

CLEANTECH CLUSTERS – SCALING LOCAL ECONOMIC DEVELOPMENT FOR GLOBAL INVESTMENT

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There has been an explosion of clean-tech clusters around the world, promising to help accelerate financing, growth, job creation and the next generation of sustainable technologies.

Four years after public stimulus funds aimed at greening the economy were committed, a new pattern of economic development, green job creation, green procurement and high growth ventures is emerging. During the last decade, the development of the clean technology sector was driven by private or strategic corporate investments in venture-grade companies, or by investment in projects underpinned by renewable energy targets and carbon markets.

We argue that the low-carbon economy has now gone mainstream. Local, regional and countrywide economic development groups, business organizations, corporate partners, investors and centers of R&D are coalescing in clusters aimed at accelerating the path to market for clean-tech innovations. From Europe to the Asia Pacific, via North America, dozens of clusters have been launched, often in conjunction with major clean-tech investment events.

Whether as incubators of clean-tech growth companies, or business services and partnerships for later stage innovators, these clusters represent and attract a portfolio of companies characteristic of their mandate (whether job promotion, green procurement, economic development, or achieving high-value exits for investors) and local business culture (see table below). Clean-tech clusters are fast becoming the driving force behind the acceleration of developments and innovations in energy, water, waste, clean fuels, green materials and green buildings.

In 2010, the Global Clean-tech Cluster Association (GCCA) was formed to facilitate global connections, develop a platform of exchange for best practices, and align emerging startups with corporate partners. By joining the GCCA, clean-tech clusters and their member companies increase their exposure for their region and companies worldwide, while also harnessing the knowledge, experience, and other benefits a worldwide association of clusters have to offer.

Until the advent of the GCCA, international collaboration was limited by a scarcity of resources and a lack of strategic alliances between clusters and cluster member companies. The GCCA is addressing this challenge by making communication and collaboration for local clusters and their companies, faster, more efficient, affordable and, most importantly, global.

Region	Country	Clusters	Cluster Type	Cluster size (companies)	Investment (general)	Company Investment (if known)							Technology Focus	
						G	A	VC	PE	D	SI	PF		
North America	USA	Washington Clean Technology Alliance (Seattle, Washington)	Business	90									CleanTech general	
		Environmental Business Cluster (San Jose, California)	Business, incubator, econ.dev	28									CleanTech general	
		Watershed Capital Group (Atlanta, Georgia)	Investor	30									CleanTech general	
		CleanTech San Diego (California)	Business, research, Investor	800									Solar, fuels, efficiency, transport., grid, storage	
		Portland Development Commission (Oregon)	Economic development	NA									Solar, wind, efficiency, transport., green buildings	
		CleanTech Alliance Mid-Atlantic (Philadelphia, Pennsylvania)	Economic development	450	Public /private									Energy, transportation, advanced materials
		Akron Global Business Accelerator (Ohio)	Business, incubator	52										Waste-to-energy
		Clean Technology and Sustainable Industries (Austin, Texas)	Business, incubator, research, investor	200										CleanTech general
		New England Clean Energy Council (Boston)	Economic development	400										Renewable energy, storage
		NYC Acre (New York City)	Business, incubator, research	NA	Public/private									Cleantech, renewables
		CleanTech Los Angeles (California)	Business, incubator, research, investor	NA										Vehicles, renewables, water, infrastructure
		Colorado Cleantech Industry Association (Denver)	Business, research, Investor	200										Energy efficiency, renewables
		Chicago Clean Energy Alliance (Illinois)	Business	NA	Public/private									CleanTech general
		CleanTech Center Syracuse (New York)	Business, incubator, research	NA										Energy, fuels, grid, buildings, transportation
Canada	EcoTech Quebec (Montreal, Quebec)	Business, Research, Investor	320									CleanTech general		
	GreenTech Exchange (Vancouver, British Columbia)	Business	NA									CleanTech general		
	MaRS Discovery District (Toronto)	Incubator	NA									CleanTech general		
Europe	France	CD2E (Loos-en-Gohelle)	Business, incubator, research, investor	550	FDI, state								CleanTech general	
		French CleanTech (Lyon)	Business, investor	360									CleanTech general	
	Italy	Progetto Manifattura (Trento)	Incubator	20									Green buildings	
	Netherlands	Amsterdam Ecocluster	Economic development	NA	Public/private								CleanTech	
		CleanTech Business Club (Rotterdam)	Business, investor	46									CleanTech	
	Denmark	Copenhagen Cleantech cluster	Economic development	27									Smart cities	
	UK	Ecoconnect CIC (London)	Business, investor	12									CleanTech	
		UK CEED (Peterborough)	Economic development	380	Public/private								Energy, water, water, green buildings	
	Germany	CleanTech NRW (Leverkusen)	Economic development	94	Public/private								CleanTech	
	Ireland	The Green Way (Dublin)	Economic development	200									Energy	
	Austria	EcoWorld Styria (Graz)	Business, incubator, research, investor	175									CleanTech	
	Belgium	Flanders CleanTech (Oostende)	Business	500	Public/private								CleanTech general	
	Switzerland	Swiss CleanTech (Zurich)	Economic development	280	Public/private								CleanTech general	
Finland	Finnish CleanTech Cluster (Lahti)	Business, incubator, research	400									Green materials, waste to energy, water		
Asia-Pacific	Australia	Australian CleanTech Network	Business, research	700	Public/private								CleanTech general	
	New Zealand	Grow Wellington	Economic development	15									CleanTech general	
	Singapore	Singapore Sustainability Alliance	Economic development	NA	Public /private								Sustainability, Green IT, management	
	South Korea	CleanTech Korea (Seoul)	Business	NA									Solar, green chemistry	
As of 01/2012. For details on each cluster see www.globalcleantech.org			Economic development = publicly financed entity	NA = not available or not disclosed	Public/private = no specific funding type indicated G = grants; A = angel funding; VC = venture capital; PE = private equity; D = debt financing; SI = (corporate) strategic investing; PF = Project finance.							CleanTech general = no specific focus is indicated, or all cleantech domains are supported		

CleanTech Clusters help Cleantech Investors.

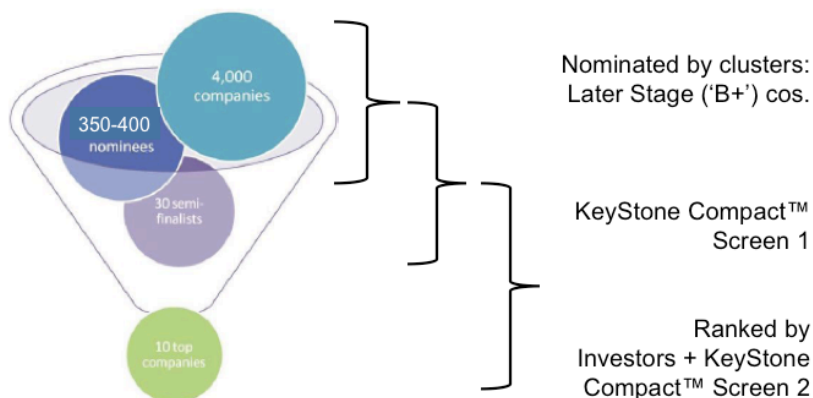
Like mutual funds, the portfolio of companies within each cluster represents a spectrum of deals that are currently investable, or that may be investable in future, whether seed and venture, debt, strategic, project or public finance. Growing interest in clean technology has drawn aggregate cluster company investments upwards of \$200 million, with individual investments in the sub-\$50 million range. The following serve to illustrate the value of cluster companies to a wide range of investor types:

- Ice Energy, a grid storage company in the Colorado cluster received series C investment of \$24 million from VC and PE investors;
- CleanTECH San Diego's EcoATM, an electronics recycling company received a private equity round of \$14.4 million;
- Finnish CleanTech's Chempolis, a biomaterials company, established a debt/project finance-funded joint venture valued at \$40 million in China's Henan Province to construct a biorefinery, producing 160,000 tons of non-wood papermaking fibres and biochemicals;
- Dublin's cluster company Open Hydro, a manufacturer of marine turbines for tidal energy production, received a nearly \$20 million strategic investment from DCNS; and
- Viridity Energy (CleanTech Alliance MidAtlantic), a smart grid demand response technology company for institutional customers, received a series C corporate VC round from General Electric.

Indeed, the seven clusters which track investment in member companies estimate that close to \$ 800 million was invested in 2010–11 as the result of cluster efforts, a figure which, if replicated across the GCCA cluster universe, would suggest an aggregate exceeding \$3 billion.

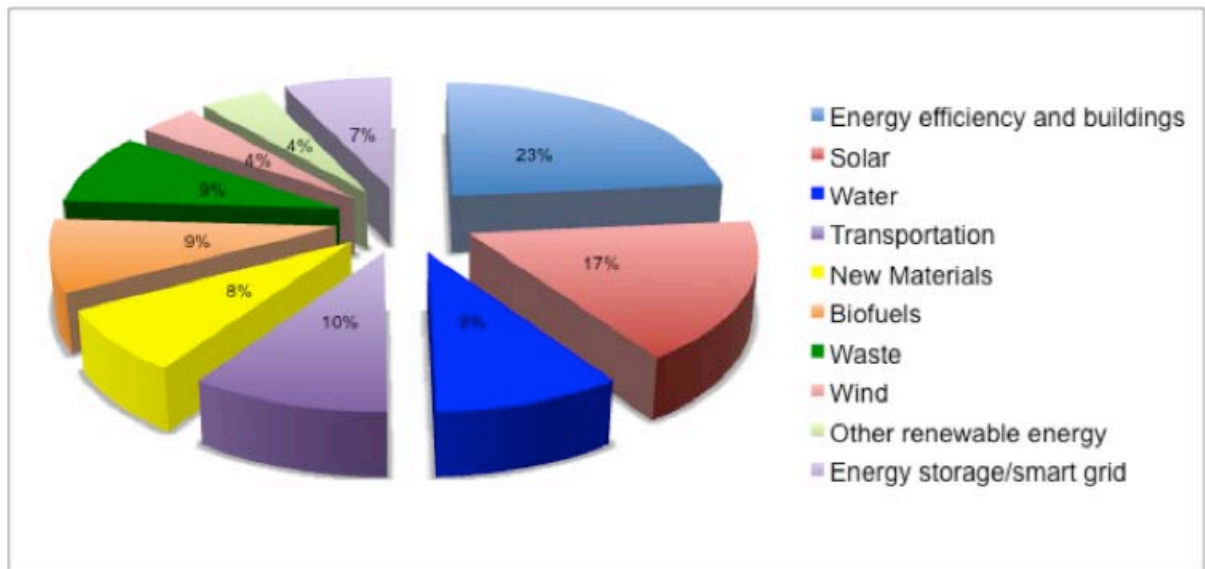
During the last few years, the CleanTech group has reported on the increasing trend of corporate strategic and venture investments in clean-tech companies. Clusters are capitalizing on this trend, engaging companies like Veolia Environnement, Siemens, IBM and Bosh and many others to accelerate the integration of cleantech innovators in new business practices. Particularly active in this space are the Australian CleanTech Network, swisscleantech, CleanTECH San Diego, the Finnish CleanTech Cluster, EcoTech Quebec, the Singapore Sustainability Alliance and An tSlí Ghlas.

The GCCA, in partnership with CleanTech Acceleration Partners, an investment strategy consultancy, piloted an investment grade stress test (equity capital investable, other form of capital, or non-investable at this time, needing restructuring) as a part of its annual Later Stage Award evaluation, based on the KeyStone Compact™ method. Developed at the Zell-Lurie Institute for Entrepreneurial Studies at the University of Michigan, companies are screened in a two-stage process (see inset; numbers based on estimated nominations for the 2012 Later Stage Award).



The first screen assesses the company's positioning for value capture based on the industry value chain, and market-entry strategy. The second screen quantifies the upside potential of investment given typical exits and investment rounds or capital required.

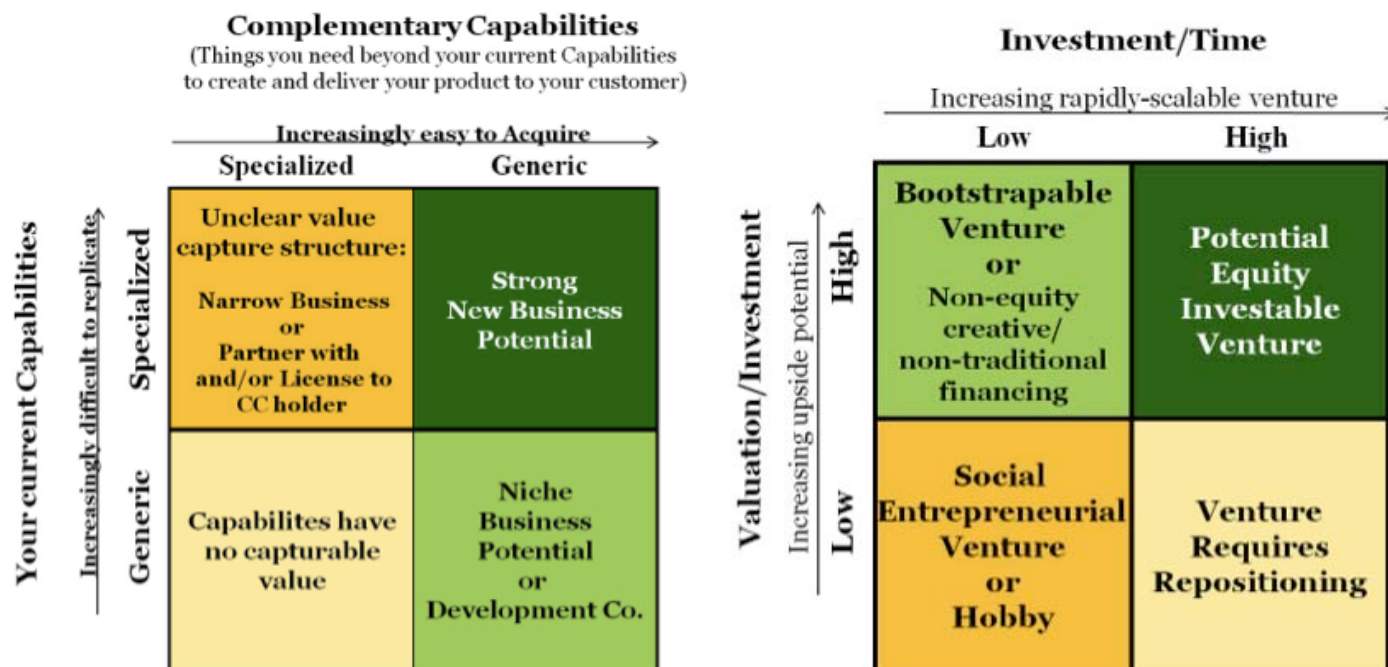
Of the 185 companies (see pie chart for distribution across CleanTech sectors) nominated by the 28 leading GCCA clusters in 2011, 30 were screened for investment grade. Based on investor IRR expectations, 45% of companies were deemed VC or PE grade, and 5% of the scale and potential to deliver project finance returns. All other companies were screened out as requiring a different form of investment capital.



The following finalists in ten sector categories, ranging from solar and wind, to water, green buildings and new materials were selected by GCCA investor judges, with \$3.5 billion of cleantech capital under management, for 'best in class' awards.

- Biofuels – Imperative Energy – a bioenergy project developer with 35 active installations - www.imperativeenergy.ie.
- Energy Efficiency/Green Buildings – Albeo Technologies - a leading manufacturer of white-LED lighting systems for general illumination - www.albeotech.com.
- New Materials – Beneq - a supplier of equipment and coating technology - www.beneq.com.
- Renewable Energy – Open Hydro - an Irish tidal energy technology company with a project portfolio spanning the USA, Canada, France, Scotland and the UK - www.openhydro.com.
- Solar - Solaris Synergy - developer of a low-cost concentrating photovoltaic (CPV) system designed to float on water surfaces, utilizing inexpensive, easy-to-manufacture platforms - www.solaris-synergy.com.
- Storage/Smart Grid – PowerGenix - the leading developer of Nickel-Zinc (NiZn) batteries - www.powergenix.com.
- Transportation – SAM Group - developed, built and launched the electric vehicle Sam EV II - www.sam-group.com.
- Waste – Newalta - Canada's leading industrial waste management and environmental services company - www.newalta.com.
- Water – Rentricity - recovers energy from excess water pressure in pipes to produce renewable electricity - www.rentricity.com.
- Wind – Moventas - one of the largest manufacturers of wind turbine gears in the world - www.moventas.com.

Assessing Cleantech Investment Value: the KeyStone Compact™



The KeyStone Compact™ is a scalable analytical tool that integrates business fundamentals with tacit knowledge gained from successful serial entrepreneurs and investors. Its value lies in the data-driven approach to progressively and rigorously assess the potential value capture and investability of new ventures and later stage companies. At its core, the assessment tools that make up the KeyStone Compact™ provide a quantitative stress test and repositioning methodology for new ventures, existing ventures seeking renewal or equity investment, or economic development sectors in need of company portfolio balancing. Iterating through the two assessment frameworks (Positioning for Value Capture, PVC and Profiting from Capabilities, PFC; see left and right diagram respectively) answers four key questions:

- (i) is the venture or the industry sector portfolio able to leverage its capabilities in a way that creates value?
- (ii) is the venture or industry sector portfolio strategically positioned to be able to capture a portion of this created value?
- (iii) is the venture or the sector portfolio attractive to outside investors?
- (iv) is this venture or sector portfolio strategically aligned with broader organizational goals such as economic development?

The method has been applied to over 500 companies in CleanTech, space science, biotech, ICT, social ventures, biomedical devices and consumer products.

Based on PVC, all companies are subjected to bottom-up analysis in their value system and are assigned a preliminary KeyStone Score™ as follows:

1. No capturable value;
2. Niche business;
3. License opportunity;
4. Strategic partnership;
5. Strong new business potential.

Only companies with scores 3-5 are carried forward to the PFC analysis. Again, either using screening level or in depth analysis, the PFC maps the company in the 'upside potential' to 'time to scale' space, resulting in four quadrants:

- social venture or hobby,
- not investable (requiring repositioning),
- bootstrappable or non-equity financing, and
- potential equity finance.

Of importance in this map is the valuation-over-investment ratio, and the investment-over-time ratio, which determines capital required and time frames over which this investment is needed. This information is analyzed using a proprietary financial model to develop the scale and projections for value capture, and investment required. Research to date indicates that the KeyStone Score™ is strongly correlated to returns on invested capital, and future valuation of the company. Only companies in the top two quadrants are generally retained for full business design and assessment, though social ventures are considered as well. Companies in the lower two quadrants of either diagram can be repositioned and restructured ('getting to plan B'), using bottom up data acquisition and analysis.

Case Study: Open Hydro

Open Hydro designs and manufactures marine turbines to generate renewable energy from tidal streams. The company's vision is to deploy farms of tidal turbines under the world's oceans - silently and invisibly generating electricity at no cost to the environment. The electricity produced is renewable since it relies on tides that are created by the gravitational effect of the sun and moon. Through this innovative technology, Open Hydro extracts energy in an economically viable and environmentally sensitive manner.

The key aspects of the PVC assessment are:

- the company's Open-Center Technology is unique and covered by a suite of worldwide patents;
- at this stage of marine energy development, there is still competition for standard designs, and no dominant business model has emerged. Integrators and operators currently capture most of the value as they control the distribution point of electricity to the grid;
- market scale is very large but market access depends on effective partnerships;

Following this analysis, Open Hydro was given a PVC KeyStone Score™ of 4, which represents high potential, the need for partnerships and an uncertain value capture-position.

Clusters Help Portfolio Companies.

No two clusters are the same, but all aim to help accelerate access to markets and provide networking, business services, and links to the R&D pipeline, corporate partnerships or investors. Aside from visibility and access to the investment community, it is the strength of global supply chain collaboration that sets the clusters apart.

For example, in 2011, the Finnish cleantech cluster connected later-stage and corporate members with CleanTECH San Diego smart grid companies and investors, and is planning to repeat this with nascent clusters in China in 2012. The swisscleantech cluster was instrumental in setting up Cleantech Nord-Rhein WestPhalen in Leverkusen, Germany, a public-private partnership. Similar cross-border connections are being promoted by other clusters, exposing member companies to corporate partners, entrepreneurial startups and potential investors.

The GCCA further amplifies this exposure and global collaboration and scalability. Examples include:

- EcoTech Quebec, focused on green procurement for ecocities, brought together 17 other member clusters and their companies in Montreal in conjunction with the EcoCities World Summit, with meetings hosted by the Quebec pension fund.
- The Green Way in Dublin, Ireland, a collaborative cluster established by industry, academic institutions and public authorities, hosted 2011 GCCA Later Stage Awards event and brought together cluster managers and member companies with the top cleantech and government players in Ireland.

Clusters Spur Economic Development.

While most cleantech clusters are primarily business, investor or research driven, around one-third are funded by economic development organizations. Clearly, the objectives here are green jobs and strategic investment. An analysis by the Brookings Institution suggested that the clean economy employs some 2.7 million workers in the US. Many of these jobs can be found generated by urban cleantech clusters.

The contributions to job creation vary widely, as do some of the underlying assumptions to quantify them. Regardless, credible sources indicate the positive economic impact of clusters. For example, the Washington Clean Technology Alliance is said to have spawned 83,000 jobs according to the Brookings report. The Colorado cluster generated about 3,000 jobs from 200 companies, while the Akron Global Business Accelerator enabled 131 jobs in association with its 52 companies. Similar stories abound in Europe. For example, the EcoWorld Styria cluster in Austria has facilitated the growth of 150 cleantech companies, providing 5,500 jobs in renewable energy and environmental technology sectors. The Finnish CleanTech Cluster attributed 500 jobs to its member companies, and Progetto Manifattura generated 100 jobs in its first year. In Australia, Australian CleanTech has estimated that the sector in Australia has 1,100 companies with a total of 45,000 employees.

One of the key issues that the GCCA seeks to tease out is, what makes a cluster successful? What are the practices that make clusters grow or founder? What are the lessons for the design of public policy instruments that drive success of clusters?

The role of the cluster is to bring together the research enterprise, corporate partners and investment capital, engage with public authorities to help develop legal frameworks (green

procurement, subsidies and market incentives), and organize trade missions to ‘make local global’.

Since composition of clusters reflects the local business environment, and since different clusters may have different mandates, best practices are difficult to identify. The emergence of a variety of networking, incubation, business development and investment-dominated clusters, all of which are helping their members attract investment and create jobs, is indicative of a wide range of potentially successful, but not necessarily replicable models. Think of the largely unsuccessful replication elsewhere of Silicon Valley’s approach to innovation enterprise – the whole is greater than the sum of the parts.

However, the public policy lessons to date include the need to promote richness in diversity, allowing local strengths to be leveraged, and to enable ‘coopetition’ instead of competition between clusters. To take cleantech to the scale that continues to be attractive to investors and governments alike, global collaboration and sharing among clusters needs to be encouraged.

By setting up policies that enable public-private partnerships, mobilize financing, incentivize green procurement targets, cleantech clusters will continue to develop and grow, allowing their member companies to capture value in the market.

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Ben Taube is an experienced leader in developing cleantech companies with an extensive expertise in shaping environmental partnerships, policy and education. With a focus on energy efficiency opportunities that yield bottom line savings, Ben leverages his experience to forge new pathways for clean energy program development and deployment across the country and globe. He is one of the founders and current Chairman of the Global Cleantech Cluster Association

