, individual quick freezing (IQF), which freezes each piece of food by itself, rather than in bulk, increases yields by up to 3%, improves nutritional value, and wastes fewer inputs. Companies are also working to improve efficiency, especially given the nature of their equipment; packaging machinery has higher likelihoods of failure than other machinery types, prompting food companies to increase attention on predictive maintenance that reduces downtime.[187] Further advances could address unique challenges of the industry; for instance, there is a common need for machinery that is more flexible than that in other manufacturing sectors, as companies need equipment that can accommodate multiple product sizes and formulations.[188]

Finally, there is also room for improvements in diversity within this sector, particularly in executive level and board level positions. The percentage of women and historically marginalized populations in board-level positions within the food industry grew 4% between 2018-2020 as compared to 11% for nonfood companies - and, most food retailers and product suppliers acknowledge that their leadership is not representative of national demographics.[189] However, this sector does provide lower-barrier opportunities in entry-level positions, as many are open to individuals without college degrees and the employment structure provides good job ladders.[190]

[182] "These Are the Biggest Trends in Clean Tech in 2021, Investors Say," Fortune, accessed May 27, 2022, https://fortune.com/2021/02/16/clean-tech-trends-investing-venture-capital-green-investment-trends-climate-change-electric-vehicles-hydrogen-agriculture/.
[183] https://www.thebusinessresearchcompany.com/report/specialty-foods-global-market-report
[184] https://rsmus.com/insights/industries/food-beverage/food-beverage-outlook.html
[185] https://www.fooddive.com/news/construction-food-and-beverage-2021/607331/
[186] https://www.fooddive.com/news/food-manufacturing-employment-leaps-in-february-as-labor-market-heats-up/619848/
[187] https://foodindustryexecutive.com/2021/09/packaging-equipment-trends-at-pack-expo-flexibility-robotics-predictive-maintenance/
[188] https://www.globenewswire.com/news-release/2022/06/09/2459384/0/en/Food-And-Beverages-Global-Market-Report-2022.html
[189] https://www.fooddive.com/news/food-and-beverage-companies-have-room-to-grow-on-diversity-goals-study-fin/605665/; https://www2.deloitte.com/us/en/insights/industry/retail-distribution/diversity-in-the-food-industry.html
[190] RW Ventures, LLC and IMEC, Chicagoland FOOD: Seizing the Opportunity to Grow Chicagoland's Food Industry

Portland's Assets and Market Position

Firm Presence and Sector Strengths

The food and beverage manufacturing cluster encompasses 4% of all of Multnomah County's jobs. From 2010-2020, the cluster's employment grew by 23%; this did not increase the location quotient, but the cluster did keep pace with the County's strong overall employment growth. The cluster demonstrates strong inclusive growth potential. Though the relevant metrics are below national averages, adjusting them for the County's demographics and high educational attainment shows that the cluster has slightly lower education requirements and has a more diverse workforce than U.S. cluster overall (see Table 14).

TABLE 14: FOOD AND BEVERAGE MANUFACTURING EMPLOYMENT DATA SUMMARY

Statistics for 2020, unless otherwise noted

Food and Beverage	US	Portland MSA	Multnomah County
Establishments	151,535	1,676	670
Employment	4,022,052	35,949	14,280
Emp. % Change (2010-20)	11%	28%	23%
LQ		1.1	1.0
LQ % Change (2010-20)		10%	0%
Average wage ($000)	$59.4	$58.0	$57.1
% BIPOC	43%	32%	33%
% Female	33%	34%	32%
% <= SCA (25+)	81%	77%	77%

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

The cluster overall only has an LQ of 1.0, but certain sub-clusters show areas of strength for Portland (see Figure 9). Beverages – both wholesaling and production – stand out, no surprise given Portland was one of the first U.S. cities to develop substantial craft beer and coffee production and has maintained its strength in that niche. As of 2021, the Portland metro had more craft breweries than any other region in the U.S.[191] Baked Goods (especially commercial bakeries and cookie/cracker manufacturing) and Specialty Foods and Ingredients (led by frozen foods and perishable prepared foods) also stand out with high location quotients and substantial proportions of the cluster's overall employee base (see Table 15).

[191] https://www.realestatewitch.com/best-beer-cities-2021/

TABLE 15: MULTNOMAH COUNTY FOOD AND BEVERAGE SECTORS WITH HIGHEST LQS

Statistics for 2020, unless otherwise noted

Subcluster	Establishments	Employees	% of Cluster Employment	Employment Growth (2010-20)	LQ	LQ Change (2010-20)	Average wage ($k)
Beverage Wholesalers	50	1,765	12%	25%	2.6	0%	$61.0
Baked Goods	91	2,544	18%	12%	2.2	0%	$51.8
Specialty Foods and Ingredients	62	1,423	10%	36%	1.9	0%	$39.7
Beverages	132	1,402	10%	42%	1.4	-13%	$49.6
Grocery and Related Product Wholesalers	152	3,457	24%	39%	1.3	+18%	$68.2
Candy and Chocolate	27	265	2%	109%	1.3	+86%	$38.4
Packaged Fruit and Vegetables	19	495	3%	110%	1.3	+117%	$43.4
Dairy Products	14	625	4%	1%	1.2	-21%	$62.8

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

A weakness of the cluster is its wages. Among Portland's priority clusters, Food and Beverage has had the lowest average wages in the observed years, and the second lowest rate of wage growth (behind Metals and Machinery). Of its strongest sub-clusters based on LQ, several have lower average wages than the cluster overall. That said, most of these sub-clusters have experienced wage growth over the last decade that is faster than the cluster average, showing their potential to catch up or keep pace with wage growth in other areas of the economy. These wage conditions could improve with greater innovation by food and beverage companies (and the addition of new technologies to the market often leads to higher paying jobs); as new, higher value products emerge and generate higher revenues, compensation should commensurately increase.

Human Capital

Entry level jobs in the cluster are fairly accessible: requiring low to mid-level skills -- 77% of jobs are accessible with up to an Associate's degree. At the same time, as food and beverage manufacturing modernizes, incorporating new technologies, job quality, pay and skill requirements are increasing. This suggests opportunities for targeted training (often on-the-job) to prepare workers for the full range of available cluster occupations. As the Greater Portland CEDS recently noted, the region overall lacks a food and beverage-focused training program that would provide workers with the skills and knowledge tailored to the cluster's unique needs.[192] The city's current Production sector workforce skews toward BIPOC populations, so it is likely that there are a substantial number of employees of color with manufacturing experience who could be reskilled for food and beverage manufacturing positions if the appropriate training was available.

Portland has been a hub of worker actions that have led to some of the improvements in the cluster's working conditions referenced above. For instance, workers at Portland's Nabisco plant, owned by Mondelez, initiated national strikes in 2021 over company proposals to reduce pensions and exempt weekends from overtime pay.[193] The resulting contract ended up increasing wages and company 401k

[192] https://www.greaterportlandinc.com/media/userfiles/subsite_214/files/ceds-final-document.pdf
[193] https://www.wweek.com/news/business/2021/08/18/oreo-makers-in-northeast-portland-launch-a-national-strike/

contributions, coupled with $5,000 bonuses.[194] In 2022, many of those same workers pushed back against Mondelez practices that often required them to extend their shifts with no notice, prompting the state to pass legislation requiring 5 days notice of mandatory overtime.[195]

Innovation and Entrepreneurship

Portland has proven itself a fertile ground for food and beverage entrepreneurs, especially craft producers, to establish their operations. These companies benefit from the presence of a large consumer base interested in craft and local products, along with two major retailers – New Seasons and Market of Choice – with substantial regional reach and a willingness to stock locally produced goods. There are ample examples of companies who have made their start in Portland, experienced substantial growth, and then been acquired by larger corporations, including Tazo Tea, Kettle Brand chips, Pacific Foods, and Stumptown Coffee.[196] Even with these buyouts, substantial facilities often remain in Portland, continuing to provide employment opportunities stimulated by the initial startup and growth of craft producers.

In addition to the product innovation occurring naturally among Portland's entrepreneurs, the city is home to the Food Innovation Center (FIC), an extension center of OSU's College of Agricultural Sciences housed in a 33,000-square foot facility. The FIC operates test kitchens, research and food safety labs, shelf-life testing areas, and sensory and consumer testing spaces, offering a broad range of services to entrepreneurs and established operations.[197]

While the FIC is a tremendous resource for the cluster, it is limited in both its mandated scope (as a state-funded center, it is required to serve companies from anywhere in Oregon) and in its staffing size from serving all Portland food and beverage entrepreneurs. In addition, the FIC is prohibited by state law from offering sliding scale prices for its services, which can keep smaller entrepreneurs from accessing this state-of-the-art facility. Several incubators and co-packers are working to fill the entrepreneur support space, including Community Co-Pack, which focuses on serving women- and BIPOC-owned companies.

Other Assets

The 2015 Multnomah County Climate Action Plan sets a goal to "reduce consumption of carbon-intensive foods and support a community-based food system"[198] – and Portland is home to several companies working towards these goals (e.g., breweries leading water-efficiency initiatives; plant-based food companies developing meat alternatives).[199]

Portland is home to the headquarters of Food Northwest, one of the country's oldest food and beverage trade associations. Roughly a decade ago, Food Northwest was a leading practitioner in the cluster organization space, having established the NW Food Processing Cluster Initiative in 2003, an effort that was a finalist for the EDA's 2010 Regional Innovation Cluster of the Year. However, this initiative, as well as an associated Innovation Productivity Center that was focused on promoting innovation in regional companies, is no longer active. This leaves Portland without any cluster organization focused on food and beverage manufacturing. Key regional industry figures have noted this gap and have had initial conversations around how the private sector could begin organizing to develop a Portland-focused cluster organization.

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[194] https://www.nytimes.com/2021/09/19/business/nabisco-union-strike.html
[195] https://www.opb.org/article/2022/02/07/mondelez-workers-at-portlands-nabisco-plant-say-theyre-forced-to-work-overtime-with-little-notice-or-face-penalties/, https://olis.oregonlegislature.gov/liz/2022R1/Downloads/MeasureDocument/SB1513/Enrolled
[196] https://www.oregonlive.com/business/2017/07/11_oregon_food_brands_that_wen.html
[197] https://fic.oregonstate.edu/fic2/quality-analysis-shelf-life/working-shelf-life-program
[198] Anderson, S., Armstrong, M., Crim, M., Diesner, K., Evans, T., Fish, I., & Williams - Rajee, D. (2015). *Climate Action Plan* (Local Strategies to Address Climate Change).
[199] See 'Climate Change Risks, Vulnerabilities, and Opportunities by Cluster' memo by Estolano Advisors for more detail.

Assessment – Portland's Opportunities

Portland's food and beverage manufacturing cluster has a confluence of opportunities and assets that can be leveraged for inclusive, climate-friendly economic growth. The national market is strong and growing for sustainably sourced and produced products with smaller environmental impacts. The region has a rich history of entrepreneurship in craft products, showing it is a fertile hub for producers looking to test their recipes in a receptive market. With food and beverage already a cluster that offers lower barriers to entry than other industries, the opportunities to create wealth via ownership are strong. There are incubators and shared kitchens already focused on expanding that ownership in BIPOC communities.

One potential strategy is to increase the innovation capacity in sustainable food product R&D. Certain products require more intensive work on recipe formulations and consumer testing than most food and beverage startups can achieve themselves. The FIC is a natural partner for deepening and focusing research of, and testing on, sustainable food and beverage products, both due to its state-of-the-art facilities and its ability to use its connections to OSU's College of Agricultural Sciences to pull in relevant academic researchers. Portland could become a national hub for producers in this market by establishing a collaborative R&D program for the food and beverage industry, identifying promising markets and companies in those spaces and then designing the R&D services that could scale those products. Given Portland's strengths in beverage production, it is possible that the market for plant-based beverages could be a natural starting point for this initiative and a jumping off point to other products.

Portland has long been a market with strong demand for locally sourced and produced foods and beverages.[200] With the rich agricultural land surrounding Portland, which has the country's second most diverse set of crops (behind only California's Central Valley), local companies can source a wide array of inputs from the local food shed. Even with that strong local food supply, producers often find themselves forced to purchase from wholesalers with non-locally sourced ingredients, especially those that have been lightly processed (e.g., vegetables that have been sliced, diced, or chopped). These market gaps present an opportunity for a locally focused wholesaler, a centralized source of local products at a scale that can better compete with larger wholesalers. Though no private company has yet entered the Portland market, there are examples from other regions (e.g., Midwest Foods in Chicago) that show this can be a viable niche. The city could support the private sector in filling this gap by convening food entrepreneurs, incubators, wholesalers, farmers, and other private sector partners to assess the market and supply chain, identify gaps, and possibly incubate a wholesaler and the smaller "light" processors who could produce the missing links in the chain. Establishing this set of firms would further support the growth of locally sourcing producers, and could potentially be a scalable, replicable model for similar regions.

This cluster experiences the same disconnect between the public and private sectors that is present throughout the Portland economy. One potential solution is to create a forum and center of gravity for the cluster that acts as a natural convener for industry stakeholders who are committed to collectively growing the cluster, and that can support the other strategies noted above. Creating an inclusive cluster organization, along the lines of the Chicagoland Food & Beverage Network, would produce this center of gravity, which could act as a natural point of collaboration between government and industry players, along with other relevant organizations. In Portland, some interviewees mentioned they have already explored the cluster organization concept on their own and have expressed interest in a body focused on the City's and region's cluster activities. The city could contribute the staffing to manage the organizing process, while quickly putting industry leaders at the fore. By forming exploratory working committees, identifying pilot projects that could generate early momentum, assembling the necessary stakeholders,

[200] Despite not constituting part of the cluster's traded industries, these products are still of interest – and can fuel growth of specialty foods and beverages (or substitute for imports).

and so on, this cluster organization could begin to guide more strategic investments and further establish Portland as a leading place to establish and grow food and beverage companies.

It cannot be ignored that the cluster has a major weak point: wages. The low pay potentially limits the cluster's ability to drive inclusive growth, as it does not offer as many jobs as other clusters that pay what might be considered quality wages. Given all of the other strengths Portland has in food and beverages, and that technology and modernization trends in the industry are slowly leading to higher wages for varied sub-sectors, strengthening the cluster should include focus on the changes or sub-sectors that can enable wage growth. Increasing innovation in sustainable food products, as mentioned above, should create new jobs for higher added value products, resulting in higher wages. The cluster could also be a place to direct energy on the implementation of the Quality Jobs Framework recently published by Columbia-Willamette Workforce Collaborative (CWWC). The Framework has an ambitious scope and a starting point is needed for testing how it can best be put into practice by the region's firms. The food and beverage industry may be an appropriate place to pilot the Framework's strategies, especially if a new cluster organization can serve as a convener and facilitator of that work.

Metals & Machinery

Cluster Definition

Metals – both ferrous or nonferrous (based on their iron makeup) – are cut, shaped and molded into finished products by metals and machinery companies. Metals and machinery clusters typically include primary metals, fabricated metals and machinery companies. These industries, together, form a supply chain that begins with raw metal, transforms it into fabricated parts, and further makes those parts into machinery – serving a variety of industries including agricultural, construction, building equipment, power transmission equipment, and more. Transportation equipment manufacturing is at times assessed separately (due to its complexity and size), but given that Portland's metals industry grew from its historic capacity for shipbuilding and aircraft component manufacturing, inclusion of transportation equipment manufacturing is important to the analysis.

The metals and machinery cluster analysis is subdivided into the following sub-clusters:

- **Primary metals** - the refining of metal ore or scrap metal
- **Fabricated metals** - shaping, welding and assembling metal into a finished product
- **Machinery** - products that apply force, e.g., industrial or commercial machinery
- **Transportation Equipment Manufacturing -** a subset of machinery; transportation equipment for road, rail, air, and water

National and Global Market Observations

Globally, the metal and metal manufactured products market size is projected to reach $4.5 trillion by 2026, at a CAGR of 7.3% from 2022 – 2026.[201] Looking at other reports and approximations of the sub-markets:

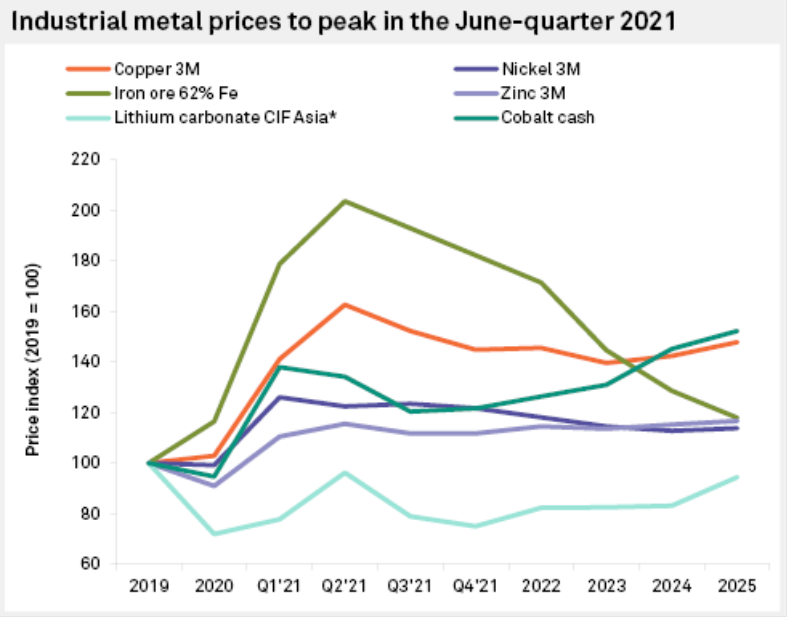
- **Primary Metals Manufacturing**: $222 billion (CAGR 3%, 2022-2026) **Note: US only* [202]
- **Metal Fabrication**: $29.5 billion by 2029 (CAGR 4.7%, 2022-2029)[203]
- **Machinery**: $5 trillion by 2026 (CAGR 9.2%, 2022 – 2026)[204]
- **Transportation Manufacturing**: $7.6 trillion (CAGR 10.9%, 2020 – 2022)[205]

[201] https://www.einnews.com/pr_news/579339160/global-metal-manufacturing-market-size-and-market-growth-opportunities
[202] https://www.marketresearch.com/First-Research-Inc-v3470/Primary-Metals-Manufacturing-32048662/
[203] https://www.databridgemarketresearch.com/reports/global-metal-fabrication-market
[204] https://www.einnews.com/pr_news/574528102/global-machinery-market-size-and-market-growth-opportunities
[205] https://www.thebusinessresearchcompany.com/report/transportation-manufacturing-global-market-report

Machinery and Transportation Equipment Manufacturing have the largest share of the Metals and Machinery market value as well as the highest projected growth.

COVID-19 significantly affected supply chains in this industry, further disrupted by spending cuts in the mining sector, and declines in metals demand and in metals prices.[206] In the US, defense and aerospace manufacturing are expected to provide a steady source of demand for metalworking machinery and manufacturing (while car and truck manufacturing demand has been more volatile – decreasing curing the COVID-19 pandemic and now rising again).[207] Globally, stimulus packages have helped the industry rebound and prices for various metals peaked in 2021 (see Figure 14), and as this support tapers off growth is expected to be driven instead by increases in renewable energy generation and electric vehicle uptake.[208]

FIGURE 14: FLUCTUATION OF METALS PRICES[209]



Global trends that apply to manufacturing more broadly (as well as Metals and Machinery[210]) include the acceleration of digital technology adoption – and, alongside this, an increased need for cybersecurity investments.[211] Digitization in manufacturing ranges from computing process improvements to increase efficiencies,[212] to integration of Computer Numerical Control (CNC) machining (a pre-programmed manufacturing process that creates shapes/products through subtraction),[213] to smart factories that provide communication with automated guided vehicles and mobile robots.[214] Within the US, machine shops' investments have been increasing in automating technology, largely to serve defense and aerospace markets.[215] Digitization trends also impact the skills needed for future careers – not just in

[206] https://www.alliedmarketresearch.com/metal-and-metal-manufactured-products-market#:~:text=The%20global%20metal%20%26%20metal%20manufactured,a%20collapse%20in%20metals%20demand,
[207] IBISWorld
[208] https://www.spglobal.com/marketintelligence/en/news-insights/research/impact-of-covid-19-pandemic-on-industrial-metals-markets-one-year-on
[209] https://www.spglobal.com/marketintelligence/en/news-insights/research/impact-of-covid-19-pandemic-on-industrial-metals-markets-one-year-on
[210] https://www.euroscientist.com/trends-metal-fabrication/
[211] Deloitte 2022 Manufacturing Review & national trend summary document
[212] https://www.automationworld.com/factory/iiot/article/21206436/digitization-a-case-for-manufacturing
[213] https://interestingengineering.com/innovation/how-is-cnc-machining-changing-the-manufacturing-industry
[214] Deloitte 2022 Manufacturing Review & national trend summary document
[215] IBISWorld

welding, forging and repair[216] but also for technicians and analysts.[217] These careers will require mechanical, electrical, automation and software skills (which will create jobs to replace those at risk of automation).[218]

To respond to shortages in raw materials, as well as the need for lightweight products (that still maintain their structural qualities), innovation in materials is resulting in new metal alloys or new composites,[219] such as magnesium and aluminum alloys, polymer composites, and carbon fiber.[220] Innovations in chemical manufacturing are improving materials strength and uses (e.g., liquid metal alloy ion coating for solar panels).[221] Processes like 3D printing provide manufacturing options for new material composites that can result in high-strength, complex, lightweight structures,[222] which can serve industries aerospace and automotive.[223]

Sustainability goals are beginning to drive change in Metals and Machinery (particularly important given that the manufacturing industry, broadly, accounts for 1/3 of global GHG emissions);[224] ESG goals increasingly drive investments.[225] It should be noted that environmental goals must be combined with increased commercialization of decarbonization solutions to truly effect change (see "Clean Economy" section). Forward-thinking machinery manufacturers are beginning to reduce their Scope 1 (operations) and Scope 2 (energy use) emissions, and retooling their operations for efficiency improvements.[226] Both steel and aluminum production are energy-intensive processes,[227] making the use of green energy even more important in this sector. These same metals are the most recycled, often used to fabricate parts.[228] Many metals are critical inputs (e.g., iron and steel) to support decarbonization across other sectors – for instance, in making charging infrastructure. In addition, manufacturers are working to improve the circularity of products; for instance, turbine makers (e.g., Vestas, Siemens Gamesa, GE-subsidiary LM Wind Power) have pledged to develop recyclable blades with a goal of zero-waste turbines by 2040.[229] To respond to these pressures, many machinery manufacturers are in need of better customer segmentation and new business models to innovate and build low-carbon product offerings that meet customers' needs.[230]

Nationally, BIPOC and women employment in this cluster is low – and of the sub-clusters, slightly better within transportation equipment manufacturing. Similarly, women make up a small percentage of the workforce (see Table 16).

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[216] https://www.cedefop.europa.eu/en/data-insights/metal-machinery-workers-skills-opportunities-and-challenges-2019-update
[217] e.g., technicians to troubleshoot CNC machining processes, analysts to assess manufacturing process data and make quality or efficiency adjustments
[218] CEDS; https://blog.wearedrew.co/en/industry-4-0-the-smart-future-of-metalworking
[219] https://link.springer.com/article/10.1007/s11837-018-3224-2
[220] https://www.tfgusa.com/innovations-in-parts-fabrication/
[221] https://dochub.clackamas.us/documents/drupal/128eada8-83dc-4635-ab1d-436d79d8ec56
[222] https://www.tritool.com/blog/reaching-new-heights-how-new-trends-are-accelerating-innovation-in-the-aerospace-manufacturing-industry
[223] https://www.tfgusa.com/innovations-in-parts-fabrication/. In addition, Identifying new, innovative metal products can improve the long-term growth of the Metals Fabrication sub-cluster in particular, as it is otherwise subject to rapid fluctuations in demand from major industries like construction, energy and aerospace. https://www.entrepreneurshipinabox.com/21418/metal-fabrication-a-closer-look-at-the-industry/
[224] https://vksapp.com/blog/manufacturing-trends
[225] that reduce energy consumption and make environmental commitments in product design, sourcing, production, distribution, and after-market. Deloitte 2022 Manufacturing Review & national trend summary document
[226] and even Scope 3 (supporting customers in reducing emissions)
[227] https://www.marketresearch.com/First-Research-Inc-v3470/Primary-Metals-Manufacturing-32048662/
[228] https://www.tfgusa.com/innovations-in-parts-fabrication/
[229] https://www.bain.com/insights/great-retooling-for-sustainability-is-a-huge-opportunity-global-machinery-and-equipment-report-2022/. Demand is expected to grow for recycled products: https://www.alliedmarketresearch.com/metal-and-metal-manufactured-products-market#:~:text=The%20global%20metal%20%26%20metal%20manufactured,a%20collapse%20in%20metals%20demand
[230] https://www.bain.com/insights/great-retooling-for-sustainability-is-a-huge-opportunity-global-machinery-and-equipment-report-2022/

TABLE 16: GENDER AND RACE BREAKDOWN OF EMPLOYMENT BY INDUSTRY[231]

	Total employed (in thousands)	2021, Percent of total employed				
		Women	White	Black or African American	Asian	Hispanic or Latino
Primary metals and fabricated metal products manufacturing	1,539	16.6	87.9	6.7	2.8	15.4
Machinery manufacturing	1,170	23.1	81.8	10.3	5.0	10.8
Transportation equipment manufacturing	2,466	25.4	77.4	13.6	6.2	13.8

Source: https://www.bls.gov/cps/cpsaat18.htm

Portland's Assets and Market Position

Firm Presence and Sector Strengths

The Metals and Machinery cluster employs over 30,000 people in the MSA, with a third of its employment located in Multnomah County – approximately 4 times the size of the Athletic & Outdoor cluster. Its LQ appears low when looking at the entire cluster (0.9 at the MSA and 0.8 at the County level), but when Transportation Equipment Manufacturing is excluded the LQ jumps to 1.4 (MSA) and 1.3 (County). Multnomah County's employment decline (-5%) from 2010 to 2020 is not shared across the region; for instance, Washington County's employment grew by 44% and Clackamas County by 4% during this same time period. BIPOC and women employment in the sector is below national averages (which, it should be noted, are already low) (see Table 17).

The cluster's relative stability and substantial share of the economy is likely due to the region's legacy metals manufacturing strengths. Portland's metals industry grew as a result of many factors, including: transportation assets (e.g., the Willamette River, Portland's first transcontinental rail link (1883), the Port of Portland), cheap water and electricity, it's strategic location on waterways (e.g., which enabled WWII shipbuilding contracts). Despite its historic stability, the cluster was significantly impacted by COVID-19 (both locally and globally). In Multnomah County, the Metals and Machinery lost over 3,000 jobs between Q1 2019 and Q3 2021 – the largest job loss of all clusters analyzed.

[231] Note: this data is provided by 2D NAICS, whereas the definition of Metals & Machinery used to assess the cluster is based on groupings of 6D NAICS. These categories loosely align but not fully.

TABLE 17: METALS AND MACHINERY EMPLOYMENT DATA SUMMARY

Statistics for 2020, unless otherwise noted

Metals and Machinery	US	Portland MSA	Multnomah County
Establishments	111,206	1,016	305
Employment	4,367,396	33,165	11,531
Emp. % Change (2010-20)	10%	11%	-5%
LQ	1.0	0.9	0.8
LQ % Change (2010-20)	n/a	-10%	-11%
Average wage ($000)	$71.5	$74.7	$73.7
% BIPOC	30%	27%	30%
% Female	22%	20%	18%
% <= SCA (25+)	80%	76%	75%

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

Multnomah County's strongest sub-cluster, historically, has been Primary Metals Manufacturing – however, its growth has slowed over the last ten years (see Table 18). Looking across the Portland MSA, specific areas of strength within each sub-cluster include both legacy strengths and newer innovations within the clean economy:

- **Primary Metals Manufacturing** - The region's foundries produce a variety of metals – steel, aluminum, iron, and nonferrous. Additional ferroalloy manufacturing strengths indicate the region may be well positioned to develop new material innovations that can be exported globally.
- **Fabricated Metal** - Metal fabrication sector strengths in structural steel likely are supplied to the building, ship building, and aerospace industries (e.g., Precision Castparts Corp – see
- Figure 15). Boeing produces some of the most critical machined parts and structures for jetliners,[232] such as flap actuation systems (see
- Figure 15) at new Gresham facility.[233]
- **Machinery** - Provides equipment primarily for the semiconductor industry (in addition to auto and building industries).
- **Transportation Equipment Manufacturing** – Largely supports aircraft parts and shipbuilding and repair (e.g., Greenbriar Gunderson; Vigor).[234] Some companies are starting to innovate in other industries (e.g., Daimler Truck North America is piloting battery electrified trucks and buses; Vigor is producing tidal energy devices).

Within the MSA, Primary Metals, Fabricated Metals and Machinery all have LQs above 1 (1.8, 1.1, and 1.1 respectively) – again, excluding Transportation Equipment Manufacturing reveals the region's current strengths. Within Multnomah County, Primary metals manufacturing is particularly strong, and is supported by Fabricated metal (see Table 18). Together, these two sub-clusters can likely support growth of emerging industries; for instance – producing new metal compositions for next-generation grid products, small-scale and utility-scale battery production and recycling, or EV charging infrastructure. As the Transportation Equipment Manufacturing sub-cluster pivots towards R&D and piloting, there may also be opportunity to scale production of small components to support R&D in this industry. In particular,

[232] https://boeing.mediaroom.com/2012-08-10-Boeing-Opens-New-Parts-Processing-Center-at-Portland-Site
[233] https://pamplinmedia.com/go/42-news/346771-226596-boeing-brings-new-system-production-to-gresham
[234] https://www.gbrx.com/press-room/perspectives-updates/100-years-of-gunderson-celebrating-a-century-in-oregon/

there may be opportunity for each of these subclusters to grow with the addition of automation or additive manufacturing processes into their operations – enabling them to more easily retool to produce products for emerging industries (while also increasing efficiency of their operations, and thus lessening emissions).

TABLE 18: MULTNOMAH COUNTY METALS AND MACHINERY SECTORS

Statistics for 2020, unless otherwise noted

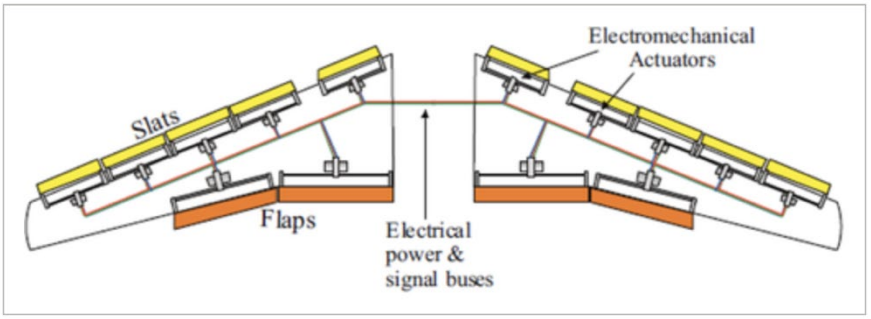
Subcluster	Establishments	Employees	% of Cluster Employment	Employment Growth (2010-20)	LQ	LQ Change (2010-20)	Average wage ($k)
Primary Metal	16	2,208	19.1%	-22%	1.8	-22%	$79.1
Fabricated Metal	170	3,282	28.5%	-7%	0.7	-13%	$59.0
Machinery	63	1,481	12.8%	14%	0.4	0%	$72.3
Transportation Equipment Manufacturing	56	4,560	39.5%	2%	0.8	-20%	$82.2

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

FIGURE 15:

Left: PCC's nickel-based superalloy, titanium, stainless steel, and aluminum investment casting for aerospace, turbines, medical and other applications[235]

Right: Example of aircraft actuator[236]



Human Capital

This cluster has typically had strong on-the-job training and opportunities to move up within companies with the addition of new skills (for instance, moving from welding to repair for barges).[237] Occupations in this cluster have relatively low barriers to entry (75% of employees in Multnomah County do not have a Bachelor's degree) and therefore present opportunities for greater inclusion (see Table 17).

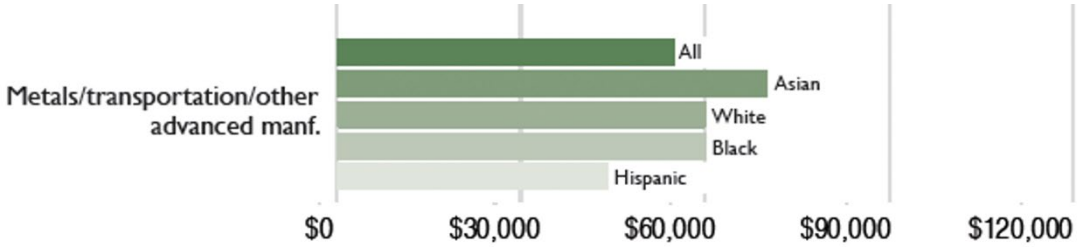
Salaries in the region are on par with the national average, and these will likely increase as the cluster continues to digitize and innovate (e.g., materials innovations, clean energy product development).

[235] https://www.precast.com/operations/pcc-investment-cast-products/
[236] https://ietresearch.onlinelibrary.wiley.com/doi/10.1049/joe.2018.8234
[237] interviews

Salaries vary by race/ethnicity – possibly a reflection of the racial distribution across entry-level and management occupations (

Figure 16). Skills-based training will continue to be important and presents opportunities to upskill Portland's BIPOC and female workforce to enter this sector. For instance, the recently launched Mechatronics Technician apprenticeship at OMIC Training Center trains students with a combined skill set of mechanical, electrical, computer and software skills (equipping them to work with advanced manufacturing processes).

FIGURE 16: METALS AND MACHINERY SALARIES BY RACE ACROSS OREGON



Data source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2019. Notes: Full time is 30+ hours/week; full year is 52 weeks/year. Race/ethnicity categories excluded from this chart have small sample sizes that result in unreliable estimates.

Source: ECONorthwest, 2021, The Condition of Oregon's Manufacturing Sector

Innovation and Entrepreneurship

Metals and Machinery firms are producing parts with greater complexity (both in Portland and nationally) – for instance, niche components for aerospace or energy generation. This is assisted by creative partnerships; for instance, Oregon Manufacturing Innovation Center (OMIC) has partnered with Autodesk to expand access to 3D printing for manufacturers in the Portland region. Manufacturers in the region have an appetite to retool and modernize their operations (e.g., automation), but often lack the resources to do so.[238] Therefore, Oregon Manufacturing Extension Partnership (OMEP) has been working with small- and mid-sized manufacturers to implement advanced practices. In addition, Oregon Manufacturing Innovation Center (OMIC) is conducting R&D to identify new markets and processes for adoption. Several firms are also entering new industries, primarily in the clean economy (e.g., to produce components for battery storage, electric vehicles, or develop material innovations in structural and non-structural building materials). These opportunities, plus increasing digitization trends, present opportunities for Portland firms to develop a new competitive edge to grow the Metals and Machinery cluster.

> "Manufacturers are in need of support, for retooling, website improvements, data integration, e-commerce assistance – and, for greater STEM connections to foster workforce development."
>
> – Industry Association leader

Other Assets

Several stakeholders collaborating across the Portland MSA and state of Oregon are assisting the region's Metals and Machinery companies in upskilling their workforce, retooling – both for process improvements and to reach climate goals – and in identifying and entering new markets. These include:

- **Oregon Metals Initiative (OMI)** – conducts industry research, encourages collaboration, develops new technologies

[238] Interviewee

- **Oregon Manufacturing Extension Partnership (OMEP)** – provides technical assistance to manufacturers, assisting them in: implementing new business strategies, implementing new technologies, training employees, improving decision-making, etc.
- **Oregon Manufacturing Innovation Center (OMIC)** - grew out of a partnership between Boeing (aerospace), Daimler (trucks), and Vigor (ships); combines applied research and development and workforce training to serve the region's advanced manufacturers
- **OMIC Training Center** – located at Portland Community College; opened Fall 2021. It includes apprenticeship programs for machinists, CNC lathe operators, CNC mill operators, welders/fabricators, and mechatronics technicians.
- **PSU College Department of Mechanical & Materials Engineering** – Programs and research focus on areas of innovation within and beyond Metals and Machinery (e.g., robotics, healthy buildings, microfluidics, nanomaterials).

Assessment - Portland's Opportunities

As digitization and net-zero goals change the sector, and engineering innovations are becoming increasingly important to inform more nimble and flexible manufacturing processes,[239] Metals and Machinery is at a critical moment where it must redefine its niche in the new economy to avoid its loss of competitive advantage nationally – and rebuild after COVID-19 impacts to the sector.

The region's Metals and Machinery cluster has the potential to grow not just from global demand but strong local demand conditions for products within semiconductors, building systems, aerospace parts, vehicle parts, ship building, energy, and measurement devices. Global trends emphasize the demand for metals components that are increasing in complexity and varied in material composition – for instance, lighter-weight aerospace components, or new alloys for solar panels. This requires both R&D strengths in materials innovation as well as process innovation so that components can be produced in smaller batches for niche uses (and machines can be re-programmed quickly to produce different parts). Organizations like OMI and OMIC conduct industry research to advance innovation, as do some college programs, but there is room to improve private-sector generation and adoption of innovation (and assist some firms in pivoting operations to enter new markets). Global trends also emphasize demand for energy-efficient process improvements for manufacturers (to decarbonize) as well as creation of products to advance climate goals (e.g., EV charging infrastructure; recycled steel) – and, Portland has the assets, both in R&D capacity and production capacity, to create these products. The missing piece is to connect these assets and stakeholders through new initiatives.

Considering the region's assets, the most competitive opportunities for Portland may be in:

- **Materials Innovations** – With strengths in ferroalloy manufacturing, metals fabrication, the potential for new partnerships in 3D Printing (e.g., with AutoDesk, OMIC), and research strengths (e.g., PSU Department of Mechanical & Materials Engineering), Portland could lead the way in innovative structural materials in aerospace, the building industry, and clean economy – among others.
- **Upskilling the future Metals and Machinery workforce** - This can assist meeting demands for the longer-term skills needed for manufacturing industries that will need flexible, nimble skill sets and continual technical training in mechanics, electronics, and software. This could be done by scaling the new OMIC Training Center and increasing connections to other workforce partners in the region (e.g., WTF's apprenticeship program with Oregon Tradeswomen, Constructing Hope, and the Oregon Bureau of Labor and Industries).

[239] https://www.mckinsey.com/featured-insights/americas/building-a-more-competitive-us-manufacturing-sector

- **Producing metals components for the clean economy** – There is a strong base of metals fabricators in Portland with varied capabilities (e.g., Precision Castparts Corp, Boeing). Opportunities to scale production of clean economy products range from wind turbines to panel connectors for Cross-Laminated Timber[240] to EV components). Several corporations are leading the way in this space (e.g., Daimler, Vigor), but could be better connected to local supply chains or collaborative innovation efforts.

In addition, there may be opportunities to support growth of the Clean Economy's environmental services sector. With Portland's climate policy goals and technical assistance support (e.g., OMEP), Metals and Machinery firms in the region may be able to lead the way for manufacturers globally in decarbonizing their operations. This would also help build Portland's reputation as a place where climate-conscious companies operate.

Athletic & Outdoor

Cluster Definition

The Athletic and Outdoor (A&O) cluster is usually defined by trade groups, market reports, and literature as two separate clusters (Athletic apparel – or, Apparel; Outdoor) and is typically focused on the retail and wholesaling of the cluster, and not production, such as mills and textile factories. As defined for this document, firms mostly include those involved in wholesaling and manufacturing of athletic apparel, shoes, and outdoor gear (such as knives and water bottles - excluding fabric mills). Note that the 'Athletic' segment of the cluster is largely comprised of athletic *apparel* firms, and does not include sport teams and associated industries. The Sports cluster is instead considered a set of closely related and supporting industries; it overlaps with Athletic & Outdoor and these intersections are considered throughout the cluster analysis.[241]

This cluster's broad definition reflects business relationships, exchange and collaboration across the gamut of companies and products within the cluster.

National and Global Market Observations

Globally, the sports apparel market is projected to reach $287.7 billion by 2029 at a CAGR of 6.7% from 2022 – 2026.[242] This is part of the larger apparel market, projected to reach $768.26 billion by 2026 at a CAGR of 6.1% from 2022 - 2026.[243] Narrowing to the *outdoor* apparel market, it is projected to reach $4.4 billion by 2026, at a CAGR of 5.3% from 2021 – 2026.[244] This growth is partially due to growth of tourism and associated outdoor activities like hiking.[245] Finally, evaluating the *outdoor gear and equipment* market size (so, broader than outdoor apparel), the market is projected to reach $75.3 billion by 2028 at a CAGR of 5.8% from 2022 - 2028.

[240]From interview: CLT could be a growing industry (currently many CLT home units are manufactured in southern Oregon); manufacturers that support mills could likely pivot to CLT – and, panel connector manufacturing (metal brackets, plates, screws) will have to increase to support the CLT industry. An old iron manufacturing facility in Vancouver recently retrofitted their manufacturing skills to build out panel connectors

[241] Including alignment with recommendations from the recent State of Sport report: https://oregonstateofsport.com/

[242] https://www.maximizemarketresearch.com/market-report/global-sports-apparel-market/83971/

[243] https://www.thebusinessresearchcompany.com/report/apparel-global-market-report#:~:text=This%20apparel%20market%20research%20report,(CAGR)%20of%209.9%25.

[244] https://www.prnewswire.com/news-releases/outdoor-apparel-market-to-record-a-cagr-of-5-3-growing-tourism-industry-to-be-a-key-trend---technavio-301616916.html

[245] https://www.prnewswire.com/news-releases/outdoor-apparel-market-to-record-a-cagr-of-5-3-growing-tourism-industry-to-be-a-key-trend---technavio-301616916.html

National trends in A&O include a growing direct-to-consumer (DTC) and E-commerce presence. E-commerce sales penetration, spurred largely by COVID, more than doubled in 2020 to 35%. Apparel and outdoor brands comprise more than 40% of all DTC sales. Despite the growth in the sector, it's estimated that approximately 75% of DTC companies have less than $1MM in sales. The number of Athletic & Outdoor startups bypassing retail, at least in the start-up phase, is increasing. This new normal is an important low barrier to entry for startups, but it is fast becoming a crowded field.[246]

Additionally, post-COVID retail recovery has positively impacted retail and wholesaling across clusters, including A&O. While DTC has expanded considerably, brick and mortar retail has nearly rebounded from the depths of the pandemic. Much of the recovery in the A&O cluster will be led by a continued resurgence in tourism.[247] As of October 2022, the nationwide retail vacancy rate was down to 6.1%, the lowest rate in 15 years. 2022 sales are expected to surpass pre-COVID levels.[248]

Within A&O, consumers are increasingly emphasizing sustainability and ethics; they care how items are produced, especially in terms of climate impacts and worker conditions. It's estimated that the US throws away the equivalent of 70 pairs of pants per person in waste from clothes and footwear each year, and that people throw out clothing after an average of 7-10 wears.[249] The EPA estimates just 15% of textiles – across all industries – get recycled. While most textile recyclers are specialized: using chemical processes on one site and with one type of textile, there are a handful of companies looking to use natural processes to process textiles (particularly in bulk from corporations) and create new clothing as well as yarn for reuse

The industry is starting to respond to consumer demand with trends like upcycling, the practice of giving previously owned clothing a new lease on life, oftentimes upgrading the piece by changing its use, fit, or combining multiple garments to create higher fashion. Another example of this is ReCommerce, short for reverse commerce, which is the process of renting, reselling, or thrifting previously owned apparel. It's estimated that clothing accounts for 20% of the 300 million tons of plastic produced globally each year, and that 87% of the total fiber input used for clothing is ultimately sent to landfills or destroyed. The ReCommerce sector is projected to rise from $7BN to $36BN by 2024 as consumers put more emphasis on both price and sustainability, and could impact demand for new products in the Athletic & Outdoor industry.[250]

Like nearly every other industry, the A&O cluster is experiencing a digital revolution. New technologies such as AR/VR dressing rooms, big data for granular trend analyses and AI-powered fashion assistants will allow small businesses to forego physical real estate and allow established brands to create a more sophisticated and personal shopping experience.[251]

The broad national trend towards on-shoring of manufacturing – in which industries have made some efforts to reshore operations in light of supply chain vulnerabilities -- does not seem to be significantly occurring in this cluster yet, which limits domestic labor demand in the near-term.[252]

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[246] https://www.mckinsey.com/business-functions/growth-marketing-and-sales/our-insights/five-traps-to-avoid-the-long-game-of-dtc-and-e-commerce
[247]https://www.technavio.com/report/outdoor-apparel-market-industry-analysis?utm_source=prnewswire&utm_medium=pressrelease+&utm_campaign=t46te_rep1_wk36_2022_007&utm_content=IRTNTR40137
[248] https://www.pymnts.com/news/retail/2022/retail-vacancy-rate-hits-15-year-low/.
[249] https://www.bloomberg.com/graphics/2022-fashion-industry-environmental-impact/?srnd=premium
[250] https://www.yieldify.com/free-guides/fashion-ecommerce-trends/
[251] "4 Top Apparel Industry Trends to Watch in 2021 and 2022" https://blog.marketresearch.com/4-top-apparel-industry-trends-to-watch-in-2020.
[252] https://sites.duke.edu/sociol342d_01d_s2017_team-7/5-offshoring-of-production-and-global-job-shifts-unfinished/

Portland's Assets and Market Positions

Firm Presence and Sector Strengths

Portland is known for its outdoor lifestyle, , and the residents and tourists who enjoy it, creating strong demand conditions for this cluster. For decades, Portland has been a hub for the cluster, including world-renowned brands like Nike, Adidas, and Columbia. Easy access to Asian markets through the port, an international airport, and rail connections have helped the cluster grow its imprint beyond the local market.

Accordingly, the Portland MSA has the highest concentration of Athletic & Outdoor employees in the country – largely focused on design and innovation (while manufacturing occurs elsewhere). Due to the way the larger players in the cluster are classified (as corporate headquarters instead of an athletic- or apparel-related classification), the MSA LQ of 1.3 underrepresents the region's strengths. This LQ represents the many smaller, entrepreneurial firms that have grown around larger corporations like Nike, Adidas and Columbia Sportwear – for instance, as support/inputs (e.g., ad agencies), spinoffs that are creating new innovative outdoor and athletic apparel products, or small manufacturers that are supporting.[253] The LQ for Multnomah County is 1.6 (up from 1.3 in 2010) – and, has grown by 23.1% from 2010-2020 (see Table 19). As of 2020 there were 7,404 employees in the cluster in the MSA, with more than half of those workers (3,700) located in Multnomah County. While the Portland MSA has much higher wages than the US average for A&O, the region has lower BIPOC employment (30%) than nationally (41%).

TABLE 19: ATHLETIC & OUTDOOR EMPLOYMENT DATA SUMMARY

Statistics for 2020, unless otherwise noted

Athletic and Outdoor	US	Portland MSA	Multnomah County
Establishments	58,669	511	254
Employment	661,905	7,404	3,708
Emp. % Change (2010-20)	-14.8%	-34.8%	10.3%
LQ	1.0	1.3	1.6
LQ % Change (2010-20)	n/a	-31.6%	23.1%
Average wage ($000)	$62.3	$82.7	$76.2
% BIPOC	41%	30%	32%
% Female	46%	43%	48%
% <= SCA (25+)	76%	71%	68%

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

Looking at strong sub-clusters in the MSA, Outdoor Equipment Manufacturing is the strongest (2.9 LQ) followed by A&O Wholesaling (LQ 1.6) and Design Service (LQ 1.5) – see Table 20. Looking at in Multnomah County, A&O Wholesaling rises to the top – comprising half of the cluster's employment, and with strong employment growth, LQ growth over time, and high wages. Manufacturing sub-clusters also have concentrations in the County; in particular, apparel, footwear and accessories manufacturing has grown by 25% from 2010 – 2020. However, A&O manufacturing sub-clusters have lower wages.

[253] https://newrepublic.com/article/79478/what-cluster-looks

TABLE 20: MULTNOMAH COUNTY ATHLETIC & OUTDOOR SECTORS WITH HIGHEST LQS

Statistics for 2020, unless otherwise noted

Subcluster	Establishments	Employees	% of Cluster Employment	Employment Growth (2010-20)	LQ	LQ Change (2010-20)	Average wage ($k)
Apparel/Outdoor Wholesaling	77	1,922	51.8%	48%	2.6	44%	$91.2
Design Services	65	260	7.0%	-25%	2.3	-50%	$114.3
Outdoors Eqpt Mfg	25	616	16.6%	-5%	1.7	-6%	$59.4
Apparel, Footwear, and Accessories Mfg.	82	894	24.1%	-12%	1.5	25%	$45.3

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

Portland's A&O cluster is unique in the quantity and diversity of firms and workers. While the market is known for Nike, Columbia, and adidas, just as important to growth of the A&O cluster are the other 500+ smaller establishments in the region. Data shows that the number of employees have declined while the number of firms expanded over the last ten years. Some of this job loss can be attributed to COVID, while some might reflect longer-term trends of larger firms turning to automation or moving out of the area.

Human Capital

This cluster is supported by six higher-ed A&O programs in the region, from certifications to master's programs. About 68% of employees within the County do not have a Bachelor's degree, indicating there may be opportunities to expand certificate programs and on-the-job training to continue cultivating talent for this cluster (paying particular attention to increasing BIPOC representation in good-paying, quality jobs).

Innovation and Entrepreneurship

The largest firms – Nike, Adidas and Columbia – each have their own in-house innovation programs and occasionally partner with local colleges and universities. For instance, Nike gives money to local universities, mostly University of Oregon's Lundquist College of Business in Portland, to encourage sports product design programs. Outside of that, according to interviewees, many of the larger firms are somewhat insular and do not collaborate with other firms or stakeholders in the region. The region does have a few emerging companies pursuing sustainable A&O trends such as upcycling (e.g., Portland Garment Factory; Looptworks).

> "There are many opportunities for cross-sector synergies; for instance – wearables. However, large corporations are often not willing to engage.
>
> *– Entrepreneurship organization leader*

The natural environment also offers aspiring entrepreneurs, who mostly spin off from the cluster's large suburban employers, the right conditions and a willing audience with which to prototype and test different products. The shifting preference towards ethical and sustainable brands should boost the cluster in markets like Portland with both a green brand and good exporting infrastructure.

There are also VC funding opportunities through organizations like the Portland Seed Fund and the Oregon Sports Angels fund. Additionally, larger companies like Nike and REI have their own venture arms that are active in the Portland market. There is further support for entrepreneurs and small businesses through the Outdoor Industry Association, which helps grow existing brands in the outdoor industry, and the Prosper Portland-sponsored Portland A&O Level Up program, providing

entrepreneurship and small business support through technical assistance (choosing a board, go to market strategy, etc.) and networking/mentorship opportunities. [254]

Other Assets

Portland's sporting events help support growth of the A&O cluster as well as growth of the related industries in the region that serve the cluster, as outlined in "Oregon: The State of Sport." Many A&O and sports companies share services, such as creative marketing, business management, accounting and financial services, and legal services.[255]

Assessment: Portland's Opportunities[256]

The A&O cluster in Portland is anchored by major corporations, which drive growth of the cluster. Particularly within Multnomah County, many small entrepreneurial firms have been growing, significantly increasing employment and LQ over the last 10 years. There are opportunities to further accelerate growth through:

- Improving collaborative innovation efforts with large corporations – specifically to grow niche research capabilities that improve the cluster's environmental stewardship
- Improving connections to the Athletic, Outdoor, Team, and Recreation ecosystem – for instance, through increased public-private partnerships, increased export opportunities, and expansion of higher education programming)[257]
- Improving inclusion in the industry, both in employment and ownership

There is opportunity to build upon proposed growth strategies for the A&O clusters from prior plans to address increased collaboration, both private and public, for instance: growing the apparel design programs at University of Oregon or Pensole Design Academy.[258] There is also opportunity to support inclusion work in mid-sized A&O firms, focusing growth services on BIPOC-owned businesses in the craft consumer vertical; and helping large, established firms become more inclusive and active in the community.[259]

Opportunities to grow the A&O industry and capitalize on Portland's green brand and sustainability trends nationally include upcycling and recycling. Upcycling could be encouraged by financial and technical assistance for emerging firms in this space, or even creation of an innovation hub for upcycling or textile recycling, which could create efficiencies and cross-pollination of ideas in the nascent field.

> "The region has R&D assets in the textile recycling industry."
>
> *– Business leader*

Computers & Electronics

Cluster Definition

The computers & electronics (C&E) cluster is comprised of establishments that manufacture computers, electronics, and their components. This includes everything from parts for electronics and computers such as semiconductors and circuit boards, to technical instruments such as fluid meters and industrial

[254] https://www.greaterportlandinc.com/media/userfiles/subsite_214/files/industries/Greater-Portland-Apparel-Outdoor-Overview.pdf.
[255] https://oregonstateofsport.com/
[256] https://www.greaterportlandinc.com/media/userfiles/subsite_214/files/industries/Greater-Portland-Apparel-Outdoor-Overview.pdf"
[257] https://oregonstateofsport.com/
[258] https://www.collegeforcreativestudies.edu/pensole-design-academy-and-the-ccs-partner-to-create-the-pensole-lewis-college-of-business-and-design-and-become-the-nations-first-hbcu-to-reopen/
[259] "Portland A&O Level Up," accessed May 29, 2022, https://aoportland.com/industry-support/; "Cluster-Action-Plans-Executive-Summary.Pdf," accessed May 25, 2022, https://prosperportland.us/wp-content/uploads/2020/05/Cluster-Action-Plans-Executive-Summary.pdf.

controllers. This does not include establishments providing software or other computer-related functions like data storage, nor does it include the utilization or installation of electronics. Employee roles can range from those on manufacturing lines, to administrative and office positions, to designers.

National and Global Market Observations

The Computers & Electronics market is expansive, perhaps best estimated by the following sub-markets:

- **Electronic Products:** $1.65 trillion by 2025 (CAGR 6.8%, 2020-2025)[260]
- **Computers**: $573 billion by 2026 (CAGR 8.3%, 2022 – 2026)[261]
- **Consumer Electronics**: $989 billion by 2027 (CAGR 5.3%, 2020-2027)[262]

As the world continues to become more connected and automated, and technology infiltrates almost every sector, demand for computer and electronics components and products should remain elevated for the foreseeable future. Most recently, the microchip industry alone saw double digit growth in 2021 and is projected to grow 10% in 2022,[263] though the recent softening in the economy and trade issues with China have slowed semiconductor demand.

Due to supply chain interruptions, labor shortages, and border closings, microchips were in extremely short supply from 2021 through most of 2022 2022 – and, although improving, this expected to continue through 2023.[264] This shortage has driven substantial increases in their price and created major backlogs in their delivery to customers. Given microchips' ubiquity, this has increased the price of everything from consumer electronics to autos, which alone will experience an estimated $210B in losses from lack of new machinery due to production delays. The impacts on chip manufacturers themselves have varied, with both higher production costs as labor and raw material prices increase, as well as increased revenue from the ability to charge higher prices due to high demand. [265]

This sector has been experiencing significant federal investment. For instance, the CHIPS+ Act, a $52 billion package of incentives and subsidies, aims to bolster semiconductor manufacturing in the US and reduce reliance on foreign semiconductors, as the share of microchips made in the United States has declined from 40% in 1990 to 12% today. In response to the legislation, Intel and Taiwan-based chip manufacturer TSMC have both announced construction of new facilities in the US.[266]

The talent shortage related to COVID and the Great Resignation has mostly been felt in programming and software-related occupations. This shortage will be pushed even further by the opening of new semiconductor manufacturing facilities in Eastern Asia (Taiwan, China, South Korea), New York, and Arizona, potentially draining some talent from Portland.[267] In addition, the industry's share of jobs at risk for automation is 39.7%.[268] The jobs that are most at risk are those which do not require advanced degrees, so re-training of lower-ed workers to more advanced occupations will be crucial to keep employment up in the cluster.[269]

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[260] https://www.thebusinessresearchcompany.com/report/electronic-products-market
[261] https://www.thebusinessresearchcompany.com/report/computers-global-market-report#:~:text=This%20computers%20market%20research%20report,(CAGR)%20of%2012.7%25.
[262] https://www.fortunebusinessinsights.com/consumer-electronics-market-104693
[263] https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/semiconductor-industry-outlook.html
[264] https://www.jabil.com/blog/global-chip-shortages.html
[265] https://www.phillipscorp.com/navigating-the-microchip-shortage-with-automation-and-robotics/.
[266] https://www.washingtonpost.com/business/chipmakers-and-congress-play-a-52-billiongame-of-chicken/2022/07/04/3a239e28-fbf6-11ec-b39d-71309168014b_story.html
[267] https://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-tmt-2022-semiconductor-outlook.pdf
[268] Economic Modeling Specialist International EMSI analysis; https://www.jabil.com/blog/global-chip-shortages.html;
Economic Modeling Specialist International EMSI analysis; https://www.jabil.com/blog/global-chip-shortages.html;

Minority ownership remains inequitable in the US. Nationally, just 12.8% of all manufacturing firms are owned by a person of color (compared to 19% of firms of any type), and 84% of minority-owned manufacturing firms have fewer than 20 employees, compared to 74% for non-minority-owned manufacturers.

Portland's Assets and Market Position

Firm Presence and Sector Strengths

Among Portland's clusters, the Computers and Electronics cluster is particularly mature and near the top in terms of concentration (with a location quotient of 4.0) and average wages. With the exception of semiconductor manufacturing, the cluster is primarily located outside of the City (10% of cluster employment is in Multnomah County).[270] The cluster continues to grow; from 2010-2020, the growth in the Portland MSA's employment in the industry has outpaced the national figure: 18% vs -3%. The County has a higher share (31%) of BIPOC employees than the other priority clusters except for food and beverage manufacturing – although this is still below the national average. Just 3% of BIPOC employees are Black, a percentage that has been persistently low. The percentages of workers who are female are lower than national averages – see Table 21.[271]

TABLE 21: COMPUTERS & ELECTRONICS EMPLOYMENT DATA SUMMARY

Statistics for 2020, unless otherwise noted

Computers and Electronics	US	Portland MSA	Multnomah County
Establishments	34,757	402	98
Employment	1,226,394	41,161	2,895
Emp. % Change (2010-20)	-3%	18%	19%
LQ	1.0	4.0	0.7
LQ % Change (2010-20)	n/a	11%	17%
Average wage ($000)	$140	$139.6	$101.3
% BIPOC	37%	39%	31%
% Female	33%	28%	29%
% <= SCA (25+)	62%	56%	68%

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

The MSA's largest sector within Computers and Electronics is, unsurprisingly, semiconductors (LQ of 17.7), with Electronic Components and Process and Laboratory Instruments at 1.5 and 1.9 LQ, respectively. Similarly, within Multnomah County, semiconductors are strongest (LQ of 2.8; 70% of the jobs in the cluster within the County are in the semiconductor sector). While Electronic Components and Process Laboratory Instruments are not as strong within the County as within the MSA (see Table 22), they have significantly grown in both employment and LQ over the past 10 years. These may have potential for continued growth if small batch manufacturing continues in the County (see "Metals and

ult/files/2021/10/12/Appendix-D-conditions-assessment-comprehensive-economic-development-strategy-updated-20211012.pdf

[270] As discussed elsewhere, the economy is regional, and its regional success is important to the City in myriad ways: city residents are employed in the cluster throughout the region; the cluster serves other industries located in the City, etc.

[271] https://www.greaterportlandinc.com/media/userfiles/subsite_214/files/industries/Greater-Portland-Computers-Electronics-Overview.pdf; https://www.oregonmetro.gov/sites/default/files/2021/10/12/Appendix-D-conditions-assessment-comprehensive-economic-development-strategy-updated-20211012.pdf

Machinery" section). This sector overall saw a slight growth in employment (2%) since 2010, though the number of establishments rose faster in that time, insinuating growth in smaller companies in the industry.

TABLE 22: MULTNOMAH COUNTY COMPUTERS & ELECTRONICS SECTORS

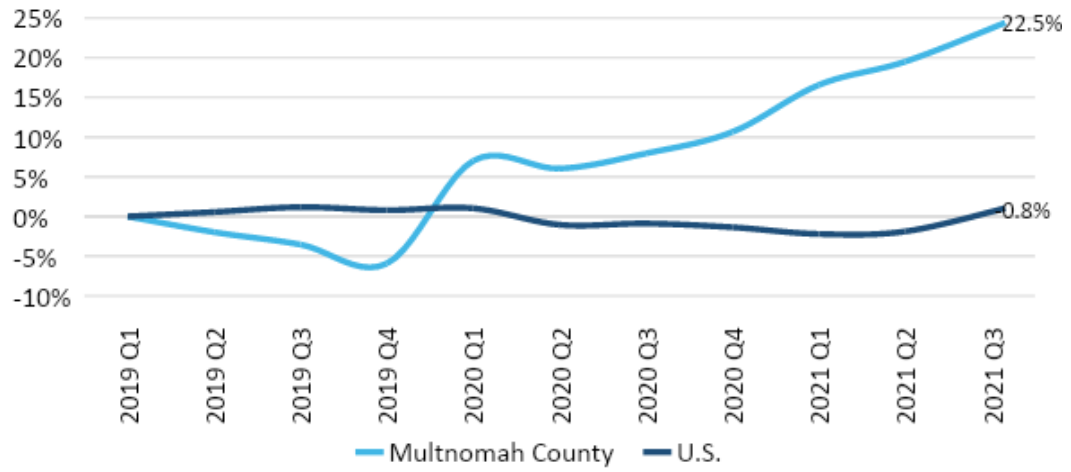
Statistics for 2020, unless otherwise noted

Subcluster	Establishments	Employees	% of Cluster Employment	Employment Growth (2010-20)	LQ	LQ Change (2010-20)	Average wage ($k)
Semiconductors	18	2,021	69.8%	2%	2.8	-10%	$76.5
Computers and Peripherals	39	530	18.3%	217%	0.4	300%	$222.3
Communications Equipment	12	92	3.2%	1433%	0.3	-	$76.6
Process and Laboratory Instruments	17	170	5.9%	24%	0.3	50%	$54.2
Electronic Components	7	77	2.7%	-36%	0.1	0%	$54.2
Software Reproducing	5	5	0.2%	-79%	0.1	-67%	$65.4

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

Portland's Computers & Electronics employment proved far more resilient during the pandemic than the US overall. The number of Multnomah County employees in the cluster increased from Q1 2020 to Q3 2021 by 22.5% while national employment in the cluster fell by -0.8% (see Figure 17). In comparison, manufacturing jobs in Multnomah County declined nearly 10% in this time, further evidence of the resilience of this cluster overall and the impact of the COVID-related boost in demand for consumer electronics.

FIGURE 17: CUMULATIVE QOQ EMPLOYMENT GROWTH – COMPUTERS AND ELECTRONICS



Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

The cluster is anchored by large corporations in the MSA region. Intel[272] decided to locate in the region in 1975 due to the region's short flight to Intel's Santa Clara headquarters, cheap water and electricity, and its stable and highly educated workforce – all advantages for Computers and Electronics firms that continue to this day.[273] Intel's decision to locate in the market galvanized the cluster, helping local companies like Tektronix[274] grow as well as spawning new firms. Many of these firms are suppliers to the microchip manufacturing industry, such as Lam Research,[275] supplier of machinery, parts, and chip-processing services – or, Siemens (manufacturer of electronics components), as well as several small and mid-sized companies.

Human Capital

One of the keys to the cluster's success in the Portland area is its highly educated workforce. Within the cluster, 44% of the workforce in the region has attained a bachelor's degree, 6% higher than the US figure. Within Multnomah County, 68% of jobs are held by employees who have not obtained bachelor's degrees – indicating the industry offers opportunities for individuals with varied credentials, which could help improve the low BIPOC and female employment rates. Automation in computers and electronics in Multnomah County, at the EMSI rate of 39.7%, would represent more than 1,100 jobs lost within the cluster, and more often threatens jobs that don't require college degrees than those that do.

Thought not enough, there are some training and credentialing (or on-the-job training) programs in the area that can provide workers with flexible and nimble skillsets able to adapt to the changing industry needs even as automation threatens some of the jobs. The University of Oregon's Center for Advanced Materials Characterization (CAMCOR) in Eugene houses multi-million-dollar cutting-edge nano technology and fabrication equipment. Oregon State University and Portland State University offer the MECOP (Multiple Engineering Cooperative Program), a prestigious paid internship program through which microchip companies have had luck finding new employees. Locally, Portland State has advanced

[272]The largest microchip manufacturer in the world by revenue, Intel has its R&D headquarters in Hillsboro, 10 miles west of Portland. The other 4 largest companies are outlined here: https://www.greaterportlandinc.com/media/userfiles/subsite_214/files/industries/Greater-Portland-Computers-Electronics-Overview.pdf
[273] https://www.oregonencyclopedia.org/articles/intel/#.YxARTHbMK3B
[274] headquartered in Beaverton, Tektronix is best known for manufacturing test and measurement devices, such as oscilloscopes.
[275] headquarters in Tualitin (a manufacturing hub about three miles south on I-5 from Portland) and manufacturing capabilities in Hillsboro.

degree programs in electrical and computer engineering, mechanical engineering, and materials science and engineering within the Maseeh College of Engineering and Computer Science and a variety of electronic and design labs.

The talent pipeline reflects shortages for everything from higher-educated employees to an impending shortage of skilled manual laborers, such as welders and electricians, which help build facilities and keep them operating. Even entry-level microchip workers – specifically, microchip technicians – are difficult to find, and local firms have given multiple raises to entry-level talent in recent years to help recruit and retain talent.[276]

Other Assets and Challenges

Opportunities in the cluster include "upstream" material storage, such as chemicals used in the semiconductor industry, which are currently shipped through Los Angeles and stored either there or in Las Vegas. Outside of Intel, which has a much different supply chain than smaller firms, users of these chemicals often see longer wait times due to restricted supply, which can slow production. Local ordinances, such as limited industrial zoning and nuisance ordinances, are often outdated when it comes to developing this sort of chemical storage facility, which requires a small footprint and can occupy undesirable or irregular parcels but can vastly increase economic efficiency.

The limited industrial land in the city presents a challenge for the cluster. Companies are struggling to find suitable existing facilities and are experiencing challenges working with the city to expand or build new facilities.[277] These barriers to development mean new facilities will most likely be sited in the suburban counties.

COVID-related supply chain issues have absorbed any excess capacity in the cluster, with one microchip company going from a two-month supply of microchips on hand to a two-year backlog. Issues felt by cluster firms include difficulty purchasing materials from China, a lack of local chemical storage, and limited availability of shipping vessels.

> "Semiconductors serve many markets (e.g., automotive, appliances) – and future markets include AVs, EVs, industrial controls, data centers, and 5G."
>
> – Business leader

Finally, as autonomous and electric vehicle adoption is accelerated - in part through government intervention, such as the California and Oregon bans on new gas-powered car sales by 2035 - there is a significant opportunity to provide the electronic and computer components for these cars. There is also opportunity to supply semiconductors to the large healthcare industry in the Portland region; most med-tech companies use semiconductors in their connected device products,[278] with many other emerging applications (e.g., DNA sequencing has the potential to be transformed by semiconductors).[279]

Assessment – Portland's Opportunities

The Computers and Electronics cluster is a key driver of growth in the region, given the presence of semiconductor R&D facilities as well as the manufacture of electronics components to support the cluster's growth. Although supply chain issues have disrupted the sector, global demand for microchips

[276] Multiple interviewees noted a lack of available workers for entry level manufacturing positions, like microchip technicians. Most qualified labor comes from locals moving between firms, and entry level positions have been especially tough to fill. As positions become tougher to fill, larger corporations have been offering higher salaries, which has raised labor costs for smaller businesses.
[277] interviewee
[278] https://www2.deloitte.com/us/en/blog/health-care-blog/2021/semiconductor-chip-shortage-hits-medtech-strategies-to-build-resilient-supply-chains.html
[279] https://www.imec-int.com/en/articles/five-semiconductor-based-concepts-will-revolutionize-dna-sequencing

has continued to increase, and the cluster will likely continue to flourish in Portland. Areas of future opportunity may include the cluster's ability to accelerate growth in emerging markets, such as the move towards greater electrification or the increased use of connected devices in med-tech. To explore these, and other new applications of semiconductors, there is opportunity to strengthen connections with innovation centers in other industries or university research centers.

There is also significant opportunity to increase and diversify Portland's workforce to meet demand in this cluster. The lack of enough top-tier engineering programs in the Portland market, ones that send graduates directly to local companies, could present an opportunities for enhanced industry-led programs or partnerships to enhance the talent pipeline. There is also opportunity to partner with other organizations working to improve BIPOC representation in STEM careers or leadership positions (e.g., LSAMP program at PSU; Emerging Leaders[280]).

Large corporations could become more involved in identifying skills needed for future talent and developing associated training programs, in partnership with local colleges and universities (e.g., Portland Community College). This could present an opportunity to grow the share of BIPOC employees (who have historically had lower educational attainment levels than their white counterparts) – and also presents an opportunity to train a future workforce to enter new markets (e.g., working with local electric car companies such as Daimler to identify future manufacturing needs and increase the region's ability to meet them locally). A last human capital component would be changing hiring practices for firms from credential-based hiring to skills-based hiring (particularly to train workers as technicians who can work on a variety of challenges in an industry that is rapidly evolving and automating).

Finally, to address the need for local chemical storage solutions, easing development ordinances and allowing local storage for these chemicals would both shrink the carbon footprint of microchip manufacturing and create more local jobs. Through acquisition and identification of multi-acre sites for industrial development, an intergovernmental coalition to grow industrial development opportunities within city limits could be important for the growth of the cluster. Most sizeable and suitable sites are located in the suburbs. To grow the cluster's footprint in the city, the City of Portland could work with Multnomah County, the Port Authority, and other large land-holding agencies to see where there's opportunity to aggregate large sites, as well as changing zoning and overlays to make development easier.

Software

Cluster Definition

The Software cluster encompasses companies that engage in the publishing of software, internet publishing and broadcasting, web portals, and software related services such as systems design services, custom programming services, computer facilities management services, and data processing and hosting services. The software cluster does not include firms or employees that simply use software for their work, such as graphic designers or architects.

National and Global Market Observations

Globally, enormous growth is projected for the software market – with estimated growth varying widely. Some reports project growth to reach $812.9 billion by 2027, growing at a CAGR of 6.5% from 2022 - 2027. Most of this growth is expected to occur in the United States.[281] As another example, the

[280] https://www.emergingleaderspdx.org/
[281] https://www.statista.com/outlook/tmo/software/worldwide

application development software market, globally, is projected to grow to $1.63 trillion by 2030 at a CAGR of 27.4% from 2021 - 2030.[282]

Employment in software has seen steady growth since its advent, as more and more of the world is connected to the internet and digitized. The Software workforce has been growing steadily and now stands at a record high 4% of national employment. Many software hubs in the United States, such as Seattle and the Bay Area, have seen exceptional growth in population and wages, but have also seen the wealth gap widen, with communities of color and those without degrees being pushed out of housing markets as higher-educated and higher-earning residents move in.

Historically, Software has been sensitive to cyclical recession risks, although that was not the case during COVID; when employment across all industries contracted 5.5%, Software jobs expanded 0.7%.[283] More recently the cluster has demonstrated some fragility, with both Amazon and Apple freezing corporate hiring, Twitter and Lyft laying off more than a combined 4,400 employees, and other companies like Peloton and crypto firms experiencing smaller but notable layoffs. Increasingly, the software workforce is choosing to work remotely.[284] As software workers continue to spread across the country, many are choosing to locate for quality-of-life purposes instead of in financial or tech hubs, which is bringing some of the affordability issues seen in tech hubs to traditionally smaller, more affordable markets.

Additional national trends in software include:[285]

- **AI and IoT** – While the number of software jobs at risk of automation is just 1.5%, AI is continuing to be deployed across industries, including software development and coding, where automated code review can replace a sizeable portion of entry-level positions. The emergence of AI and IoT is creating jobs for talent with advanced analytical skills and, of course, will drive demand for new software.
- **High wages and increased flexibility** – Due in part to the remote work trends mentioned above, labor expenses will likely rise as contract and salary demands become higher. For workers, this is good news in a high-demand, high-wage cluster, but these increased prices will be passed on to consumers.
- **The maturation of software and computer systems** – Many businesses, especially legacy businesses and institutions, are locked in to dated systems, which will eventually require major upgrades to modernize to be compatible with modern technology. One of the keys to remote work has been the continued evolution of the cloud, where data is hosted on the web instead of on a physical drive. As the cloud matures and becomes naturally integrated into software and systems, software jobs will be in further demand[286] – such as cloud security analysts and cloud architects.[287]

[282] https://www.globenewswire.com/en/news-release/2022/08/22/2502572/0/en/Application-Development-Software-Market-Size-Will-Achieve-USD-187-Billion-by-2030-growing-at-27-4-CAGR-Exclusive-Report-by-Acumen-Research-and-Consulting.html
[283] https://www2.deloitte.com/us/en/insights/economy/spotlight/tech-workforce-expanding.html
[284] https://www.weforum.org/agenda/2021/01/teleworking-remote-working-pandemic-covid-19-industry
[285] https://www.buildingbettersoftware.com/blog/software-trends-2022-tips-to-tackle-remote-work/; https://www.oregonmetro.gov/sites/default/files/2021/10/12/Appendix-D-conditions-assessment-comprehensive-economic-development-strategy-updated-20211012.pdf
[286] https://www.sam-solutions.com/blog/software-development-trends/
[287] https://www.knowledgehut.com/blog/cloud-computing/cloud-computing-demand

Portland's Assets and Market Position

Firm Presence and Sector Strengths

The Portland software cluster's solid location quotient and impressive job growth even through COVID, with less job loss and a faster rebound than the US, suggest it has the potential to become an even larger strength in the area's economy. The Portland market outpaced the national growth rate of 65% from 2010-2020, with Multnomah County employment increasing 117% in that time, and the number of establishments more than doubling (see

Table 23). The cluster has the highest percentage of employees with bachelor's degrees and higher (48%) of all priority clusters, making this a good labor-demand match for Portland, as the share of population aged 25+ in Portland with a bachelor's degree (51.0%) or higher is nearly 15% higher than the national figure (37.9%).

TABLE 23: SOFTWARE EMPLOYMENT DATA SUMMARY

Statistics for 2020, unless otherwise noted

Software	US	Portland MSA	Multnomah County
Establishments	389,560	4,586	1,983
Employment	3,358,405	31,350	14,800
Emp. % Change (2010-20)	64.7%	68.6%	117.1%
LQ	1.0	1.1	1.3
LQ % Change (2010-20)	n/a	-8.3%	30%
Average wage ($000)	$151.3	$129.1	$134.3
% BIPOC	38%	23%	20%
% Female	34%	34%	35%
% <= SCA (25+)	50%	51%	53%

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

At the MSA level, the strongest sub-clusters are Software Publishers, Computer Facilities Management Services, and Data Processing, Hosting and Related Services – with LQs of 2.3, 2.0, and 1, respectively. These same three sub-clusters are concentrated in Multnomah County as well. Software publishers – the largest sector within the cluster – are highly concentrated in the County (LQ of 2.8), with more than 30% of employment located within the county (see Table 24). Data processing and hosting is another strength, has a County LQ of 1.7 and comprise 14.1% of the cluster's employment. Across each sector, wages are notably high (but note in Table 23 that BIPOC and female representation in this cluster is low).

TABLE 24: MULTNOMAH COUNTY SOFTWARE SECTORS

Statistics for 2020, unless otherwise noted

Subcluster	Establishments	Employees	% of Cluster Employment	Employment Growth (2010-20)	LQ	LQ Change (2010-20)	Average wage ($k)
Software Publishers	820	4,845	32.7%	79%	2.8	-13%	$127.5
Computer Facilities Management Services	20	603	4.1%	253%	2.4	140%	$123.7
Data Processing, Hosting, and Related Services	136	2,094	14.1%	63%	1.7	6%	$132.4
Internet Publishing and Broadcasting and Web Search Portals	204	1,002	6.8%	167%	1.0	-17%	$115.8
Custom Computer Programming Services	529	3,506	23.7%	330%	1.0	150%	$137.2
Other Computer Related Services	52	327	2.2%	289%	0.8	300%	$148.3
Computer Systems Design Services	222	2,423	16.4%	76%	0.7	17%	$154.0

Source: dataFab and RW Ventures, LLC analysis of QCEW and QWI data

Major tech firms like Google, Apple, and Amazon have small footprints in Portland.[288] Instead, the largest software companies include those focused on database management (e.g., ZoomInfo; Oracle),[289] as well as decision-making and problem-solving software (e.g., Navex Global; New Relic).[290] Additional strengths include creative software (font management software to support graphic design and architecture firms, for example), survey research firms (ClearlyRated, SurveyMonkey, AskNicely), and cybersecurity.[291] The cluster further benefits from the concentration of professional services firms concentrated in downtown Portland, which creates demand conditions for many of these software services.

Human Capital

The cluster remains a majority white, majority male cluster. With remote work practices, some Portland firms interviewed are now able to hire a more diverse workforce than before, given Portland's proportion of white residents is the highest of major US metros. Interviewees also mentioned that it was more difficult to get people of color to move to Portland versus hiring them where they already live.[292]

There is a distinct lack of diverse talent attraction and retention in this cluster. BIPOC Portlanders have shorter terms at companies than their white counterparts, and transplant BIPOC employees have even

[288] https://www2.deloitte.com/us/en/insights/economy/spotlight/tech-workforce-expanding.html
[289] ZoomInfo – a B2B database for connecting companies – supplying businesses with key contacts and business information.
Oracle – third-largest computer technology corporation in the world, including but not limited to database, middleware, and enterprise management software.
[290] Navex Global – a legal, regulatory, and sustainability risk software suite to guide companies through the risk and compliance decision-making process.
New Relic – AI-powered problem-solving software for identifying where issues exist within both a company's network and technical stack.
[291] interviewees
[292] interviewee

shorter terms than BIPOC Portlanders.[293] Despite these challenges, many software companies, when interviewed, noted they are excited to increase BIPOC hiring and continue to invest heavily in staff training and retention.[294] Investment in STEM and computer science fields in younger populations could help prepare a more diverse population for employment in the software field. [295]

Innovation and Entrepreneurship

The Software cluster attracts the most investment of all priority clusters analyzed – and also reflects a growing trend in software to scale until acquisition (see "Innovation and Entrepreneurship" section). This is true in Portland; interviewees noted that one of the barriers to scaling tech firms in Portland is that owners cash out before they can grow.[296] Venture Capital and larger firms often swallow up promising smaller firms (e.g., the recently acquired AskNicely, which sold for $62MM). Sometimes these firms are moved to other cities or offices are shrunk or closed, which diminishes intellectual capital in the Portland market. Interviewees agreed that any new local fund to support software firms would need to be capitalized with a minimum of $150MM to allow software firms to secure the necessary scale-up capital.[297] Interviewees also pointed out opportunities for innovation and growth within software around: cybersecurity, drones to support aerospace industries, climate tech, consumer products, health tech, gaming and mixed reality.

Other Assets

Portland provides a supportive cluster ecosystem; several organizations offer support in the tech industry, formally or informally, including the Technology Association of Oregon (TAO) (connects software entrepreneurs with resources), Code Oregon (teaches coding), Women Who Code (network of women technologists), Startup Oregon (educational offerings for startups), PDX Startups Switchboard (community to share resources), and Partners in Diversity (resources for retaining BIPOC employees). [298] Another strength for the cluster is that starting a software business in Portland is cheaper than most other major tech hubs when accounting for quality of talent, payrolls, electricity and real estate costs.

Despite its resilience and steady growth, the cluster is seen locally as more of a support cluster for other industries, including supporting manufacturing, media, and architecture. For instance, one of the largest industry groups in the state suggested using tech to scale other industries instead of trying to scale tech.[299] This indicates there may be opportunity to deploy an already-strong software workforce to serve other and emerging markets as they digitize. This will likely require industry-specific training programs.

[293] interviewee
[294] interviewee
[295] https://globalurban.org/Portland_Metropolitan_Economic_Strategy_Report.pdf
[296] On the other hand, a VC investor in software claims that it's no more difficult to scale in Portland as it is anywhere else, and they believe that Portland is simply a cyclical city mired in a slow growth cycle.
[297] Early 2022 VC funding is lagging both 2020 and a record-breaking 2021, but the Q1 figure of $243MM (across 31 deals in the Portland metro) is still up from the years prior to 2020.
[298] https://www.forestgrove-or.gov/sites/default/files/fileattachments/economic_development_commission/meeting/47472/2._appendix_a_-_action_matrix.pdf
[299] interviewee

Assessment – Portland's Opportunities

Since the software cluster serves many other industries as well as consumer uses, nearly all of which are aggressively digitizing and otherwise incorporating more software, its growth opportunities may particularly flow from closer coordination with other key clusters and innovation centers. Software is already doing this to some degree within manufacturing and machining as these facilities become more reliant on technology to increase efficiency and boost sales (e.g., technical assistance provided by OMEP helps manufacturers digitize). Other opportunities could include working with athletic apparel and outdoor firms to grow the practice of VR/AR stores, or working with companies in the electronics manufacturing industry, specifically those companies manufacturing energy and flow measurement devices. These connections and collaborations could occur through convening other priority cluster organizations and groups like TAO or through Prosper Portland's Business Advancement practice.

> "There is opportunity for tech to collaborate with legacy industries."
>
> *– Industry Association leader*

In addition, Portland could capitalize on the cluster's articulated enthusiasm for a diverse workforce by creating a stronger labor pipeline from communities of color to the software industry. A potential place to build from could be through a certification program at Portland State University or through Prosper Portland's Portland Means Progress initiative.[300] Expanding programs and training through high schools, the junior college system, and non-educational routes would offer opportunities for entry into a very high-earning cluster for a more diverse group of residents.

Finally, software provides opportunities in traditionally non-tech-oriented industries that can help meet equity goals. This can include utilizing software to meet other goals such as automating childcare management software to help foster upward economic mobility for Portlanders. Across each of these opportunities, there is significant potential for industry and employer leadership in developing a workforce or innovation strategy to grow the cluster.

Human Capital

KEY TAKEAWAYS

The Portland MSA has a highly educated population, particularly concentrated in the City of Portland; the number of residents with advanced degrees is much higher than the US average. Employment of Portland's residents has grown substantially over the last 10 years, and the share of occupations requiring higher skills is growing faster than US averages. However, workers deployed into those high-skill occupations are disproportionately white (while BIPOC are over-represented in lower-skilled jobs). Median incomes for Asian, Black, and Hispanic/Latino populations all had smaller increases than white residents, despite the move into more management, business, science, and art-related jobs.

The region has more workers than average to support the Clean Economy / Green Cities, Software, and Computers and Electronics clusters – but has challenges efficiently matching this workforce with high-growth jobs, particularly for BIPOC. There is a need to improve labor market efficiency, which can be done by increasing sector-specific employer-led consortia, employers adapting new hiring and training practices, and improving the alignment of employer and trainer/educator practices. These changes may also address worker shortage challenges.

[300] Cluster Action Plans, Executive Summary

"Human capital" is the collective knowledge and skills of an area's workers. The most common measure of it is education, but that is a rough proxy, as it does not adequately reflect the skills and experience workers gain in less formal ways. Human capital is the single most important input for economic growth – though producing and attracting it is not sufficient: it must be deployed to drive economic growth.[301] That is, this market lever focuses not just on development of human capital, but on the functioning of labor markets. Workers must be prepared for and then employed in the jobs that best utilize and reward their skills and education to efficiently translate human capital into economic outputs. Effectively leveraging a region's human capital is even more essential in today's economy, where the impact and value of knowledge is greater than ever.

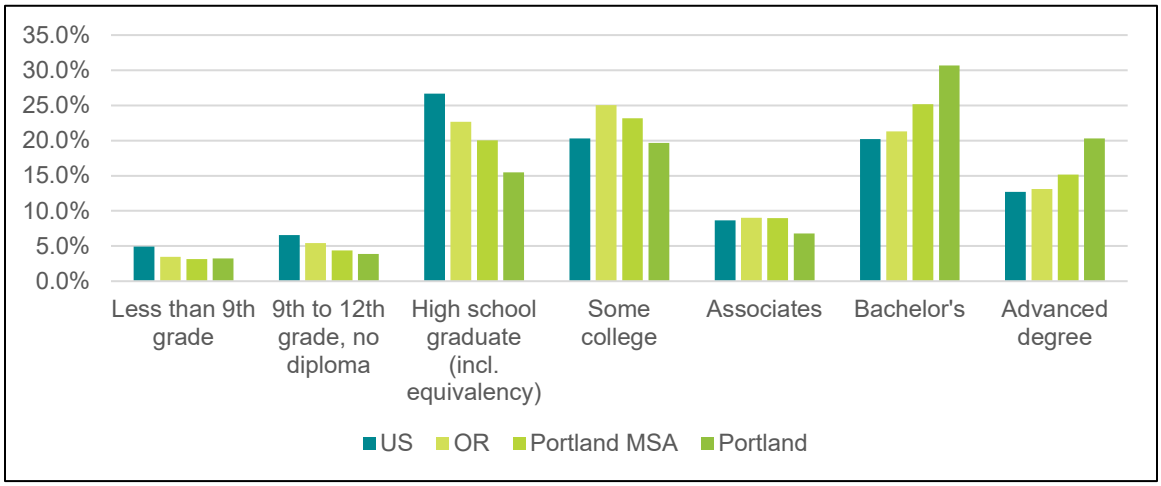
To create these conditions, three main labor market functions must work well together:

1. The supply of skills in the region must be robust and quality, generated by a combination of "producing" the skills locally (i.e., educating residents), retaining existing talent, and recruiting new talent;
2. The current and projected demand for skills from companies, especially those in the region's strongest, growing sectors (see Clusters section above) must be well-defined and transparent; and
3. The systems that match these two elements – labor supply and demand – must be nimble and responsive to employer and employee needs and make connections between workers and jobs as efficiently as possible.[302]

Supply: Educational levels

Overall, the Portland MSA has a highly educated population, particularly concentrated in the City of Portland. In 2020, 51% of the city's residents 25 and older had a bachelor's or advanced degree, roughly 18% higher than the US average and 11% higher than the Portland MSA (See Figure 18).[303] This was an increase of 11 percentage points from 2010, double the increase in the US as a whole and faster than Oregon and the metro region.

FIGURE 18: EDUCATIONAL ATTAINMENT (2020): PORTLAND COMPARED TO US, STATE, AND MSA

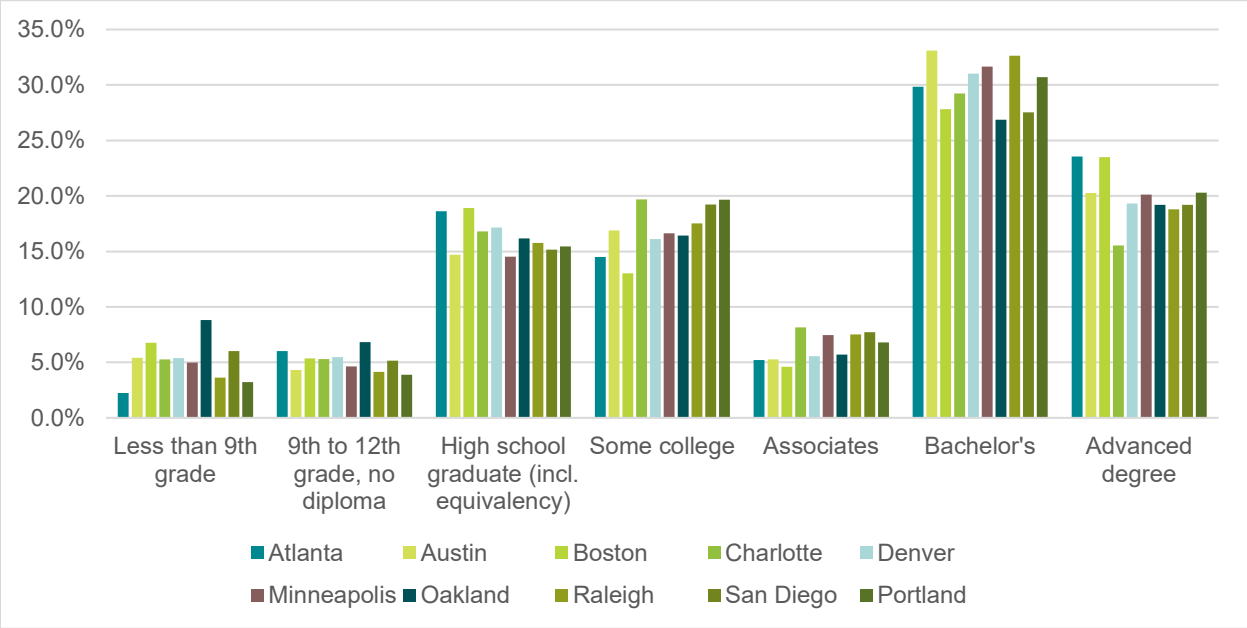


Source: RW Ventures analysis of American Community Survey data

[301] For example, some of the places with the highest human capital do not have particularly strong economies: college towns and government centers. For much more in-depth discussion of what attracts and retains human capital, and accounts for its economic impact, see Berry and Weissbourd, "Grads and Fads" (CEOS for Cities, 2004), <http://rw-ventures.com/grads-and-fads/>.
[302] For much fuller discussion and literature review, see George Washington Institute of Public Policy and RW Ventures, LLC, Implementing Regionalism: Connecting Emerging Theory and Practice to Inform Economic Development.
[303] RWV analysis of ACS data, table B15003

Comparison to peer cities is of limited utility because one of the selection variables for peer cities was education rates. Not surprisingly, Portland's share of residents with a bachelor's or advanced degree is on par with other cities. One additional observation: Portland has a higher number of residents that have proceeded past high school to complete some college – but do not have a degree (see Figure 19).

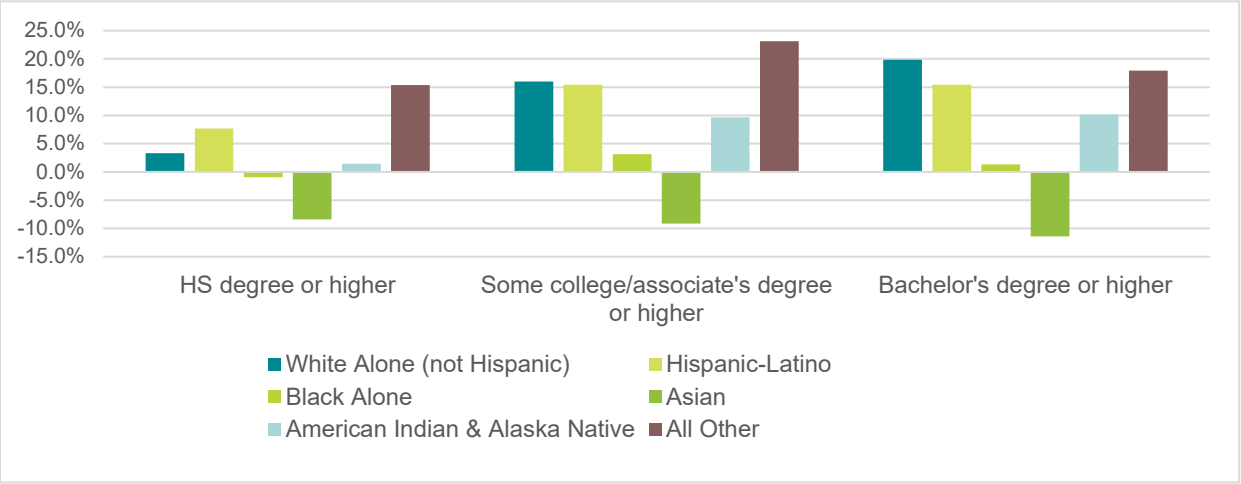
FIGURE 19: EDUCATIONAL ATTAINMENT (2020): PORTLAND COMPARED TO PEER CITIES



Source: RW Ventures analysis of American Community Survey data

Within Portland's city-wide data, there are unfortunately lower rates of educational attainment for Portland's BIPOC populations. The city's white residents are 2.4 times as likely as Black residents to have a bachelor's degree or higher, a larger gap than in the US overall (1.6 times). This is true even though Portland's Black residents are slightly more educated than the US average; the gap is larger here because white residents have so much more education than the US average (56% with a bachelors or higher versus 37%).

FIGURE 20: DIFFERENCE IN EDUCATIONAL ATTAINMENT, PORTLAND V. US (2020)



Source: RW Ventures analysis of American Community Survey data

There are also gaps between white residents' educational attainment and that of other BIPOC communities, but the degree of those gaps is noticeably different than the patterns for the US overall. (see Figure 20). For instance, Portland's Hispanic-Latino population has notably higher than average educational attainment; 33% of those residents had a bachelor's degree or higher in 2020, nearly double the US proportion. Conversely, while their overall educational levels are higher than other BIPOC populations in Portland, the proportion of Asian residents 25 and over with a bachelor's degree or higher is 11 percentage points lower than the US. All of Portland's racial and ethnic groups became more educated from 2010 to 2020, with the changes roughly mirroring the overall patterns noted above: the Hispanic-Latino population 25+ with a bachelor's or higher increased 14 percentage points, versus 11% for White-alone, 5% for Black, 7% for Asian, and 15% for all other races.

Though Portland's residents are generally more educated than U.S. averages and on par with peers, those credentials are not, for the most part, translating into higher wages.[304] In 2020, only white and American Indian/Alaska Native populations had median incomes higher than the U.S. overall. Asian residents' median income was 22% lower than the national figure, while Black residents were 17% lower and Hispanic/Latino workers were nearly equal.

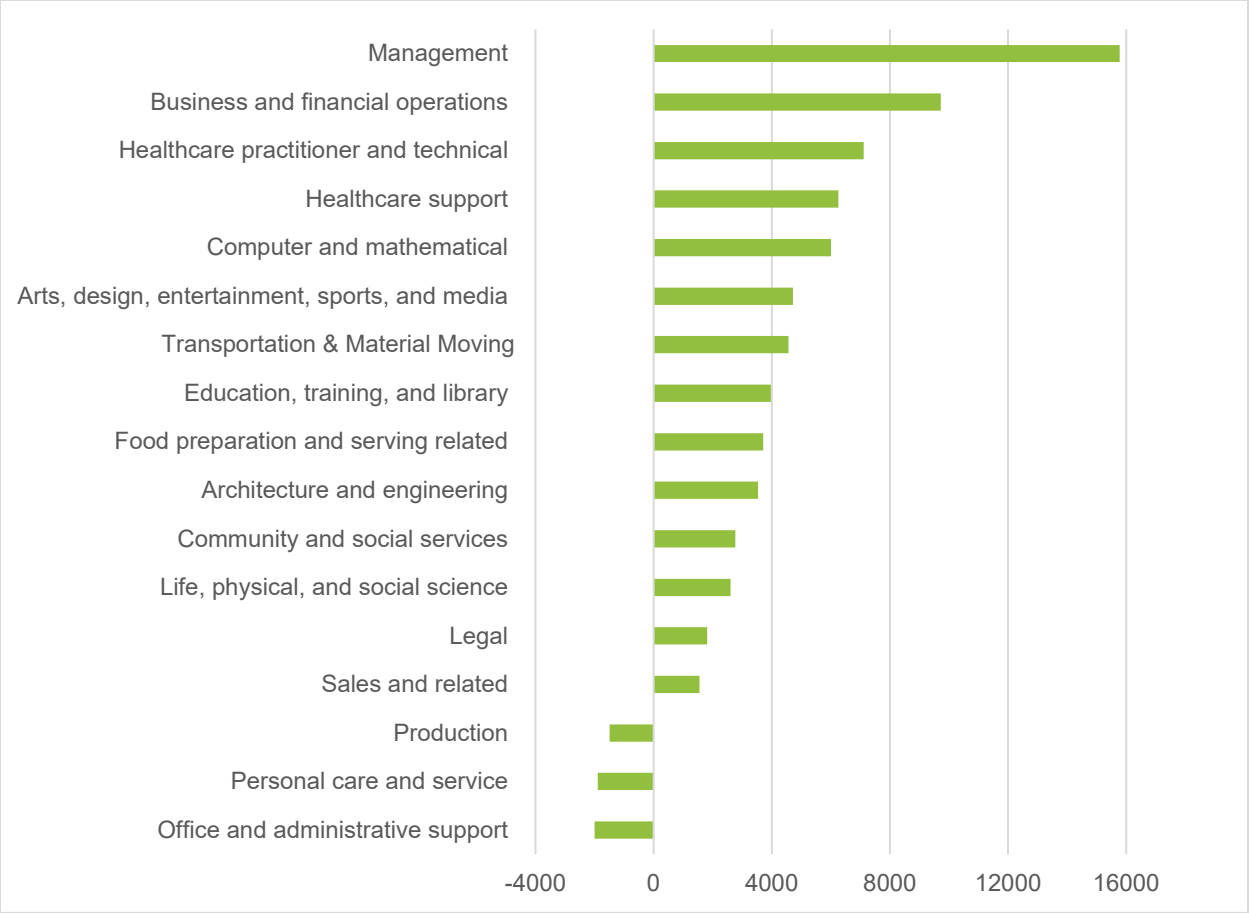
Supply: Occupations[305]

Education is just one way to describe a workforce, as it only counts credentials earned, rather than skills and expertise gained.[306] There are no direct measures of the skills and expertise in an area's workforce but examining what jobs residents hold and the skills required to perform them provides a proxy measurement. While this approach will miss the cases where workers are over- or under-qualified for their position and their skills do not match the job, it does provide an approximation of the expertise of Portland's residents. (Note that this analysis is on the occupations of Portland's *residents* – the assessment of occupations located in Portland follows in the next section on labor demand.)

The number of Portland's employed residents grew substantially from 2010 to 2020. While the city's overall population increased by 12% over that period, the number of employed residents 16 and over grew nearly twice as fast, at 23% - higher than the US average increase of 18%.[307] Using Bureau of Labor Statistics (BLS) job groupings, the hundreds of different occupations can be assembled into 22 higher level categories. Of those, 18 experienced increases in employment from 2010 to 2020. Looking at the job categories that showed a significant increase or decrease (defined here as +/- 1,000 jobs) shows where the balance of Portland's workforce shifted over this period. (See Figure 21).

[304] This may reflect an over-supply of human capital for the job base (e.g. the storyline that PHDs are working as baristas), or be explained by other characteristics of the job base or preferences of the labor force (e.g. to work in professions that might be lower paying).
[305] Worksystems is working on a "State of the Workforce" report; once findings are available they may provide additional insights to inform this report. https://www.worksystems.org/labor-market-info/economic-overview.
[306] And as is discussed later, credentials would ideally not be the primary way in which employers assess applicants' skills, with more direct skill-based assessments being employed.
[307] From January 2010 – January 2020, ages 16 and over. https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm

FIGURE 21: OCCUPATIONAL CATEGORIES WITH 1,000+ CHANGE IN EMPLOYMENT, 2010-2020



Source: RW Ventures analysis of American Community Survey data

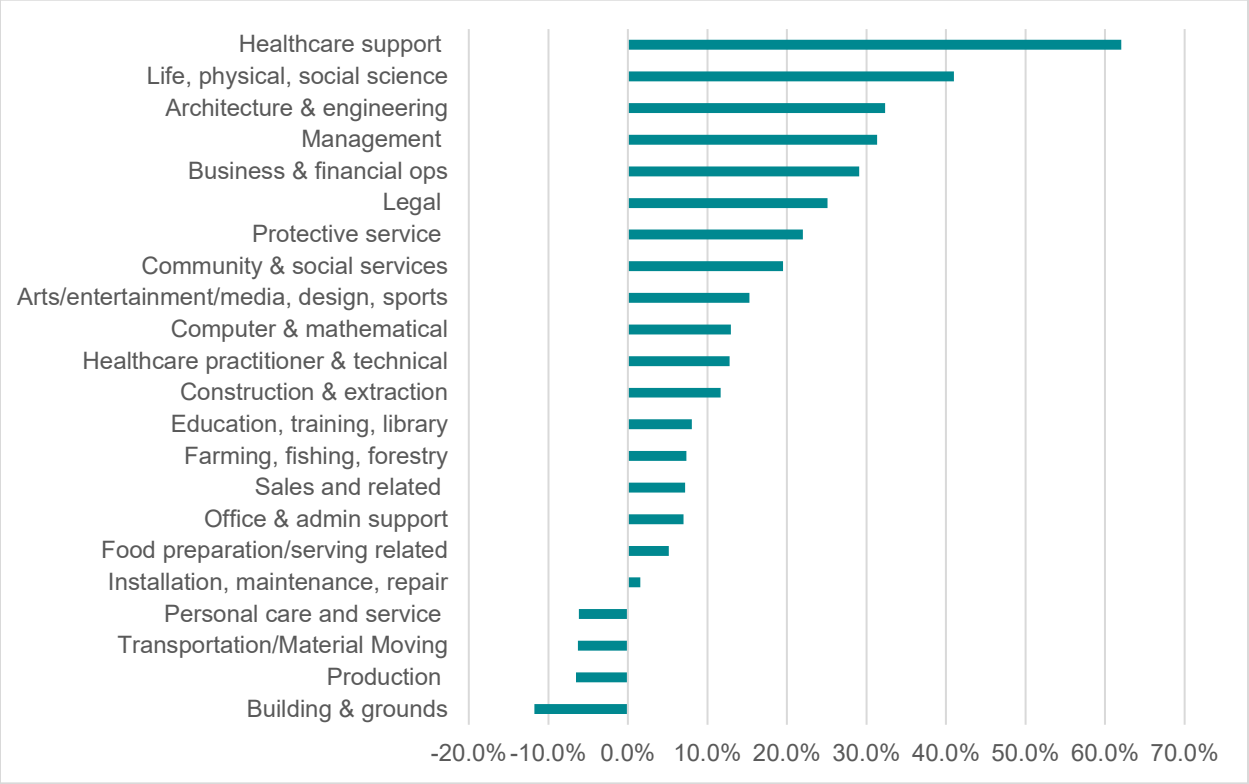
Each of these broad categories covers dozens of different positions, with a range of needs for skills, education and expertise. The average job zones[308] show that several of the largest changes in occupations were in higher skilled categories with average job zones near 4 (indicating most jobs require a bachelor's degree): management, business and financial operations, and computer and mathematical (see Figure 21). The other categories with large changes that required less education were in categories that also saw large national changes: healthcare (with growth in line with an aging population and greater demand for services) and transportation and material moving (given the shift to ecommerce and increased shipping needs).

Comparing the changes in the job categories in Portland from 2010-2020 to what happened in the national economy shows the unique shift in Portland's occupation mix. By ranking the job categories based on how much more or less Portland's jobs changed relative to the US overall, Portland's move to higher skilled jobs grows more obvious (see Figure 22). The top half of this ranking – those occupations with greatest growth compared to the US – is comprised of 9 out of 11 categories with average job zones at or near 4; the bottom half has only one such category. This bottom portion of the categories included

[308] These categories can be roughly ranked from "high" to "low" skill by analyzing the education requirements for the underlying jobs, using federal O*NET data from the BLS. O*NET estimates the level of education needed to obtain a particular job and codes that occupation with a "job zone."# Taking the average of all occupations' job zones within the 22 broad categories used above approximates the skill level of the category, with higher job zones indicating higher skill needs.

lower-skill white-collar positions (office and admin support, personal care and service) that support higher-skill occupations, and should in theory have grown as the higher-skill positions increased.

FIGURE 22: CHANGE IN PORTLAND'S OCCUPATIONAL CATEGORIES RELATIVE TO US, 2010-2020

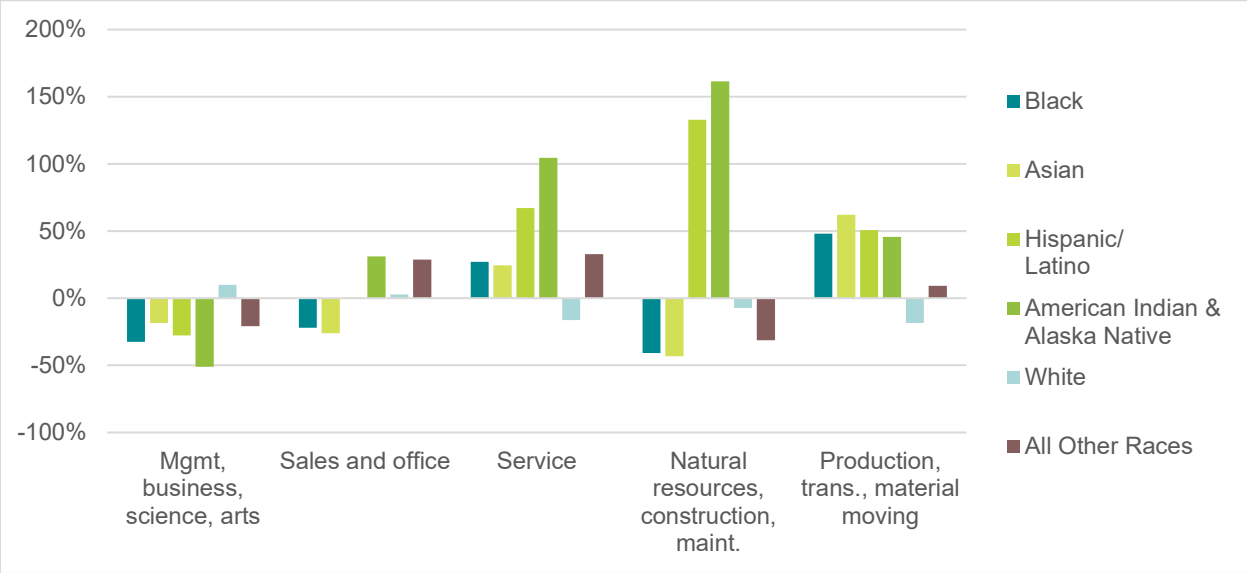


Source: RW Ventures analysis of American Community

Breaking down these occupational trends by race and ethnicity reveals the differences in employment among these groups. By comparing the demographics of Portland's workforce overall – the percentage of all workers represented by major races and ethnicities – to those groups' representation in major occupational groupings, it is clear that white workers are disproportionally working in higher-skilled jobs while BIPOC populations are almost all underrepresented in those same positions, and over-represented in lower-skilled jobs (See Figure 23).[309]

[309] One barrier to improving this may be that BIPOC populations early in their careers do not see themselves represented in senior positions in the industries they want to enter. BIPOC retention in high level jobs is an issue in the Portland region. Mentorship may help to navigate advancement opportunities in different careers paths. (Source: Estolano Advisors 'Engagement Takeaways' memo)

FIGURE 23: DIFFERENCE IN PORTLAND WORKFORCE DEMOGRAPHICS AND OCCUPATION REPRESENTATION, 2020



Source: RW Ventures analysis of American Community Survey data

The changes in occupational distributions from 2010-2020 by demographic groups almost uniformly show that all of Portland's workers moved into jobs requiring more educational credentials, regardless of race or ethnicity (associated wages, on the other hand, are inequitably distributed – as discussed below). In fact, most BIPOC groups showed larger shifts into those occupations than white workers; Black workers had a 44% increase in their presence in management, business, science, and the arts positions, and Hispanic/Latinx employment in those jobs grew by 53%, compared to a 17% growth rate for white workers in the same period.

Though BIPOC populations experienced these larger shifts into occupations that *generally* require more education and pay more, their income changes do not reflect their occupational changes. Median incomes for Asian, Black, and Hispanic/Latino populations all had smaller increases than white residents from 2010-2020, despite the move into more management, business, science, and art-related jobs. This could be due to unequal pay for the same positions as white workers, or because within the broadly higher-education occupation categories, BIPOC workers are being hired for the relatively lower-paying positions.[310]

Labor Demand

Human capital's impact on economic growth is dependent on how well it is deployed: the degree to which workers are finding and being hired for jobs that fully leverage their skills and knowledge, translating that capital into economic value. This requires aligning the supply of skills with the ones employers are seeking, both for current roles and for those that are on the horizon. And in an ideal labor market, employers' focus on and communication of their skills needs would infuse their entire hiring process. Rather than relying so heavily on degrees to assess workers' preparation, employers could be defining

[310] Additional factors that may contribute to lower pay (Source: Estolano Advisors 'Engagement Takeaways' memo):
- In the Asian/Asian American communities within Portland alone, there are upwards of 40 different languages spoken; all of those communities plus Pacific Islander communities have different needs.
- Many immigrants have professional credentials that are not recognized by US employers and as a result, people struggle to enter more advanced career paths that match their experience and expertise.

precise skills needs that holders of many degrees - or in some cases, none at all - could fulfill. It would also inform a different kind of training and education model, both more informed by and more centered with employers (through apprenticeships and other formal and informal on-the-job training). While formal degrees would have a place, they would often be designed around more specific skills demands, and concurrently, shorter-term, targeted, stackable credentials would emerge where appropriate, reducing the time and cost needed by prospective workers to prepare for open jobs and for employers to find qualified workers. Absent this precision around isolated skills, data on recent occupational changes and the general education requirements associated with those jobs suggest what skills Portland employers are looking for.

Generally, the skill sets sought by the Portland region's companies are in line with the overall national economy. Data on the mix of jobs in the Portland MSA (versus the prior section's examination of *residents*' occupations) across the 22 BLS high-level occupation categories can show whether the region employs more or less educated workers than the national occupational mix (e.g., whether Portland has more graphic designers than floral designers underneath its Arts and Design occupations than the US overall). The results show Portland's workforce closely aligning with US skill levels. There is a balanced distribution across the 22 categories, with 7 having a job composition that is 1% "more skilled" than the US average (i.e., requiring more educational credentials), 6 that are within 1% above or below, and 9 that are more than 1% "less skilled." The occupation groups with the largest differences above or below the US average are heavily local serving: protective, healthcare, community, legal, and personal services. Thus, employers in Portland's traded clusters are generally looking for a level of skills on par with the overall economy. They are also not rewarding higher education levels with the same kinds of earnings premiums as companies in peer regions. Portland's average wages for bachelor degree holders were 68% higher in 2020 than high school graduates'; among its peers, the City of Portland ranks last (10th) in median earnings.[311] This is all somewhat surprising, given the previously discussed higher-than-average educational profile of the region.

This incongruence could be evidence of a substantial mismatch between workers' education and the skills demanded by employers. The mismatch is most clearly seen at the Graduate degree level (or higher); 19% of Multnomah County is at that educational level, but only 6% of jobs require graduate degrees, a 13% differential.[312] This is higher than the US average (8%) but comparable to cities like Nashville, Raleigh and Denver. [313] One possible explanation for this apparent education/job demand gap is geography - highly educated residents are working outside of Multnomah County (and even remotely for other metropolitan regions entirely) and thus their jobs' demands aren't being captured in this data. At least one set of indicators suggests this is not the case. Relative to some of its peer metros, Portland residents are much more likely to work in the city, with a larger differential between in-city workers and the next largest destination, and have the highest proportion of jobs less than 10 miles away (see Table 25).

While this data lowers the probability that job location explains the education supply/demand gap, there are nuances. When grouping residents by three broad occupation groups,[314] Goods Producing workers

[311] ACS; see "Economic Overview" section for data
[312] EMSI 2022
[313] Counties that have similar gaps at the graduate degree level are Davidson County (Nashville; 11%), Wake County (Raleigh; 16%), and Denver County (Denver; 15%). EMSI 2022
[314] Full data from OnTheMap. Note: This is the most granular level provided by LEHD.

- Goods Producing - 45% of those residents work in city
- Trade Transportation and Utilities - 56%
- All Other Services - 66%

Distance to job less than 10 miles

- Goods Producing - 65%
- Trade etc. - 74%
- All other - 82%

show notably lower rates of working in the city or being less than 10 miles from their job (45% and 65% respectively). Other occupation types are close to or above the overall averages on those statistics. This suggests that the mismatches in educational attainment and job requirements may be geographically driven in certain occupations (notably production) but not others.

TABLE 25: RESIDENCE AND EMPLOYMENT PATTERNS, PORTLAND AND SELECTED PEERS,[315] 2019

City	Residents Working in City	Gap between City employment and next highest adjacent municipality	Residents <10 miles from job	Size (sq miles)
Portland	62%	15x (Beaverton)	79%	145
Denver	47%	5x (Aurora)	69%	155
Minneapolis	44%	5x (St. Paul)	78%	57
Tampa	42%	10x (East Lake-Orient Park)	56%	176
Sacramento	40%	10x (Arden-Arcade)	56%	100

Source: RWV Analysis of U.S. Census Bureau LEHD data via OnTheMap (https://onthemap.ces.census.gov/)

The LQs of occupational groupings and of the jobs underneath show that the priority clusters examined in this report have strong human capital assets backing them. The Architecture and Engineering (1.8) and Computer and Mathematical (1.3) categories have the two highest LQs, showing the region has more workers than average to support the Clean Economy, Software, and Computers and Electronics clusters. While the LQ for Production occupations overall sits right at 1.0, which does not suggest an occupational strength, several key jobs within that group have strong LQs. Out of 90 positions, 38 have an LQ greater than 1, including several food processing jobs (e.g., bakers, food batch makers) and several types of machine operators.

Looking specifically at the Clean Economy, Portland already has a strong concentration of climate-related occupations and workers,[316] and these are expected to play a critical role in the region's inclusive, climate-centered growth. "Green" occupations within the Portland tri-county region with the most anticipated growth in job openings (from 2020-2030) are landscape architects (38%), hazardous materials removal workers (27%), remote sensing technicians (24%), and industrial engineering technologists and technicians (2%).[317] In addition to these, there is opportunity to develop new education and training

[315] Some peer metros are not appropriate for this comparison - notably Indianapolis, Nashville, San Diego - because of their large size; the substantially larger area they cover by necessity causes more residents to work in the city.
[316] As compared to the US average. Source: Estolano Advisors memo, 'Climate Occupations Analysis', October 2022
[317] Green occupations are defined as those with a high share of specific tasks that are considered green. See: Popp, D., Vona, F., Marin, G., & Chen, Z. (2021). The Employment Impact of a Green Fiscal Push: Evidence from the American Recovery and Reinvestment Act. Brookings Papers on Economic Activity, September 9, 2021. Examples of green tasks include:

- Analyze storm water systems to identify opportunities for water resource improvements
- Manage the movement of goods into and out of production facilities to ensure efficiency, effectiveness, or sustainability of operations
- Implement or monitor carbon or environmental management, accounting, or audit systems

Source: Estolano Advisors memo, 'Climate Occupations Analysis', October 2022

pipelines to prepare the region's workforce for emerging, high-growth opportunities in the Clean Economy. Occupations in demand include:[318]

- **Environmental engineers.** Greater Portland has a higher-than-average concentration of this occupation, with occupational employment expected to grow about 15% from 2020 to 2030. The region's postsecondary institutions produce credentials associated with this occupation equal to 58%of the anticipated need for new environmental engineers.
- **Electrical and electronic engineering technologists and technicians.** Employment is concentrated in manufacturing, particularly in semiconductor and other computer and electronic products manufacturing. Occupational employment expected to grow about 10% from 2020 to 2030, faster than the national average. Tri-county production of credentials (largely Associate's degrees) equals 17 percent of the anticipated annual need for new workers in this occupation.
- **Automotive service technicians and mechanics.** Although competitive education for this occupation is identified as an associate degree, education requirements may increase over time as the skills required to maintain an increasingly electrified fleet evolve. In total, credentials produced in the region amount to only 15% of anticipated annual openings.
- **Heating, air conditioning, and refrigeration mechanics and installers.** Employment is expected to grow by 11% from 2020 to 2030, Tri-county production of relevant credentials amounts to less than one fifth of anticipated annual openings in this occupation.
- **Inspectors, testers, sorters, samplers, and weighers.** This occupation, concentrated in manufacturing, particularly transportation equipment manufacturing, has no postsecondary training program in the region (despite a relatively large number of openings anticipated each year - 363).

In general, "green" occupations demand skills distributed across: communications & critical thinking; operating machines & processing; physical work; clerical & service - presenting a wide range of opportunities for individuals interested in climate-related jobs or looking to switch careers.[319]

Labor Market/workforce programs

> "There are emerging corporate-led workforce programs, for instance in software, apparel, metals, and food industries – but a need for greater partnerships and flexibility."
>
> *– Various business leaders*

The next economy is significantly changing labor markets. Employers' demands for skills are evolving rapidly, and the existing systems to match employers and workers are not keeping up. Employers continue to rely on hiring processes oriented around traditional credentials, rather than candidates' relevant skills. Without skills-based hiring, employers are being less accurate in their assessments of applicants' real preparation for a job, or their aptitude to acquire those skills quickly through on-the-job training. To combat this imprecision, and to generally reduce their perceived risk with a new hire, many companies lean more heavily on their networks for referrals, limiting their total applicant pool and reducing the chance of finding the right match. This system stymies workers as well, as it's harder for them to know what employers are looking for and thus what skills they should obtain. Even when workers are aware of the required skills, it can be difficult to identify the right training programs.

These conditions feed into a workforce training system largely driven by third-party providers. These providers are critical because the private sector underinvests in developing workers (in part because they

[318] For more detail, see: Estolano Advisors memo, 'Climate Occupations Analysis', October 2022. The memo also calls out Machinists as an area of opportunity in the clean economy, although there may be an adequate supply of credentials to meet demand.
[319] For more detail, see: Estolano Advisors memo, 'Climate Occupations Analysis', October 2022

may not stay). As a result, workforce training is often a public good provided through public agencies or subsidized non-profits. While these workforce training and education systems are necessary, they often cannot nimbly design and launch programming that is responsive to in-demand skills. Many of these systems are working to become more employer- and demand-driven, but employers can be hard to engage, and they themselves need to change their hiring systems first to genuinely enable flexible and responsive training delivery.

The net effect: complex, inefficient labor markets where employers struggle to find the talent they need, workers struggle to identify skill requirements for job opportunities, and trainers and educators struggle to keep their courses up to date. Major structural change to re-align employer, job seeker and workforce program practices is needed for new labor market systems that work for the next economy.

Portland's workforce system has many of the legacy characteristics noted above. For instance, Portland Community College is a significantly sized institution and one that somewhat recently received significant financial investment ($374M from a 2008 bond issue).[320] While it produces an array of one and two-year degrees, few of them align with the growing traded clusters. A handful of manufacturing courses that would tie to the production-related clusters are all that are currently available.

> "There are not enough students in micro-chip-relevant programs to fill the industry demand pipeline."
>
> *– Electronics firm manager*

There are also no substantial privately led training programs with a focus on cluster-specific skills (particularly for Clean Economy skills and occupations, as listed above). Offerings tend to be focused on training in healthcare or locally serving, legacy positions. Many interviewees cited workforce as a challenge – and seemed willing to do on-the-job training if employees arrived with a base set of skills (e.g., one manufacturer cited that as long as hires had an aptitude for "fixing things," they would be able to learn additional skills on the job to succeed at the company). Many interviewees, across several industries, were interested in increasing partnerships with colleges and universities to build better pipelines of qualified candidates.

> "Although colleges are not used to partnering with industry, there is opportunity to initiate these partnerships and to engage public schools to develop programming for non-college-bound students."
>
> *– Nonprofit leader*

The region is not home to a Carnegie Research 1 university (despite having research centers like OHSU and PSU), a rarity for a metro of its size. Oregon State (OSU) and the University of Oregon (UO) are roughly one-to-two hours away; while some extension programs and centers link those universities to Portland (e.g., OSU's Food Innovation Center), the connections are not as deep as they could be. However, there are efforts afoot among Portland's higher education institutions to improve their integration, a movement that OSU and OU could tap into. Traditionally, deep connections between the various Portland post-secondary institutions, as well as deep connections to employers, have been lacking and degrees often have been designed in isolation. This is starting to change as Portland State University – the largest state school in Portland – has started improving its connections to Portland Community Colleges and creating more stackable credentials. Doing so would improve the talent development pipelines through the entire higher education continuum. For example an Associate's degree that supplies technician skills would be easier to leverage into a transition to an engineering bachelor's degree. Connecting UO and OSU into this organizing process would expand the potential of this pipeline and produce more homegrown talent.

[320]https://www.oregonlive.com/hillsboro/2010/03/portland_community_colleges_willow_creek_center_earns_platinum_leed_certification.html.

The region does not have any sector-specific employer-led consortia to improve the alignment of employer and trainer/educator practices. One challenge in forming these bodies has been that employer engagement in workforce development has been difficult. The larger companies often feel they are self-sufficient, or they may have ingrained procedural preferences (e.g., how H1B visas are managed) that make them reluctant to engage with the ecosystem more broadly. There have been some successes in connecting with more locally serving clusters and sectors. Interviewees indicated that the community college system has found success in linking their programming and training closely with opportunities in health care, with less robust connections to other sectors. Worksystems – the 501(c)3 that serves three counties in improving the quality of the workforce – has established a good partnership with the construction industry, where businesses have helped inform the curricula requirements for pre-apprenticeship programs. This initial effort could provide an informative model for similar efforts in other clusters.

Deeper collaboration with the private sector might also address the challenge of worker shortages. Semiconductor manufacturers are struggling to find entry level techs, and are reporting that it can still be challenging to engage with community colleges that are not used to industry partnerships and aligning with industry conditions (e.g., some semi-conductor shifts are 12 hours, which don't match with traditional academic schedules). Utilities and production-related companies and sectors do not have a large enough pipeline of applicants to fill open positions. Jobs in these areas are likely to have strong starting wages and solid career ladders.

Generally, interviewees noted a substantial amount of disorganization among the stakeholders in the labor market system, especially on the provider side. While many organizations are eager to be engaged in discussions around new programs and initiatives, it has been challenging to institutionalize or scale these discussions and move them to actual implementation.

Assessment: Portland's Opportunities

Portland's human capital is overall one of its strongest assets. Though racial and ethnic disparities exist, the high levels of educational attainment speak to the region's ability to provide talent. While the production of that talent, versus the area's ability to attract it, could be strengthened, there is a strong base upon which to build. The question is how to take this major asset and create more inclusive growth with it.

While certain actors in Portland are working to update their portions of the workforce development system, it is a massive undertaking with significant inertia built in. A concerted, collaborative effort across the various actors in this system - workers, employers, educators, trainers, etc. - is needed to make aligned changes at scale in a way that truly changes how these markets function. Prior and current practice suggests that the most effective means for this kind of coordinated action is through an employer-led industry consortium. The State of Oregon is slated to pilot the formation of these types of consortia at a state level - Portland should be at the lead of those efforts, or spearheading their own. Having the private sector at the forefront is crucial - they can often be the hardest to engage, given their day-to-day demands, but when a critical mass is assembled and on board with a change in direction, action can accelerate quickly. Their input on the skill demand side of the equation is crucial to ensure that workers are being prepared in the ways that will most quickly place them in better-paying, more aligned job opportunities. These preparations need not be limited to traditional high school and post-secondary degrees, either. Apprenticeships are coming back into favor as ways to deepen worker training on relevant skills and provide more time to assess worker fit, all while providing income to an apprentice. Employers can provide essential insight into where and how to incorporate more apprenticeships as

training options, along with other models (e.g., stackable credentials). They can also work to address career pathways and upward mobility, particularly for BIPOC – as they are underrepresented in higher-skilled jobs, and over-represented in lower-skilled jobs.

There is also opportunity to develop *sector-specific* employer-led consortia focused on the priority clusters outlined in this report. Current sector-specific education and training programs tend to focus on locally serving clusters and sectors. Perhaps the biggest opportunity is within emerging green industries; expanding credentialing programs and other types of training[321] for green occupations (such as those mentioned above) may assist Greater Portland in capturing the enormous potential of the green economy. In addition, matching these career pathways with BIPOC talent will help Portland become the inclusive, climate-centered economy that it aims to be.

At the same time, employers need to address their own shortcomings in labor market dysfunction. The well-established methodology of assessing job applicants based on education credentials and finding them through personal networks has been shown to be inefficient in the long run. Credentials are imprecise proxies for skills, and networks are limited in their scope, precluding potentially well-qualified applicants from even getting a foot in the door. Skills-based hiring is finding traction in many places and showing tangible results that indicate it provides a better workers/job match. When implemented well, these practices drive down turnover, increase productivity, and generate more equitable hiring outcomes. Using sector-specific employer-led consortia to pilot and scale these practices in Portland's clusters will increase the inclusive growth impacts of the clusters' expansion.

Innovation & Entrepreneurship

KEY TAKEAWAYS

- The Portland region has a wide range of resources for entrepreneurs – and substantial innovation activity, particularly in software, clean tech, and athletic apparel (reflected by strong indicators such as high level of patent activity, VC investment, SBIR/STTR grants).
- However, despite the wide range of services available, the landscape is fragmented and, for many entrepreneurs, not easily accessible nor navigable, lacking centralized resources and clear connections and pathways between services.
- In addition, some parts of the landscape could be enhanced. Support for scale-ups is targeted to a narrow group of firms that will scale quickly (e.g., software) – patient, longer-term capital, as well as support for early-stage and specialized R&D, are lacking for innovations in sectors like clean tech or advanced manufacturing, or to support faster-growing firms in Food & Beverage Manufacturing.
- Funded start-ups are generally acquired by other firms, and firms that leave Portland often don't go far - they move to nearby cities in Oregon or Washington. Improving support for company growth within Portland may help reverse this trend. In particular, there is a need for more targeted, culturally-specific support for different groups of BIPOC entrepreneurs and small businesses.
- While university innovation models are improving, partnerships can be further improved to accelerate R&D support from large companies and commercialization.

[321] Many green economy jobs require skills that build from foundational skills in related occupations – for example, leading national programs provide building contractors modest additional training to enable them to do housing energy efficiency retrofits. (See, e.g., Elevate Energy, https://www.elevatenp.org/, or, PCEF grant awardees who are training BIPOC workers to do retrofits: https://www.portland.gov/bps/cleanenergy/2022-pcef-rfp-2-grant-recipients).

Overview

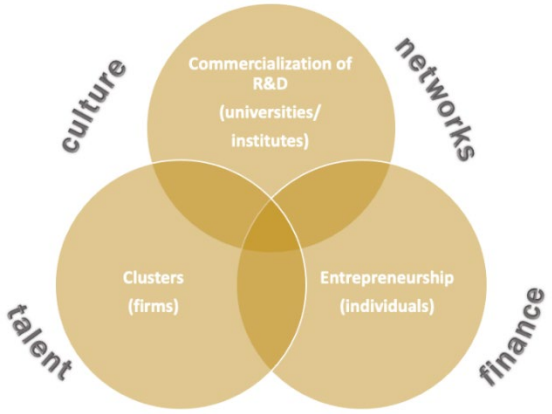
At a fundamental level, in the long run, all economic growth stems from innovation, which by definition generates new value from existing resources through the creation of novel products and the implementation of new processes. [322] The information intensity, technological advances and other characteristics of the knowledge economy enable more rapid and continuous innovation, while at the same time the pace of change and heightened global competition require it. To attain and maintain a competitive edge, firms need to prioritize pursuit of innovation, making idea generation, development and testing (i.e., applied R&D) integral to their business models. Educational and training providers need to produce graduates that are not only at the cutting edge in their respective disciplines, but also experienced in the process of innovation and entrepreneurship. The regional ecosystem must also evolve to provide the multidisciplinary networks that facilitate knowledge exchange and collaborative problem solving, along with the resources to support invention, commercialization and entrepreneurship through their various stages.

Innovation flows from three primary pathways, representing distinct sets of actors (see Figure 24):

1. Commercialization of basic and applied research emerging from universities and private institutes;
2. Entrepreneurs conceiving, prototyping, piloting and producing new products and processes; and
3. Activities within existing firms.

These pathways overlap and function best when closely connected (e.g., research can be commercialized through industry partnerships or entrepreneurs). Crucial supporting elements facilitate those connections and support innovation activities: an innovative, risk-tolerant culture; a rich talent pool; nimble, flexible networks to connect the system's actors and resources; and the right capital to support and scale the various stages and types of activity.

FIGURE 24: PATHWAYS AND FACTORS DRIVING INNOVATION



[322] Innovation is ultimately the source of all long-term economic growth (although in the shorter term, growth can also occur through increasing economic inputs or importing someone else's innovations). See Paul M. Romer, "Two Strategies for Economic Development: Using Ideas and Producing Ideas" (Proceedings of the World Bank Annual Conference on Development Economics, 1992). See, generally, Paul M. Romer, "Endogenous Technological Change" (Journal of Political Economy 98.5.2, 1990): S71-S101; Gene L. Grossman and Elhanan Helpman, Innovation and Growth in the Global Economy (Cambridge, MA: MIT Press, 1991); and Joseph A. Schumpeter, Capitalism, Socialism, and Democracy, 2d ed. (New York: Harper & Bros., 1947; rpt. New York: Harper & Row, 2010). For a review of empirical studies confirming the relationship between innovation and regional economic growth, see Jeremy Howells, "Innovation and Regional Economic Development: A Matter of Perspective?" (Research Policy 34.8, 2005): 1222-1223. For a much more detailed innovation review, see: George Washington Institute of Public Policy and RW Ventures, LLC, *Implementing Regionalism: Connecting Emerging Theory and Practice to Inform Economic Development.*

A region's innovation and entrepreneurship environment and performance are particularly shaped by the degree of grounding that relevant activities have in the region's economic and industrial base. These include strong connections between academic R&D and local industry, industry-focused technical assistance and funding resources, and connections between growing entrepreneurial businesses and the region's largest corporations.

Note the distinction between innovation and entrepreneurship. While entrepreneurship is a key driver and pathway to innovation, not all entrepreneurship is innovative;[323] and not all innovation occurs through entrepreneurship.[324] (The phrase "innovation ecosystem" generally refers more narrowly to the ecosystem supporting entrepreneurship, which heavily overlaps with but is not identical to this broader framing of drivers of innovation.)

Commercialization: Academic R&D and patents

Academic R&D

Higher education can play a crucial catalytic role in innovation. Universities can become centers of cutting-edge research, license commercially important innovations, provide local firms with consulting expertise, and generate a steady flow of talent. University R&D is just the first step in the path to production and growth; to create economic value, applied R&D must be commercialized – through existing firms (industry partnerships) or the creation of new firms (entrepreneurship). In this way, universities can become conveners and even shapers of the regional economy, as they have in Boston and the Bay Area, as well as in Seattle, Boulder/Denver, Austin, and Pittsburgh.

Major universities in the Portland MSA include Portland State University (PSU) and Oregon Health and Science University (OHSU), with a network of several smaller colleges and universities surrounding them; major institutions outside the Portland MSA include Oregon State University (OSU) and University of Oregon (UO).[325] The Portland area does not have a Carnegie Research 1 institution,[326] but looking at its leading research centers (see Table 26):

- **OHSU**'s R&D spending is in the top 60 nationally, at $447M, up by more than a third since 2016.[327] It is 45th in life sciences R&D.[328]
- **Portland State University (PSU)** is ranked 212th nationally in R&D expenditures,[329] attracting only $1.3M in business R&D funding in 2020, mostly for engineering projects.[330]

[323] Entrepreneurship also encompasses more standard small business formation, and growth in existing products and services. While this type of entrepreneurship may not generate transformative innovations, it is still relevant for regional growth, and particularly to inclusion since it provides a path to increased wealth.
[324] The huge and critical category of firm and cluster-based innovation, for example, often gets too little attention.
[325] There is potential – and interest - for both of these universities to partner with firms or organizations in the Portland MSA; although currently partnerships are limited.
[326] A university must award at least 20 research/scholarship doctoral degrees in the update year, spend at least $5 million in total research, and score high in a Research Activity Index calculation, which measures universities across ten indicators, driven by research expenditures, research doctorates awarded, and the number of research staff in Science and Engineering fields. The two Oregon Carnegie Research 1 institutions are the University of Oregon (Eugene) and Oregon State University (Corvallis).
[327] NSF Science and Engineering Indicators, Table 20
[328] NSF Table 41
[329] NSF Table 23
[330] NSF Table 28

TABLE 26: R&D EXPENDITURES AT PSU AND OHSU, 2020

	PSU		OHSU	
	Amount ($1000s)	National rank	Amount ($1000s)	National rank
Total R&D expenditures	43,667	212	446,890	64
Federally financed R&D expenditures	31,315	184	321,572	45
Business Financed R&D expenditures	1,321	208	38,692	39
Computer and information sciences	996	192		
Life sciences	15,844	222	433,917	45

Source: National Center for Science and Engineering Statistics, Higher Education Research and Development Survey (Tables 20, 23, 38, 40)

OHSU and PSU provide several commercialization support activities and research collaborations (detailed in Appendix). For instance:

- **OHSU** operates an extensive innovation support operation,[331] managed by OHSU Innovates, with five core functions: supporting startups (particularly to move life science technologies through the early stages of development), securing and managing major partnerships (e.g., GE Healthcare, AstroZeneca), training and educating potential entrepreneurs through "commercialization readiness courses," helping with funding, and technology transfer and licensing. Collaborations include OHSU's partnership with the Pacific Northwest National Lab (PNNL) on PMedic, a patient data integration project.[332]
- **PSU** - The PSU Center for Entrepreneurship[333] and Portland State Business Accelerator (PSBA)[334] support entrepreneurs, and while PSBA has secured $180M in investment for entrepreneurs since 2007, this is still a small percentage of the total $8.2 billion that companies in the city have raised. Collaborations include the PSU Center for Electron Microscopy and Nanofabrication (CEMN) - a collaboration between Oregon's research universities, the Pacific Northwest National Laboratories, and industry partners.[335] The PSU Digital City Testbed Center brings together academics with entrepreneurs.[336]

Some of these activities could be used as models elsewhere in the Portland innovation ecosystem.

> "Higher education is doing very little to create/promote founders; most students, particularly at public universities or colleges, pursue skills to become employed."
>
> *– Incubator leader*

[331] This section draws primarily on the 2021 OHSU Innovates Impact Report
[332] http://pmedic.labworks.org/. PMedic is a research collaboration seeks to integrate multidimensional patient data such as genetic, proteomic, and metabolic profiles, and integrate this information, with imaging and clinical results, to customize disease treatment and improve human health. It includes a number of significant collaborators. More than 60 joint (OHSU-PNNL) publications have resulted from collaborative projects to date.
[333] https://jobs.partnersindiversity.org/company/portland-state-university-center-for-entrepreneurship-2130
[334] See https://www.pdx.edu/accelerator/what-we-offer. 140 startups have been served since 2007 (of which 70% are still active, and including 14 PSU spinouts), which secured $180M in capital and generated $75M in revenues along with 2,000 jobs.
[335] It has collaborated with over 60 companies since its inception. https://www.pdx.edu/research/news/center-electron-microscopy-and-nanofabrication
[336] e.g., the Smart Trees Collaboratory, a group of researchers working to measure and monitor the health of urban trees in Portland and identify their impacts on human health and wellbeing and social equity: https://www.pdx.edu/digital-city/smart-trees-collaboratory

Patents

> "The next level of funding to help commercialize research does not exist." – *Business leader*

Commercialization often requires the protection of intellectual property (IP), so patenting activity is a useful proxy for measuring the connection between knowledge and commercialization. Portland metro area companies and universities overall patent at a high rate; Portland ranks 8th among the top patenting metro areas in the US, generating more than 1,000 patents per 100,000 population, levels similar to cities like Minneapolis and Seattle, surprisingly close to the Boston area, and considerably higher than some noted tech hubs like Atlanta and Washington DC (see Table 27). Relative to its peer cities, Portland ranks 6th.

TABLE 27: UTILITY PATENTS GRANTED BY MSA, 2000-2015

Rank	Metropolitan Area	Utility Patents (2000-2015)	Patents/ 100k pop
1	San Francisco-Oakland-Fremont, CA	89,981	4,498.0
2	Boise City-Nampa, ID	19,188	2,509.2
3	Austin-Round Rock-San Marcos, TX	33,753	1,478.2
4	Raleigh-Cary, NC	15,950	1,463.1
5	Boston-Cambridge-Quincy, MA-NH	62,653	1,267.9
6	Minneapolis-St. Paul-Bloomington, MN-WI	41,696	1,129.9
7	Seattle-Tacoma-Bellevue, WA	44,406	1,105.0
8	**Portland-Vancouver-Hillsboro, OR-WA**	**25,717**	**1,023.4**
9	San Diego-Carlsbad-San Marcos, CA	45,465	957.4
10	Detroit-Warren-Livonia, MI	37,342	850.2
11	Rochester, NY	20,239	613.6
12	Los Angeles-Long Beach-Santa Ana, CA	74,381	563.4
13	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	32,416	519.1
14	Chicago-Joliet-Naperville, IL-IN-WI	46,991	488.5
15	New York-Northern New Jersey-Long Island, NY-NJ-PA	92,577	459.7
16	Dallas-Fort Worth-Arlington, TX	34,898	456.9
17	Houston-Sugar Land-Baytown, TX	32,197	452.1
18	Phoenix-Mesa-Glendale, AZ	20,933	432.0
19	Washington-Arlington-Alexandria, DC-VA-MD-WV	24,760	387.8
20	Denver-Aurora-Broomfield, CO	11,436	385.9
21	Atlanta-Sandy Springs-Marietta, GA	22,970	377.2
n/a	Charlotte-Gastonia-Rock Hill, NC-SC	4,527	170.2

Source: USPTO, US Census. Portland's peer cities are highlighted.

Within Oregon, companies located within the City of Portland are dominant, accounting for 2/3 of all utility patents registered by Oregon companies between 2011 and 2021.[337] Beaverton and Hillsboro were the next most prolific cities, but each accounted for less than 20% of Portland MSA's total. Both Portland and Oregon have seen robust growth in the number of patents issued, up 148% and 170% respectively over the past ten years.[338]

Unsurprisingly, a relatively few companies dominate patenting. Table 28 shows the top patenting companies in Portland (2011-2021). They include some technology companies, both PSU and OHSU, and several athletic, apparel and outdoors companies:

TABLE 28: TOP PATENTING ORGANIZATIONS IN PORTLAND 2011-2021

Assigneee organization	Utility patents
Oregon Health & Science University	548
Electro Scientific Industries, Inc.	520
Lattice Semiconductor Corporation	296
Columbia Sportswear	215
ESCO Corporation	214
Tyfone, Inc.	178
Portland State University	174
Leatherman Tool Group, Inc.	167
Blount, Inc.	157
Sorel Corporation	126
Total (all Portland patents)	7,166

Source: USPTO

Based on patenting evidence, Portland generates IP at a rate similar to or better than most comparable metro areas; patents are spread across a range of sectors; and the patenting rate continues to grow (although there are some signs of declining growth most recently – see Appendix).

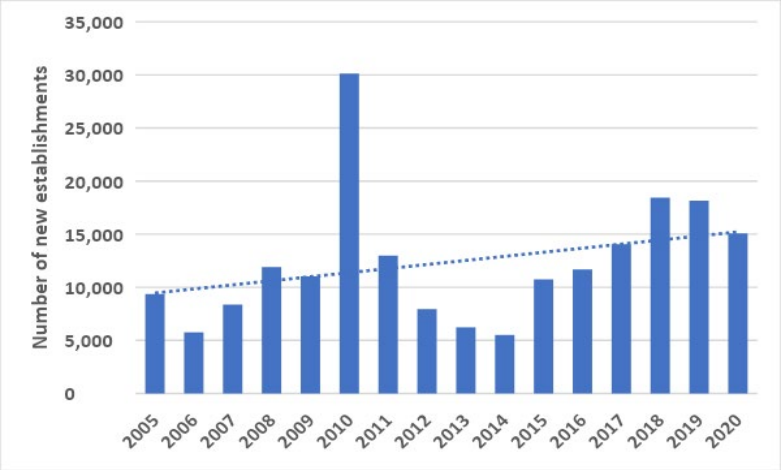
Entrepreneurship

Startups[339]

Patterns of startup formation are broadly influenced by the state of the overall economy. Figure 25 shows startups in Portland since 2005; with the exception of the anomalous year 2010,[340] the pattern fits fairly closely with overall macroeconomic conditions.

[337] USPTO. Calculated as a percentage of patents in towns with more than 100 patents, 2011-2022. See table xx in Data appendix.
[338] USPTO. See Data appendix for chart.
[339] The NETS data slightly overstates the amount of startup activity because it measures establishments, not companies. However, the overwhelming majority of new establishments are in fact new companies.
[340] This could be the result of a policy change; for instance, when home health aid workers were required in Oregon to register as self-employed contractors. NETS data counts new establishments, defined as "a single physical location at which business is conducted or services or industrial operations are performed." per US Census. Self-employed are counted to the extent that they register as a business.

FIGURE 25: STARTUPS IN PORTLAND 2005-2020



Source: NETS

While the number of startups in priority clusters is less than ideal (see Cluster-Based Innovation section), these startups *survive* at approximately similar rates to Portland startups as a whole (with Food & Beverage[341] and Metals & Machinery surviving slightly less well, and Software startups surviving somewhat better than average - see Appendix for more detail).

Gazelle companies

Gazelles, defined as companies that grow at least 20% annually for at least three consecutive years, provide some indication of the balance of entrepreneurship in high-growth sectors (as distinct from a wide range of small businesses, particularly local retail as distinct from traded sectors, that are not designed to grow big) – and they are rare. Gazelle companies as a whole account for a very small share of employment and sales, with the largest gazelle establishment ranked #729 in Portland employment in 2021.

There were 73 gazelle companies in Portland as of 2021, with 85 establishments.[342] These were largely outside of the priority clusters (see Table 29), and 17 were subsidiaries, sometimes of much larger companies (e.g., Amazon, Berkshire Hathaway). The five gazelle companies with the most employment were (in order) in tutoring, food manufacturing, fast food, home health care, and apparel.

TABLE 29: GAZELLE COMPANIES IN PORTLAND BY SECTOR, 2021

Sector	# Establishments
Apparel & Outdoor	1
Clean Tech / Clean Economy	21
Food & Beverage Manufacturing	3
Metals & Machinery	4
Non-Specified	54
Software	2
Total	85

Source: NETS

[341] Food and beverage was the worst performing sector, some 6.5% points below the Portland average.
[342] Thirty-eight of these establishments had at least 100 employees in Portland, but none had more than 700. Note: while there are no readily available national datasets to pull comparable data, anecdotally – this is a fairly large number for a city of Portland's size. Further data analysis is needed, particularly because NETS data, which was used to calculate this, undercounts small companies. Additional exploration could also include assessing the 73 companies more deeply to determine how long growth phases lasted, which sub-sectors they are in, whether they tend to leave or stay, whether there is opportunity to connect them to further resources (e.g., IP, SBIR, VC).

Movement into and out of Portland

Multiple interviewees noted that companies leave Portland to scale up. However, the data supports that assertion only in part (see detail below). There is also some evidence that the *objective* of the startup has changed: founders seek to reach a point where the company can be successfully sold – which often leads to relocation.[343] This is not necessarily a failure for or by Portland; it is the current nature of the economy especially in some sectors (e.g., software and internet), but it does make growing successful and long-lasting companies more challenging.

Portland is in fact a substantial net gainer of companies from beyond Oregon and Washington, especially from other important tech hubs like San Francisco (see Table 30). On average, about 100 companies - of all ages and sizes - move in each direction annually.

TABLE 30: MOVEMENT TO AND FROM PORTLAND -- OUTSIDE OREGON AND WASHINGTON STATES, 2005-2021.

City	From Portland	To Portland	Net
SEATTLE, WA	110	152	42
SAN FRANCISCO, CA	31	104	73
LOS ANGELES, CA	28	52	24
SAN DIEGO, CA	23	44	21
BOISE, ID	13	29	16
BROOKLYN, NY	12	29	17
CHICAGO, IL	20	27	7
DENVER, CO	19	27	8
SALT LAKE CITY, UT	16	25	9
PHOENIX, AZ	14	23	9
HOUSTON, TX	21	18	-3
TUCSON, AZ	19	14	-5
SACRAMENTO, CA	12	14	2
LAS VEGAS, NV	39	13	-26
SCOTTSDALE, AZ	21	12	-9
ALBUQUERQUE, NM	12	12	0
RENO, NV	11	12	1
AUSTIN, TX	16	10	-6
SANTA ROSA, CA	13	5	-8
HENDERSON, NV	10	5	-5
SPRINGFIELD, MO	10	2	-8
Total (all cities)	**1,548**	**1,932**	**468**

Source: NETS. Note: This table lists all cities that gained at least 10 Portland companies during the time period.

On net, firms leave Portland for Washington, moving most often across the river to Vancouver WA, which had a net gain of 582 establishments between 2005 and 2021 (see Appendix). Portland also sees net loss of firms to other cities in Oregon, notably those that are fairly close to Portland: 18 cities attracted at least 100 firms from Portland, and Beaverton, Lake Oswego, Gresham, and Tigard all attracted more than 500 (see Table 31). Portland lost 1,400 firms to nearby cities between 2005 and 2021.[344]

[343] With important parts of the innovative economy now dominated by a handful of firms, it becomes more realistic to sell out to a big company than to compete with it.

[344] Future analyses might explore further the differences between entering and exiting firms: entering firms for example generated 9% lower median revenues, as of 2021.

TABLE 31: MOVEMENT TO AND FROM PORTLAND - OREGON CITIES, 2005-2021.

City	From Portland	To Portland	Net
BEAVERTON, OR	1,389	1,237	-152
LAKE OSWEGO, OR	934	636	-298
GRESHAM, OR	532	459	-73
TIGARD, OR	506	742	236
HAPPY VALLEY, OR	490	71	-419
CLACKAMAS, OR	481	272	-209
MILWAUKIE, OR	431	801	370
HILLSBORO, OR	350	302	-48
OREGON CITY, OR	312	213	-99
TUALATIN, OR	273	203	-70
WILSONVILLE, OR	216	113	-103
WEST LINN, OR	212	133	-79
TROUTDALE, OR	167	90	-77
SALEM, OR	148	169	21
BEND, OR	128	80	-48
SHERWOOD, OR	109	91	-18
GLADSTONE, OR	107	61	-46
BORING, OR	102	49	-53
Total (all)	8,509	7,109	-1,400

Source: NETS

Interviewees noted a few challenges that may impact their desire to stay in Portland, such as gaps in the talent pipeline. A lack of founders and of C-level talent means that accelerators and incubators are often not run by founders. In addition, workforce development for innovative companies is a significant challenge, particularly as they seek to scale; the pool of talent is too small in part because insufficient companies in the past have scaled. Industrial property is becoming harder to find, a key necessity of firms especially within manufacturing. Further, industry-specific space is expensive and shared facilities are not easy to access (e.g., lab space). Innovation support services (see next section) may further impact company location trends, as well as tax rates and the governance culture issues discussed below.

Overall, Portland is not losing out to major tech hubs or peer cities outside the region, but is instead facing competition from Washington state cities, notably Vancouver, and from other cities in Oregon. There could be many reasons for this; for instance, the cost of taxes or doing business may be too great within Portland (see "Governance" section), support for continued growth may be lacking, affordability challenges may present issues for founders who face a long commercialization timeline, remote work may enable access to startup resources from anywhere – or, this may even be natural movement for early-stage, risky companies.

Funding

VC investment

Taking an idea through the stages from invention to a growing business requires considerable work, and particularly tailored financial resources.[345] Potentially high-growth companies with novel products and services particularly need investment to move forward: typically, they are unprofitable or barely profitable

[345] Entrepreneurs and novice investors often need reminding that an invention is not yet a product, a product is not a market, and a market is not a business – different activities, expertise and particularly financial resources are needed at each stage of business development and growth.

during their early and growth phases, needing to invest in continual product development, marketing, and the corporate infrastructure to accelerate.

Therefore, the number and scale of investments are useful metrics for assessing the strength of the entrepreneurship ecosystem. Funding can come from many sources – typically, initial funding comes largely from friends and family, then from angel investors, and only after the technology and market shows significant promise do strategic investors and/or venture funders come in. Many of these investment rounds are invisible to outsiders – private companies are under no obligation to disclose them. Data is always sparse and often missing, and databases often understate the full extent of third-party investment.

That said, CB Insights lists 652 Portland companies that received third-party funding since 2011 (see Appendix), totaling $8.2 billion.[346] The biggest were for Vacasa and Orca Security ($634.5M and $632M respectively), although the database includes 300 companies for which the amount of investment is unknown. The companies with the largest investments (before acquisition or IPO) are listed in Table 32:

TABLE 32: COMPANIES WITH THE MOST OUTSIDE INVESTMENT IN PORTLAND (PRE IPO/ACQUISITION)

Company	Amount ($m)
Vacasa	634.50
Orca Security	632.00
Exascale Power Company	500.00
NuScale Power	468.65
Wallstreet Commerce & Trade Institute	262.00
Element Power	240.08
Moda Health Plans	238.00
Jama Software	233.00
Puppet	189.50
PWCC Marketplace	175.00

Source: CB Insights data platform. Investments since Jan 1, 2011.

A significant number of companies in Portland attracted outside investment – more than the selected cities in Table 33 (except Denver and Seattle). Note that the cities in Table 34 are not the same 9 peer cities chosen for Portland but instead reflect a range of cities, some that have strong research universities (e.g., Seattle, Minneapolis, Pittsburgh, Baltimore, Denver) and others, like Portland, that have fewer research universities (e.g., Tampa, Nashville, Boise, Salt Lake City). In Portland, the amount of funding per company is relatively low, which may reflect either the sectors in which the capital is engaged (more capital-intensive sectors require higher levels of investment), or the stage of the investment (earlier stages typically require much lower levels of funding). It may also be that Portland companies tend to be acquired at a relatively early stage of development.

[346] CB Insights data platform.

TABLE 33: EARLY-STAGE FUNDING IN 10 SELECTED CITIES

City	Funded companies	Total Funding ($B)	$/company ($m)
Denver	945	35.31	37.4
Seattle	1,498	27.63	18.4
Minneapolis	514	8.50	16.5
Portland	**652**	**8.24**	**12.6**
Nashville	417	7.65	18.3
Salt Lake City	332	7.14	21.5
Pittsburgh	583	7.06	12.1
Tampa	283	6.03	21.3
Baltimore	460	4.55	9.9
Boise	101	1.27	12.6

Source: CB Insights data platform

When looking at VC deals in Portland and its peer cities, Portland ranks 7th of 10 in its number of deals and amount of capital raised (see

Table 34). This indicates that, while Portland does better in attracting investment than other cities with fewer research university assets, when compared to its peers, it does slightly worse.

TABLE 34: VC FUNDING IN PEER CITIES

	Deals (2022)	Capital Raised (2022) ($M)	$M/Deal (2022)
Atlanta	263	7,004	27
Austin	601	12,001	20
Boston	718	18,240	25
Charlotte	59	1,420	24
Denver	298	7,530	25
Minneapolis	94	1,350	14
Oakland	169	2,800	17
Portland	**128**	**2,270**	18
Raleigh	100	1,640	16
San Diego	295	4,880	17

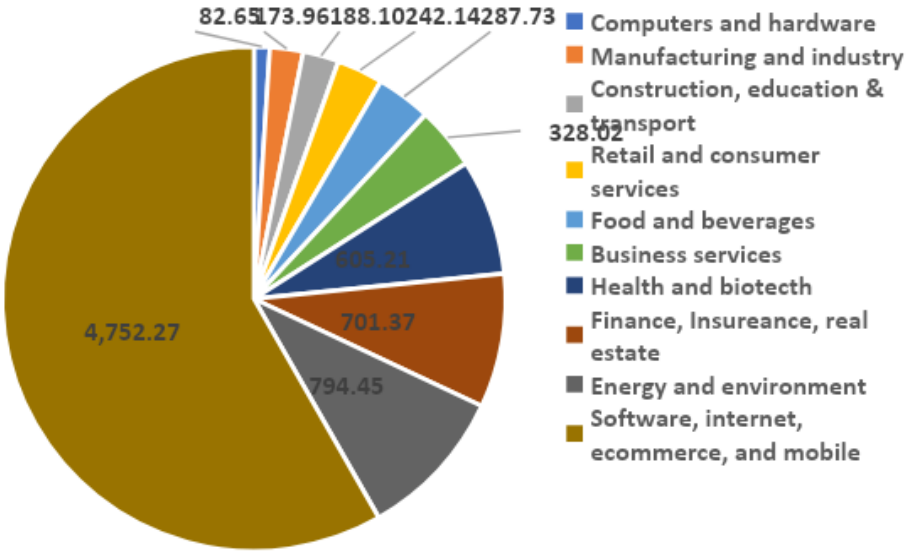
Source: PitchBook. Search Criteria: Companies & Deals Search; Privately Held (backing); VC backed

In some cities, third-party investment is concentrated in specific sectors – Silicon Valley for example, or healthcare and biotech around NIH in Bethesda, MD. In Portland, while Software and Internet related companies do account for a majority of the deals reported and of total funding (accounting for 50% of deals and 58% of funding), other sectors are well represented: eight other sectors received at least

$100M in investment over the period since the beginning of 2011, and two generated more than $500M (see

Figure 26). The preponderance of software and internet investments likely reflects the narrow focus of VC investors rather than the volume of high-quality opportunities in that sector.

FIGURE 26: THIRD PARTY INVESTMENT IN PORTLAND BY SECTOR, 2011-2022



Source: CB Insights data platform

> "Entrepreneurial energy in the city isn't toward scalability."
>
> *– Leadership Roundtable*

The stage at which investments are made tends to affect the amounts invested. A healthy entrepreneurship ecosystem finds sufficient investments being made across the entire timeline. Comparing Portland to one of its peers, Minneapolis, there are more investments and very early-stage dollars in Portland (see Table 35), which also generates a lot more investment from the wide range of "other deals" captured by CB Insights. Interviewees commented on the strong support system for small consumables companies but noted significant gaps in funding past very early-stage. Tentatively, the data indicate that mid- and later-stage funding (beyond the D round) may be easier to find in Minneapolis, where that funding accounts for 56% of the total, compared to 45% in Portland.

TABLE 35: INVESTMENTS BY STAGE IN PORTLAND AND MINNEAPOLIS

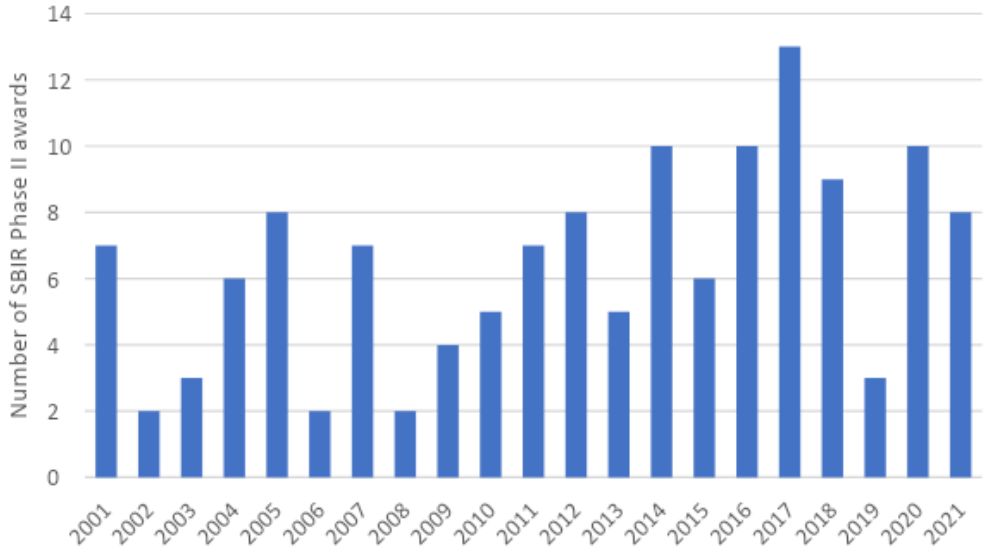
Portland						Minneapolis			
Selected stage	# deals	$M	$ of deals	% of $		# deals	$M	$ of deals	% of $
Seed/angel	434	476	24.7	5.2		166	189	16.0	2.7
Series A	197	1,300	11.2	14.2		106	798	10.2	11.4
B/C/D	191	3,250	10.9	35.5		86	2,080	8.3	29.8
E+	8	254	0.5	2.8		16	1,130	1.5	16.2
Pvt/growth equity	46	404	2.6	4.4		56	1,250	5.4	17.9
Debt	333	1,400	19.0	15.3		199	1,510	19.2	21.6
Other VC	57	241	3.2	2.6		14	23	1.3	0.3
Other deals	490	1,830	27.9	20.0		395	3	38.1	0.0

Source: CB Insights data platform

SBIR and STTR

The SBIR (Small Business Innovation Research) and STTR (Small Business Technology Transfer) programs represent the biggest Federal government investment in small innovative businesses, providing about $2 billion annually in non-dilutive funding through programs at 13 Federal agencies, notably DOD and NIH. SBIR and STTR constitute a key source of relatively early stage funding, a badge of value for companies that are selected, and so provide a metric against which to benchmark the entrepreneurship ecosystems of regions and cities.

FIGURE 27: SBIR PHASE II AWARDS TO PORTLAND COMPANIES 2001-2021



Source: SBA

Between 2001 and 2021, Oregon received 530 Phase II SBIR/STTR awards,[347] of which Portland received 135 – about one fifth of the total (see Figure 27 Table 36). Portland companies are achieving adequate access to SBIR/STTR funding when compared to other cities;[348] Minneapolis-St.Paul received

[347] Phase I awards are ~$100-150,000. Around 11.3rd of Phase I awards are selected for Phase II awards of ~$1m, and companies can sometimes receive more than one for a technology. So Phase II is a marker of significant commercial promise.
[348] Portland's overall success with SBIR/STTR may also be understated because there are no SBIR "mills" in Portland – companies that use SBIR as a regular source of revenue, acting in effect as tech-oriented consulting companies for Federal agencies. These

116 awards, Denver 66, Pittsburgh 246, Seattle 144, and Madison 122. The outlier – Pittsburgh – may largely reflect the presence of two tier 1 research universities, both of which have aggressive commercialization operations, along with major medical research hospitals. The trend in Portland is also modestly positive: annual award numbers broadly grew from 2008 to 2017, and have remained at relatively high levels except for the COVID year of 2019.

Portland's awards tilted sharply toward funding from NIH, which accounted for more than half of the awards, while DOD was significantly under-represented at 21.5% (given that DOD provides about 50% of total SBIR/STTR funding). This inverted balance reflects the impact of OHSU and its spinoffs (more suited to NIH funding). DOE accounted for 6% (8 awards), a surprisingly small number given the large number of cleantech startups in Portland – although, this is likely to increase in the future.[349]

TABLE 36: COMPANIES WITH 3 OR MORE SBIR/STTR AWARDS 2001-2021

Company	#Phase II awards
Galois, Inc.	15
Aronora Inc	12
Apdm, Inc.	6
Chemica Technologies, Inc	4
Innovation Laboratory, Inc.	4
IPM Development Company Inc.	4
Continuous Solutions LLC	4
Targeted Gene Delivery, Inc.	3
Portland Bioscience	3
Greenwood Resources, Inc.	3
Hemex Health, Inc.	3
Vesticon	3
Elex Biotech, Inc	3
Voxtel, Inc.	3

Source: SBA

Given the increased use of SBIR as a positive signal for third-party investment, it is encouraging that Portland compares well with other cities, and that the trend is broadly positive. There is of course room to improve support for SBIR/STTR applications.

Entrepreneurship Ecosystem

Portland is home to numerous startup support organizations. Most offer physical space, networking opportunities, access to mentors or other information resources, help with business basics, and in some cases organized access to angel investors. As Table 37 indicates, most startup supports have been focused on very early-stage companies.[350]

companies may receive more than 100 Phase II awards over time, so their absence skews the local award rate downward quite sharply. But that absence also means that SBIR awards are scattered widely – 79 different Portland companies received SBIR awards between 2001 and 2021. The top awardee, Galois, received almost all of its awards from DOD. Aronoma received theirs exclusively from DHSS/NIH.

[349] This may be because DOE SBIR awards for renewables clean tech have been tightly limited in the past, and many Portland cleantech startups are not focused on the kind of new technologies that might attract SBIR support. The recently expanded emphasis on renewable energy at DOE should encourage more applications from Portland cleantech companies.

[350] Unfortunately, few organizations publish systematic data about their activities, or even list significant success stories. It is therefore hard to determine their effectiveness.

TABLE 37: SELECTED STARTUP SUPPORT ORGANIZATIONS IN THE PORTLAND REGION.

Name	Type	Sector focus	Stage focus
Built Oregon	Accelerator	Consumer products	Early-stage
Cascadia Cleantech	Accelerator	Cleantech	Early-stage $25k investment
EO Portland	Accelerator	Sector agnostic	Early-stage startups to ~$1M
IBRN	Technical Assistance	Sector agnostic	Small businesses
Oregon Bioscience Incubator	Incubator	Biotech	
OSU Advantage Accelerator	Accelerator	Sector agnostic	Stage agnostic
PIE	Accelerator	Mobile, SaaS	Pre-funding and Pre-revenue
Pitch Black	Pitch competition	Sector agnostic	Early-stage Black-led
Portland State Business Accelerator (PSBA)	Accelerator	Tech, Green, Bioscience	
Small Business Hub	Technical Assistance	Sector agnostic	Small businesses
Starve Ups	Accelerator	Sector agnostic	End-to-end lifecycle
TIE Oregon XL Bootcamp	Incubator	Sector agnostic	New entrepreneurs
VertueLab	Various supports	Cleantech	Early-stage
NW Xcelerator	Accelerator	Cleantech	Early-stage black-led
Xcelerate	Accelerator	Sector agnostic	Early-stage women-led

The state of Oregon is also active in this area, having published a ten-year innovation plan in 2021 focused on support for new ideas and their commercialization, developing a deep pool of risk capital, and strengthening entrepreneurial support services (including development of regional innovation Hubs and Centers for Innovation Excellence). [351] A number of related programs are operated under the umbrella of Business Oregon, the state's economic development agency (see Appendix for full list of programs). These include emerging industry supports like VertueLab (a full-service support center for cleantech startups located in Portland), High Impact Opportunity Projects (HIOP) that expedite commercialization in sectors like advanced manufacturing,[352] a Commercialization Gap Fund to help companies in key sectors, and Regional Innovation Hubs (one of which is assembling an inventory of supports for innovation-based entrepreneurs to then identify regional gaps).

The profusion of programs is both encouraging and a concern. It shows the needs of early-stage entrepreneurs and companies are well known, and any entrepreneur in Portland should be able to find

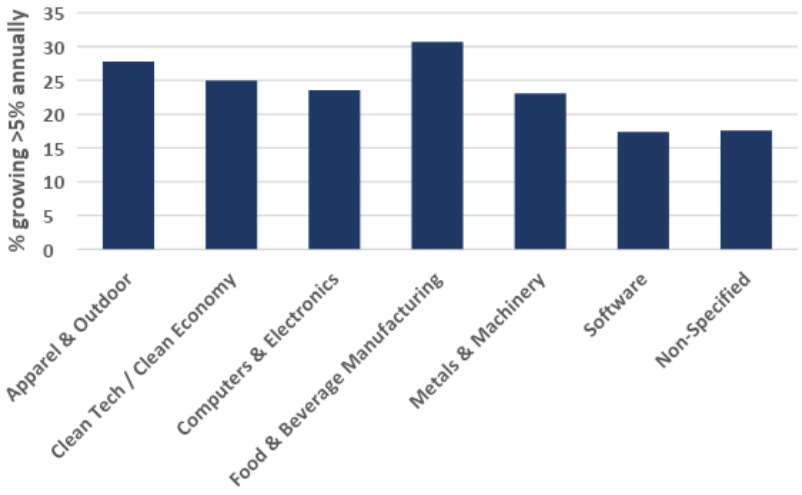
[351] http://www.w.oregon4biz.com/assets/reports/InnoPlan2021.pdf
[352] This has been developed partially in response to the state's ambitions to work beyond the startup stage. Note: HIOP targets four sectors - which in reality loose agglomerations of industries with very limited connections or opportunities to cross-fertilize. For example, the Natural Resources sector includes agricultural technology, wood products, and food and beverage. Each will require almost entirely separate supports at the scaleup stage. While many companies may benefit from HIOP activities, it is less clear that this program will provide scaleup support for specific sectors.

useful services.[353] Programs are beginning to address this (e.g., Inclusive Business Resource Network); however, there is still a need (as stated by interviewees) for a more streamlined, centralized way for entrepreneurs to identify and navigate the wide range of services available, and to make informed decisions about which organizations and programs might be most helpful. The incoming Regional Innovation Hubs may fulfill at least part of this function, as the planning phase is starting with a scan of the regional innovation landscape, including the services available and the organizations that are working in this space;[354] expansion of IBRN may be another solution (as explored in more detail in the strategy "Targeted Scale-Up Support").

Cluster and firm-based innovation

Portland is home to several significant clusters with the potential to drive regional growth – six priority clusters are analyzed in this report. As described in the cluster section, above, the firms in these clusters are undertaking – and have major opportunities to further undertake – substantial innovation. Overall, about 20-30% of firms in these clusters are high-growth (with revenue growing over 5% annually[355]). Looking at employment growth, Food and Beverage performs especially well (see Figure 28) – which could be an indirect indicator of the level of innovation that is occurring.

FIGURE 28: SHARE OF HIGH GROWTH COMPANIES BY SECTOR IN THE CITY OF PORTLAND, 2005-2021



Source: NETS

Since 2005, startups in priority clusters accounted for about 15% of all Portland startups – although this has been declining since 2012.[356] This could be due to the focus on locally serving retail businesses that are launched in Portland. Clean Economy accounts for two-thirds of all priority cluster startups (likely because of the expansiveness of the Clean Economy),[357] with Athletic & Outdoors a further 21% (in 2020). The shares of Software and Food & Beverage Manufacturing in overall startups have fallen quite sharply in recent years. See Appendix for more detail.

[353] Some of these programs are led and staffed by people who have been entrepreneurs (e.g., Built Oregon); but, definitely not all.
[354] https://www.pdx.edu/news/psu-and-metro-region-partners-receive-140k-grant-develop-regional-innovation-hub
[355] See Appendix
[356] In 2020 selected sectors were only 7.7% of the total, down from over 20% as late as 2014.
[357] Clean Economy encompasses more NAICS codes than the other selected sectors, so is likely over-represented in this sample.

Culture, Talent, Finance, Networks

Portland has for more than a decade been a home for startups and tech companies, and many view Portland as a city of tinkerers - people who enjoy the innovation part of the start-up process, or enjoy building new things. Innovation is becoming a part of the business culture, as reflected in the strong patenting and SBIR/STTR numbers. However, interviews reveal conflicting feelings. Overall, there is a public culture of anti-growth in Portland. "Founder" and "impact" resonate much more positively than "entrepreneur" or "ROI." Yet entrepreneurs complain that the city (and many residents) focus too heavily on main street businesses (mainly service and food/retail), rather than traded sectors.

More worryingly, some mid-sized companies said that engaging with the public sector on economic growth would simply invite a harsher critique of their organization - and increased regulatory hurdles - while yielding little benefit (see Governance section). Therefore, they are only marginally engaged in the City's economic development efforts, which is a barrier to growth given that established firms can often provide critical talent, technology and supply chain factors that help new enterprises succeed.

Further challenges face BIPOC entrepreneurs. Many reported feeling tokenized in the process of seeking support. Deep family roots in Oregon have historically opened doors and created support channels that entrepreneurs of color often lack.[358] Many BIPOC professionals have moved to the Portland area for opportunities with Intel, Nike, Microchip, Tecktronix, and other large companies – but, there have been few visible efforts to engage these companies in entrepreneurship, to cultivate the next generation of BIPOC talent, or to seek insights into making the Portland area more attractive for BIPOC businesses and professionals. Portland's native Black community has also suffered from gentrification, as development intensifies in traditionally Black communities (see Portland's Racial and Economic History section). Several interviewees stressed that quality-of-life amenities and public services (including entrepreneurship and workforce development) have become more difficult to access as a result.

Assessment: Portland's Opportunities

Portland has historically had a culture of entrepreneurship and has decent supports in place for startups and early-stage firms. Given Portland's relatively high levels of VC investment and SBIR Phase II awards, Portland companies are not significantly disadvantaged in the search for outside capital.[359] However, investments tend to focus more on earlier-stage investment,[360] and scaleup funds can be hard to find.[361] There may also be sector-specific weaknesses: some interviewees reported difficulties for entrepreneurial manufacturing firms, as capital flowed more readily to sectors with faster scale-up

> "There is opportunity for a fund of funds that de-risks investments – and, at the other end of the spectrum, opportunity for micro funding for those that are not yet ready to scale."
>
> *– Industry Association leader*

[358] Operationally, there are reports of disconnects between BIPOC-focused programs and networks – which are also seemingly divorced from other programs that are not specifically geared towards supporting underserved populations.
[359] Portland ranked 4th among ten comparable cities for VC investment, and its companies were awarded more SBIR Phase II awards than most of its peers as well.
[360] The digital sectors receive the lion's share of investment (though at levels only slightly elevated above national averages), but there is a wide spread of investment across sectors and across investment stages, and an average of about 60 companies annually have received outside investment since 2011. Data from Pitchbook on deals by sector are comparable, although the companies use different categories (neither of which exactly correspond to NAICS codes. See Pitchbook data at https://docs.google.com/spreadsheets/d/1h-gAoxSad-Iga3aJ1JESW-Ur7ncM_Tm0/edit#gid=1320044853
[361] interviewees in Portland point to a gap in funding between startup and scale-up. There are nuances and dimensions to these issues that local organizations need to explore further. For example, the role of regional banks is beyond the project scope, but they can play an important role in providing operating funds as companies become more established. In particular, how they address historical bias and evaluate risk directly affects BIPOC-owned businesses.

potential such as Software.[362] As elsewhere, the financing culture favors larger, longer-term businesses over entrepreneurs, and firms may be caught in a growth trap: growing too slowly for VC investment but too quickly for traditional loan funding.

Portland generated about 15,000 startups in 2020. The critical step to significant economic impact lies in scaleups – the capacity to grow from a small organization into a stable and accelerating company with growing revenue in the low millions and consequently a rapidly growing set of employees. Scaleups need much more industry-specific support (e.g., assistance with product certifications, accessing specialized capital and specialized R&D, identifying industrial space), and opportunities for that in Portland have largely been missed.[363] There is opportunity to build more robust sectoral support to scaleups, including specialized expertise, including particularly tailored to BIPOC.

Finally, on a net basis Portland, counting all companies (including startups and ongoing businesses), is gaining companies from the big tech hubs and other cities outside the region, but is losing companies to Vancouver WA and to the Oregon cities that surround it. While this could be due to growing trends towards acquisition (in industries like software), for other priority clusters in Portland, improving the support ecosystem for startups and scaleups – and the relationships between private and public sector to drive innovation – may reverse this trend over time.

There are several entrepreneurship support organizations in Greater Portland – some mentioned in

Table 37 above. Many have overlapping missions, there is little coordination, and they compete for funding (and clients). It is difficult to sort through the web of incubators, accelerators, initiatives, and organizations, so entrepreneurs may become serial consumers of numerous programs. While there are some industry-specific incubator and accelerator programs, there are limited innovation hubs or labs providing physical space to amplify these programs - empowering innovation for selected sector entrepreneurs looking to scale.

> There is a need for corporate-university partnerships to spur innovation."
>
> *– Business leader*

Finally, there are limited resources, both publicly and privately, for university R&D support – although this is slowly changing as OHSU and PSU extend innovation activities beyond their campuses (e.g., Regional Innovation Hub effort led by PSU). In the private sector, there have been many missed opportunities to engage the talent and innovation capacity at large and midsize corporations. Firms with existing R&D infrastructure are largely self-sufficient, having found resources within the company or from outside the region.

To create an innovation ecosystem that will guide Portland into the more knowledge-intensive next economy, increased scale-up support is needed (both technical and financial) alongside greater public-private partnerships and investments to spur collaborative innovation.

[362] This is not surprising: VC investment is focused on the narrow band of startups that can grow to scale very quickly and return multiples of investment. Sectors and companies outside that narrow focus will struggle, especially in sectors where physical plant is required which naturally imposes production limits and higher marginal costs.

[363] Partly in consequence, supplier clusters have not developed around the area's largest companies. Many of the biggest companies are now fully globalized: they source manufacturing internationally, and do design and product development wherever the best talent can be found. The absence of these organic links means that Portland will have to work much harder to connect to large and mid-size companies.

Governance: Effective Public and Civic Institutions

KEY TAKEAWAYS

Portland's metro area has historically delivered a strong tax value proposition – with strong economy, public goods, workforce, infrastructure and amenities – delivering high value to its residents and businesses compared to tax costs. However, as quality of life and public amenities have suffered (e.g. houselessness, crime) and business taxes rise, interventions are needed to restore this balance.

Govern**ance** needs attention: building formal and informal, inclusive, networks that enable flow of ideas and deals in the knowledge economy, particularly broader private sector engagement and leadership.

Overview

In the increasingly dynamic economy, regions succeed by enabling the ready entry of new people and firms and the fluid development of relationships, deals and activities that drive innovation and economic investment. Facilitating this type of environment requires a new form of governance – a constellation of public, private and civic institutions – that fosters open, adaptive and flexible cross-sector networks. **Gover*nance***[364] thus includes but goes well beyond the role of government, referring to the business, civic, and cross-sector institutions that constitute the formal and informal networks enabling economic growth.

Government needs to enable economic activity through value-added public goods; efficient and streamlined processes; transparency and information sharing; and broad-based stakeholder engagement. In addition, public-, private- and civic-sector actors alike need to heighten their capacity to deliberately and proactively engage in collaborative, cross-sector efforts; develop locally tailored economic growth strategies; and engage leaders and stakeholders across all sectors to own and execute them. Notably, the private sector plays an increasingly critical and productive role in governance, as business leaders are observing the alignment of their business interests with broader regional economic success.[365]

Governance is also a key element in advancing both climate action, as it influences local production and consumption habits, and economic inclusion, as it shapes the composition and growth dynamics of the local market, including who gains access to the information, networks and support needed to participate in the economy.

Examining governance falls into three broad categories:

- **Fragmentation** – the proliferation of units of government, both vertically and horizontally, and its effects on firm efficiency, productivity and the costs of doing business
- **Tax-value proposition** – the value that firms and households receive in the form of public goods and services, relative to the amount of tax dollars paid
- **Cross-sector institutional environment and culture** – the extent to which public, private and civic stakeholders coordinate and collaborate, the norms of local business culture (e.g., openness, flexibility, etc.), and the effectiveness of partners in their economic development work in regional and local spheres.

[364] As Bradway and Shah (2009) define it, governance is "the formulation and execution of collective action at the local level."
[365] See: http://rw-ventures.com/evolving-corporate-business-engagement-in-community-and-economic-development/

Market Observations

Fragmentation

Government includes the county, municipal, school district, and various special districts in a regional economy. Systems of decision-making in metropolitan areas are often complex and involve numerous levels of government. Vertical fragmentation refers to the number of tiers of government while horizontal fragmentation refers to the number of local governments in each tier. [366] High levels of fragmentation tend to create inefficiencies, leading to increasing costs – in terms of time, effort and money – for residents and businesses.

Government fragmentation is not a significant issue for Portland. The MSA is home to 65 units of general government (e.g., municipalities) and, on a per-capita basis, ranks 313th out of 383 governments examined (ranking metros with most governments per capita)[367] – indicating very low horizontal fragmentation. This is fairly average as compared to peer cities (see

Table 38). Portland also benefits from a regional government, Metro, which provides additional coordination and services on the regional level.

TABLE 38: NUMBER OF GOVERNMENTS OVERALL AND PER CAPITA, FOR PORTLAND AND PEER CITIES.

Metro Area	General Purpose Governments	Govs per 10K Population
Atlanta-Sandy Springs-Roswell, GA	177	0.3
Austin-Round Rock, TX	54	0.3
Boston-Cambridge-Newton, MA-NH	201	0.4
Charlotte-Concord-Gastonia, NC-SC	81	0.3
Denver-Aurora-Lakewood, CO	53	0.2
Minneapolis-St. Paul-Bloomington, MN-WI	412	1.1
Portland-Vancouver-Hillsboro, OR-WA	**65**	**0.3**
Raleigh, NC	30	0.2
San Diego-Carlsbad, CA	19	0.1
San Francisco-Oakland-Hayward, CA	69	0.1

Source: https://www.governing.com/news/headlines/gov-most-local-governments-census.html

It should be noted that the City's commission form of government (which will be restructured by 2024) has created some challenges for economic growth, enabling political interests in decision-making and driving performance focused on departmental success metrics versus organizational objectives. The new government structure – 4 districts with 3 City Council members each - will include a city administrator to

[366] Horizontal fragmentation refers to multiple governments of the same type covering distinct sub-areas of a geography – for example, to multiple municipalities within a metropolitan area. Vertical fragmentation occurs through overlapping governments of different types covering the same sub-area – e.g., a resident or business may be served (and taxed) by a municipality, a school district, a county, and various special districts.
[367] https://www.governing.com/news/headlines/gov-most-local-governments-census.html

oversee bureau leaders and staff. It is expected that these changes will improve coordination across departments, and reduce challenges currently experienced by private-sector firms in navigating business issues within the City (see more detail in "cross-sector institutional environment and culture" below).

Tax-Value Proposition

The knowledge economy favors places that compete based not primarily on low costs, but rather on tailored value-added. Therefore, regions and cities must strategically determine what levels of taxes (e.g., property, user fees, etc.) are justified for provision of valued public goods and services (e.g., infrastructure, public safety, human capital development, research centers, recreational amenities, etc.) that will make their location most productive and attractive for their residents (labor force), firms, and industries. They also must then deliver the value.

Over the last three decades, Portland led the way into the knowledge economy, growing firms and attracting talent partially because of its reputation as a high value (strong job base, public goods, natural and other amenities) and low-cost location for workers and firms. Essentially, it offered a very strong value proposition, and taxes were not particularly low, but well worth the value provided.

More recently, however, Portland has evolved into a higher-tax, higher-regulation environment[368] for both businesses and residents. Today, Portland ranks 8th among 50 cities for residential tax burden - and is the highest of its peers (for those that have data available; see Table 39).[369]

TABLE 39: 2020 ESTIMATED BURDENS OF MAJOR TAXES FOR A HYPOTHETICAL FAMILY EARNING $75,000/YEAR

City	% Burden
Atlanta	10.3%
Austin	--
Boston	6.5%
Charlotte	8.9%
Denver	8.1%
Minneapolis	8.3%
Portland	11.7%
Raleigh	--
San Diego	--
Oakland	--

Source: https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/2020%20Tax%20Rates%20and%20Tax%20Burdens_Nationwide%20Comparison.pdf. If unavailable, % burden is not listed.

In addition, the tax structure for businesses is radically misaligned with other nearby counties. Business taxes unique to Portland include the Portland business gross receipts tax, the Portland property tax - parks, the Portland Public Schools property tax, the Portland business income tax, the Portland CEO tax,

[368] The tax burden for businesses has been dramatically increasing. County-wide, taxes increased just over 8% from 2020, and the cumulative business tax burden in Multnomah County is set to rise 23% because of new taxes passed by the 2019 Legislature.
[369] A Portland household earning $75,000 on average paid $8,798 in combined income, property, sales and auto taxes in 2020. This April 2022 study examined the overall tax burden on households of the largest city in each state in the USA as well as Washington, D.C. Note that the US Census estimates a median household income for Portland of $73,159 in 2020. https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/2020%20Tax%20Rates%20and%20Tax%20Burdens_Nationwide%20Comparison.pdf

and the Portland Clean Energy Fund Tax. Further, in Multnomah County, there are business taxes to be paid that are not found in neighboring counties[370] - with additional taxes causing concern at the state level (e.g., Corporate Activity Tax[371]). Negative perceptions around the local area and state's tax climate have arisen due to the passage of these multiple new tax measures.

Portland has typically had a high value proposition due to its strategic infrastructure investments, adequate government services, amenities and quality of life assets. In interviews, Portland businesses emphasize their success in the region as an outgrowth of unique regional assets such as the Port, select anchor companies, and a singular quality of life woven together by an outdoor culture and rich amenities. However, the value proposition has substantially diminished over the last several years as challenges such as houselessness, crime, and poverty threaten the perceived value of Portland for residents and businesses. Bureaucratic hurdles, unclear paths to investment, a lack of coordinated institutional networks, and an anti-growth mentality (discussed below) further intensify those sentiments.

Cross-sector institutional environment and culture

Portland benefits from a broad mix of economic development organizations, business service organizations, associations, and government actors supporting business attraction, entrepreneurship, and cluster development. Groups such as Business Oregon and Greater Portland Inc focus more on business attraction while Prosper Portland provides pointed on-the-ground support to foster real estate development, entrepreneurship, and inclusive growth. There are numerous other organizations such as the Port of Portland, the Portland Business Alliance, Worksystems, and Portland Community College, that work in concert towards related yet distinct economic growth objectives - and collaborate with one another as needed.

Despite the prevalence of economic development organizations, many have fairly narrow or conventional agendas, and the formal ongoing ties between them are limited. The region does not seem to have the kind of cross-sector, accepted organization leading development and implementation of comprehensive economic growth strategy which is increasingly prevalent in successful regions.[372] While there are organizations that have potential to fill this role (e.g., Greater Portland Inc), it is not clear that any have sought or been given a role of this scope, breadth and depth, and they would need considerably more resources. Avenues for staging towards such an organization or role are further discussed in the Strategies section.

Business and nonprofit leaders stress that strategies historically have not had sufficient long-term funding, political will, or commitment to reach full implementation. Organizations that may have elements of economic development responsibilities seem reluctant to push an agenda, perhaps due to longstanding regional tensions or cultural elements which reject a pro-growth strategy (see below). Interviewees expressed that the City seems to function in a siloed way failing to recognize synergies and shared opportunities in business development with suburban communities. This lack of an integrated approach to growth not only constrains the region's economic trajectory but also limits the City of Portland's growth, given that the geography of economic activity does not stop at the City's borders but is at least regional in scope.

Government has disproportionately "owned" and driven economic development activities in the City of Portland, rather than more private sector engagement, ownership and driving of inclusive economic

[370] This includes: the Multnomah County business income tax, Multnomah County individual income tax, Multnomah County property tax - libraries, Metro individual income tax - homeless services
[371] The fact that it was implemented at a time when the COVID-19 pandemic was causing widespread economic displacement drove home the reality that it is a tax on revenues, not profits, and businesses have to pay it even when they are losing money.
[372] See "Strategies" section, "Private-Sector Led Economic Development Initiatives" strategy, for examples of business-driven economic development entities, of varying scales.

development through cross-sector institutions that the City participates in and supports, but does not lead. Greater private sector involvement faces a number of challenges:

- **Anti-growth mentality.** There is a perception among some activists and small business advocates that big business means bad business.[373] "Anything that smells like a corporation is poo-pooed by Portlanders," commented an interviewee. This mentality makes the development process longer, makes for a more hostile corporate environment, and places too much emphasis, in terms of time and funding, on the small business community. Even small business advocates agreed that many Portlanders espouse anti-capitalist positions, and they believe that the messenger will be just as important as the message when it comes to overcoming this sentiment. These realities have manifested themselves in the excessive politicization of economic development efforts, lack of involvement of the business community in economic development, and in general an anti-growth culture. There is a marked reticence of private industry to engage with government or participate in governance institutions as private firms fear that any interaction might result in greater public scrutiny, increased regulation or bureaucracy, and greater costs.
- **Distrust.** A sense of distrust cuts across relationships between citizens and business, business and government, and city and regional organizations. BiPOC communities are perhaps some of the most distrustful, as Portland's historical track record for supporting inclusive growth efforts has been spotty at best.
- **Elevation of form over substance.** A number of those interviewed commented on there being much economic-related planning and lots of conversation about equity, but little action and limited outcomes – essentially, elevating form over substance. Interviewees lamented that various stakeholders "like to talk about it" but measurable actions, progress indicators, and functioning partnerships are not yet the norm.

> "Everyone wants to be engaged, but no one wants to lead."
>
> *- Nonprofit leader*

There is a need for greater collaboration between organizations on strategic initiatives (and perhaps for a new organization), more jointly facilitated transactions, and greater access to targeted tools and investments to foster the 21st-century economy that should correspond with Portland's healthy asset and talent base. Functions where greater collaboration likely makes sense include industry- and cluster-based business retention and expansion, entrepreneurship and innovation, workforce and place-making.

> "There's a feeling that Portland does a lot of planning, but not enough doing."
>
> *- Various business leaders*

Assessment: Portland's Opportunities

Improving governance, including government, is at the heart of Portland's current challenges and opportunities. Portland's economic performance generally exceeded that of other metropolitan areas for several decades as it benefited from and transitioned into the knowledge economy. However, Portland has been a victim of its own success. Its economic growth was accompanied by severe negative effects, revealed and aggravated by the COVID-19 pandemic along with social unrest following the murder of George Floyd. At the same time, its focus and success with a disproportionately amenities and talent driven economic model meant insufficient attention was paid to other next economy fundamentals – particularly new forms of governance – needed to address these negative effects and manage growth well going forward.

[373] As discussed above in Economic Framing, much of the opposition to economic growth is not in fact to increased prosperity, but to the negative effects of growth if not well managed (particularly of accompanying population growth). There is a troubling disconnect, as reported by several interviewees (including business owners), in understanding how "good" growth need not cause -- and in fact is necessary to help overcome -- the social issues so pervasive in the city.

These challenges are not unique to Portland. Indeed, once again ahead of the curve, Portland aspires to become the model next economy city that continues to prosper while managing growth well, particularly by supporting the "good" types of businesses and economic activities that align economic growth with equity and climate mitigation. In addition to, and in the context of, paying attention to the five market levers which drive economic growth, inclusion must be integral to all growth activities, and growth (both demand and supply side) that aligns with Portland's "green" assets must be prioritized.[374] Deliberately and continually managing to these goals, addressing current negative effects of growth and anticipating and preventing future ones, is no small task – and requires exceptional both government and governance.

> "There is room for better balance and partnership between the business community and the city."
>
> *– Business leader*

To promote and manage the desired growth, greater institutional capacity and closer strategic and tactical collaboration of governments and economic development organizations across the region will be needed. This should take many forms – from cross-sector institutions with broad "ownership" of strategic economic growth planning to cluster organizations, workforce collaboratives and so forth. While most of these components can already be found piecemeal in various organizations, departments, and entities, there is a need to revisit objectives, reset "tables," and create a more productive, aligned vision, dialogue and institutional infrastructure for action – engaging a wide range of stakeholders and overcoming the "politicization" and trust challenges described above. Government (both regional and City) cannot and should not play these roles alone; rather, it can be a convenor, and a key partner in aligning its activities with emerging growth planning.

Portland will need to take clear steps to build an actionable and trusting partnership with the private sector in particular, which reaffirms a growth mindset, shows balance in regulations, and offers shared investment and execution opportunities with an inclusive and climate-action-oriented lens. While rebuilding trust and changing culture is difficult, the charter reform (discussed above) may present an opportunity to reconvene the private sector around economic development efforts.

Portland has to think and act differently, to cultivate a democratic capitalism that builds the economy in an inclusive, climate-resilient way. Greater Portland and the City of Portland have reached a point where they can no longer simply rely upon past trends to predict future performance. There is a need to build the formal and informal, inclusive, networks -- particularly including broader private sector engagement and leadership -- that enable the flow of ideas and deals in the knowledge economy, and the deliberate management of targeted growth.

[374] In addition, because climate change increasingly threatens the natural environment which has served as foundational to Portland's value throughout its history.

Spatial Efficiency

KEY TAKEAWAYS

The Portland region's existing urban growth form could be better aligned with the type of dense, mixed-use, well-connected built environment that will support growth in the new economy. Portland's jobs-housing mismatch is worsening across the region; job centers are shifting away from downtown Portland and in general are less accessible to underserved neighborhoods (e.g., East Portland).

There is opportunity to ensure land use and transportation work in concert to close the jobs-housing mismatch and increase opportunity for disenfranchised communities. In the past, Portland has shown a willingness to try out-of-the-box zoning and policy solutions, which may be needed once again to encourage more flexible development that is responsive to changing demand and technological innovation. This means bringing industrial, employment, open space, and residential development closer together where compatible to increase economic efficiency.

In addition, there is opportunity to target cluster-based business growth and job creation near high-access locations, and to locate major economic investments near underserved areas.

Portland's role in the region is changing, which has created an opportunity to reimagine the Downtown area and its role in the broader region.

Overview

From an economist's point of view, the very reason for the existence of cities is to reduce the transportation (i.e. transaction) costs for moving around and connecting people, goods and ideas.[375] The concept of "spatial efficiency" refers to the relative location of businesses, suppliers, workers, and consumers within a region and the physical and virtual infrastructure that connects them. These two features – co-location and connecting infrastructure – determine transportation costs, magnifying or diminishing the many economic benefits of agglomeration (such as shared labor pools and knowledge spillovers).[376]

The shift toward a more dynamic, knowledge-intensive economy favors a new urban growth form, as the demand for rapid exchange of goods and ideas, face-to-face interactions, physical density of economic assets, and co-location of employment and residential activities lead to more demand for urban density and new types of "economic placemaking." As a result, mixed-use and inclusive communities with strong transportation connections are best positioned to flourish in the new economy.

Spatial efficiency also especially offers opportunities for aligning equity and climate goals with economic growth. A spatially efficient built environment has fewer environmental impacts from transportation[377] and denser development patterns (generally resulting in fewer emissions per unit). It also, by minimizing jobs-housing mismatch, provides more equitable access to and participation in economic activities.

[375] https://www.nber.org/system/files/working_papers/w28287/w28287.pdf
[376] Inefficiencies also generate higher government costs (to provide more extensive transportation infrastructure, for example), potentially leading to higher tax burdens and fewer resources for other development activities.
[377] Since less transportation is required – and transportation accounts for approximately 20% of global CO_2 emissions.

Achieving these outcomes entails:

- **Compact, well-connected urban form.** Aligning land use and economic regulation, incentives and activities to foster dense, mixed use patterns of development;
- **Connectivity.** Investing in transportation infrastructure to connect businesses, workers and consumers.

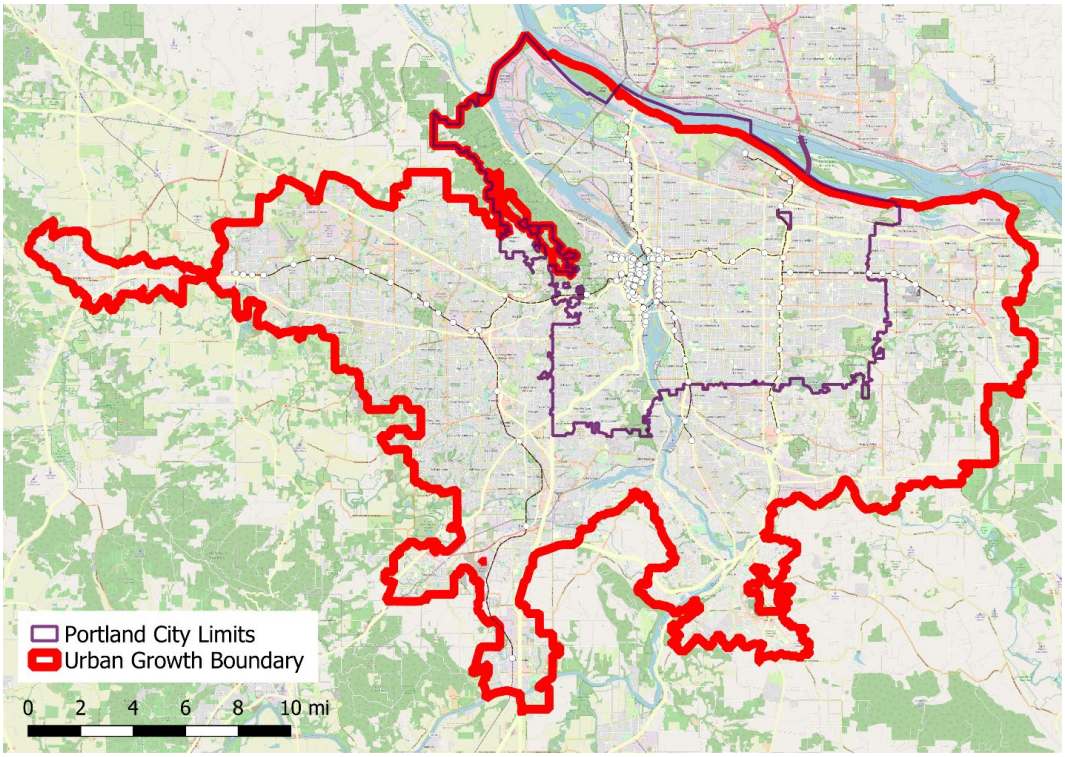
These two sets of factors – where economic assets and activity are located, and how they are connected – determine spatial efficiency, and particularly can help drive inclusive, climate-centered economic growth. Inclusion requires reducing economic segregation and isolation of geographic areas or populations (the "jobs-housing mismatch") by locating jobs near disconnected residential areas, and by providing better transportation connections between job and housing locations. The role of downtown, particularly given the current challenges and the impacts of remote work, also deserves special attention.

Market Observations

Compact, Well-Connected Urban Form

Portland's Urban Growth Boundary (UGB)[378] has kept the urban form relatively compact, limiting extended sprawl (see Figure 29).

FIGURE 29: THE URBAN GROWTH BOUNDARY



Source: RW Ventures with data from Oregon Geospatial Data Clearing House

[378] The UGB comes from a state law requiring each of Oregon's cities and metropolitan areas to create a boundary around its perimeter – a land use planning line – to contain expansion into farm and forest areas. The Metro Council controls annexation decisions. Portland's UGB is part of what makes the region so unique, with its natural environs being so close to city borders. While the Metro Council has annexed over 3,500 acres since 2012, it has not annexed any further land since 2,200 acres in 2018 (see, Metro Council website).

Within the UGB, Portland's built environment is similar to other mid-sized cities on the West Coast (San Francisco, Seattle, San Diego) which saw a pattern of sprawl throughout much of their development in the 20th century. This pattern was heightened in Portland during the 1990s and 2000s, when Portland saw population growth of approximately 20% in both decades. As less and less of the City's land was available or appropriate for development, population growth shifted to Portland's suburbs. Across the Columbia River, Vancouver, WA has seen its population more than quadruple since 1990, from 46,000 to 192,000 in 2021.

In addition, job centers are beginning to shift to counties outside of Multnomah. Employment growth is slowing in Portland. While Multnomah County has the most businesses and employment in the region (see Table 40), employment growth has *slowed the most* between 2010 and 2020 as compared to surrounding counties. Washington County (which contains Hillsboro [Intel] and Beaverton [Nike]) and Clark County (which contains Vancouver) are both experiencing more growth. Looking more closely at COVID-19 impacts, Multnomah County has similarly been impacted the most, with an 8% drop in employment over a 2-year period between 2019 Q3 and 2021 Q3 (see Table 41).

TABLE 40: SOURCE: QCEW

	2020 estab	2020 emp	2010-2019 emp growth	2010-2020 emp growth
Clackamas County, OR	15,550	143,083	28%	19%
Clark County, WA	16,893	131,067	33%	27%
Multnomah County, OR	**36,522**	**406,240**	**28%**	**16%**
Washington County, OR	20,478	264,585	32%	25%

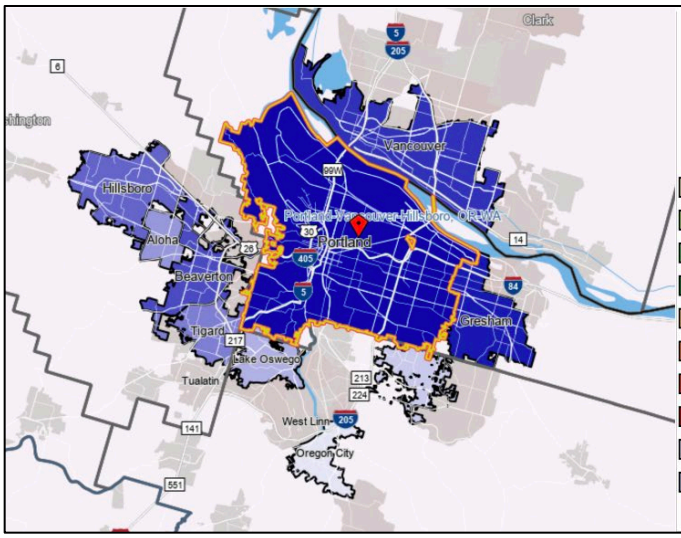
TABLE 41: SOURCE: QCEW

	2019 Q3 emp	2021 Q3 emp	Difference	% Difference
Clackamas County, OR	466,956	452,325	-14,631	-3%
Clark County, WA	417,390	425,922	8,532	2%
Multnomah County, OR	**1,349,934**	**1,247,328**	**-102,606**	**-8%**
Washington County, OR	848,790	822,186	-26,604	-3%

About 40% of Portlanders work in Portland (which is comparable to Seattle, where 38.3% of residents work in the city). The remaining Portlanders commute elsewhere – largely to Gresham, Vancouver, Hillsboro or Beaverton (see Figure 30).[379]

[379] Three of these four job centers function primarily as regional employment centers and do not house many residents:
- Hillsboro – 21% of residents work there [majority commute from Portland]
- Beaverton – 12.5% of residents work there [majority commute from Portland]
- Gresham – 21.2% of residents work there [majority commute from Portland]
- Vancouver – 30.5% of residents work there

FIGURE 30: THE SHARE OF PORTLAND RESIDENTS THAT WORK IN DIFFERENT PLACES ACROSS THE REGION.



Jobs Counts by Places (Cities, CDPs, etc.) Where Workers Live - All Jobs

	2019 Count	Share
All Places (Cities, CDPs, etc.)	477,994	100.0%
Portland city, OR	201,991	42.3%
Gresham city, OR	22,752	4.8%
Vancouver city, WA	19,201	4.0%
Beaverton city, OR	15,291	3.2%
Hillsboro city, OR	10,988	2.3%
Tigard city, OR	8,361	1.7%
Aloha CDP, OR	6,926	1.4%
Lake Oswego city, OR	6,883	1.4%
Happy Valley city, OR	5,266	1.1%
Oregon City city, OR	5,080	1.1%
All Other Locations	175,255	36.7%

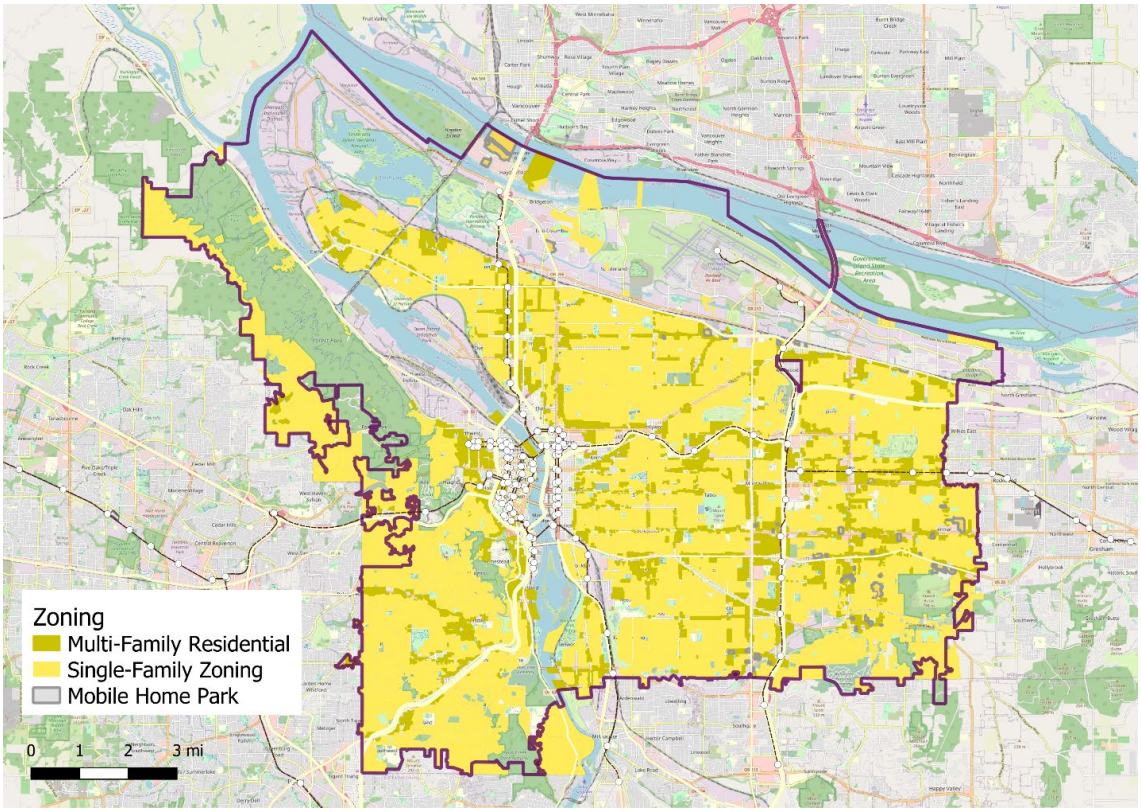
Source: https://onthemap.ces.census.gov/

> "Portland has a bustling industrial sector; this is not understood or prioritized."
>
> *– Business leader*

Portland uses traditional Euclidean Zoning – a separation of all land uses, which it has done since adopting zoning practices in 1924. These separated uses mean workers and their workplaces are separated by large swaths of single-use development (see Figure 31), meaning less efficiencies and higher costs for residents, businesses and government. East Portland, for example, is mostly zoned for low-density housing, meaning to shop and to work requires a longer commute than might occur with a more diverse set of uses. The waterfront has long been marked almost exclusively for industry (see Appendix), as industrial uses traditionally needed waterfront access.[380] Besides a few commercial corridors throughout the city, mixed-use zoning and development is rare (see Appendix). As is the case in many cities, the current zoning and overlays (see Appendix for more detail) are not nimble enough to adapt to next-economy economic growth opportunities, and particularly do not reflect the extent to which much modern industrial activity is compatible with nearby residential and commercial activity.

[380] This may be changing, notably with a new waterfront residential development proposed in an industrial sanctuary. https://www.kgw.com/article/money/omsi-new-portland-waterfront-remodel-120-million/283-d5bbe8c2-f869-46a7-9262-8aee992bc53d

FIGURE 31: RESIDENTIAL ZONING MAP



Source: RW Ventures with data from Oregon Geospatial Data Clearing House and City of Portland's Corporate GIS page

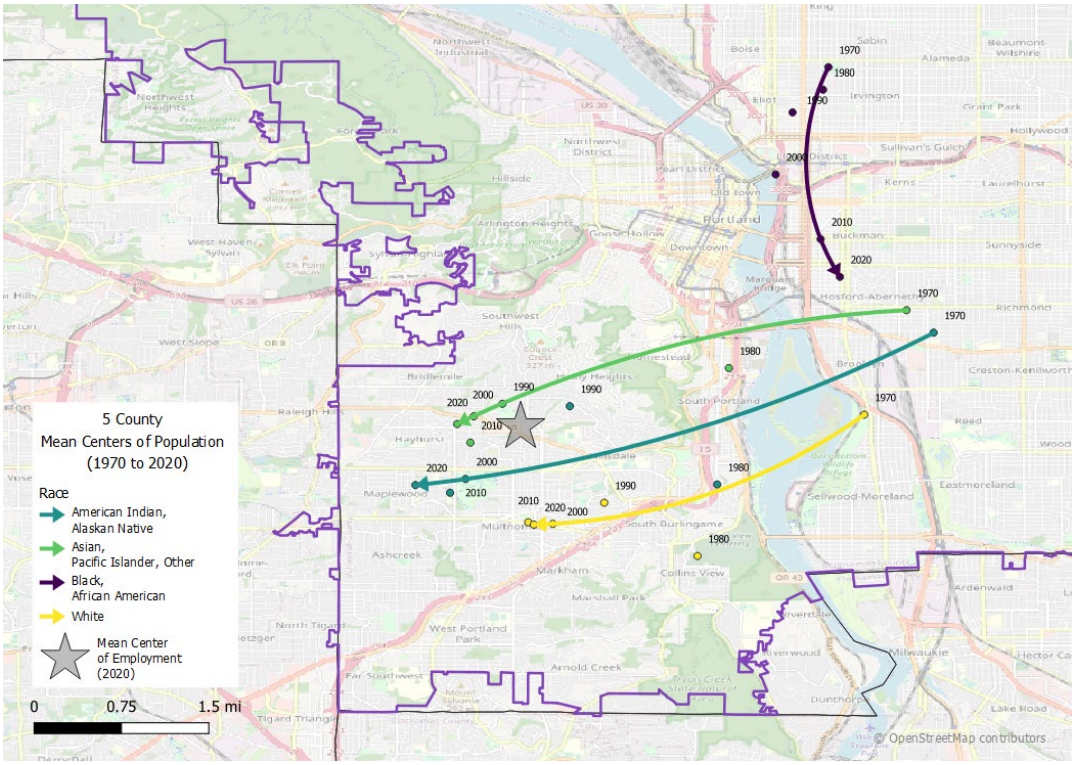
Jobs-Housing Mismatch

Strong connections and ease of access between workers and jobs boost worker and firm productivity, and reduce the costs of worker turnover, placing a premium on the proximity of jobs and housing, but also on good connections between jobs and housing when the two are not proximate.

The job center for the Portland region[381] is southwest of downtown – likely being pulled farther from the city center by growing suburban employment centers. Access to the job center varies by race. The Black population is more than two times the distance from the employment center than other racial groups that have been moving closer to the job center over time (see Figure 32).

[381] Note, for this analysis (due to QCEW data availability) the job center and movement of residents was calculated using the 5 counties within the Portland MSA that fall within Oregon.

FIGURE 32: MOVEMENT OF RESIDENTS OVER TIME IN RELATION TO JOB CENTER



Source: Analysis of QCEW data for Oregon (5 Oregon counties within Portland MSA)

Commutes are lengthening, with population growth in suburbs over 30 miles from Portland (and Clark County, WA) outpacing those areas less than 20 miles from Portland.[382] The share of those with average commute times of 24 minutes or shorter[383] has decreased from 60.9% to 52.8% between 2010 and 2020. The largest gains occurred for residents with commutes 45-59 minutes long (+2.3%) and those with commutes 25- 34 minutes long (+2.9%). The total number of commuters increased from 273,148 to 315,901 during this time, meaning there are 15,000 more workers in Portland with commutes over 45 minutes,[384] creating more auto traffic and in turn, pollution, than in 2010.

From 2010-2021, there were drastic changes in how residents commute. Much of this was due to COVID, with an increase of more than four times in those working from home (from 6.4% to 34.9%). See 'Role of Downtown' section for additional observations on remote work. Relatedly, there were sharp declines in the percent of the workforce driving (-16.8%), taking public transportation (-7.6%), and walking or biking (-4.3%). Interestingly, those taking cabs or rideshare saw an increase of 0.3% over that time.

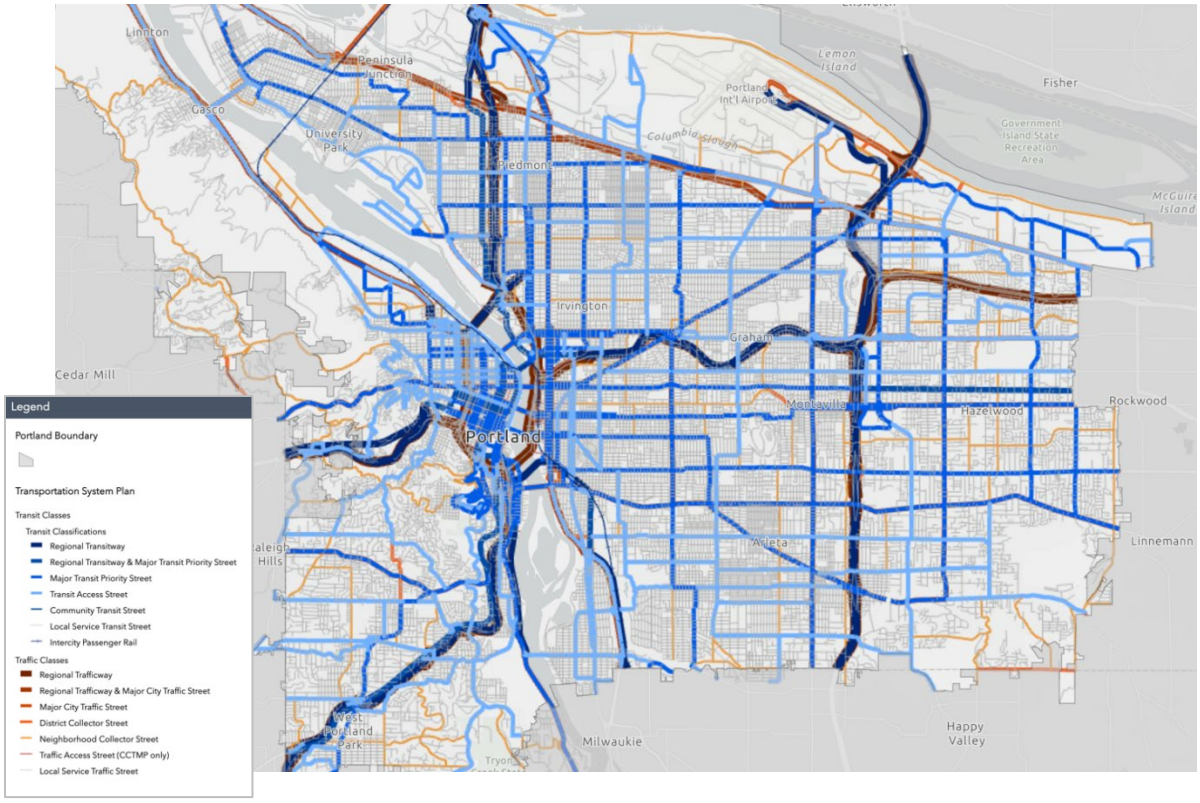
Several factors, discussed elsewhere, exacerbate the region-wide jobs-housing mismatch. These particularly include the traditional zoning causing more industrial businesses to have to locate further from residential centers, the housing supply and affordability issues, and the governance challenges.

[382] https://jordanramis.com/article/population-growth-on-the-fringe-of-portland-metros-urban-growth-boundary/
[383] The census estimates the average commute to work takes roughly 26 minutes.
[384] Those with commutes over 45 minutes comprise 35%

Connectivity and Mobility: Next-generation Infrastructure

Public transportation in Portland has long been a national model. In the 1970s and 1980s, in response to suburbanization and decline, Portland was a national leader in downtown revitalization and repositioning.[385] Strategic decisions were made in the 1970s and 1980s to invest in light rail and high quality streetscape improvement to reinforce the centrality and the amenities of downtown. The MAX light rail system has been running longer than many other systems in medium-sized cities across the country, and popularity was growing through 2019. The street grid and transit patterns are concentrated in downtown Portland, radiating outward (see Figure 33). However, East Portland is very disconnected from downtown, particularly east of I-205. Public transportation is lacking to this area: one of the furthest from downtown's dense job core and most industrial job centers. Portland has begun trying to close this gap in earnest, including with the recently opened bus rapid transit line on Division and improvements to the Halsey-Wieidler streetscape.

FIGURE 33: PORTLAND TRANSITWAYS AND TRAFFICWAYS. NOTE: THE DARK BLUE NORTH-SOUTH CORRIDOR ON THE RIGHT IS I-205.



Source: https://pdx.maps.arcgis.com/apps/webappviewer/index.html?id=d1d5e545ca6f436fb119932d710ff2fb

Portland has strong infrastructure for exporting: a port with connection to Asian and West Coast markets, an international airport, extensive rail connections, and major highways, which all together connect the region with global markets.

[385] To bring in more business and increase appeal, Portland created the downtown transit mall, the Tom McCall Waterfront Park, Pioneer Courthouse Square and the Pioneer Place mall. By the end of the 1980s Portland was heralded by the Wall Street Journal, the Urban Land Institute and Neil Peirce as a model of urban success.

The region's primary transportation systems and connecting infrastructure include those described below. Each has been impacted recently by COVID, as is the case in other major cities, and it is unknown how deep these impacts will be or for how long they will affect the region.

- **Public transportation** - The light rail system, MAX, ran a peak of 40MM riders in 2016, but has steadily declined since then, with a 52% decline in ridership YOY from 2020-2021, down to just 15MM passengers last year. While the light rail system ridership continues to grow, it's still down from pre-COVID ridership numbers. Bus ridership is rebounding at a faster rate and carries far more people than the train. Improvements to public transportation are underway, and ridership is expected to continue to improve. [386]

- **Freeway system and street grid –** About 60% of Portlanders drive alone to work.[387] The current perception of public transportation as more dangerous than it was pre-COVID, along with the termination of transportation projects like the Vancouver to Portland ferry, have kept reliance on driving high. This creates a burden on highways and surface streets. In 2019, this traffic cost the region more than $1.4BN in lost efficiency, wages, and fuel costs, and travel times are continuing to rise by minutes per day on a per capita basis annually.[388] While most impactful on lower-wage workers, workers of all incomes are more often coming from Gresham, Vancouver, or even further out.

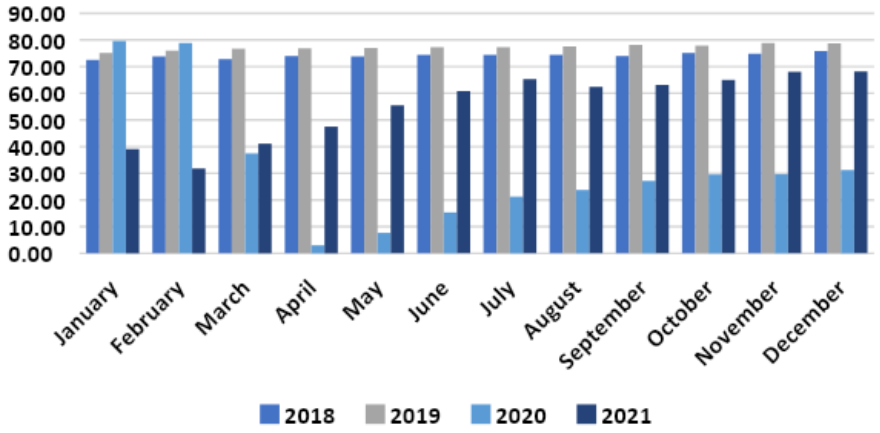
    - PBOT has announced plans to address its High Crash Streets, offering more non-auto-oriented options, with a goal to expand opportunities for those who don't use cars and to "better serve businesses" on various thoroughfares. Adopting geographically specific policies to ensure transportation infrastructure reflects the unique nature of different parts of the city (economic activities, topography, history, natural features, demographics, land use) is an important aspect to bolstering spatial efficiency. [389]

- **The Port –** The Port of Portland oversees the airport and marine activities – with 4 marine terminals and three airports. At one point Portland moved 340,000 twenty-foot equivalent units (TEU) containers per year by water (although, between 2016 and January 2020, the Port of Portland did not move shipping containers due to a lengthy labor dispute). 2020 saw a small launch of service by SM Line, a South Korean ocean carrier servicing Portland, Vancouver, Seattle, and the Chinese ports of Yantian, Ningbo, Shanghai, and Korean ports of Pusan, and Kwangyang, increasing activity in the Port of Portland. The Port is currently surrounded by many businesses that need waterfront access (Willamette Technical Fabricators, Vigor, Daimler, etc.) – and is working to increase export activity, particularly to help not just these but other small businesses in the region.

- **Air travel -** The PDX airport handles 90% of Oregon's passenger air travel and 95% of air cargo. Due to COVID, passenger air travel continues to lag and is down to levels not seen since pre-2002 – just 5.6MM passengers in 2021 – up 2.3MM over 2020, but still sitting at 60% of 2019 levels of 9.4MM (see Figure 34. Air freight, however, rose in 2021 as the economy continued to expand post-COVID.

[386] Improvements to the MAX system include the "A Better Red" project, which lays double track along the Airport MAX, which runs adjacent to a major industrial submarket (Airport Way), in addition to extending Airport MAX service to the Hillsboro airport and should be completed in 2024. This should offer better transportation to the Airport Way submarket and beyond. Expansion of rail north into Vancouver, WA should be completed in the next two decades, offering more commute options for (likely low-income) residents without a car, as well as any others that work and live on opposite sides of the river.. Source: https://web.archive.org/web/20200325015636/https://trimet.org/betterred/pdf/fact-sheet-english.pdf
[387] https://www.portland.gov/transportation/planning/documents/tsp-overview/download
[388] https://inrix.com/scorecard/
[389] https://www.portland.gov/sites/default/files/2019-08/09_transportation.pdf

FIGURE 34: PORTLAND AREA PASSENGER ENPLANEMENTS ON US AIRLINES



Role of Downtown

In the next economy, the value of agglomeration economies has only increased, given the heightened innovation and other benefits which flow from concentrating and enabling fluid interaction between knowledge assets embedded in firms, human capital and technology. Dense, mixed-use communities with excellent transportation and virtual connections foster rich networks and economic interactions, reducing transaction costs for employers, workers and consumers to move goods, people and ideas. In many ways, downtowns are the ultimate manifestation of these principles: they have historically been central hubs of economic, civic, and cultural activity[390] and – until COVID – have been thriving in the knowledge economy. They are the hub of transit connections (see Figure 33), house a disproportionate share of workers and firms, concentrate specialized services which serve regional industry clusters, and function as key formal and informal points of entry, exchange, coordination and management for firms, entrepreneurs, consumers and government.

Pre-pandemic, approximately 100,000 jobs -- one-third of employment in the City of Portland -- were located downtown at the center of the regional transit and highway system. The two largest job sectors downtown were office-based industries: Professional, Scientific, and Technical Services, and Finance and Insurance.[391] Significantly, 97.4% of those working downtown pre-pandemic, commuted into the downtown.

Circumstances, of course, have dramatically changed. COVID emptied downtowns throughout the country, and hybrid work schedules continue (with uncertain futures, as discussed below). In Portland, the rise of houselessness and concerns about public safety have further deterred return to work, shop and play downtown, as well as use of public transportation.[392] Like many cities across the country, Portland must rethink the role of its downtown and develop new revitalization strategies. The Revitalize Portland Coalition, a new group of property owners and developers, has prioritized addressing public safety (concern about personal safety is the number one barrier to returning to the office[393]), houselessness, the need for more affordable housing and creating an improved image for the city.

[390] Although downtowns encompass a small land area in the region, they have an outsized economic impact.
[391] The third largest sector, accommodations and food services, generally is highly dependent on the presence of office workers and a successful convention and tourism business.
[392] Downtown is still recovering; in 2021, the office vacancy rate for the Central Business District reached 20%; https://www.opb.org/article/2021/06/14/how-will-we-know-when-downtown-portland-is-back/
[393] Results from a recent survey of building owners, managers and developers representing 87 properties in the central business district.

As the direct impacts of COVID subside, and houselessness and public safety concerns are addressed, the question becomes whether remote work and related trends will continue, and their implications for the future of downtown. In truth, nobody knows – particularly as the trends are compounded by on-going economic and technological changes which may affect the role of downtown. Some considerations:

- The benefits of being in person for employees and businesses remain substantial: the planned and unplanned encounters and connections, and the in-person exchange of ideas, breed creativity, innovation and deals (beyond the capacity of remote digital meetings).[394] These benefits vary by business – and (not by coincidence) may particularly apply to the types of businesses that tend to concentrate downtown, and are increasingly concentrating downtown in Portland, such as professional services.[395]
- On the other hand, the cost and time savings from not commuting, convenience considerations, and the preferences of labor (to an extent) will outweigh these benefits for other types of businesses, resulting in more remote and hybrid work arrangements. As a result, downtowns may become more specialized, focused on fewer industries.
- Downtowns serve as centralized, easily accessible, cultural and social centers, including as centers of retail and other amenities. While it is unclear how these roles will shift with less daytime (workforce) population, it seems likely that these roles may become more central as downtowns revitalize through having more social and cultural events to attract people, and particularly as many downtowns convert office space to residential.

These trends have implications for neighborhoods as well. To the extent hybrid and remote work continues at higher levels, there may be opportunities for design and development of more meeting places, business services and amenities in neighborhoods. These are further explored in the "Strategies" section.

In many major cities, including Boston, San Francisco and Chicago, offices make up more than 50% of downtown real estate[396] – and, cities with more downtown office jobs recovered more slowly from the pandemic.[397] Currently, downtown Portland is made up of 41% office space, 10% retail, 7% hotels, 30% residential, and 12% other.[398]

Portland's downtown will likely continue to be a key center of gravity and economic engine for the region despite shifting concentrations of industries and retail uses. Looking ahead, it will be important to be deliberate about defining roles and associated investments in infrastructure, both downtown and in surrounding neighborhoods, to increase spatial efficiency.

Assessment: Portland's Opportunities

The Portland region was generally ahead of the curve in managing urban sprawl, creating efficient transportation infrastructure, providing connectivity for businesses and people within and outside the region. However, the distribution of jobs and workers has been shifting across the region and the

[394] In addition: innovation, creativity and the mentoring of younger employees may best be achieved through fac- to-face interactions within the office and even through chance encounters at retail and other venues.
[395] Some types of companies whose work is more creative or otherwise benefits from personal interactions will be more competitive and grow faster than competitors by bringing employees back to work; others will see advantages in hiring by offering more flexible schedules. By and large, it is likely that hybrid and full-time work from home will continue at higher rates than pre-COVID, but will diminish considerably, particularly in certain industries. The finance, management, professional services and information sectors have the highest potential for remote work: https://www.mckinsey.com/featured-insights/future-of-work/whats-next-for-remote-work-an-analysis-of-2000-tasks-800-jobs-and-nine-countries.
[396] Downtown "office jobs" are measured by the percentage of jobs in the Professional, Scientific, and Management fields. https://www.nytimes.com/interactive/2021/07/07/upshot/downtown-office-vulnerable-even-before-covid.html; (A national study of 62 cities conducted by the University of California Berkley)
[397] https://www.downtownrecovery.com/death_of_downtown_policy_brief.pdf
[398] CoStar analysis

externalities associated with under-managed growth (particularly increased inequity in wealth creation, houselessness and crime), along with COVID, have severely undermined downtown. As a result, there are opportunities to improve spatial efficiency, including in ways which increase economic efficiencies, reduce climate effects, and enhance equity.

Opportunities which bear further exploration and development include

- **Locate major economic investments and target business growth near underserved areas.** Siting new major economic investments (i.e. innovation centers) strategically in or near underserved residential areas (e.g., East Portland) – areas with lower incomes or higher unemployment rates than the average, or those communities with poor transportation connections to job centers.[399]
- **Continuing to target both residential density and business growth near high-access locations.** Take advantage of existing infrastructure, particularly public transit, by increasing density of people and jobs around transit stations.
- **Augment transportation options to existing job hubs.** In addition to co-location (of jobs and housing) efforts, augmenting transportation options to areas of high economic activity from less connected areas could be prioritized. To increase equity through connectivity, the city should continue to build out safe, contiguous bike infrastructure, enhance bus and rail frequency, and identify priority communities to better connect with job centers.
- **Develop more housing near job centers.** Continue to increase residential density near jobs where possible and appropriate, which will have a positive impact on affordability issues and the environment (as well as provide opportunities to support BIPOC developers).
- **Re-assess zoning.** As discussed above, the dated practice of Euclidean zoning – a separation of all land uses – is likely holding Portland's growth back, particularly from inclusive growth and climate change perspectives. Modern "clean" manufacturing, and other industrial uses, are increasingly compatible with commercial and residential uses. Being more flexible with development regulations could help bring jobs closer to people and talent closer to firms. This could include transit-oriented development (TOD) incentives to boost density near transportation corridors;[400] redeveloping industrial sanctuaries with both housing and industrial space;[401] or enabling more mixed use – including industrial – development in neighborhoods.
- **Evaluate Urban Growth Boundary.** The urban growth boundary helps prevent sprawl and protect highly valued green and agricultural space. At the same time, as the region's population and industries have grown, changed and moved (sprawling within the boundary, and limiting land availability, particularly for industrial development), the balance of costs and benefits may benefit from updated evaluation, and it may be that some extensions or exceptions to the boundary would make sense. Metro is currently considering these issues.[402] These issues should be considered in conjunction with the zoning issues, since zoning changes may affect this balance.
- **Reimagine and Revitalize Downtown**. The downtown of a 21st Century City serves multiple functions –as an economic hub, a cultural and entertainment destination, and a place to live – whose balance may be shifting, but are no less important overall. This may require continuous testing and learning to get the right diverse mix of commercial businesses, amenities and residential living (and likely entails considerable increase in residential[403]).

[399] This also helps address the ever-lengthening commutes the region is experiencing - increasing overall economic efficiency, as well as addressing both climate and economic justice.
[400] This has proven successful in creating new housing in cities such as Los Angeles and Chicago.
[401] With new manufacturing being "cleaner," it's likely that at least some of these waterfront areas and others could be redeveloped.
[402] Interviewee
[403] It is likely there are office buildings with potential for adaptive reuse, including to residential. Co-locating more residential uses in such a dense job center can make Portland dramatically more spatially efficient. For instance: https://www.wweek.com/news/city/2022/08/26/mayor-ted-wheeler-wants-developers-to-convert-downtown-office-space-to-workforce-housing/

Market Analysis Summary

Portland led the way into the knowledge economy – beginning with a strong job base, and continuously attracting talent, growing its entrepreneurship base and improving livability.[404] Portland's human capital is overall one of its strongest assets; along with its remarkable industrial base. The region's culture of entrepreneurship has resulted in a supportive ecosystem for startups and early-stage firms and has attracted innovators and disruptors to the region. As residents have been drawn to Portland, for these reasons and also its natural amenities, the City has also become a leader in managing urban sprawl (e.g., through its Urban Growth Boundary) – in addition to creating efficient transportation infrastructure, and providing connectivity for businesses and people within and outside the region. As a result, Portland's economic performance has generally exceeded that of other metropolitan areas for several decades.

However, more recently, Portland has been a victim of its own success. The natural attraction of skilled labor enabled its economy to transition and grow without tending to key fundamentals in next economy institutional infrastructure, business support, human capital production, cross-sector engagement and regionalism; and it has failed to adequately manage the unintended, challenging consequences of its growth model. For instance, Portland lacks sufficient cross-sector, particularly private-sector led, organizations developing, coordinating and implementing economic growth strategies. Instead, it suffers from a highly politicized, partisan and fragmented institutional infrastructure, resulting among other things in many missed opportunities to engage the talent and innovation capacity at large and midsize corporations in economic development. The externalities associated with under-managed growth – particularly increased wealth inequity, air pollution, carbon emissions, houselessness and crime – aggravated by COVID, present fundamental short- and long-term challenges, and have severely undermined downtown. The distribution of jobs and workers has been widening across the region (particularly for Black residents), and the center of economic activity has been shifting away from downtown Portland and towards growing economic hubs in nearby suburbs.

Therefore, as Portland develops the vision for its next stage of development, along with a set of strategies to realize that vision, it will need to also tend to some of these missing fundamentals. The region has many assets from which to build –industry strengths across diverse sectors (e.g., athletic apparel, manufacturing, software), R&D strengths in green product and services development, a highly skilled workforce, and a myriad of organizations and resources for economic development (e.g., entrepreneurship resources, workforce programs). Portland has an opportunity to build from these assets to establish a new model of growth, one in which all residents participate in rising prosperity, that strengthens climate resiliency and avoids the negative effects of growth.

[404] Although, it should be noted (and as discussed elsewhere): these benefits have not necessarily been equitably distributed across the population.

VI. VISION, OBJECTIVES, METRICS

Vision

Building from its strong historical economic performance and current assets, while observing and learning from its current challenges, Portland has lofty aspirations. As discussed at the outset, the question is not whether to seek economic growth, but rather *what kind of growth* to pursue, and how to get there. Figuring out how to grow well – without the unintended consequences (often flowing from under-managed population growth), the increasing wealth gap and the negative climate impact – is a core challenge of cities successfully transitioning to the next economy. Portland has been a leader in transitioning to a knowledge-based economy (and, incidentally, in experiencing the negative effects of growth). Now, it must also be a leader in developing a model of growth for the 21st Century that can nimbly navigate the economic transformations of the Fourth Industrial Revolution and beyond.

Such a model, while having some universal characteristics (some of which we begin to tease out below), cannot be specified once and for all. First, it must be particular to place (building from the market analysis above): every region will have a different pathway, given their unique set of assets and challenges. Second (and especially characteristic of being on the leading edge), the model must include capacity to continually and flexibly seize new opportunities and address new challenges, particularly to anticipate and prevent potential unintended consequences of growth. In other words, the model must have substantive economic development components as well as institutional (or procedural) components. While it cannot be fully specified, its outlines and some of the necessary components are emerging.

As metros rethink their models of growth, they do so in rapidly changing times, presenting great challenges and opportunities. The disruptive effects of the pandemic are transforming global supply chains and the rise of remote work is reshaping the role of downtowns. The pressures of climate change are also starting to mount, accelerating the need for innovative solutions. The rise of renewable energy is changing how industries are fueled, how buildings are operated and how people get around. Digital technologies are transforming communication between people and devices, enabling remote work trends to continue. In recent years, production has shifted to small-batch, customized manufacturing for industries ranging from food manufacturing to wearables. The 21st Century City may need to make land use changes to better integrate new and evolving functions – and may leverage renewable energy sources to expand modes of transportation. These emerging trends will not only shape the built environment but also transform economic markets, creating new opportunities for business.

Considering these changes, governments are making significant investments and regulatory changes that will transform the production economy and accelerate technological advances. Urban and metropolitan economies are at the forefront of these structural changes. Metro areas will have to build up institutional infrastructure to continually reinvent as the economy shifts in unexpected directions.

We are moving towards a future where metros, for long term success, will need to practically align economic growth with sustainable and inclusive outcomes, creating thriving economies that offer opportunity and generate innovation and quality of life without negative effects. Before long, cities may look and function quite differently as they work to achieve the vision of growing well in an evolving economic landscape. To start, metros need to hit the reset button and broadly consider the shifting economic landscape and their own position in it to create a vision.

As a starting point, Portland's vision for the 21st century is to grow *well*, achieving economic growth without negative effects. As we've seen, broadly, the negative effects of growth flow from three

(overlapping) areas: (1) population growth if not well managed results in unaffordability, congestion and other problems; (2) next economy growth tends to increase wealth disparities, underdeploying assets, aggravating affordability problems and causing a wide range of costly poverty-related challenges; and (3) economic growth can cause climate change challenges. Portland's vision and model seeks to grow the economy while minimizing and managing the effects of population growth; in ways that are fully inclusive, restoring economic equity; and aligned with climate resiliency.

While the vision and model that Portland develops for the 21st Century can only be specified over time, some of its characteristics and implications, particularly considering the assets and challenges of the City of Portland, include:

> "There is opportunity to grow more B corps in Portland – businesses that want to do good."
>
> *– Business leader*

- Quality Businesses – economic growth is essentially business growth. Accordingly, the question of what kind of growth translates in part to what kinds of businesses and their roles. Realizing this vision requires creatively incenting, supporting and attracting "good" businesses and industries: ones that – in addition to prospering, complementing the region's assets and providing quality jobs – are committed to inclusion and climate resiliency and, more broadly, seek long-term value creation for all of their stakeholders and collaborate in economic development as aligned with their business interests.[405]
    - Considerable policy innovation may be necessary here: creating incentives and programs that enable firms to take risks in pursuing new avenues for alignment of business growth, equity, climate and quality of life. Policies and avenues could range from financial incentives and prizes for "good" firms, or particular practices (such as new more inclusive hiring systems or collaborative workforce training; or "greening" their facilities), to encouraging firms to experiment with new business models that share ownership and expand stakeholder participation. This will entail on-going analysis of which industries offer the best possibilities, and in what particular ways they need support to align their business practices. This approach must be carefully designed: the goal is to make Portland a more attractive place for certain types of businesses, rather than to have the unintended consequence of making it appear less welcoming to business generally. Carrots will be more important than sticks.
- Economic Growth – can be accomplished without population growth; focus on business and economic growth (i.e. the five market levers) rather than attracting people.
- Managing Population Growth – anticipate population growth as the region prospers and adequately plan to prevent negative effects (through housing policy, infrastructure planning, etc.).
- Inclusion – develop and deploy *all* of its people and other assets, creating a thriving economy driven by and rooted in long-term inclusion, with special attention to making workforce development more employer-driven and skills-based, and to supporting BIPOC entrepreneurship in growth sectors.

[405] See, e.g., http://rw-ventures.com/evolving-corporate-business-engagement-in-community-and-economic-development/. Regions have always been concerned about creating, retaining and attracting high-growth businesses that offer quality jobs. Portland wants to go one step further and cultivate a concentration of businesses that understand that broader participation in supporting their industries, regional economies and assets, as well as inclusion and climate resiliency, are in fact aligned with their business interests – and collaborate to increase and implement that alignment. This flows, of course, from having strengths across the five market levers (clusters, human capital, innovation, spatial efficiency and governance) that are the primary focus of this report. See the 'cluster selection criteria' (in "Clusters" overview section) for some further considerations on what constitutes a "good" business.

- Greening – build on Portland's already leading "green" brand by leading the way in green industries producing the products and services that will be increasingly in demand to prevent and redress climate change; create local demand conditions using these products to continue making Portland a model "green" city – including continuing to implement leading-edge policies that further the market demand for these products.

- Quality Institutions – build new levels of cross-sector, including particularly private-sector led, governance – institutional capacities to continually manage, coordinate and innovate, both region-wide and for particular industries and development activities. These institutions will become interconnected, flexible networks that support the flow of knowledge, enable innovation, generate and support new ventures, create the capacity for deliberate strategy development and execution, and provide access for new and diverse firms and stakeholders, among other critical functions.

- Quality Labor Markets – build new labor market systems, moving towards market- and employer-driven workforce development, and skills-based employer hiring practices.

- "Democratic" Capitalism – together, these characteristics and implications for 21st century cities begin the re-examination of capitalism in the context of the next economy, and suggest Portland will lead in defining a "democratic" or "enlightened" capitalism[406] – that builds new networks and systems, re-balancing roles of markets and government, to achieve inclusive, climate-resilient growth.

All more easily said than done, and some breaking new ground – but Portland has been a "first mover' in the past and, if it can reset the table and discussion, Portland has the critical pieces in place from which to realize its vision of a prosperous 21st century city.

VISION

Portland will become a model 21st century city which targets and manages growth well, aligning economic growth with equity and climate resiliency to provide a prosperous, vibrant, healthy place for all Portland residents and businesses. It will support and attract companies that are leading the way in long term, stakeholder, value creation approaches which encompass inclusion, sustainability and broader corporate engagement. It will be a national leader in the invention and commercialization of "green" products, as well as in their use.

Objectives and Metrics

A set of objectives, below, will guide stakeholders towards realizing Portland's vision. A set of strategies, in the next section, have been proposed to carry out these objectives and execute upon the project's vision. While the strategies are designed to be mutually-reinforcing and overlap with one another, they are categorized here according to which objective(s) they most closely relate. In addition, for each objective, metrics are proposed which may help measure progress towards its realization.

[406] https://www.theguardian.com/commentisfree/2023/feb/06/joe-biden-democratic-capitalism-changed-economic-paradigm-reagan-free-market

The list of metrics is non-exhaustive but provide examples of how each objective may be measured. Since these objectives work towards economic growth goals, aligned with inclusion and climate action, inclusion and climate-specific impacts should be considered as a component of each metric. See the Climate and Equity Lens for some considerations, along with a few specific examples listed in the metrics in Table 42.

TABLE 42: OBJECTIVES, ASSOCIATED STRATEGIES, IMPLEMENTATION METRICS

Objective	Associated Strategies	Implementation Metrics
Grow clusters that are advancing climate action • Develop industry-specific workforce and innovation strategies to support growth of "green" products and services • Enhance public-private collaboration in priority clusters	• Growing Good Business • Growth of Green Products and Services • Materials Innovation Strategy • Inclusive Growth of the Food & Beverage Cluster • Export Strategy	• Location Quotient • Number and growth of firms • Investment (Private, Public, Philanthropic) • Intellectual Property • "Green" jobs created • "Green" product/service R&D
Grow and diversify entrepreneurship and R&D capacity • Diversify company ownership • Pipeline networks and resources (e.g., innovation centers) • Greater commercialization of R&D, particularly in "green" products and services • Research, entrepreneurship, and finance collaborations	• Targeted Scale-Up and Mentorship Support • Industry-Specific Financial Products • Inclusive Growth of the Food & Beverage Cluster	• Spinoffs/ Startups (and, % BIPOC, women-owned) • Business ownership (and, % BIPOC) • Business revenue • Employment (and, % BIPOC, female) • Investment in businesses
Support industry-based job training and high-quality employment, particularly for BIPOC • Retrain workers in lower-growth industries into new, high-growth positions – particularly to support the clean economy • Deepen engagement of private sector – and, increase collaboration between workforce providers and industry • Industry-driven skills based apprenticeships	• Next-Economy Education, Training, and Hiring Systems • Growth of Green Products and Services • Inclusive Growth of the Food & Beverage Cluster	• Wages (and, BIPOC breakdown; breakdown by position) • Labor Participation • "Green" jobs created • Corporate participation

Strengthen and diversify business and civic networks, institutions and partnerships • Bring civic and business organizations together around the vision • Improve government-industry collaboration to co-develop initiatives • Ensuring diverse representation at the relevant private, public and civic sector "tables," where growth strategies are shaped and deals get done	• Growing Good Business • Private-Sector Led Economic Development Initiatives • Targeted Scale-Up and Mentorship Support • Growth of Green Products and Services • Inclusive Growth of the Food & Beverage Cluster	• Investment in initiatives (Private, Public, Philanthropic) • Initiatives launched • Corporate, especially C Suite, participation
Increase equitable access and opportunity • Strengthen Connections between employment & residential centers • Site and support innovation centers in places that are readily accessible to disadvantaged populations • Ensure transportation and other infrastructure provide access to jobs and other economic activity centers • Manage land use patterns to shrink jobs-housing mismatch • Market-making inclusive industrial land re-use	• Next-Economy Education, Training, and Hiring Systems • Growth of Green Products and Services	• Live/Work Distance (and, BIPOC breakdown) • # of key initiatives in priority areas • Commercial space availability • Commercial real estate ownership (% BIPOC) • Housing affordability

It should also be noted that, as strategies are refined and specific initiatives are implemented, a much more specific list of metrics should be generated to measure program-specific impact.

VII. STRATEGIES

To realize this vision and execute upon the objectives, a series of mutually-reinforcing strategies are presented below – designed to deliberately move Portland's economy forward as a model of growth, inclusion and climate action. These strategies are not meant to be comprehensive, in two senses: (1) many other economic growth opportunities surfaced in the market analysis – the strategies listed here seemed the most important, feasible starting points considering current assets and activities, opportunities and challenges; and (2) as discussed elsewhere, many foundational challenges need attention (such as houselessness) which are beyond the scope of this economic growth plan. Furthermore, these strategies are necessarily at a fairly high level at this point: each needs its own business planning to confirm, refine, adjust and convert to concrete implementable initiatives. Finally, each strategy concludes with relevant models for further reference; please note that these models are illustrative reference points: each varies in their strengths, and none are tailored to Portland's unique assets, challenges, and opportunities.

Strategies presented include:

1. Growing Good Businesses
2. Private-Sector Led Economic Development Initiatives
3. Next-Economy Education, Training, and Hiring Systems
4. Targeted Scale-Up Support
5. Industry-Specific Financial Products
6. Growth of Green Products and Services
7. Materials Innovation Strategy
8. Inclusive Growth of the Food & Beverage Cluster
9. Align with Central City and Commercial Corridors Plans
10. Export Strategy

Each of these strategies builds from the market analysis conclusions, proposing a next step to address the highlighted opportunities and challenges. While the strategies suggest potential projects or initiatives that may be implemented to execute each one, this Plan does not go beyond the strategic level. Detailed business plans for each of the strategies – addressing operations, finances, etc. – would be a next phase of the work. Also, note that the strategies do not pick up *all* of the recommendations/ideas proposed in the market analysis section but instead select a narrower set of inter-related strategies that mutually reinforce one another and begin to execute the vision for Portland's growth.

Growing Good Businesses

Overview

Portland aspires to be a city that grows and attracts *good* businesses. Realizing this vision requires creatively incenting, supporting and attracting good businesses and industries: ones that – in addition to prospering, complementing the region's assets and providing quality jobs – are committed to inclusion and climate resiliency and, more broadly, seek long-term value creation for all of their stakeholders and collaborate in economic development as aligned with their business interests.

Recommendation

Supporting and attracting good businesses is best done with incentives (rather than increased regulations). Portland is already a national leader in policies and practices that encourage businesses to be environmentally friendly and prioritize inclusion. New incentives can be tailored to support growth of

good businesses – and will further build Portland's reputation as a place where these types of business want to grow and locate.

Several strategies, outlined in the report sections below, will help incentivize good businesses to grow in Portland. Additional ideas that may be woven into the strategies include:

- Prioritizing economic development programming for businesses that fit Portland's vision;
- Creating a coalition of firms that make transformative commitments (see "Private-Sector Led Economic Development Initiatives" for recommendations on creating a coalition or working group); in addition, a coalition may help prioritize economic development programming for "good" businesses;
- Creating an annual award program recognizing innovative business practices aligning firm growth with inclusion and climate action;
- Providing specialized resources to support and attract good businesses (see "Targeted Scale-Up Support," which provides specific support tailored to "green" businesses, or "Growth of Green Products," which among other things, recommends assisting manufacturers in lowering their emissions);
- Facilitating partnerships between academia and industry (e.g., industry training/hiring commitments);
- Creating a strong capital ecosystem that allows mission-oriented startups to form and mature firms to scale (see "Targeted Scape-Up Support" and "Industry-Specific Financial Products").

Private-Sector Led Economic Development Initiatives

Overview

As it extensively appears throughout the market analysis, particularly with respect to governance, Portland needs to expand the formal and informal, inclusive, networks – particularly including broader private sector engagement and leadership – that enable the flow of ideas and deals in the knowledge economy. Across the country, and particularly in leading metropolitan areas, corporations are realizing a greater alignment of their business interests with economic development activities – including enhancing regional competitiveness, building industry competitiveness, supporting workforce, innovation, community market development and other programs.[407] Due to the politicization, distrust, fragmentation and other issues identified in the market analysis, Portland lags in next economy institutional infrastructure, both across the region and in the city, and with respect to both overall coordination of economic growth activities and narrower collaborations around particular industries or opportunities.

Recommendation

Given the challenges, incremental steps should be taken to build stronger, private-sector led, networks – and to help build trust and collaboration across industry sectors, public and private stakeholders, and BIPOC communities. While rebuilding trust and changing culture is difficult, the charter reform may present an opportunity to reconvene the private sector around economic development efforts. Portland has an opportunity to formalize a public-private partnership to remain in place beyond administrations. As a first step to building greater private sector involvement in managing economic growth, consider convening the private sector around a specific economic development initiative.

Initiatives around which to organize could include, for example, employer-driven training programs for un- and under-employed residents; venture funds, targeting particular technologies, industries, or firm stages

[407] http://rw-ventures.com/wp-content/uploads/2021/05/CorporateBusinessEngagementinCommunityandEconomicDevelopment_May2021.pdf

of growth; supply chain development, again focused on targeted industries, and particularly expanding the capacity of people of color and women-owned small businesses to meet procurement needs; accelerators or incubators to support local innovation; or coordinating or facilitating large-scale residential, commercial or industrial development.

There are a number of ways to get started in organizing and convening the private sector. For instance, the process could start by slowly staging a group of highly credible, diverse, collaborative, action-oriented leaders to review strategies and initiatives, and iteratively engage other stakeholders and select initial activities. Alternatively, the group can be built around an in-progress initiative (e.g., Clean Industry Hub), gathering leaders who are passionate about that particular project. Other ideas include forming a "green advisory council," private-sector led with university participation, to advise the City on strategies that the City can implement in priority clusters to grow their export opportunities while simultaneously reducing emissions, water, waste, and toxics in their own operations and throughout their supply chain.[408] Or, convene several working groups of local industry representatives to identify local supply chain opportunities for specific clusters.

These meetings can eventually become more formalized, leading to the development of a private-sector led Economic Development Collaborative, new or potentially housed within an existing organization. For instance:

- **GPI acts as the convenor of a corporate working group**, selecting a group of highly-engaged corporations and facilitating meetings around particular economic development initiatives.
- A **Corporation Leadership Alliance** would enable corporations to engage in and help implement many aspects of economic growth, and identify and launch new initiatives.[409] Establishing a Corporate Leadership Alliance requires engaging key institutions and leadership – institutions should include leading employers in the region and representatives should be C-suite level and able to make decisions without further approval. Programmatic starting points and priorities would have to be defined, which can be done through a series of focused, well-organized meetings with a small group of business leaders. Organizational structure will also need to be determined – some collaboratives have dedicated staff and resources, while others engage pro-bono services to manage the work. Collaboratives often receive financial support from members (particularly from corporations and anchor institutions), philanthropy, and/or the public sector.

This program may leverage existing initiatives underway, such as Future Ready Oregon industry consortia[410] - Three statewide industry consortia are being assembled around healthcare, manufacturing and technology – largely around targeted recruitment strategies.

Relevant Models

As mentioned, corporation-driven economic development is increasing and broadening in scope in the leading regions, taking many collaborative forms. Established collaboratives and organizations include, among many others:

- The ITASCA Project in Minneapolis, MN[411]
- CenterState CEO in Syracuse, NY[412]
- M7 in Milwaukee, WI[413]

[408] In particular, there is opportunity to gather the private-sector leaders around a climate-centered initiative to further Portland's efforts to execute its vision for a leading-edge "green" city.
[409] https://hbr.org/2022/04/how-business-coalitions-can-have-a-strong-local-impact
[410] https://www.oregon.gov/highered/policy-collaboration/Pages/Future-Ready.aspx
[411] https://itascaproject.org/; https://www.nytimes.com/2018/07/03/opinion/community-revitalization-lancaster.html
[412] https://centerstateceo.com/
[413] https://www.mke7.com/

- MidAmerica Regional Council in Kansas City, MO[414]
- The Newark Anchor Collaborative in Newark, NJ[415]
- World Business Chicago (WBC) in Chicago, IL[416]
- Regional Economic Development Advisory Committee in Houston, TX[417]
- Mid-Ohio Development Exchange in Columbus, OH[418]
- Talent 2025[419] - A group of over 100 CEOs from western Michigan, who identify workforce gaps and leading practices – and work together to implement them
- Vital Communities[420] - tackles workforce housing shortages in Vermont and New Hampshire
- Partnership for Rhode Island[421] – focused on initiatives in workforce development, business attraction, K-12 education and infrastructure
- Greater Houston Partnership[422] - focused on strategies for Houston's low-carbon future
- Tampa Bay Partnership[423] – focused on strategies for carbon-emissions reductions

Next Steps

Recommended next steps include:

- Determine whether to engage leaders around an existing initiative, such as the Clean Industry Hub, or more broadly engage leaders interested in economic development.
- Select a relatively small group of highly credible, diverse, collaborative, action-oriented executives committed to helping drive deliberate economic growth (or the particular initiative, if leading with organizing around an initiative) for a first meeting, and support them in engaging their peers and relevant stakeholders towards creating on-going institutional capacity.

Next-Economy Education, Training, and Hiring Systems

Overview

Portland suffers from a common ill of major metro regions: an antiquated system for educating, training, and hiring its workers. Generally, trainers and educators have been slow to modernize existing systems and processes that prevent them from forming deeply market- and employer-driven curricula, and doing so along a continuum of aligned degree options from 1-2 year certificates through advanced degrees. Meanwhile, most employers have not updated their hiring practices, relying largely on traditional credential evaluations and professional and personal networks, via LinkedIn or other avenues, in part to reduce the uncertainty inherent in a hiring process. These practices are imprecise in assessing workers' match with open positions and lead to inefficiencies (higher turnover, lower productivity from poor worker/job matches) and inequitable hiring outcomes. Skills-based hiring processes have demonstrated the potential to ameliorate these outcomes, better identifying the workers - regardless of degree or background - who truly have the sought-after skills and aptitudes.

Many regions around the country have tackled this issue, and best practices have shown that employers should lead the collective action to change these integrated systems. Starting from the demand side of the skills equation - getting timely, detailed insight on what employers are looking for from employees,

[414] https://www.marc.org/
[415] https://www.newark-alliance.org/programs/newarkAnchorCollaborative/
[416] https://worldbusinesschicago.com/
[417] https://www.houston.org/committee/regional-economic-development-committee
[418] https://columbusregion.com/mode/
[419] http://www.talentfirst.net/
[420] https://vitalcommunities.org/housing/
[421] https://partnershipforrhodeisland.com/
[422] https://www.houston.org/energy-transition
[423] https://www.tampabay.org/

both currently and in the coming years - is the ideal approach for revamping the programs and processes that prepare workers and get them into jobs. Employers can be the most difficult stakeholders to engage in broader workforce development efforts, as day-to-day operational needs occupy most, if not all, free time. Getting industry champions up front and leading from the outset clears a major organizing hurdle early on, and these first movers can encourage other companies to follow suit.

Recommendation

The labor market system is vast, and updating it requires a long-term, concerted, aligned effort across the many participants. To lead this work, Portland should develop **employer-led industry consortia** that assemble the private- and public-sector stakeholders that can collectively chart a path toward modernizing education, training, and hiring practices.[424] With these many active programs, a single forum in which to assemble will reduce fragmentation and be more efficient for all involved parties (especially employers, who may be asked to serve on multiple advisory committees or working groups by trainers, educators, WDBs, etc.)

These consortia should aim to migrate towards being more industry-specific and centered. The breadth of each industry is an initial design question, balancing the benefits of specificity and targeting with the realities of scale and impact. For example, a general manufacturing consortia would have greater reach and impact more jobs and employees in a renewed labor market system. Breaking that consortia into metals manufacturing and food and beverage manufacturing would allow for more targeting of training and hiring processes, but may not be able to reach a scale that would generate substantial impact, or to raise and deploy the financial and technical resources needed to implement new programs and install new systems. Organizing these consortia is a labor-intensive process. The first one should be chosen based on an industry where the private sector is most likely to engage and lead, where the ecosystem of relevant stakeholders is substantial, and where the receptiveness of all parties to collaboration is high.

One opportunity may be within Clean Economy industries, as demand for new skills is expected to continuously grow (and newer industries may be easier to create new systems around) – see “Clean Economy / Green Cities” section for more detail. For instance, this could include expanding credentialing programs[425] for green occupations (e.g., electronic engineering technologists and technicians, environmental engineers, inspectors, and testers - see “Human Capital” section for more detail) and matching these career pathways with BIPOC talent – or, creating an initiative to train underserved populations for green consulting opportunities (as mentioned below, modeled after Bitwise Industries).[426]

Each consortia can serve as a center of gravity for the initiatives and pilots that will bring new labor market practices into action. The primary tracks to pursue:

- **Skill-Based Hiring Practices** - changing a company’s HR processes to facilitate skills-based hiring is a significant endeavor. Job descriptions, candidate sourcing, interview and assessment processes, and more must be adapted, and buy-in secured from the necessary employees to ensure successful implementation. A pilot program could be established that would recruit a cohort of companies willing to make this transition. The pilot would test change management approaches and process updates, identifying the actions and their staging that most successfully

[424] As one interview described, Portland is program rich but systems poor in the workforce development space.
[425] Many green economy jobs require skills that build from foundational skills in related occupations – for example, leading national programs provide building contractors modest additional training to enable them to do housing energy efficiency retrofits. (See, e.g., Elevate Energy, https://www.elevatenp.org/, or, PCEF grant awardees who are training BIPOC workers to do retrofits: https://www.portland.gov/bps/cleanenergy/2022-pcef-rfp-2-grant-recipients).
[426] In addition, a green economy workforce initiative could be developed as part of the “Growth of Green Products Strategy”. Additional details on workforce opportunities are outlined in the *Climate Occupation Analysis* memo by ECONorthwest.

advance skill-based hiring adoption. The pilot findings can be brought back to the rest of the consortia, guiding further application of this model across the industry.

- **Industry-Specific Training and On-Ramps** - tying training and post-secondary education programs more tightly to industry demand is not a new approach, but an employer-led industry consortia will provide a more effective vehicle for designing and delivering these resources, and in expanding options for the training structure and location. Rather than relying solely or mostly on the public sector or third-party providers, more and more companies are developing on-site training programs to fill employment gaps. Companies are also increasingly turning to apprenticeship programs to fill pressing talent gaps, such as United Airlines' program that will train 1,000 new maintenance technicians by 2026.[427] or even more employer-driven models such as Bitwise Industries. The consortia can also fund pilot programs that test new training and apprenticeship options, partnering with third-party providers when appropriate, encouraging their adoption throughout the industry.
    - Of particular interest may be emerging business models that scale training in particular high-demand industries paired with running profitable consulting businesses deploying the talent. Bitwise Industries, for example, does this for IT training and consulting (see 'Relevant Models' below). Possibly this model could be adapted, for example, to "greening" consulting.

- **Alignment of private/public training sectors** – The above track does not preclude work with the education and private training sectors, which still play a key role in talent development. The consortia can also provide opportunities for all related players to collectively assess their offerings in terms of credentials,[428] certificate, and degrees, identifying opportunities for tighter alignment of offerings and coordinated programming, to minimize duplication of efforts and more completely address talent demand. Over time, the goal is for the private sector to naturally engage and partner with university and college training programs.

> "The workforce development system currently does not include enough wraparound services, such as childcare, transportation assistance or financial literacy."
>
> *– Political leader*

Note that any workforce initiatives implemented should also coordinate with organizations providing the necessary wraparound services (e.g., childcare, transportation assistance) to help them succeed.

This program may leverage existing initiatives underway, such as:

- Future Ready Oregon industry consortia[429] - Three statewide industry consortia are being assembled around healthcare, manufacturing and technology – largely around targeted recruitment strategies. This $1M effort to pilot industry consortia is in the early stages of development.

Relevant Models

Relevant models and resources include:

- **Employer-led Industry Consortia**
    - U.S. Chamber of Commerce Foundation's Talent Pipeline Management (TPM) Initiative

[427] Ibid.
[428] Interviews also pointed out the need for greater recognition of foreign credentials.
[429] https://www.oregon.gov/highered/policy-collaboration/Pages/Future-Ready.aspx

    - Talent-to-Industry Exchange (TIE), managed by the Mid-America Regional Council (MARC) in Kansas City - has helped assemble collaboratives in Skilled Trades
    - Executive Roundtable Program in Milwaukee, WI[430]
- **Industry-Specific Training and On-Ramps**
    - American Airlines maintenance worker program – in partnership with the Aviation Institute of Maintenance in Chicago, American Airlines is training maintenance workers for their facilities[431]
    - Accenture Apprenticeship program – a year-long on-the-job training and coaching program that provides a pathway to a full time role[432]
    - Bitwise Industries - trains people with tech skills, building on-ramps for those traditionally left out of the technology industry; also has major tech consulting and real estate businesses to deploy trainees and generate program revenue[433]
    - Worker Education and resources Center (WERC) – develops curriculums and assists with placement into public service jobs in Los Angeles County[434]
- **Skills-Based Hiring Practices**
    - TalNet - brings cohorts of Michigan-area employers together to employ an evidence-based selection model around hiring based on skillset assessments[435]
    - OneTen - hires, promotes and connects Black individuals with jobs, using a skills-first approach[436]

Next Steps

Recommended next steps include:

- Identifying the first industry for consortium organizing, based on the criteria mentioned above, among others (e.g., private sector engagement, ecosystem scale/quality, collaboration environment and opportunities); in addition, identifying available funding (e.g., Inflation Reduction Act opportunities to inform the development of workforce programs for building decarbonization).
- Recruiting industry champions to co-lead socialization of consortium, recruit other first adopters, Advisory Board members, etc.
- Forming Advisory Board with representatives from the private sector, education, training providers, WDBs, etc., to lead design of consortium and plan/manage socialization activities (one-on-one networking, events, working groups)

Targeted Scale-Up Support

Overview

Greater Portland offers a wide array of resources for early-stage entrepreneurs – reflecting the culture of Portland as a city of tinkerers: those that enjoy building new things. While early-stage entrepreneurs face challenges accessing the available resources, organizations like Prosper Portland have begun to address this through federally-funded business assistance programs.

Unlike the array of resources available to start-ups (if they can find them), greater support for scale-ups is needed. Not only are there insufficient resources, but the institutional and public culture does not support

[430] https://www.mmac.org/executive-roundtable-program.html
[431] https://www.chicagotribune.com/business/ct-viz-biz-airplane-maintenance-hiring-20221102-nnzt6dji6rg5raggagyf7q6hwm-photogallery.html
[432] https://www.corpcoalition.org/business-unusual/accenture-apprenticeships
[433] https://bitwiseindustries.com/
[434] https://werctraining.org/
[435] http://talnet.org/aboutus/
[436] https://oneten.org/about/mission/

high-growth businesses. BIPOC-led firms particularly have a harder time accessing resources (both for start-up and scale-up, and are too often limited to lower growth businesses). Currently, scale-up support is targeted to a narrow group of firms that will grow quickly (e.g., software). Greater technical and financial assistance is needed for innovations in sectors like clean tech or advanced manufacturing, or to support faster-growing firms in food & beverage manufacturing. Each of these sectors requires very specific and targeted support, tailored to their industry and stage of growth. For instance:

- **Clean Economy:** Many emerging clean economy innovations face unique barriers to commercialization (e.g., long commercialization timeline, risk-averse customers such as utilities or large industrial users, need for specialized space for product testing, need for patient capital and funders that understand the complexity of the product).
- **Athletic & Outdoor:** Apparel/textile companies have expressed an interest in entering the textile upcycling market; that is, reusing textiles from their own operations or possibly other corporations and creating new clothing as well as rags and yarn for reuse. Barriers to scaling are often regulatory (e.g., permit processes, zoning restrictions, need for subsidies) and there is a need to address supply chain gaps in an emerging market.
- **Food & Beverage Manufacturing:** Many companies in this sector start as small batch producers serving local consumers and businesses – and are in need of specialized scale-up resources. Scale-up support could include specialized industry connections, connections to regional and national supply chains and markets, technical support and working capital for expanded operations and exporting beyond the region, or access to co-packing spaces.

Recommendation

Portland should build on existing programs to increase the depth and duration of **targeted scale-up support**. Deep, sophisticated business and finance support services enable firms to scale-up their operations and grow into established companies. This program could be an expansion of existing programs:

- Inclusive Business Resource Network (IBRN) – provides one-on-one advising to businesses, alongside connections to partners that provide loans or grants.[437]
- PDX Small Business Hub – Provides small business resource navigation and connections to partners (who provide business advisory services).
- Technology Association of Oregon – provides mentorship support[438]
- Built Oregon Accelerator – provides mentorship support[439] (and, services are accessible through the IBRN network)
- Community Co-Pack – a low barrier contract manufacturer that incubates and scales BIPOC and women-led businesses. Currently activating a community-oriented production facility to support a more equitable and inclusive consumer products industry.[440]

While these programs already provide assistance to businesses in navigating resources and receiving advising and mentorship support, there is opportunity to expand the depth of assistance provided, as well as the industry- and growth-stage-specific nature of mentorship. IBRN and the PDX Small Business Hub could continue to connect businesses with an advisor and resources for lighter-touch assistance – and provide a navigator/clearinghouse function to guide firms through various available resources. Fundamentally, scale-ups need more sophisticated and tailored support from experts experienced in their industry and stage of growth, ideally in an on-going relationship, who can help with business growth

[437] https://prosperportland.us/portfolio-items/inclusive-business-resource-network/
[438] https://www.techoregon.org/
[439] https://www.builtoregon.com/accelerator
[440] See, https://www.communitycopacknw.com/

planning and execution, including through accessing a network of specialized business and financial resources.[441] Existing programs (not just or even primarily in Portland, but by historical design) tend to offer more "generic," short term advice without getting to know and work as deeply with the business and owner. Existing programs could be expanded to connect businesses with these more specialized experts or "mentors", who help put together and guide execution of a customized business growth plan (based on the needs and barriers to scaling of each business).

Expanding this program will first require building additional program infrastructure (e.g., staff including a Program Manager and "concierges" to field business support requests; a robust CRM system; a clear operational process), and identifying the business types and industries most in need of support (e.g., BIPOC-owned; firms in high-growth clusters). This program could build upon its network of mentors and resources to provide different industry-specific "tracks" offering (1) mentorship in a variety of industries; (2) an expanded network of specialized services (e.g., lawyers, accountants, marketing and finance professionals) that businesses with their mentors could access as needed to implement growth plans; and (3) an expanded network of partner programs (e.g., those currently working with IBRN and PDX Small Business Hub, as well as cohort-based courses). The program would target SMEs with growth potential.

As an example of how the program could operate:

- Concierges screen businesses and match them with the right mentor.
- Mentors begin with a deep assessment of the particular firm's challenges and opportunities, and put together with the business owner a customized scale-up business plan. It will be important to create a diverse mentorship network, representative of BIPOC and other underserved groups in the Portland region – as being matched with a mentor with similar life experiences and/or racial identification will help business owners to establish trust with the mentor, and will help businesses receive culturally-relevant guidance.
- Mentors deliver services that may include (but are not limited to) business planning, management advising, market analysis, product development, certification, production and finance.
- Mentors also connect the business with specialized services or partners to execute on the plans.

Another option to expand partner programs is to bulk-buy services from private sector business consulting and services firms and then offer their discounted services to businesses, although this would be a more complicated program infrastructure to set up.

Relevant Models

Relevant models include:

- SDA Stimulus Program[442]
- Baltimore BASE Network[443]
- Motor City Match[444]
- NYC Business Solutions Centers[445]

[441] One of the attractions of the scale-up venture fund model is that it brings industry expertise with deep, on-going engagement through combining finance and management support.
[442] https://southlanddevelopment.org/mid-sized-small-business-owners/
[443] https://www.baltimorebasenetwork.org/
[444] https://www.motorcitymatch.com/
[445] https://nextstreet.com/small-business-services/

Next Steps

Recommended next steps include:

- Determine whether this program could be run as an extension of Prosper Portland's existing programming or should be run by a third party group.
- Identify staff (e.g., Program Manager and concierges).
- Identify the skillsets needed from mentors across each industry, and begin to recruit a broader mentorship and specialist network.

Industry-Specific Financial Products

Overview

The region has funding available for early-stage startups - but there are important gaps in the funding environment, particularly for firms looking to scale. The valley of death at the end of product development remains a substantial challenge; specific difficulties are also faced by BIPOC entrepreneurs; and appropriate resources (e.g. patient working capital) are scarce for companies seeking to scale up. In particular, there is a need for greater funding to enable:

- Firms to scale in specialized sectors (e.g., clean tech, advanced manufacturing, food and beverage manufacturing)
- BIPOC entrepreneurs to secure growth capital

Recommendation

The "Targeted Scale-Up Support" strategy will assist businesses with developing tailored growth plans (including capital needs), and then with securing appropriate funding to help implement them and scale. This initiative proposes taking a step further to fill gaps in the region for mid- and later-stage funding, particularly targeting specific sectors and BIPOC entrepreneurs. Possible funds that could be developed include:

- **Low-Interest/equity fund for targeted investments.** Expand availability and types of loans (larger capital loans with patient repayment terms, equipment financing, low-interest loans, and forgivable/convertible loans). For instance, offer companies forgivable loans in exchange for limited equity. Create a revolving fund that can provide working capital to targeted sectors, filling a major gap left by traditional financial institutions and venture investors.
- **Inventory financing for product companies.** This capital layer has not existed in Portland; the ISO could work with traditional lenders and perhaps SBA to create this kind of funding facility.
- **Industry specific scale-up funds** – which take equity or quasi-equity positions and bring management, Board and other active participation.
- Additional fund recommendations can be found in the 'Climate Change Risks, Vulnerabilities, and Opportunities by Cluster' memo, written by Estolano Advisors.

More broadly, the region lacks an innovation champion to execute an initiative like this. These funds can be developed through the "Private-Sector Led Economic Development Initiatives" strategy recommendation – by first convening a working group of private firms and/or investors to more narrowly define the financing needs, risks and opportunities for target sectors, and design and offer viable financial products.

Consider scaling existing programs, such as:

- **Prosper Portland's loan programs (e.g., revenue-based financing)** - These were created to provide stage- and industry-specific financial assistance. For example, revenue-based financing for high-growth, early- and growth -stage companies with solid but irregular revenue streams (but often few hard assets to provide security) that are unable to secure bank financing or venture capital. Revenue-based financing combines features of bank debt and equity, without the dilutive effects of the latter and the inflexible repayment schedule of the former. Repayment of the financing is based on a percentage of the borrower's monthly revenue rather than a fixed amount. The payments fluctuate with the financial performance of the business, with payments increasing when revenue is strong and decreasing when it is lower. Monthly payments are made until a pre-defined return multiple, internal rate of return or maturity date is reached, at which point the debt is paid off.

Relevant Models

Relevant models (in addition to more conventional scale-up funds) include:

- LARTA in LA,[446] as an example of an organization that provides connection to funding as well as invests in innovators
- Allies for Community Business term loans and lines of credit[447]
- Utah Capital Investment Corporation[448]
- Black Business Investment Fund[449] provides education, training, loans, and investments to Black businesses in Florida
- MEDA[450] provides business consulting, commercial lending and contract opportunities for BIPOC businesses

Next Steps

Recommended next steps include:

- Partly in connection with other strategies identified here, a more systematic inventory of funding needs in targeted sectors and of funding availability should be undertaken to further specify needs, likely deal volume, financial products and so forth. This will effectively serve as market analysis for a business plan for new investment program(s).
- Determine based on the analysis what existing or new institutions can best deliver the financial products.

Note that both the "Targeted Scale-Up Support" and the "Industry-Specific Financial Products" strategies would be, as appropriate, closely coordinated with and perhaps delivered by industry specific and innovation initiatives, including those described below. For example, a green products accelerator might include or avail itself of both of these other initiatives.

Growth of Green Products and Services

Overview

There is enormous opportunity to grow the clean economy, to execute Portland's vision to drive economic growth through climate-related innovation and product development. Portland is well positioned to become the model "green" city, both creating the demand conditions for green products and services, and

[446] https://larta.org/about/
[447] https://a4cb.org/services/loans/
[448] http://utahcap.com/
[449] https://bbif.com/
[450] https://meda.net/

becoming a global leader in providing some of them. Portland already has strong demand conditions as well as key production activities (e.g. green architecture consulting services) to build upon.

There is opportunity to leverage Portland's legacy "green" services strengths to make Portland the place where new green products and services are invented and commercialized – ranging from low-carbon materials, to products to support the smart grid and EVs, to products created from recyclables and waste, to sustainable food product R&D. In addition, the region's strong software workforce has the potential to be upskilled to support innovation within these emerging industries.

Recommendation

Portland already has a major initiative underway focused on both economic growth and climate resilience: the Clean Industry Hub Initiative. BPS is undertaking a landscape assessment[451] for the planned Hub, which will recommend actions to accelerate reductions of carbon, pollution, and waste from heavy emitting manufacturers in Portland and facilitate the transition to a circular, clean, and inclusive economy. The Clean Industry Hub will address opportunities and challenges to making this transition, and may be place-based, virtual, or a combination. The landscape assessment and roadmap will likely be completed by mid-2023.

There are also opportunities to undertake "green" initiatives that are separate from the Clean Industry Hub, but aligned with its targeted sectors and programming, These may include:

- **Grid modernization software and hardware products –** Portland has strong R&D capacity in both renewables and storage solutions. Grid modernization involves scaling grid infrastructure (e.g., capacitors, inverters, specialized semiconductors, transmission systems, switches, etc.), creating smaller-scale batteries and units to enable distributed generation, as well as developing software solutions that enable better communication and coordination between energy generation, storage and distribution. Portland has a strong tech workforce, many of which can be upskilled to develop software solutions.
- **Decarbonization consulting** - Green process consulting, to decarbonize specific sectors (e.g., manufacturing) - also leveraging IRA/IIJA funding. This may be accomplished through an advisory group, convened by the City in partnership with universities, to implement. This type of technical assistance could be made available to businesses with a focus on reducing their emissions by implementing decarbonization technologies.
- **EV Readiness consulting** - for instance through public-private partnerships focused on building readiness for transportation electrification, running vehicle-to-grid energy pilots. This is also an opportunity to leverage federal EV funding through IRA/IIJA[452] and local PCEF funds and collaborate with the City and state.[453]

There is opportunity to accelerate entrepreneurship to develop electrification and grid modernization products, as well as accelerate manufacturing of these products. The Clean Industry Hub may provide one avenue to do this, but other ideas to grow this sector may include:

- **Climate X Prize** – develop a major, annual financial prize given to an entrepreneur with a disruptive idea in electrification or grid modernization
- **Utility Partnerships** – strengthen utility partnerships with entrepreneurs or early-stage companies to assist in testing/integrating their products into the grid

[451] This project will identify and assess the merits, actions, and feasibility of clean industry hub options, providing answers to specific questions regarding geographic scope, current gaps and priorities, industry needs and preferences, policy and finance tools, lessons regarding design and implementation of successful clean industry hubs, and suggested next steps.
[452] See, https://www.atlasevhub.com/data_story/3-billion-in-federal-funding-for-evs-to-date/
[453] See, https://goelectric.oregon.gov/our-strategy

- **Industry-led employer consortia** – Gathering industry leaders in electrification and grid modernization could lead to the creation of new workforce programs to fill anticipated gaps in the future Clean Economy workforce, or collaboration to execute one of the strategies above, etc.
- **Manufacturing Innovation Center** - similar to mHUB [454] (a Chicago-based HardTech innovation center) in conjunction with OMEP – specifically to help prototype and produce green products, providing innovation, production and scaling synergies between entrepreneurs, small and large companies through shared workspace and specialized equipment, product development consulting and network services, accelerators, hackathons and so forth.

Relevant Models

Relevant models include:

- Hydrogen Cluster in Scotland, which has a space to demonstrate and tinker with products
- Kalundborg Symbiosis in Denmark
- Greenpoint Manufacturing and Design Center in NY[455] creates and sustains manufacturing space (often small-scale), and the Urban Manufacturing Accelerator Fund assists other nonprofits in developing similar properties[456]
- mHUB,[457] a HardTech innovation center with a range of programming including prototyping labs, industry partnerships, and accelerators

Next Steps

Recommended next steps include:

- Identify Clean Economy private sector leaders who could lead the development of an initiative around this strategy.
- Identify areas of intersection/alignment with the Clean Industry Hub as the concept is realized.

Materials Innovation Strategy

Overview

Demand for innovative materials is growing across industries. Within Metals and Machinery, there is demand for metals components that are increasing in complexity and varied in material composition – for instance, lighter-weight aerospace components, or new alloys for solar panels. Within the Clean Economy, demand for low-carbon products is growing. And within many other sectors, demand is growing for products made from recycled components, plant-based components, or other replacements for carbon-intensive products.

Portland has existing R&D strengths in material composition, both in private-sector (e.g., recycled wind turbines; repurposing trash for non-structural building materials; low-carbon building materials) and at universities (e.g., metal variations for electrolyzers). There is opportunity to build on these strengths to research and develop innovative low-carbon products (e.g., low-carbon steel, using recycled materials in batteries).

Prototyping these products will also require process innovation so that components can be produced in smaller batches for niche uses (and machines can be re-programmed quickly to produce different parts). With existing strengths in ferroalloy manufacturing and the potential for new partnerships in 3D Printing

[454] https://www.mhubchicago.com/about
[455] https://nextcity.org/urbanist-news/manufacturing-fund-launches-to-support-industry-and-jobs-in-nyc
[456] https://anhd.org/project/urban-manufacturing-accelerator-fund-umaf
[457] https://www.mhubchicago.com/

(e.g., with AutoDesk, OMIC), Portland could lead the way not just in inventing but also in prototyping innovative material compositions for application in aerospace, the building industry, clean energy, athletic apparel, food & beverage – among others.

There is also a need and opportunity for greater awareness of both existing and emerging manufacturing career pathways (and of the improved job quality and pay), as well as greater networks/connections into these jobs.

Recommendation

Consider developing a **Materials Innovation Strategy** to develop and pilot new products in the region, particularly products that also drive climate resiliency goals. This could take several forms, for instance:

- Improve collaborative research between private sector firms and universities (or research labs) to develop new product compositions; in particular, there is significant opportunity within the sustainable building material industry (e.g., hemp-based concrete, light weight aluminum, mass timber). This can involve replacing carbon-intensive materials (e.g., steel, concrete) with lower-carbon alternatives (e.g., wood) – or even products like straw or hemp insulation, which are renewable.[458] New low-carbon building products are constantly being developed (for instance – using rice straw to make MDF panels;[459] 3D printing from recycled forest products[460]). An innovation collaborative could first conduct market research to identify the most promising applications of material innovations to industry.
- Launch a grant program for manufacturers making green products (e.g., green steel).
- Develop new certificate programs to train the future workforce needed to both develop and manufacture products
- Create a physical center to host collaborative innovation efforts and to prototype and test materials, and perhaps develop and deliver commercialization and accelerator programs.

There may be potential to partner with existing private sector firms or universities; for instance, the PSU Center for Electron Microscopy and Nanofabrication (CEMN) has already collaborated with over 60 companies since its inception. Pacific Northwest National Laboratory (PNNL) may provide opportunities for collaboration in this subject area.

Relevant Models

Relevant models include:

- Jabil's Materials Innovation Center in Chaska, MN[461]
- University of Leiceste Materials (Metallic and Alloys) Innovation Centre[462]
- Ames Laboratory Critical Materials Institute[463]
- Collaborative Innovation Center of Steel Technology (CICST)[464]
- Germany's research around green steel[465]
- MR Manufacturing career pathways services[466]

[458] https://www.aia.org/articles/70446-ten-steps-to-reducing-embodied-carbon
[459] https://www.architectmagazine.com/technology/products/sustainable-building-materials-for-low-embodied-carbon_o
[460] https://umaine.edu/news/blog/2022/11/21/first-100-bio-based-3d-printed-home-unveiled-at-the-university-of-maine/
[461] https://www.jabil.com/services/additive-manufacturing/engineered-materials/materials-innovation-center.html
[462] https://www.twi-global.com/innovation-network/innovation-centres/materials-ic
[463] https://www.ameslab.gov/cmi
[464] https://en.ustb.edu.cn/Research/CentersInstitutes/b050012a602647f797c46e715bc04e50.htm
[465] https://www.common-wealth.co.uk/reports/steel-the-deal-the-race-to-the-top-for-european-green-steel
[466] https://mfgren.org/career-pathway-services/

Next Steps

Recommended next steps include:

- Identify a group of stakeholders to partner in development of the strategy.
- Conduct additional market research to identify the initial materials and applications of focus.
- Work with private sector leaders in Portland's industrial harbor economy to develop a partnership/campaign to raise awareness about high quality manufacturing jobs and pathways to access them, particularly surrounding materials innovation.

Inclusive Growth of the Food & Beverage Cluster

Overview

Portland appears to have a major growth opportunity with its food and beverage manufacturing cluster that aligns with climate resilience and inclusive growth, based on overall market trends and the assets of the region. However, job quality - from wages to working conditions - is a real concern, and has complicated previous attempts to prioritize the cluster's growth. Ironically, the overall trends in modernizing food and beverage manufacturing are producing more attractive workplaces, better jobs and job ladders. These conditions seem to present the opportunity for Portland to focus on expanding this cluster with an inclusive growth emphasis that centers modernization accompanied by quality job development (as articulated in CWWC's recent Quality Jobs Framework[467]).

Recommendation

Several interviewees cited the absence of a "center of gravity" for Portland's food and beverage manufacturing cluster, and private sector stakeholders have expressed enthusiasm for being a part of the creation of such a hub. Portland should thus consider developing a version of the optimal model for this kind of lead organization: an **inclusive cluster organization.**

Cluster organizations[468] are designed to promote growth of a strong cluster, to enable the continuous innovation needed to be competitive, and build a globally competitive region. Cluster organizations consider all aspects of growing a cluster – technology, workforce, market development, entrepreneurship, supply chains, exports, etc. This requires deliberately creating the synergies that make clusters succeed by efficiently connecting firms to each other, researchers, entrepreneurs, workforce organizations, investors, suppliers, supporting industries, and data analytics.

In this case, the opportunity is to explicitly create an inclusive cluster organization, one of whose areas of joint focus is growing the industry through broader inclusion as entrepreneurs, owners and employees. Key to the formation of any cluster organization is buy-in, championing, and leadership from the private sector. Often this is one of the hardest steps in cluster organizing, especially persuading potential competitors that there are benefits to their individual companies from collectively growing the sector. The city could contribute the staffing to manage the organizing process, while quickly putting industry leaders at the fore.

As a hub for regional food and beverage manufacturing firms and stakeholders, the cluster organization would be a natural point from which to develop initiatives that focus on major inclusive, climate resilient

[467] https://www.worksystems.org/sites/default/files/CWWC%20Quality%20Jobs%20Framework.pdf
[468] Note that a cluster organization is distinct from a traditional industry association, in which firms join together to primarily to address externally facing challenges or opportunities, primarily through lobbying and policy work, for example to limit regulations and taxes. Custer organizations are instead focused on firms collaborating to grow the industry internally, so to speak: addressing issues like workforce development, overall industry innovation resources, joint market development, etc.

growth opportunities. The critical mass of industry participants that a cluster organization can provide offers a substantial set of resources from which to draw - in expertise and funding - and can create a whole more than the sum of its parts, increasing the likely impact and reach of cluster-specific growth initiatives. Portland could use this platform to guide implementation of initiatives, for instance:

- **Resource for firm modernization** – A cluster organization could be a resource to help food and beverage firms modernize, implementing new processes and technologies. This may be done in conjunction with the "Targeted Scale-Up Support" strategy. Greater innovation by food and beverage companies, as well as the addition of new technologies to the market, often leads to higher paying jobs, better career ladders, and higher value products (that generate higher revenues).
- **Export assistance** – As Portland continues to cultivate food and beverage entrepreneurs, especially craft producers, there is opportunity to assist these firms in expanding their distribution channels, exporting to new regions – and in navigating the challenges of doing so.[469] Reference the "Export Strategy" for additional details.
- **Implementation of the Quality Jobs Framework** - CWWC's Framework articulates a case for the need for and benefits of quality jobs - not just for employees, but for employers as well, in terms of lower turnover, increased productivity and innovation, etc. Framework implementation activities could be tested with a cohort of companies, with feedback from the process informing further Framework application, in food and beverage and otherwise.
- **Plant-Based Product R&D Initiative** - To capitalize on the market opportunity in plant-based products and to leverage Portland's relevant assets - connections to OSU's food research and innovation resources, craft and entrepreneur activity, proximity to diverse local crops - the cluster organization can help support deeper investment in R&D and commercialization programs in this market. The cluster organization is highly unlikely to directly implement such a program - rather, it can serve as the convener of the relevant parties and bring private-sector participants to the table to inform the true market potential and opportunities relevant to Portland's cluster.

Relevant Models

Relevant models include:

- The Chicagoland Food and Beverage Network (CFBN),[470] a cluster organization that connects over 4,000 companies in the Chicago region to collaboratively drive innovation and growth.
- America Makes,[471] a public-private R&D initiative

Next Steps

Recommended next steps include:

- Assembling key cluster leadership - manufacturers, suppliers, industry services providers (lawyers, bankers, consultants, etc.), education - to socialize the cluster organization concept and begin recruitment of other early adopters
- Formation of early working groups around Resources for firm modernization, Export assistance, Framework implementation, and Plant-Based R&D - assembling relevant stakeholders and beginning ideation and planning activities around these concepts, developing them in parallel with the cluster organization itself

[469] https://today.oregonstate.edu/news/oregon-state-study-focuses-challenges-facing-food-and-beverage-companies-seeking-export
[470] See Chicagoland FOOD report, which recommends an initiative for greater inter-firm collaboration: http://rw-ventures.com/wp-content/uploads/2017/01/Chicagoland-FOOD-Report_Final.pdf, which led to the creation of an inclusive cluster organization, CFBN: https://www.chicagolandfood.org/page/about-us
[471] https://www.americamakes.us/about/

- Early design activities and business planning around organization itself - structure, governance, programming, finances, operations - and on Framework and R&D initiatives - management, staffing, funding, etc.

Align with Central City and Commercial Corridors Plans

Overview

As the distribution of jobs and workers shifts across the region, there are opportunities to improve the region's spatial efficiency – to increase economic efficiencies, reduce climate effects, and enhance equity. Addressing the geography of jobs may involve locating major economic investments and targeting business growth near underserved areas. For any of the strategies in this plan, it will be important to consider where they are located (for physical centers) and to whom they are accessible (for both physical and virtual initiatives). Strategies like this and others are explored in more detail in the "Spatial Efficiency" section, and may assist in the long-term improvement of the region's economic geography.

The more near-term priority is to reimagine and revitalize downtown, as many of the negative externalities associated with under-managed growth are becoming increasingly visible there. Downtown faces challenges such as:

- A negative feedback loop of public safety issues, leading to fewer visitors and workers downtown, leading to further entrenchment of unsafe conditions.
- High office vacancy rates; increased remote work
- Ranked #60 out of 62 downtowns across the nation in post-pandemic recovery rates

Broadly, there is opportunity to revitalize and rebrand the downtown through creating a new balance of business activity with residential living, entertainment and cultural amenities, with a vibrant "good for good business" identify. Although specific actions to address the negative externalities that are increasingly visible downtown are beyond the scope of this report, these issues impede growth. It will therefore be important for the strategies and initiatives recommended in this report to be coordinated with the work of agencies addressing houselessness and public safety.

Recommendation

Portland has two in-progress studies that will provide recommendations for rebranding and revitalizing the downtown area:

- Central City Plan
- Commercial Corridors Plan

Therefore, to revitalize Portland's downtown – addressing negative externalities while also planning for sustained future growth – this strategy will flow from these two plans for further actions.

For further assessment as the Central City Plan and Commercial Corridors Plan are completed, ideas are listed below that have been surfaced throughout this project's analysis:

- **Address public safety and houselessness.** Support the work of other agencies addressing public safety and houselessness,[472] and support best practices that have demonstrated success in other regions. For instance, as seen in Philadelphia, the addition of highly visible, uniformed,

[472] For instance, for further examination: The Revitalize Portland Coalition has made recommendations to city government to address street-level homelessness and cleanliness to get employees and tourists to return to the city.

unarmed public safety ambassadors who can patrol on foot and on bikes could provide a reassuring presence to returning workers, shoppers and visitors.[473]

- **Develop incentives to attract workers & businesses** downtown (e.g., provide grants for new businesses occupying vacant retail/commercial space; provide amenities and offset commuting costs for workers).
- **Attract more downtown visitors** through events, other attractors (e.g., sidewalk vending, food trucks, and seasonal fairs). Working in partnership with downtown restaurants and retailers, the BID could be actively promoting all the amenities of the downtown and work with arts and cultural organizations to program parks and public spaces near office buildings to restore on-street vitality.
- **Expand downtown housing stock.**[474] Undertake a comprehensive look at class B and C office buildings downtown to determine which may best be candidates for conversion to residential or hotel use, what barriers may exist and what incentives might accelerate the process of conversion. A vital downtown office sector is essential, but if many firms adopt a hybrid work model, using their offices for collaboration and mentoring no more than two to three days per week, the demand for office space long-term may decline. While older office space remains essential for start-up and emerging businesses, removing obsolete inventory can not only shore up demand and rents in Class A space, it can add new residents to the downtown, diversifying land-use and creating new sources of demand for downtown restaurants and retail. See in-progress OMSI waterfront development as an example.
- **Encourage development of small-scale creative & innovation hubs** that serve as anchors of economic and social activity (e.g., maker spaces, 3D printing facility, artist studios).
- **Deliver new business development services for existing and new businesses.** Help stabilize existing businesses in the downtown area (e.g., matching them with funds to expand operations) while also creating new opportunities for up-and-coming businesses – potentially in partnership with the "Targeted Scale-Up Support" Strategy or "Industry-Specific Financial Products" strategy.
- **Encourage mixed-use development and flexible use.** More than any other place in the city, downtowns have to be nimble and respond to economic shifts, both anticipated and unexpected. There is opportunity to develop real estate sites that are flexible in their use and serve different functions. For example, a warehousing & distribution building could be converted into a production plant or commercial site that houses multiple ventures.
- **Grow Portland's BIPOC developer pool.**[475] This, in turn, increases housing stock, encouraging business formation and growth, and building trust with city government.[476] Current financing structures and support systems are not sufficient to grow the community of developers of color. Disinvested communities typically do not have the generational wealth nor business capital on hand to start or expand businesses, and traditional lending sources often offer unsuitable loan terms. More growth opportunities and support are needed, including partnerships with majority developers, driven in part by owners, funders, government and other stakeholders. Some places are deliberately building BIPOC developer capacity through targeted partnerships, support and staged progression into bigger deals, often starting by, for example, having CDFIs, CDCs, BIPOC

[473] Philadelphia's bike patrols, Community Service Representatives, and Ambassadors of Hope are further outlined in the 'State of Center City Philadelphia 2022' report, available at: https://centercityphila.org/uploads/attachments/cl2aifk0z9tn0leqdfiq7c5ef-socc-2022-web.pdf. There may be opportunity for Portland to develop its own homeless outreach teams that partner trained social service, drug addiction and mental health providers with BID staff and crisis intervention trained police officers and engage the houseless who are camped on downtown sidewalks, provide a van to transport individuals to the broad range of services provided in Portland, and, after offers of services and shelter are extended multiple times, police, as part of a coordinated encampment resolution strategy, can ask campers to move. Paul Levy, President and CEO of Center City District in Philadelphia, was part of the consulting team that produced this report and is able to provide additional resources on downtown revitalization work – building on the list included here.

[474] According to the ECONorthwest Central City report, central city areas where more people live and events are regularly held (Pearl District, South Waterfront, Goose Hollow) have seen growth during the pandemic. Meanwhile, core downtown areas with lower population densities (due to lower residential use and higher office footprint) have experienced declining conditions.

[475] Note that this, of course, is not limited to downtown redevelopment.

[476] Interview with real estate professional

and mainstream developers collaborate initially to build the experience and portfolio of developers of color within their own neighborhoods.[477]

- A campaign can/should be launched to **rebrand Portland** as a business-friendly city that achieves many of the objectives outlined in this plan (see "Vision" section for a list), a city that: offers quality workforce and jobs (particularly for BIPOC); has strong, inclusive cross-sector institutions that execute economic development initiatives; provides a supportive environment for good businesses. This campaign could be carried out locally and nationally with entrepreneurs, and public, private, and community leaders.

Relevant Models

Relevant models include:

- Public Safety Ambassadors[478]
- Philadelphia More Beautiful Committee[479]
- For four years, the CCD has carried out this "co-service delivery model" of outreach to the homeless, persuading 140 individuals to accept services and come off the streets in 2021 with 120 accepting services so far in 2022 with no arrests or citations issued by police throughout the duration of the program[480]

Next Steps

Recommended next steps include:

- Revisiting this strategy after the Central City Plan and Commercial Corridors Plan are completed.

Export Strategy

Overview

Greater Portland specializes in a number of goods and service industries that are highly tradeable – and likely will be in high demand in emerging markets. This creates significant potential to increase exports of goods and services. There are many benefits of export strategies: exporting fosters innovation; enhances global competitiveness; and of course leads to higher revenues and wages. Simultaneously, in line with Portland's goals for greater climate action, there is opportunity to develop innovative export strategies that also help companies offset GHGs. Assistance with export strategies is particularly needed for small and mid-sized businesses.

Recommendation

Components of an export strategy could include:

- Build pipelines between high demand product or service producers and growing foreign markets
- Enhance the export ecosystem through coordination of services and firms (e.g., create/align networks of current and interested exporters based on industry and market interests; establish a provider network and pathways to navigate for firms; conduct peer mentoring)

[477] See, e.g., the CEMDI program in Chicago (available at: http://www.cemdi.org/wp-content/uploads/2021/12/CEMDI-2021-SR.pdf).
[478] https://centercityphila.org/pressroom/ccd-expands-public-safety-outreach-crime-prevention-programs
[479] https://www.phila.gov/programs/philadelphia-more-beautiful-committee/
[480] https://centercityphila.org/ccd-services/public-safety/homeless-outreach

- Provide export promotion grants for small and mid-sized enterprises (e.g., to subsidize costs for market research or promotion)

An export strategy could be implemented by scaling an existing or proposed program, or through creation of an export connector. For instance, this strategy could proceed as:

- A component of the "Targeted Scale-Up and Mentorship Support" strategy; one component of the mentorship that firms receive can be tailored assistance to connect firms with foreign markets
- A new institution acting as an export connector. For instance, a newly created Innovation and Growth Office (IGO) at the City could provide export connections – acting as a liaison between the business community and the export services offered by the Department of Commerce and the State Department, and potentially EEX-IM Bank as well.
- Building partnerships at the state level, for instance with Business Oregon's Export Promotion Program.[481]
- Building the capacity of The Port of Portland, which is already working to create more partnerships with Asian markets such as Vietnam, in hopes that small business owners, especially BIOPC-owned, can begin to export internationally.

[481] https://www.oregon.gov/biz/programs/export/pages/default.aspx

VIII. CONCLUSION

The City and region have been a model for growth in the early stages of the next economy, but have arrived at a key turning point. Failure to manage growth well, including the current challenges, could cause stagnation. On the other hand, this is a moment of enormous opportunity[482] – one where you can establish the model for what it means to grow *well* in the 21st century – to achieve long term, inclusive, sustainable economic growth enhancing prosperity and quality of life for all residents. This plan offers a starting point for creating transformative initiatives and major investments to realize your vision. You have strong assets from which to build – the people, industries, and institutions. What's needed now is to build the institutional capacity – the "you" – to collaboratively refine the vision, strategies and initiatives, to be executed by private, public and civic leaders – *together*. Portland can become a leader for cities across the country, demonstrating what it means to grow prosperous in ways which fully align with improved quality of life, equity and climate.

[482] Not coincidentally: "In the midst of every crisis, lies great opportunity." Albert Einstein