

Supporting regional cleantech sectors in North America

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ABSTRACT

The development of a vibrant clean technology (or 'cleantech') sector has numerous advantages for a regional economy, among them economic development and job creation. But how do governments go about developing this sector? General demand policies and environmental regulations are clearly important, but this review of regional cleantech policies focuses on the less well-recognized area of governmental assistance for cleantech-business development. The research identifies four main policy instruments: clean-energy and high-technology funds; commercialization and incubation support; research, development, and testing facilities; and assistance to business networking organizations such as business associations. Two cases of cleantech-sector development, one in California and one in New York State, are discussed in more detail. They show how state- and local-demand policies provide important background assistance but also highlight the importance of developing independent intermediary organizations that represent and network the cleantech-business community. Moreover, this focus on the business-networking side of clean-energy policies can also help to broaden political support, especially in conservative regions where environmental frames are controversial.

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Introduction

The development of a vibrant clean-technology (or 'cleantech') sector offers many benefits for a regional economy. The ongoing environmental degradation of the planet implies a continuing need for sustainability transitions in various industries, and the failure of many governments to enact relevant policies means that there will be an ongoing need for innovation. We define the cleantech sector to include technologies, products, processes, and services that reduce environmental impact in contrast with those currently used by incumbent actors in an industry. A vibrant cleantech sector can help a region to contribute to global efforts to reduce greenhouse-gas emissions, to support the transition of industries to more sustainable configurations, to diversify the local economy, and to create new jobs and businesses.

To date, there has been some prior research on the development of regional cleantech sectors (e.g., Cooke 2008, 2009; Lente et al. 2003; Musiolik et al. 2012; Potter et al. 2012) and some consideration of government policies that help to develop innovation clusters (e.g., Kivimaa 2014; Musiolik et al. 2012; Okamuro and Nishimura 2015), but very little attention has been devoted to the activities of state and

provincial governments in North America to strengthen their cleantech sectors. We address the gap by examining one type of policy support, namely business development for the cleantech sector in selected states and provinces. This group of policies is distinct from the category of sustainability demand policies and environmental regulations. Sustainability demand policies increase consumer or business demand for products and services with an improved environmental performance. The policies include renewable energy-portfolio standards, distributed energy-resources support (e.g., net metering or feed-in tariffs), energy-efficiency standards, and financial assistance for project development. Environmental regulations include pollution and greenhouse-gas rules and standards, which are now recognized not simply as cost burdens on industries but as spurs to innovation and product development (Ashford and Hall 2011; Porter and Van der Linde 1995). Together, demand-pull policies and environmental regulations help to build market capacity for the products of cleantech industries such as renewable energy and energy efficiency, including demand for innovative products and for test markets.

This review focuses on the complementary set of policies that support the development of cleantech businesses. The decision to focus on business-

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Table 1. Summary of business-development policies in support of the cleantech sector.

Policy and program	Examples
Access to general funds	
General funds for clean-energy projects	California: California Clean Energy Fund New York: Clean Energy Fund Massachusetts: Clean Energy Center British Columbia Tech Fund California iHub program
General funds for high-tech businesses	
General funds from economic development agencies	
Commercialization and incubation	
Incubators	New York: state-sponsored network of cleantech incubators
Commercialization and start-up services, often with colocation	Ontario: Discovery District California: Los Angeles Cleantech Incubator Oregon: VertueLab
Research, Development, and Testing	
Government-supported university-industry research and commercialization partnerships	New York: state-sponsored centers for advanced technology and centers of excellence Ontario: Centres of Excellence
Support for research consortia	Colorado: Colorado Energy Research Authority Florida: Florida Energy Systems Consortium
Testing and prototyping facilities	British Columbia: showcasing new products California: La Kretz prototyping facility Massachusetts: wind turbine blade testing New York: battery and energy-storage testing
Partnerships with Business-Networking Organizations	
Partnerships for business-development programs	Washington: Cascadia Clean Tech accelerator California: regional innovation network program California: Los Angeles Cleantech Incubator
Initiation of or funding for business associations or consortia	New York: New York Battery and Energy Storage Technology Consortium California: Cleantech San Diego

development policies is partly because knowledge about energy-transition demand policies is widespread, and it is well recognized in studies of cleantech-policy development (e.g., Burtis 2004, Cooke 2008). In contrast, less attention is paid to the business-development side of cleantech development. This category can be thought of as part of the ‘technology push’ or ‘supply’ side of innovation policy (Rogge and Reichardt 2016, Taylor 2008). Much of the analysis of this side of innovation policy focuses on government-assisted research and development. Although this type of policy is important, other businesses-development policies may be essential at a local level, such as assistance to intermediary organizations that provide commercialization, testing, prototyping, and networking functions.

The review that follows is divided into two parts. Part one is an overview of cleantech business-development policies at the state and provincial level in the United States and Canada. Part two provides two brief case studies of how both the demand and supply sides of policies can come together to help develop the cleantech sector in California and in New York State.

Overview of cleantech business-development policies

This section is based on a survey of cleantech business-development policies in the four most populous provinces in Canada (Alberta, British Columbia, Ontario, and Quebec) and the four most populous states in the United States (California, Florida, New York, and Texas). In addition, four

other American states that have cleantech sectors with strong government policies are included (Colorado, Massachusetts, Oregon, and Washington). We selected the state or provincial level of government because economic development policies and funding are more extensive at this scale than at the federal or local level of jurisdiction. An inventory of cleantech business-development policies was formulated for each state or province and for city-level organizations within the states and provinces. Again, we did not include general demand policies and environmental regulations in this analysis. From the inventory, the programs and organizations were classified into four main policy instruments: access to general funds; commercialization and incubation; research, development, and testing; and partnerships with business-networking organizations (Table 1).

With respect to the first general category of business-development policies, several states have dedicated green funds. These funds often develop markets and can be considered part of the demand side of policies, but a portion of the funds is sometimes targeted for clean-energy businesses development. For example, the New York State government developed a plan to spend US\$5 billion over ten years on the state’s Clean Energy Fund, which includes a US\$782 million green bank to leverage private-sector investment (New York State Office of the Governor 2016). Likewise, the state government of Massachusetts created a separate state agency, the Massachusetts Clean Energy Center (2017), which provides funding and support services for business development. In some cases, these investments can

be linked to employment growth. For example, job expansion in the US\$12 billion cleantech sector of Massachusetts increased by 75% from 2010 to 2017 (Massachusetts Clean Energy Center 2017).

General green funds as well as funds specifically dedicated to cleantech-business development may be more politically acceptable in states with a left-leaning or progressive government, especially in the United States. It is notable that we did not find government-sponsored green or cleantech funds in conservative (Florida, Texas) or mixed (Colorado) states. However, the cleantech sector can also take advantage of general state and provincial funds for economic and business development. Examples of such general funds that are available to cleantech businesses are the British Columbia Tech Fund, the California iHub program, the Florida Opportunity Fund, and the Texas Emerging Technology Fund (closed in 2015). In conservative states, these general technology funds may be a better strategy than a financial source specifically devoted to cleantech, but even in progressive states, a general fund will create a broader business constituency that can provide political support for continuing appropriations to the fund.

The second general category of business-development policies for cleantech instruments is commercialization and incubation assistance. These programs can be set up to include cleantech as a prioritized sector. For example, the provincial government of Ontario is among the supporters of the MaRS Discovery District, a nonprofit organization that provides facilities for start-ups and related organizations, access to funds for start-ups, and networking benefits to encourage colocation. Originally named MaRS for 'medical and related sciences', the organization subsequently diversified to include other business sectors. One of its four main sectors is cleantech, which benefits from a dedicated venture-services team that provides assistance for a range of stages of development from start-ups to growth. Another example is the nonprofit organization VertueLab, originally known as the Oregon Built Environment & Sustainable Technologies Center (Oregon BEST). In 2015, Oregon BEST contributed to colocation synergies by moving its offices from Portland State University to Desk Hub, a co-working company with room for multiple start-ups and a location in the Pearl District, the city's revitalized warehouse area. The organization is partially funded by the state-government, and it works specifically with the cleantech sector to provide access to funding opportunities for early-stage companies and other support services.

The third main category of cleantech business-development policy is funding to facilitate

university-based research and its commercialization. For example, the province of Ontario has a program of Centres of Excellence that assists research projects connected to commercial applications. State and provincial governments have also funded research consortia to develop synergies and collaborations across research universities and to focus research on areas appropriate to regional needs and resources. For instance, in Colorado, the state government supports a research consortium, the Colorado Energy Research Authority, which connects research efforts at the locally headquartered National Renewable Energy Laboratory and three research universities. The consortium used relatively modest state-government funding of US\$8 million between 2008 and 2015 to leverage US\$96 million in research funding with an estimated economic impact of US\$194 million (Frank 2016). The Florida Energy Systems Consortium also linked researchers across a wide range of energy-research areas and held an annual technical workshop to publicize the results. However, this program provides an example of how political support can be contingent on the political party in power. Despite an impressive record of gaining research funding, in 2016 the legislature cut the consortium's US\$2.5 million annual budget to US\$500,000, and the governor vetoed even the severely reduced level.

Another instrument that has facilitated technology transfer and commercialization is government funding for testing, prototyping, and demonstrations. For example, the Vancouver Economic Commission includes the 'green economy' as one of its three targeted industries. The Commission's Green and Digital Demonstration Program provides businesses with access to buildings, streets, vehicles, and digital infrastructure to test and showcase products. Other examples include assistance for a wind-turbine blade-testing center from the Massachusetts Clean Energy Center and a partnership of government and nonprofit organizations in Florida that underwrites the Transportation, Energy and Space Technology Hub (TEST Hub) at the Kennedy Space Center, where advanced hydrogen-powered transportation technologies can be tested.

The fourth main type of policy instrument involves partnerships with or development of business-networking organizations that are independent nonprofit entities that provide networking, information sharing, and business-development services, as well as in some cases policy advice and advocacy. This category includes business associations and other types of intermediary organizations, such as incubators, that provide business-networking services. Although cleantech-business associations generally emerge from the business community,

governments can work with them to implement business-development programs. One example is a partnership formed in 2016 that involved the CleanTech Alliance, an association that represents 87,000 jobs in cleantech businesses in the states of Washington and neighboring Oregon. With support from Oregon BEST, the business alliance created Cascadia CleanTech, an accelerator program that offers mentoring, training, networking, and funding opportunities for cleantech start-ups. Another instance of a partnership with government is Cleantech San Diego, which represents about 10,000 jobs and over 100 organizations. In 2016, the business association received US\$5 million from the California Energy Commission to launch the San Diego Regional Innovation Network, an initiative that assists cleantech enterprises in bringing concepts to market.

In addition to facilitating existing business associations and providing them with financial assistance to develop new programs, state and local governments can also help to create new intermediary organizations that network and assist the cleantech-business community. Two examples are the Los Angeles Clean Energy Incubator and the New York Battery and Energy Storage Technology Consortium, both of which are discussed in more detail below.

Case studies

This section provides a brief overview of two cases of government support for the cleantech sector that draw attention to the role of how governments can help to create independent organizations that provide crucial networking and business-development services for the cleantech community. We select examples from California and New York State to show how the background of demand policies and general business-development policies matter but also to highlight how advancement of the cleantech sector benefits from new organizations that provide networking and other services. Although the two organizations that we profile have this common feature, they differ in their geographical and industrial scope. The California case centers on the creation of a cleantech incubator in Los Angeles, which provides sector-wide services for the metropolitan region, whereas the New York State case focuses on the establishment of a statewide business association that is devoted to a single industrial sector. The two cases show some variation in the way that governments can assist in the development of business-support organizations that offer networking and other services. Depending on the scope of one's definition of industrial clusters, these two cases could be conceptualized as organizations that facilitate the

development of cleantech clusters, which are geographically concentrated combinations of agglomeration, transactions, and/or social networks (Karlsson 2008).

California: the Los Angeles Cleantech Incubator

In North America, California is the leading hub of innovation in terms of venture capital investment (PwC and CB Insights 2018), and it is also ranked first in the U.S. Clean Tech Leadership Index (Clean Edge 2017). Leadership in this area is based partly on a strong framework for environmental regulation and energy-transition demand policies. Because air quality is a significant problem for many regions of the state, stringent emissions and air-quality regulations have helped to spur a transition in the electricity and transportation sectors toward cleaner technologies. California also has advanced energy-transition demand policies, such as a renewable portfolio standard of 100% carbon-free energy by 2045; a cap-and-trade policy for greenhouse-gas emissions from large industrial sources (AB 32, or the Global Warming Solutions Act of 2006); a wide range of energy-efficiency policies; and support for distributed energy resources.

Turning now to the business-development side of state policy, the California Energy Commission is the primary energy-planning agency and the main source of support for this type of policy. The government agency funds the Public Interest Energy Research Program, which has invested US\$700 million in public funds for research since 1996. The commission has also created several funding opportunities for energy innovation, including the Energy Innovations Small Grant Program (which awards funds to organizations that conduct research on innovative energy concepts) and the Electric Program Investment Charge Program (which assists with all aspects of the energy-innovation pipeline, from research and development to marketing). Among the other projects of the California Energy Commission is backing for the California Clean Energy Fund (CalCEF), which is a nonprofit private equity and venture capital firm that has representatives from industry, other nonprofits, and academia on its board of directors.

The cleantech sector is present in all of California's leading population centers, including Los Angeles, Sacramento, San Diego, San Francisco-Oakland, and San Jose. The cleantech firms in these cities benefit from synergies with research universities, a statewide entrepreneurial culture facilitated by venture capital networks, and related industries such as information technology and the media. Although the fertile conditions of strong energy-transition demand policies and

a vibrant entrepreneurial culture reduce the need for local business-development policies to help develop the cleantech sector, metropolitan and city levels of government have also initiated programs to assist their cleantech sectors. A leading example of a new organization that has won international awards as a top university-associated business-development organization is the nonprofit Los Angeles Cleantech Incubator (2015, also called LACI).

An example of an intermediary organization that originally was closest to our second type of support function (incubation and commercialization), LACI has expanded significantly into general business-networking services with assistance from the local and state governments. Founded in 2011, LACI is an independent nonprofit organization with a board of directors that includes representatives from the private, public, and academic sectors. Although it is an independent organization, it has benefited from local government support, and it provides an example of how governments can help to create organizations that provide networking and other services to the cleantech community. The launch of LACI was made possible with assistance from the City of Los Angeles, the Los Angeles Department of Water and Power (LADWP), and the Los Angeles Community Redevelopment Agency. Local demand policies also helped to create a hospitable economic environment for the metropolitan area's cleantech sector. For example, LADWP developed various solar-energy initiatives, including a feed-in tariff and solar development agreements. Although much solar manufacturing has moved to Asia, LACI has helped to develop new solar companies in the solar thermal and solar project-development industries. The government assistance has also played an important role in demand policy for the transportation sector. In 2016, the voters of Los Angeles County passed Measure M, a ballot initiative that funded US\$120 billion in transit development. Furthermore, in the following year, Los Angeles Metro, the city's Department of Transportation, and the city council committed to a transition of the bus fleet to 100% electric vehicles by 2030.

As a business incubator, LACI provides resources and services such as mentoring and access to networks for start-up companies. This activity involves working with new firms by pairing them with an executive-in-residence to provide coaching and to set benchmarking goals. The Advanced Prototyping Center also provides access to lathes, laser cutters, and a precision water jet for cutting steel. Furthermore, the organization has developed diversity initiatives that help to facilitate opportunities

for women and under-represented ethnic groups in the cleantech sector.

The activities of LACI have expanded since its launch, and it has become the central network for the area's cleantech firms. Networking activities are complemented by the strategic location on the La Kretz Innovation Campus, a 3.2-acre site on land owned by LADWP. The facility houses offices, meeting and event spaces, laboratories, the regional advanced transportation center, and a training center. Situated in the city's Arts and Innovation District, which in turn is part of the Cleantech Corridor, the strategic location encourages networking with related industries. The organization also links Los Angeles area businesses to wider statewide and international networks. For example, in 2014, LACI received a grant from the U.S. Department of Energy to create the statewide California Cleantech Commercialization Coalition, which gave rise to an additional networking role of linking cleantech efforts across the state. In 2016, the California Energy Commission selected LACI to be one of four organizations statewide to serve as a hub for regional innovation involving energy technologies. One result of this initiative was establishment of the Energize California program, which welcomed its first cohort of innovators in 2017 and provides start-up companies with mentoring. In 2017, LACI also hosted the LA New Mobility Challenge, an international prize competition that offers winning start-up companies a cash award and various other benefits. The initiative helped to position Los Angeles in the global industry of transportation-mobility innovation and provided local-global networking opportunities. As of 2018, LACI also brokered connections involving over 40 companies that are working on cleantech in the transportation sector, and some of the Energize California companies selected for mentoring are involved in developing new mobility services and technologies.

In summary, LACI is an example of a business-support organization that provides several important services to the area's cleantech sector beyond traditional incubation and prototyping. The organization also offers other forms of assistance that are less visible such as networking and information-sharing opportunities for cleantech businesses. Although focused on networks in the Los Angeles area, LACI additionally links area businesses to the statewide cleantech sector and to the global industry.

New York state: the New York Battery and Energy Storage Technology Consortium

New York State has a diversified economy that includes a strong cleantech sector, and the state has

consistently been ranked in approximately fifth position among states in the U.S. Clean Tech Leadership Index (Clean Edge 2017). As with California, this generally progressive state has strong energy-transition demand policies and environmental regulations that provide broad market demand for its cleantech sector. For example, New York State has a clean energy standard to generate 50% clean energy by 2030, and former Governor George Pataki led the development of the Regional Greenhouse Gas Initiative, which began negotiations in 2003 and was launched in 2009. The regional carbon-trading program has raised significant public revenue, which the state government has used to fund programs in energy efficiency and renewable energy. Under current Governor Andrew Cuomo, the state government initiated the Reforming the Energy Vision initiative, which involved grid modernization to facilitate investment and distributed energy resources.

Two state agencies provide most of the administrative assistance for the cleantech sector. The New York State Energy Research and Development Authority (NYSERDA) administers many of the programs that create demand for cleantech-energy technologies as well as several initiatives that help to develop cleantech businesses. For example, NYSEDA's Clean Energy Fund targeted US\$5 billion of state-government funding for the growth of the state's clean-energy economy (New York State Office of the Governor 2016). Programs of the Clean Energy Fund include market development for energy efficiency and private sector development (US\$2.4 billion); the NY Sun program, which funds solarization (US\$961 million); investments in cleantech innovation and research (US\$717 million); and the NY Green Bank, which was launched in 2014 to provide financing assistance for renewable-energy, energy-efficiency, and other clean-energy business development (US\$782 million). The agency also supports cleantech incubators that are located throughout the state and generally connected with universities, and it hosts 76West, an annual competition for clean-energy start-ups. The other state-government organization, NYSTAR (the Division of Science, Technology, and Innovation in the state's economic development agency, Empire State Development), assists with business development across a wide range of industries and includes some programs specifically focused on cleantech. For example, NYSTAR's centers for advanced technology and centers of excellence help to improve university-industry collaboration and commercialization. Centers at Rensselaer Polytechnic Institute, Stony Brook University, and Syracuse University

involve energy and electricity research and commercialization (NYSTAR 2016).

New York City is the economic center of the state, and it has a vibrant innovation economy. However, the state also has a belt of mid-sized cities in its upstate region that were vibrant manufacturing centers during the middle decades of the twentieth century but by the 1970s suffered from deindustrialization (from east to west, the cities are Troy, Albany, Schenectady, Utica, Binghamton, Syracuse, Rochester, and Buffalo). There are several leading research universities in the upstate region, and the state government has attempted to develop their commercialization and economic development potential. The upstate region also has historical industries that include battery manufacturing for the automotive industry, and it is home to emerging energy industries such as fuel-cell manufacturing. Unlike California, the state government opted to launch a statewide cleantech organization rather than to fund and develop local organizations, and it has focused on an industry within the cleantech sector, battery and energy storage, where the state has advantages due to the related legacy industries. The decision to initiate a statewide organization also was consistent with the goal of developing the economy of the upstate region, an area that has faced considerable challenges over the last few decades. A second state initiative, the NYS Smart Grid Consortium, was less oriented toward cleantech business development and is not discussed here.

Under the direction of then Governor David Patterson in 2010, NYSEDA dedicated US\$25 million in funds to launch the New York Battery and Energy Storage Technology Consortium (NY-BEST) to develop the state's energy-storage industry, which includes fuel-cell and battery companies. Over half of the funding was for competitive research-and-development awards, for which NY-BEST also advised NYSEDA. The NYSEDA money for NY-BEST was seed funding, and the goal was for the organization to become a self-sufficient business organization by 2018. As these initial financial resources wound down, revenue was shifting to membership dues, fees, testing, contracts, and grants (Phelps 2015).

As of the latter months of 2018, the organization had over 150 members from business, government, and academia, and the board of directors also included representatives from the three sectors. State-government initiatives in 2017 and the early part of 2018 had added momentum to the sector. For example, in 2017 Governor Cuomo announced Imperium3 New York, a consortium of businesses that was investing in research, development, and production of lithium-ion batteries in the

Binghamton area. In 2018, the governor also announced plans for 1500 megawatts of energy storage by 2025, a goal that exceeded that of California and was intended to enhance New York State's leadership position in the industry. The program included US\$200 million from NYSERDA's Green Bank and US\$60 million from its Green Fund.

NY-BEST's general services include advising, assistance, and commercialization, and it provides funding through its Business Resources to Innovate, Develop, Grow, and Excel (BRIDGE) program. This initiative also offers access to facilities that support the industry. For example, in 2014, the US\$23 million Testing and Commercialization Center opened in Rochester (the home of Eastman Kodak) in the Eastman Business Park. Funded through a partnership that linked NY-BEST with NYSERDA, Empire State Development, and the global company DNV GL, the center provides testing and certification services to assist with battery-and-energy-storage product development. This public-private partnership is connected with the Battery Prototyping Center located at Rochester Institute of Technology and the Kodak Cell Assembly Center, which opened in 2017 and is also located in the Eastman Business Park.

As in the case of LACI in California, NY-BEST provides services to the industry such as prototyping and testing facilities, but it also benefits the state's battery and energy-storage industry by facilitating networking, mentoring, and information sharing. In addition to dissemination through reports and its listserv, the annual Energy Storage and Technology Conference provides a forum for networking, and webinars create opportunities for further collaboration. A review of NY-BEST based on a survey of members indicated that the most frequently mentioned benefits of membership were facilitating connections (66% of those surveyed) and information gathering (59%; Phelps 2015).

Comparison of the two cases

The cases of LACI and NY-BEST suggest how government support for cleantech industrial development includes but goes beyond strong energy-transition demand policies (e.g., renewable portfolio standards) and environmental regulations. Both states also have well-developed business-development policies that support the cleantech sector, such as funding opportunities to complement and motivate private-sector capital and assistance for research, incubation, testing, and commercialization. The two cases point to how policies can also contribute to the less visible side of cleantech business development: having strong organizations that facilitate

relationship building, networking, career development, and information sharing. In both cases the organizations are independent entities with a board of directors that brings together leaders from the 'triple helix' of business, government, and academy (Etkowitz 2002). As the literature on intermediary organizations has recognized, independence is important because too much government involvement can weaken the legitimacy of the organization and its effectiveness in serving as an advocate for the industrial sector (Kivimaa 2014, Klerkx and Leeuwis 2009).

Conclusion

Successful government cultivation of cleantech industries requires sectorally targeted business-development policies in addition to general demand policies. In studies of cleantech regional innovation systems, Cooke (2008) and Burtis (2004) drew attention to the role of demand policy, and they also recognized the importance of research funding and adequate capital investment. The overview of cleantech policies presented here is largely consistent with their findings. In other words, government policies for cleantech business development in the United States and Canada provide support for access to finance, including dedicated government green funds or high-tech funds; for commercialization and incubation; and for research, development, and testing.

This review also draws attention to another important and less well-recognized aspect of cleantech business development: government support for organizations that can provide less tangible benefits such as networking, mentoring, career development, and information sharing. The two cases presented here highlight the importance of the ongoing networking that helps to develop the workforce, to connect regional businesses and researchers, to keep governments informed, to provide mentoring opportunities, and to connect the local network with national and international markets and partners.

Attention to the role of networking in government-supported intermediary organizations like LACI and NY-BEST may also have implications for the general contextual issue of gaining political backing for the cleantech sector in conservative states. Our review suggests that in the United States commitment to the provision of public resources to the cleantech sector is more prominent in the 'blue' states associated with the Democratic Party (the left-of-center party) than in the 'red' states associated with the more conservative Republican Party. In Canada, the situation was more complicated during the 2017–2018 period, when this review took place,

because Prime Minister Justin Trudeau provided favorable policy signals at the federal level, but there were also differences across the provinces that were in some ways parallel to the divisions across states in the United States. In the American case, it is likely that the best strategy in conservative states is to embed support for cleantech sector development in broader programs for high-tech development. For example, a review of state-government economic development programs showed that although cleantech receives more political support in 'blue' states, in states with Republican governors it was also included as a highlighted industry among a list that the state government provides of its industrial strengths (Hess and Mai 2015). In a similar way, policies that assist high-tech development – business-development funds, incubators, testing centers, and so on – may provide an umbrella for the development of cleantech industries in states where the political climate is otherwise not hospitable. Moreover, government assistance for business associations or other business-development networking organizations may also be less polarizing politically than demand policies and regulations, which can attract criticism from conservatives because of concerns with cost and government overreach.

The development of a regional cleantech sector has potential implications beyond the widely recognized environmental, job creation, and economic development benefits. Although these goals are worthy in themselves, the development of the sector can also serve to strengthen public opinion in favor of energy-transition policies. For example, in 2010, when three Texas oil-and-gas companies funded a ballot proposition (Prop 23) to suspend California's global warming law (AB 32), donors from the high-tech and financial sectors provided substantial funds to help to defeat the ballot initiative and to preserve the legislation (Hess 2014). By shifting the frames from greenhouse-gas mitigation and sustainability to job creation, economic development, and innovation systems and clusters, and by including cleantech sector development in a broader set of high-tech development policies, it may be possible to reduce some of the political tensions that have emerged over other energy-transition demand policies such as climate-change mitigation programs and renewable portfolio standards. At the same time, by building up the cleantech sector, advocates of sustainability policies can help to strengthen a potentially powerful constituency of voters whose jobs and businesses are linked to policies that support a transition to more sustainable industrial systems.

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