



Growing the
Green
Economy
in Washington State

Exploring an Eco-nomic Center

Executive Summary | March 2019

Full report available at www.cfqc.org



AWC Center for Quality Communities

Acknowledgments

The Eco-Nomics project is sponsored by the Association of Washington Cities Center for Quality Communities (AWC-CQC). AWC-CQC is committed to helping Washington cities respond to a changing climate and culture and bringing together the leadership necessary to build the green economy in Washington State. The project is a collaborative effort with partners from business, government, education, cities, and other organizations.

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The full *Growing the Green Economy* study is published at www.cfqc.org.

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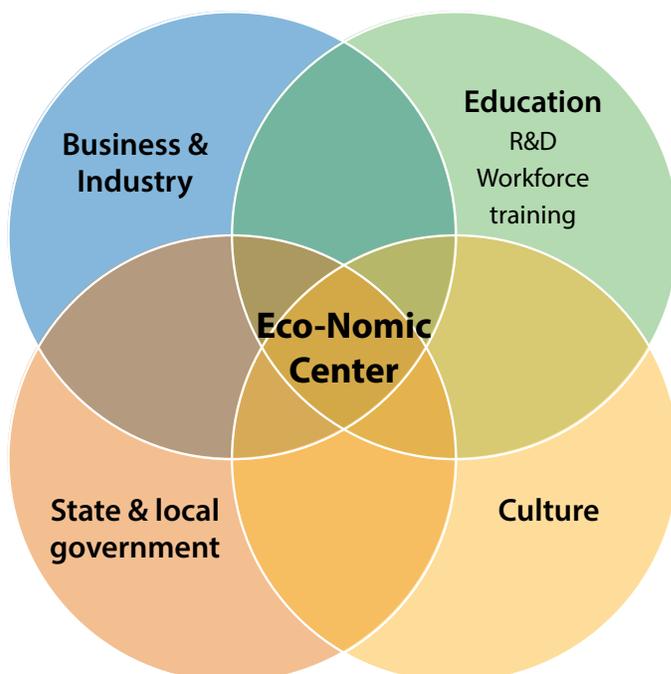
Introduction and Executive Summary

A changing climate creates significant challenges and opportunities on a global, national and regional scale. Governments and businesses around the world are responding to climate change with strategies to mitigate (reduce greenhouse gas emissions and transition to renewable energy) and adapt (prepare for changes in storm events, floods, droughts, fires, sea level rise, and more).

Mitigation and adaptation requires innovative engineering, technologies, and products to address myriad changing circumstances. Responding to climate change also requires developing a green economy with a range of sectors: energy, water, agriculture, transportation, health care, forestry, business, finance, insurance, and more.

The US Defense Department describes climate change as a “...significant challenge for the United States and the world at large”, calling it a “threat multiplier”, increasing severe weather and rising sea levels with destabilizing impacts on food and water.¹ A growing number of scientific assessments point to accelerating climate impacts and call for more urgent action. Successful responses demand new collaborations that more fully engage public and private sectors, academia and NGOs in building the green economy.

Washington State is well positioned as a global center to help build the green economy. Critical state attributes include: strong public and private sector support responding to climate change; corporate and business leadership with global markets and supply relationships; a supportive culture, political will and strong environmental values; world class higher education institutions engaged in research and development (R&D) responding to climate change; and capacity in Internet and communication technology (ICT), artificial intelligence (AI) and venture capital.



Recommendations

- 1 Create an Eco-Nomic Center in Washington State to serve as a clearing house
- 2 Invest in educational R&D and workforce training
- 3 Create a Water Innovation Center in Washington State
- 4 Create a Clean Energy Center
- 5 Integrate ICT capabilities in all four business groups
- 6 Encourage smart grid technologies
- 7 Expand focus on cross-laminated timber
- 8 Expand R&D in agriculture and food production
- 9 Develop different economic models for assessing risk, managing assets, and financing infrastructure

The full study
is published at
www.cfqc.org.

Growing the Green Economy In Washington State (Eco-Nomics) is a high level examination of four industry sectors essential to addressing climate change: energy, water, agriculture and forestry, and building materials. Washington State has deep roots in all four and is recognized as a leader in clean technology in all of them.

This analysis examines how well Washington's economy is positioned to provide new clean technologies, manufacturing capabilities, research and development, and education and workforce training to meet emerging trends and opportunities. The Eco-Nomics project is a first step toward development of an Eco-nomic Center in Washington State focused on the green economy.

Partners

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Community Attributes, Inc. | HDR | King County Parks and Natural Resources
| McKinstry | Puget Sound Energy | Puget Sound Regional Council
Pure Blue | Snohomish Economic Development Alliance
Snohomish and King County Master Builders
Washington State Department of Natural Resources
University of Washington | Washington State University

Summary of findings and recommendations

Washington's relative position as a leader in the four sectors is measured based on the strength of existing economic activity, potential for future development, and the relative position vis-a-vis national and global market demands and trends related to clean technology. The study found potential for new opportunities, business expansion and development in all four sectors. However, in water and energy, Washington State has the potential to emerge as a significant national and global leader. In building materials, and agriculture and forestry, opportunities also exist for lucrative business development and investments.

Specific recommendations for the four business sectors are identified under *Sector Roadmaps and Recommendations* in the full *Growing the Green Economy* study, published at www.cfqc.org. The following are key findings and overarching recommendations:

1 Create an Eco-Nomic Center in Washington State to serve as a clearing house

Building the green economy in Washington State requires collaboration and coordination, advocating for additional resources, and removing barriers. There is an urgency to this work, bringing together elements of the private sector, public sector, higher educational (R&D and workforce training), and non-government organizations (NGOs). Currently, there is no central place identified for this work. An Eco-Nomic Center should be created to bring these elements together.

An Eco-Nomic Center would serve as a clearing house, adding value to work already underway. For higher education, it would help inventory existing efforts in R&D and workforce training. For the private sector and NGOs, the Center would help identify targets of opportunity, promote marketing a clean—green—energy economy and identify and remove barriers. And, for the public sector, the Center would help cut across silos, identify and address barriers, and advocate for policies, infrastructure, resources, and best practices.

“An Eco-Nomic Center would serve as a clearing house.”

2 Invest in educational R&D and workforce training

Economic sectors (industry groups) are defined in part by the interactions of educational institutions with the private sector. Educational institutions provide basic research and workforce training, and the private sector applies these assets in developing goods and delivering services. The relationships are porous, allowing and encouraging human resources to move freely between academic and private institutions, and even between private sector competitors.

“Economic sectors (industry groups) are defined in part by the interactions of educational institutions with the private sector.”

For example, technology sectors centered around the San Francisco, Boston and Seattle metropolitan areas rely on major research universities (e.g. Stanford, Harvard & MIT, and University of Washington (UW) & Washington State University (WSU) respectively) to conduct research essential to those particular industry groups. Workforce training is undertaken by these universities as well as other four- and two-year educational institutions and private sector education and training initiatives.

Washington’s two major research universities (WSU & UW) have nationally recognized programs focused on research and education related to water, energy, agriculture, forestry, and environmental science. Other Washington educational institutions, colleges and community colleges have dedicated R&D and workforce training. For example, the Center for Sustainable Infrastructure (a contributor to this study) partners with the University of Oregon and Portland State University, and Western Washington University’s Institute for Energy Studies is one of the only bachelor’s degree programs in the country to combine technology, economics, business, and public policy at the undergraduate level to prepare students for jobs in the new energy economy. Over the last three years, enrollment in the Institute for Energy Studies has more than doubled.²

Demand for energy workforce training at community colleges across Washington state continues to grow. In the last 10 years, workforce training programs in the state quadrupled, from five to 20. Enrollment in training in key clean energy industries like wind, solar, sustainability, and smart buildings is growing at almost 12 percent.³

As infrastructure and workforce age and new technologies emerge, the burden will fall on higher education to advance R&D and educate and train a new workforce. Education initiatives are needed to prepare for new realities of integrated systems, smart grid, ICT, systems management, new energy efficient products, infrastructure, business, economics, and finance.



The study recommends

Inventory higher educational resources, consider how best to support and marshal them to respond to a changing climate, and target public and private investments to meet new realities.

3

Create a Water Innovation Center in Washington State

The availability and supply of fresh water is a present and emerging crisis across the globe. Climate change will exacerbate this crisis.

All water is local. Addressing water supply is challenging as it is inherently place-bound, shaped by unique geographic, geological and meteorological characteristics. Communities are organized around water sources such as rivers, lakes, aquifers, or wells—all fed by precipitation. Opportunities to improve supply are limited, but include conservation, rain capture, re-use, and wastewater treatment.

While water sources are unique, demands are more similar: potable (drinking and human consumption), irrigation, industrial uses, wastewater (both a supply and demand factor), surface water, renewable energy, and natural resources sufficient to support natural systems. Addressing demand, efficiencies in water delivery, wastewater treatment, and purification present significant opportunities that may be exportable to other localities.

Washington State is well positioned to be a leader in water, serving potentially broad markets. As stated by Egils Milbergs of Pure Blue: “The Global Water Crisis can be an economic development opportunity by creating a water innovation ecosystem that increases the efficiency, resilience and adaptive capacity of Washington's water infrastructure. This can be realized by connecting and aligning players toward shared strategies, goals and outcomes.”⁴

There are markets locally, nationally, and globally for new technologies, products and services addressing potable water, wastewater, irrigation, surface water, industrial uses, and efficiencies. R&D centers in Washington's higher educational institutions are already engaged in this work. Washington companies are developing and applying solutions to water issues. Further developing opportunities will require focused investments and partnerships on the part of public and private sectors and academia. It will also require marketing resources and assets nationally and internationally. Washington State is well positioned to meet these challenges.

Encourage and advance development of One Water concept

One Water is a way of looking at water and resource management in a holistic manner. This approach cuts across traditional utility and water system silos, placing an emphasis on reuse. Unprecedented changes in the water industry provide both a challenge and an opportunity to rethink the fundamentals of how we manage water, wastewater, surface water, and utilities. One Water is integrating systems previously managed separately and valuing natural systems as a part of water resource management.⁵

The One Water concept expands the menu of technology and solutions available to providers and consumers for water recycling, reuse, and integrated systems. In addition to traditional water systems, One Water strategies often involve broader community objectives such as land use, green infrastructure, disaster preparedness, gray water, energy, and more.

Integrated One Water systems can significantly reduce infrastructure costs while improving water resource management. Advancing One Water systems development should be encouraged.



The study recommends

Washington State has the capacity to develop opportunities responding to the growing needs of a parched planet. Leaders in public sector, private sector and academia should come together to consider a Water Innovation Center in Washington State. The key elements are already here.

“The Global
Water Crisis
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development
opportunity.”

Egils Milbergs, Pure Blue

“Washington State is a pioneer in the global clean tech industry.”

4 Create a Clean Energy Center

Clean energy sources and efficient energy use are key to responding to climate change and reducing greenhouse gas (GHG) emissions. Washington State is behind the curve in large scale production of photovoltaic cells and wind turbines relative to China or Germany. However, the State is well positioned to lead in energy efficiencies, energy smart technologies and emerging clean technologies.

Washington State is a pioneer in the global clean tech industry, home to the largest state trade association of clean tech businesses in the U.S. (The Clean Tech Alliance is a partner in this study); one of the world’s greenest buildings (Bullitt Center); companies such as McKinstry and Master Builders Association of King and Snohomish Counties (MBAKSC) ‘Built Green’ program pioneering building efficiencies; leading renewable energy production—anaerobic digesters and waste water biogas-to-pipeline RNG facility; and a #1 ranking for hydroelectricity production in the nation.⁶

Washington has developed competitive advantages across several energy industries according to the Department of Commerce 2017-2019 Proposed Strategic Plan for the clean technology industry: energy generation, energy storage, energy infrastructure, energy efficiency, and transportation.⁷ Many Washington businesses are at the forefront of clean technology, are members of the Clean Technology Alliance, and are contributors to this study including McKinstry, HDR Engineering, and Puget Sound Energy. Washington’s educational institutions are leaders in R&D and workforce training related to clean technologies.



The study recommends

The Clean Technology Alliance provides the essential framework for a Clean Energy and Technology Center in Washington State. Leaders in public sector, private sector and academia should consider this model, focusing investments and supporting clean energy.

5 Integrate ICT capabilities in all four business groups

Washington State has some of the most sophisticated manufacturing technology capabilities in the world with industries such as aerospace, technology, biomedicine, bioengineering, and more. Throughout this study, the integration of ICT is identified as a prospect for new business development. The sophistication of sensor technology is improving while costs are going down. In water and energy, the integration of ICT is already adding to efficiencies and conservation. Integration of ICT in agriculture and forestry and building materials is emerging in many new ways.⁸



The study recommends

Engage Washington’s technology and manufacturing companies, as well as academia and the public sector, in more focused integration of ICT in efficiently managing resources.

6 Encourage smart grid technologies

The smart grid is evolving today, and based on the dynamic nature of energy and ICT technology, it will need to be flexible, capable of two-way functions, simultaneously receiving and sending electrons, and balancing fluctuations in demand. For example, as we increase the numbers of electric vehicles (EVs), home solar power and wind generation, more energy efficient appliances and conservation measures, the grid will need to balance sources and supply of electricity.⁹



The study recommends

Smart technologies and two-way grid systems are priorities for future investments.

7 Expand focus on cross-laminated timber

Cross-laminated timber (CLT) shows promise as a sustainable building material. The advantages of CLT include smaller carbon footprint, construction efficiencies, fire safety, structure and weight, better forest management, and reduced project costs. Research into applications should continue, and the Catalyst project in Spokane can help inform this effort. Additionally, identifying and addressing market and regulatory barriers will help realize the promise of CLT. These include changes to building codes, addressing market conditions that favor traditional materials, and labor issues including training and acceptance in the building industry.



The study recommends

Expand R&D and promotion of CLT, and work with local governments, business and labor to remove barriers.

“New sustainable farming practices are ripe for investment.”

8 Expand R&D in agriculture and food production

Increasing food production and efficiencies in water and energy will help define the future of agriculture in the face of a changing climate. This is an opportunity for targeting new business development and investments. Washington’s higher educational institutions have done impressive work in agricultural research led by Washington State University. For example, the relationship of food, energy and water (FEW) presents opportunities for further R&D in Washington.¹⁰

Additionally, research and applied science in agronomy, biology, bio-engineering, and genetics are prominent in Washington State. Several private companies and NGOs are working in agriculture and the agricultural supply chain including water, waste water, energy, genetics, biology, and more.



The study recommends

New sustainable farming practices are ripe for investments. More investments and business development should be encouraged.

“Recognize risk associated with climate change as a significant economic issue.”

9 Develop different economic models for assessing risk, managing assets, and financing infrastructure

Events associated with climate change (fires, storms, floods, hurricanes, and sea level rise) are occurring with greater frequency and intensity with major impacts on infrastructure. Historic weather and climate patterns are no longer reliable predictors of the future. These events increase risk and uncertainty, and in turn increase capital costs and demand on capital markets.

The United States spends billions of dollars each year to maintain, upgrade and build new water and energy infrastructure. Most nations around the globe are doing the same. Infrastructure projects compete for capital in global markets, often financed with debt instruments running for 20 to 30 years (to 2040 or 2050). In many instances, the infrastructure being built has a life expectancy of 30 to 50 years or more (2050 to 2070+). These time frames correspond with anticipated growing demands for capital spending associated with reengineering and redeveloping coastal infrastructure, responding to sea level rise, and other demands driven by climate change. Competition for capital will likely intensify and new ways and means to finance infrastructure is needed.



The study recommends

Recognize risks associated with climate change as a significant economic issue and develop financial, insurance and legal strategies to address it. Washington's higher educational, business and finance institutions are well positioned to lead in these efforts. Higher educational policy organizations such as the Ruckelshaus Center or the Evans School of Public Policy can be called on to explore these issues.



Methods and data

The Eco-Nomics project is a high-level review of four industry sectors in Washington State (energy, water, agriculture and forestry, and building materials) deemed essential to respond to climate change. The study is not intended to serve as an exhaustive treatment of this subject. Rather, it is intended to identify targets for business opportunities, investments, and policy initiatives to build the green economy in Washington State. This work is limited by budget and time and additional analysis is anticipated for all four business sectors.

AWC-CQC retained Community Attributes Incorporated (CAI) to conduct an assessment and survey of clean technologies, trends, capabilities, and assets globally and in Washington State related to the four industry groups. The “Green Economy Industry Roadmap Meta-Analysis” (Appendix A) analyzed global trends in clean technology reviewing existing literature, research, and interviews with partners and industry leaders.

A wide range of sources were used in the research, compilation and synthesis of the assessment: reports, news articles, data on industry trends from national and international organizations, and more than 30 interviews with industry leaders, government agencies, investors, and trade associations. The assessment did not conduct any original research.

Following the initial assessments, CAI conducted a review of clean technology assets and capabilities in Washington State including industry profiles, leading trends and capabilities, work force and human capital, and research and development. CAI assessed how well positioned Washington businesses and organizations are to take advantage of leading clean technology trends and opportunities.

The scope and scale of the CAI assessment is not intended to provide an exhaustive review of these four industry groups. As the title indicates, it is a meta-analysis of Washington’s strengths, weaknesses and opportunities relative to the dynamic factors associated with climate change and the growing demand for clean technologies.

Using the CAI assessment, AWC-CQC developed the body of the report and Sector Roadmaps. This work included additional engagement with study partners, and additional research including reports from the Center for Sustainable Infrastructure (CSI) and the Metropolitan Center for Applied Research & Extension at Washington State University. The report was then prepared by AWC-CQC for distribution to study partners, Washington cities, economic development organizations, and other business, government and educational institutions.

Additional studies and articles that informed this study are listed in “Appendix B” to this report including CSI “Rewiring the Northwest’s Energy Infrastructure” and “A Northwest Vision for 2040 Water Infrastructure”.

Read the full
Growing the
Green Economy
study at
www.cfqc.org.



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¹"Quadrennial Defense Review 2014" Chapter 1: Future Security Environment p. 8; United States Department of Defense

²"Green Economy Industry Roadmaps", Community Attributes Inc. (CAI); p. 18

³Ibid #2, p. 17

⁴Ibid #2, p. 47

⁵"A Northwest Vision for Water Infrastructure," Center for Sustainable Infrastructure, The Evergreen State College; p. 19

⁶Ibid #2. p. 14

⁷Ibid #2. p. 14

⁸Ibid #2. p. 13

⁹"Renewing the Northwest's Energy Infrastructure", Center for Sustainable Infrastructure, The Evergreen State College; pp. 31-33

¹⁰Interview and research information provided by Dr. Brad Gaolach, Director, Metropolitan Center for Applied Research & Extension; Food Energy Water (FEW) at WSU, and WSU: <http://csanr.wsu.edu/publication-library/climate-change/>