



Cleantech Ecosystems: Why Massachusetts and California are Ahead of the Rest

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With the financial system in shambles, unemployment rates high, and a clean energy-conscious president looking to revamp the U.S. economy, the U.S. government has significantly increased investment in the cleantech sector in an effort to jump-start American innovation and spark green job creation. As proven pioneers in creating fertile ecosystems for cleantech businesses to grow, Massachusetts and California have been able to capitalize on this increased investment.

If other states wish to reap the benefits of a developed and mature cleantech economy, they must follow the lead of Massachusetts and California and cultivate the fledgling technologies that may one day power America. Both states possess five essential characteristics that have made them prime targets for government funding: (1) access to venture capital and other investor networks; (2) academic, R&D, and innovation resources; (3) active state and local governments that provide incentives, act as customers, and create early market adoption conditions such as renewable portfolio standards; (4) already established cleantech clusters, organizations, and incubators; and (5) a community of repeat entrepreneurs and a culture that connects this community and helps support their start-ups. Here's a closer look at how Massachusetts and California have developed such remarkable cleantech ecosystems:

Massachusetts

A viable cleantech ecosystem must have both the innovative research institutions necessary to produce clean technology products and the financial resources necessary to convert those products into commercially viable businesses. Massachusetts has an abundance of both. In 2009, the state ranked second (only to California) in venture capital investment in the sector with businesses receiving \$356 million in 27 venture capital deals. The state has received \$1.8 billion in venture capital investments since 2005. One reason for such heavy investment stems from the plethora of academic institutions in the state that have dedicated themselves to cleantech innovation. Massachusetts is home to the top cleantech university in the country, the Massachusetts Institute of Technology (MIT), whose programs and competitions have helped support numerous successful ventures in the past several years including Sun Catalytix, A123 Systems, and FastCAP Systems. In addition, Massachusetts boasts seven of the Aspen Institute's 2009 World's Top 100 Green MBA programs (Babson, Bentley, Boston College, BU, Brandeis, MIT, and UMass Boston) and is home to arguably the top undergraduate institution and graduate business school in the country, Harvard University.

Cleantech innovation, however, does not occur exclusively in university classrooms or corporate conference rooms. Massachusetts' public leaders and policy makers have implemented pioneering policies essential to driving growth in the cleantech sector. In 2008, Governor Deval Patrick signed The Global Warming Solutions Act, which

many consider to be the strongest greenhouse gas (GHG) reduction act in the U.S., mandating a 10-25% reduction from 1990 GHG levels by 2020 and an 80% reduction by 2050. Under the Green Jobs Act of 2008, he established the Massachusetts Clean Energy Center (MassCEC) which became the first state authority in the U.S. exclusively devoted to job creation and economic development in the clean-energy sector. On top of this, his Green Communities Act has one of the nation's most aggressive energy-efficiency programs—including \$2 billion in public and private investments (three times more per capita than the amount invested in California).

Massachusetts is also a member of the Regional Greenhouse Gas Initiative (RGGI), the Northeast's regional cap-and-trade system which has generated \$79 million in carbon credits for Massachusetts. Such progressive policies have helped the state earn a large portion of federal grants in the cleantech sector. Massachusetts recently received 16 of 123 awards from the DOE's Advanced Research Projects Agency-Energy (ARPA-E) program—a total of \$62.8 million and by far the most of any state per capita.

These policies have also encouraged the success of numerous cleantech clusters, organizations, and incubators. Just recently, DOE Secretary Steven Chu announced that a partnership between the Fraunhofer Center for Sustainable Energy Systems, the New England Clean Energy Council (NECEC), MassCEC, and the Association of Cleantech Incubators of New England (ACTION) would receive a \$1 million grant over three years to expand the Fraunhofer TechBridge Program and establish the Innovation Acceleration Program (IAP). The IAP project combines technical prototyping services from Fraunhofer Techbridge with the NECEC's entrepreneur network to develop start-ups' business plans and validate their market value. MassCEC and the ACTION incubators add services and support helping to connect these entrepreneurs to industry professionals and funding sources. According to Peter Rothstein, President of the NECEC, this "collaboration will accelerate lab-stage opportunities to venture validation and private sector support. It is clear evidence of the partnering taking place across the regional New England cleantech innovation community." Such a grant was undoubtedly made possible by the preemptive government policies which have made Massachusetts a center for cleantech growth and development.

California

California has also proven itself to be a leader in its dedication to the advancement of clean technology and renewable energy. In terms of access to capital, California is unrivaled in its venture capital and other investment resources committed to cleantech initiatives. In 2009, venture capital and private equity investment in cleantech topped \$2.1 billion in over 115 separate deals. From 2006 to 2008, California received over two thirds of all U.S. cleantech venture capital investment—totaling \$6.5 billion.

Coupled with the high-technology experience and culture that can be found in Silicon Valley, California is also home to world-class universities and national laboratories that are dedicated to developing 21st century cleantech solutions. Cleantech Media ranked the University of California (UC) Berkeley the #2 cleantech university in the U.S. (behind MIT). The university sponsors several innovative partnerships including the Energy and Biosciences Institute which was funded by BP for \$500 million over the next 10 years. Stanford is also atop the cleantech charts and has sponsored research partnerships such as the Precourt Institute for Energy and many successful cleantech ventures through the Stanford Technology Ventures Program.

Equally as important are California's four national laboratories, which collaborate with its many universities and the state and federal government to encourage cleantech innovation. The Joint BioEnergy Institute funded by the DOE, brings together the Lawrence Berkeley National Laboratory, the Sandia National Laboratory, the Lawrence Livermore National Laboratory, and UC's Berkeley and Davis to advance the development of next generation biofuels.

Furthermore, California has some of the most amenable government policies and incentives to support cleantech growth. California's AB-32, the Global Warming Solutions Act, requires that the state's GHG emissions be reduced

by 30% (to 1990 levels) by 2020 and by 80% by 2050. Under the Act, the state will use direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, and market-based mechanisms such as a cap-and-trade system to achieve these goals. In conjunction with AB-32, California regulators have recently voted to increase the state's renewable portfolio standard from 20% to 33% by 2020 and to include in the mandate the Los Angeles Department of Water and Power, the largest utility in the country. Other cleantech-friendly initiatives include the California Solar Initiative and the New Solar Homes Partnership, which use rebates and incentives to make solar panels more affordable.

California is already home to several prominent cleantech clusters, organizations, and incubators. CleanTECH San Diego has developed a comprehensive one-stop-shop and vibrant ecosystem aimed at accelerating the growth of the more than 650 San Diego cleantech businesses. The Environmental Business Cluster manages the largest private technology commercialization program in the United States for clean energy start-ups. Among many others, these cleantech organizations have helped to foster an experienced and productive cleantech community which has warranted investment from private and public sources. Simultaneously with the Fraunhofer grant, the University of California, San Diego's William J. von Liebig Center for Entrepreneurism and Technology Advancement received a similar grant aimed at commercializing and funding university-originated technologies in California. With the help of such grants, California will be able to nurture up-and-coming technologies and make sure that it remains a center of cleantech innovation for decades to come.

Conclusion

Other states such as Texas, New York, Colorado, and Michigan have followed the lead of Massachusetts and California and have begun to distinguish themselves as centers for cleantech innovation. By enacting cleantech friendly legislation and mobilizing their various research and academic institutions to the cause, these states are creating fertile ecosystems for early-stage businesses and have seen the benefits of their steadily emerging cleantech economies. With renewable energy and climate change legislation on the Congressional horizon, these states, led by Massachusetts and California, stand to gain the most.

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