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Introduction

The “clean economy” is neither an abstract concept nor a separate component of the larger economic system. It represents a shift in the host economy toward less carbon-intensive solutions and longer-term, sustainability-based planning and programming. A clean economy is one that promotes enhanced economic performance, strengthens global competitiveness as well as energy and environmental security, and promotes sustainable investment.

As noted by the Brookings Institute, “the clean economy matters because its emergence responds to critical global and national environmental, security, and economic trends and associated challenges, most notably the growing demand for global environmental sustainability, the sharpening need for resource security, and the aspiration everywhere toward economic transformation.”¹

In broad terms, the clean economy is about creating and retaining wealth and jobs, reducing the carbon footprint of societies, restoring the natural environmental balance of critical ecosystems, and implementing improvements in energy and industrial efficiency, all of which contribute to enhanced economic competitiveness.

Research by the PEW Charitable Trusts shows that between 1998 and 2007, clean economy jobs in the US grew by 9.1%, while total jobs grew by only 3.7%.² The West Coast region in particular is well advanced in terms of the clean economy and well positioned to receive its economic benefits. Of the total new clean economy jobs created in the US in 2007, 21% were in California, Oregon, and Washington.³ Clean economy employment in California grew by 53% from 1995 to 2010, while jobs in the wider economy in that state grew by 12%.⁴

The concept of the clean economy also supports enhancing local manufacturing and related employment opportunities, and utilizing recycled or locally-sourced raw materials

wherever feasible. It also promotes the export of value-added, processed materials and advanced products with lower embodied energy. By reducing the need for imported energy, materials, goods, and services, the goal is to keep capital circulating longer through local sourcing and supply chains.



In terms of developing resiliency to market shocks, a newly released study by Next10 found that the clean economy in the US lost fewer jobs than did the overall economy during the height of the recent recession. In California for example, from January 2009 to January 2010 the overall economy lost 7% of jobs while the clean economy sectors lost only 3%.⁵

While clean and renewable energy sources and technologies figure largely in the substance of the clean economy, the opportunities for job creation and investment promotion range far wider and find expression in all areas of public policy and private enterprise.

In addition, investments and developments in clean technology sectors such as solar and biofuels in countries like China and Brazil are transforming the market opportunities and underscore the importance of working as a region to remain globally competitive.

1 See: http://www.brookings.edu/~media/Files/Programs/Metro/clean_economy/0713_clean_economy.pdf, p. 9

2 See: http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf, p. 3

3 IBID

4 See: http://next10.org/next10/publications/pdf/MSOG_2012_M2.pdf

5 See: http://next10.org/next10/publications/pdf/MSOG_2012_M2.pdf

In 2010, HSBC Global Research estimated worldwide revenues for the clean economy at \$500 billion and predicted that this value could grow to \$2.3 trillion by 2020.⁶

It is hard to imagine any other global economic opportunity of this magnitude on the near- to medium-term horizon, suggesting that the clean economy and the policies that drive it are a key pathway to global competitiveness.

While investment incentives and stimulus spending are important short-term drivers of change, the clean economy encompasses structural adaptations that recognize the need for forward-looking strategies that minimize the negative impacts of economic growth and maximize positive contributions to the West Coast region's quality of life and collective prosperity.

6 HSBC Global Research (2010), Sizing the Climate Economy



KEY TRENDS

Some of the more important trends shaping the evolution of the clean economy are highlighted below.

High volatility in commodity supply and prices will be a continuing fact of life for at least the next two decades.

Research from the McKinsey Global Institute's Sustainability and Resource Productivity Practice suggests that prices for commodities (e.g., energy, materials, food, water, etc.) will remain high and volatile for at least the next 20 years as global resource markets oscillate in response to surging global demand and inelastic supplies.⁷

The impacts of this reality will be felt both globally and locally throughout the West Coast region. While this volatility may temper "business-as-usual" economic growth, it also presents a unique window of opportunity to promote clean technology solutions to meet growing demands for global commodities and to stabilize price volatility.

For example, clean technology can be leveraged to provide reliable renewable energy supply (e.g., biofuels, hydrogen, etc.) to reduce demand pressures on carbon intensive fuels, and also to accelerate the adoption of more energy-efficient practices in industries such as agriculture and construction, where cleaner practices and technologies can lead to higher crop yields and lower energy consumption respectively. It is anticipated that supply increases from sustainable sources, along with resource productivity improvements, will be able to sustain up to 30% of the world's resource demand by 2030 and will help make global growth sustainable for generations to come.⁸

Natural gas technologies and liquefied natural gas as a fuel alternative are ripe with potential for job creation and investment promotion – particularly in use with ferry fleets, large urban vehicle fleets, and long-haul intercity trucking.

As stressed by US President Barack Obama in his State of the Union address in January 2012, the development of natural gas will create jobs and power trucks and factories that are cleaner and cheaper. His address set the course for federal support for a variety of initiatives, including tax credits equivalent to 50% of the extra cost of purchasing natural gas-powered trucks compared to those that run on diesel or gasoline.

7 See: <https://www.mckinseyquarterly.com/PDFDownload.aspx?ar=2887>

8 See: <https://www.mckinseyquarterly.com/PDFDownload.aspx?ar=2887>



While on the positive side, the greater use of natural gas as a cleaner motive fuel can offer a significant payoff in terms of potential GHG emissions reductions, concerns over the environmental impacts from the increased use of hydraulic fracturing or “fracking” technologies to capture natural gas from deep sedimentary shale gas deposits have been raised. British Columbia has been demonstrating leadership in this area by becoming the first province in Canada to enforce the public disclosure of ingredients used for fracking.⁹ This is also an area where the West Coast jurisdictions have leverage power in working with federal agencies to ensure that the expanded use of natural gas does not lead to corresponding deleterious environmental impacts – as was recognized in the collaborative agreement signed by Premier Clark and Governor Gregoire in February 2012.

Natural gas use is only one way of accelerating the clean economy. Its potential as a reliable energy source that can compliment other renewable power sources and can be rolled out in the immediate term. Exploiting a stable one hundred year supply of a cleaner energy source will reverberate throughout the economy, and will help to overcome boom and bust cycles that have been so much a part of our recent economic history.

Full costing of carbon is an essential element in strengthening the clean economy. Implicit in the foregoing is the fact that over the long-term, distortions of the energy marketplace that have artificially lowered the true costs of fossil fuels serve as disincentives to the deployment of

renewable and clean energy technologies. This is true in terms of both the price paid at the pumps for fossil fuels and for raw commodities. As well, there are significant untold costs related to health and the environment that at the moment are treated as externalities. While government subsidies and financial incentives for renewable energy to a limited extent have helped to “level the playing field”, such public cost outlays are unsustainable in the long run and must be led by private sector investment.

In North America, carbon pricing mechanisms in leading jurisdictions including California and British Columbia, and collaborative efforts such as the Regional Greenhouse Gas Initiative (RGGI) in the US Midwest, have been effective for driving improvements in energy efficiency.

Whether through direct or indirect carbon taxes, other market-based mechanisms, or other policy approaches, the real costs of all forms of energy generation and deployment must be allowed to work their way through the economy. The full costing of carbon is an essential component for driving clean economy innovation and investment, and for creating long-term, sustainable employment.

Sub-national economic development and carbon management initiatives are also emerging as key drivers of change to accelerate this successful transition. While progress on the development and implementation of a multilateral regulatory regime governing GHG emissions reductions has been minimal, significant gains have been made by state and local governments.

⁹ See: <http://www.newsroom.gov.bc.ca/2012/01/canadas-first-hydraulic-fracturing-registry-now-online.html>

The importance of cities as leaders in preparing for and adjusting proactively to climate change cannot be understated. As was noted by the World Bank, cities are the “first responders to climate impacts.

Indeed, cities in the four West Coast jurisdictions under review have become “hotbeds”, driving growth of the clean economy through a variety of sustainability initiatives and programs designed to preserve urban ecological integrity, improve waste management, reduce energy use associated with the built environment, limit urban sprawl, and enhance social and economic well-being. Below are examples from each jurisdiction.



Example 1: San Jose, California, has embarked on a fifteen year plan for economic growth, environmental sustainability, and an enhanced quality of life for its community. The San Jose Green Vision Plan will transform San Jose into the world center of clean technology innovation, promote cutting-edge sustainable practices, and demonstrate that the goals of economic growth, environmental stewardship, and fiscal responsibility are inextricably linked.¹⁰

¹⁰ See: <http://greenvision.sanjoseca.gov/GreenVisionGoals.aspx>



Example 2: Portland, Oregon, is pursuing an assertive, bottom-up regional development strategy to move to a carbon-free future as part of the Climate Prosperity Alliance, a national coalition of regions that share a common belief that they can simultaneously expand economic opportunities and reduce GHG emissions through practical strategies involving business, government, education, and other community partners.¹¹

¹¹ See: <http://www.climateprosperity.com>



Example 3: Seattle, Washington, is updating its Climate Action Plan that lays out a roadmap for how Seattle can become a carbon neutral city by the year 2050 and includes strategies identifying how it can reduce its GHG emissions in the transportation, building, energy, and waste sectors.¹²

¹² See: <http://www.seattle.gov/environment>



Example 4: Vancouver, British Columbia, has assembled a group of independent experts named the Greenest City Action Team, with the mandate of helping the City identify actions needed to help it become the “greenest city in the world” by 2020.¹³

¹³ See: <http://vancouver.ca/greenest-city/background.htm#team>

AN ACCELERATED POLICY AGENDA

While the incremental transition toward cleaner, lower-carbon business practices is inevitable, achieving the full investment and job creation benefits of the clean economy will be possible if the West Coast region focuses on the four key areas highlighted below.

Job creation within the clean economy can best be realized with a clear, strategic approach. Despite an uneven playing field that favors fossil fuel use and consumption, energy from renewable sources continues to be the fastest-growing sector of the global energy mix and offers the greatest potential to address issues of energy security and sustainability. Solar, wind, and biomass sectors on average produce more net jobs throughout the supply chain than traditional energy sources such as coal and natural gas. (see Figure 2).

Figure 2: Average employment over life of facility (jobs per MW of average capacity).

	Manufacturing, construction, installation	Operating & maintenance/fuel processing	Total
Solar PV	5.76-6.21	1.20-4.80	6.96-11.01
Wind power	0.43-2.51	0.27	0.70-2.78
Biomass	0.40	0.38-2.44	0.78-2.84
Coal-fired	0.27	0.74	1.01
Natural gas-fired	0.25	0.70	0.95

Note: Based on findings from a range of studies published in 2001-04. Assumed capacity factor is 21% solar PV, 35% for wind, 80% for coal, and 85% for biomass and natural gas.

Source: UNEP, ILO, IOE and ITUC, 2008

A sole emphasis on more jobs per MW, however, raises questions about long-term costs and whether the goal should be to make the economy more productive. In fact, even with higher initial costs with technologies such as solar, these technologies are more cost-effective in the long run because the fuels used to drive these technologies are free and renewable and labor costs for maintenance are low, while at the same time, incurring none of the carbon externalities.

As noted by the International Energy Agency, the deployment of renewable energy so far has focused on just a few of the available technologies. Even in more advanced markets, this has been hampered by problems of systems integration, limited budgets, lack of access to primary energy resources, and action delaying political debate.

An important caution is warranted here, however. One of the great disappointments of recent economic revitalization initiatives was the failure of the much heralded “green jobs” boom to materialize overnight. Indeed, this has resulted in a backlash in many quarters to clean economy initiatives that promise increased employment opportunities.

The reality is that clean economy jobs cannot and will not materialize overnight. As noted in the sections to come, while some immediate employment gains can be realized through specific initiatives such as building retrofits or renewable energy deployments (as evidenced in California’s highly successful Million Solar Roofs initiative), industries need time to plan long-term clean technology investments and ramp up with the skilled labor. Production processes have to be redesigned and new capacities brought on-line. This take time. Even the deployment of lower-cost natural gas as an energy source or the integration of renewable energy supplies into the energy grid will require a period of adjustment and transition. That is the reality of the marketplace, a reality that early proponents of the “green job revolution” failed to recognize.

The important point to note, however, is that once these changes take root, they lead to job gains that are stable, long-term, and higher paying. The earlier cited Next10 report on California’s green jobs bears witness to this fact, and similar assessments of British Columbia’s green economy carried out by GLOBE Advisors have conveyed the same message.

To maximize the acceleration of job creation and investment in the clean economy, there is need for a clear vision, progressive and forward-looking policies, and concerted action toward change.

There is a need for more private sector investment and the stable policy frameworks to encourage these investments.

The jobs are there and they will prove greater in all respects than many existing industries. Jobs in clean technology development, as one example, already are collectively larger than those in many primary resource industries throughout the West Coast region such as mining and oil and gas. And there is much room for further growth and investment.



Immediate local employment and investment gains will come from improvements to existing infrastructure and the built environment. Not all clean economy jobs will arise from the deployment of new technologies or from renewable and cleaner energy sources. Research cited throughout this report reveals that programs supporting energy efficiency upgrades and the renovation of the existing built environment can have immediate and positive benefits, not only in terms of job creation, but also in setting the stage for longer-term growth in the green building market and strengthening the resiliency of our urban areas to the impacts of climate change.

Indeed, energy efficiency ranks at the top in terms of attracting investment capital because these applications can be applied immediately to existing infrastructure and generate positive cash flows faster than new technologies or existing, expensive, and capital-intensive projects based on proven technologies. Energy efficiency initiatives also help to lower electricity bills, making buildings more affordable for consumers and increasing disposable income.

There is also a need for expertise related to preparing infrastructure for the impacts of a changing climate, such as extreme weather events that include coastal storm surges, flooding, drought, and wild fires.

It's about improvement, not revolution.¹⁴ The "greening" of existing skilled trades and the introduction of sustainable practices into existing businesses is the most practical means to achieve a cleaner economy.

There is a need to build on the knowledge economy.

While new jobs are at the core of the clean economy, the future of the clean economy is inextricably linked to strengthening the knowledge elements of society. Investments in innovation, education, skills training and upgrading, and professional development will have immediate payoffs in terms of employment opportunities at home, and will strengthen the region's competitive advantage in the larger global marketplace.

The member jurisdictions of the PCC are already world leaders in many aspects of the knowledge economy. California has set the world standard for innovation for fuel standards and electric vehicle development and deployment. British Columbia is also a global leader in technology development for the hydrogen and fuel cell transportation sector. Opportunities abound for the West Coast jurisdictions to continue this leadership in many areas related to the clean economy, but it will require sustained investment in the knowledge economy.

Regional collaboration provides significant competitive advantages. Despite its enormous size and diversity, the West Coast region is one extended geographic, economic, and social ecosystem. The region's local economy is connected by multiple energy, information, transportation, and trade channels through which flow hundreds of millions of dollars of commerce daily.

California, Oregon, Washington, and British Columbia are acknowledged leaders in realizing the economic opportunities implicit in tackling the twin challenges of global economic competition and environmental protection and recognize the benefits of policy harmonization and collaborative leadership in close partnership with key stakeholders. Furthermore, growing the regional clean economy to its optimal level will require close coordination and collaboration by the partners. The many benefits arising from such collaboration are identified below.

1. Economic Gains from Intra-regional Trading:

The most direct benefits from regional collaboration are gains from trade. Producers with a comparative advantage in one jurisdiction can provide a clean

¹⁴ The other top areas attracting investment dollars in rank order are: Recycling technologies, Green Building Materials, Water Resources Conservation, Home Products, Geothermal Energy, Applications and Technologies to improve Solar and Wind Energy, Cleantech Marketing Companies and Websites, Green Services and Investment Funds, and Environmental Services. Source: <http://researchwhitepaper.com/venture-capital-blog/10-green-sectors-attracting-investments-863.html>



economy good or service more efficiently than producers in another jurisdiction. This reduces costs to consumers and enables firms in each jurisdiction to specialize, increasing the aggregate size of the clean economy. An example could be the supply of cellulosic ethanol to meet low carbon fuel standards in the region. If a firm develops a new production technique that reduces costs of ethanol and can sell to fuel blenders out of state, this allows the blenders to purchase a lower cost ethanol as well as increases the revenues of the innovative firm.

2. Harmonized Codes and Standards: The development of region-wide standards for the clean economy can reduce transaction costs for firms, as well as reduce program administrative costs. As one example, the NW Energy Star building codes for residential buildings were developed regionally by the NW Energy Efficiency Alliance and its stakeholders, and were later integrated into the 2009 national residential building energy codes.¹⁵ In addition, the PCC project on energy standards for equipment has resulted in harmonized standards for televisions in BC and California. While identical codes and standards may not be practical across all jurisdictions given differences in regional economics and climate, the use of common tools and principles can help to this end.

3. Regional Market Development: Regional collaboration can also provide firms with larger common markets for their goods. When considered with common regional standards, firms can develop products and services for larger markets, gaining important economies of scale. Economies of scale reduce the average per unit cost of clean economy goods and services as production

increases. Lowering the costs of many clean economy goods and services is essential for them to gain market share. This is evidenced by the collective regional economic demand for building construction and/or building equipment systems as one example.

4. Inter-regional Workforce Development: There is a long history of labor mobility throughout the West Coast region, which is critical for knowledge transfer as well as for providing a trained workforce for the clean economy. Regional workforce development can help mitigate such shortages through regional training programs that deliver high-quality learning curricula targeting clean economy production and process skills. Examples of process training include the Green Building Council's Leadership in Energy and Environmental Design (LEED) professional accreditation programs, the Climate Action Reserve's (CAR) verification training program, and the Oregon-Washington Jobs and Innovation Acceleration program for the US Economic Development Administration.

5. Positive Network Externalities: Positive network externalities allow an "expansion of the pie," so to speak, by creating synergies that would not occur by the efforts of a single jurisdiction alone. As an example, positive network externalities develop when more users purchase electric vehicles (EVs) because of their increased infrastructure and acceptance. The PCC's Green Highway Initiative linking Southern California to BC with new transportation technologies to stimulate private infrastructure investment recognizes these positive network externalities. Other examples include improved marketing and branding recognition for the West Coast region's clean economy and the stronger political voice that a collaborative approach carries when seeking federal political attention.

¹⁵ See: <http://neea.org/successstories/codes.aspx>

6. 21st Century Infrastructure: According to studies by the American Society of Civil Engineers and others, the West Coast region will need to invest in up to \$1 trillion of infrastructure projects in the next 20 years. With strong regional policy alignment designed to attract outside capital and lift up new forms of green infrastructure and environmental services, job creation in the clean economy could happen at an even greater scale through a cooperative approach that uses public-private partnerships for example.

The analysis throughout this report demonstrates how cooperation in many key areas provides win-win opportunities for investment and job growth that will enable the West Coast region to stay competitive in the highly volatile global marketplace. By scaling clean economy market opportunities through creative leadership and multi-jurisdictional mechanisms such as the PCC, the West Coast region will be better able to achieve prosperity for its citizens while confronting the risks and impacts of a changing climate.

The West Coast region has historically benefited from strong economic, social, and environmental leadership, which in many instances has set the stage for the quality of life and prosperity enjoyed by many of its citizens. The PCC provides an opportunity for the use of the West Coast region's strengths, synergies, and economic power to set in motion new trends that will enable the vast opportunities of the clean economy.

Region-wide clean economy strengths include:

- An environmentally-conscious population strongly supportive of lifestyles that leave a smaller carbon footprint;
- A history of innovation as evidenced by strong and growing clusters of clean technology and advanced energy companies;
- A hospitable quality of life that attracts a skilled and diverse workforce;
- A widely distributed network of post-secondary educational institutions offering advanced education and skills training programs;
- Leadership on energy efficiency codes and standards and a long history of world-class, demand-side management programs by energy utilities;
- A high concentration of research facilities focused on clean technology research;
- A wide array of environmental networks, organizations, and think-tanks;
- A full spectrum of available alternative and renewable energy resources and options;
- A large natural resource base including large reserves of natural gas which will continue to sustain the region's economic well-being; and
- A strategic location adjacent to the rapidly expanding economies in Asia.