

# THE FUTURE OF CLEANTECH

**“Co-opetition” not competition**

Key lessons and recommendations






**Climate-KIC is the EU's main climate innovation initiative. It is Europe's largest public-private innovation partnership focused on mitigating and adapting to climate change. Climate-KIC consists of companies, academic institutions and the public sector.**

The organisation has its headquarters in London, UK, and leverages its centres across Europe to support start-up companies, to bring together partners on innovation projects and to educate students to bring about a connected, creative transformation of knowledge and ideas into products and services that help mitigate and adapt to climate change.

Climate-KIC is one of the Knowledge and Innovation Communities (KICs) created in 2010 by the European Institute of Innovation and Technology (EIT), the EU body tasked with creating sustainable European growth while dealing with the global challenges of our time.

[www.climate-kic.org](http://www.climate-kic.org)

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The project team is grateful for the vital input of numerous experts across the Climate-KC community who have made this report possible.

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1. Make our horizons global
2. An international network of partners
3. Gaining the power of a real community

# THE FUTURE OF CLEANTECH

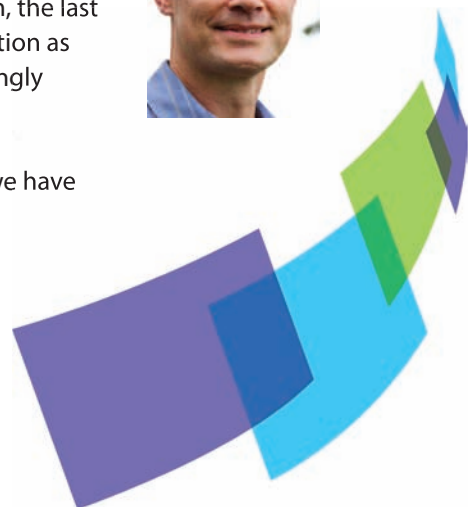
Climate-KIC believes that entrepreneurs and innovators hold the key to responding to the climate challenge.

From the low of 2009, and the so-called 'death' of cleantech, the last five years have seen a steady resurgence of climate innovation as governments and organisations around the world increasingly pursue the sustainability agenda.

There is no time for complacency, however, which is why we have chosen this time to detail our vision for cleantech 2.0.

### **Frans Nauta**

*Deputy Director Entrepreneurship, Climate-KIC*





# 1. CLEANTECH ISN'T DEAD

Just as claims that the “internet is dead” after the dotcom crash of 2000 were wide of the mark, however, so cleantech hasn’t ‘died’ in the years since 2009. Global investment in clean technology grew to \$381bn in 2009, representing an astonishing 32% overall increase from 2008 (source: GlobalData). Global VC funding for cleantech firms hit \$8.8bn in 2008, private equity financing reached \$19bn. In the US, according to the National Venture Capital Association, VC funding in cleantech grew from hundreds of millions of dollars in 2005 to \$4.1 billion in 2008.

From that peak of excitement, interest and investment levels the cleantech sector has suffered some setbacks. 2010 saw a significant decline in cleantech investment. Despite a recovery in 2011, Global VC investment in cleantech slumped to \$6.8 billion in 2013 (source: Cleantech Group), and overall new cleantech investments dropped to \$212 billion according to Clean Energy Pipeline, a 20% fall compared to 2012.

There is now widespread scepticism, particularly in the US and other developed markets, regarding cleantech start-ups and cleantech in general as a viable investment market. This scepticism has dominated coverage of the sector. In 2012 Wired ran a story detailing the ‘collapse’ of cleantech investment: “*Why the Clean Tech Boom Went Bust*”, and in January this year US current affairs show *60 Minutes* broadcast a special on “The Cleantech Crash”.

## CLEANTECH 2.0

However, just as claims that the “internet is dead” after the dotcom crash of 2000 were wide of the mark, so cleantech hasn’t ‘died’ in the years since 2009. In fact cleantech has continued to develop in both developed and developing markets and the sector is now regaining its momentum – although perhaps it is slightly misleading to refer to the sector only as ‘cleantech’. We are now very much in the era of ‘cleantech 2.0’, going far beyond the renewable energy focus of ‘cleantech 1.0’, to include energy, material and resource efficiency as well as adaptation technology – a much broader spectrum of what we would term ‘climate innovation’.

Although Europe has historically lagged behind the US in terms of VC infrastructure, it remains the world’s preeminent hotbed for climate innovation. In the latest *Global Cleantech Innovation Index*, a report identifying the world’s leading hotspots for sustainable innovation released in June 2014, European countries made up 7 of the top 10, and 12 of the top 20. This world leading innovation has enabled Europe to produce some of the world’s most successful cleantech ventures. For example, Denmark has the highest number of publically traded cleantech companies proportional to its population – such as Novozymes, Vestas and Grundfos. Companies like ABB in Switzerland, Avantium in The Netherlands, Glo AB in Sweden and Eniram in Finland, have also been recognised as some of the most successful examples of Europe’s cleantech innovation.

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## GROWING MOMENTUM

In the US VC investment is returning to the cleantech sector. Of the global total of VC funding for cleantech, the US accounted for \$5 billion, with investment rising each quarter during 2013 at 14%. The recent successes of companies like Tesla, Nest, XL Hybrids and SolarCity demonstrate how the momentum is once again growing for cleantech ventures in the US.

Although China experienced a 4% drop in cleantech investments in 2013 according to Bloomberg New Energy Finance, the government continues to push ahead with ambitious plans for large-scale sustainable developments. The country’s 12th Five-Year Plan, covering 2011–2015, marked the first time China had formally incorporated mitigating climate change into its core economic strategy. The government has also committed to spending \$850 billion to improve water supplies over the next decade and \$283 billion to tackle air pollution over the next five years. China’s nine “New Areas” are major new economic development zones established across China earlier this year to spur development in line with ecological principles with the help of the central government. China has also set itself very ambitious goals in solar and wind power – targeting tripling its solar capacity to 70 GW, and increasing wind power generation to 150 GW by 2017.

India too is becoming a major part of the

global sustainability drive. In particular the solar market in India is soaring, setting the stage for fast growth of sustainable energy in the Asian market.

As this momentum builds across the world, so the cleantech sector finds itself aligning with some key technological and political drivers that are bringing new focus to the space and re-establishing cleantech’s credentials as a dynamic, growing and desired investment market.

For example, wind and solar are quickly becoming the cheapest forms of energy – indeed the price of PV cells dropped to 74 cents per watt in 2013 (source: Bloomberg New Energy Finance), and earlier this year JinkoSolar in China announced that it was producing sub-50-cents-per-watt solar modules. For the first time since 2006 the industry is faced with production shortages, and is expected to install 52 GW of new solar capacity this year and over 60 GW next year.

The adoption of electric vehicles is accelerating, with a report by the International Council on Clean Transportation (ICCT) stating global sales of electric vehicles doubled last year. Moreover, the price of the lithium ion batteries required by electric vehicles are tumbling – several forecasts have suggested that prices could fall by as much as 70% in the next few years – with lower cost manufacturing spurred by the Obama administration and other governments around the world.

## RENEWED POLICY FOCUS

As well as these technological developments, for international governments there is also a renewed policy focus on emissions and energy efficiency. China is clearly pursuing an ambitious programme of government-funded sustainability projects, the European Union is pushing ahead with its multibillion Horizon 2020 programme, and the UN hosted its September 2014 Climate Summit in New York to: “catalyse climate action ... reduce emissions, strengthen climate resilience, and mobilise political will for a meaningful legal agreement in 2015 [at the COP21 conference].”

These trends, amongst others, are ushering in a new, more meaningful period of growth in the cleantech sector. We are already seeing signs that investment is creeping up – Clean Energy Pipeline reported that the first quarter of 2014 saw a 14 per cent year-on-year increase in global clean energy investment. As governments and organisations around the world increasingly pursue the sustainability agenda, we expect to see greater recognition for the long-term, durable value of cleantech ventures.

This is good news, but when we look at the size of the climate change challenge we must realise that there is much more than needs to be done. How can we increase cleantech investment exponentially? How can we better support and nurture cleantech entrepreneurs? How can we inspire the next generation of business leaders to adopt even more ambitious sustainability goals? And ultimately: how do we give cleantech innovators and entrepreneurs the best chance of success?



## 2. THE POWER OF “CO-OPETITION”

**Of course the fact that four of the world’s most influential regions – China, the US, India and Europe – are actively stepping up their support for and engagement with the cleantech sector is a significant step forward. However, the fact is that each region on its own does not have the perfect environment to maximise the potential of cleantech entrepreneurship.**

Europe has a long-standing tradition of cleantech innovation, but lacks the start-up venture capital infrastructure of the US, and also lacks the investment capacity of China in improving production facilities. The US lags behind in terms of having a stable and consistent policy environment. China has the ambition and the funding, but is looking outside its borders for new ideas and innovation.

Clearly there is much that each region can learn and adopt from each other – from institutional change, to education programmes, investor knowledge, long-term

strategic thinking and many other elements both big and small. If cleantech is going to deliver the benefits that are required to mitigate and adapt to climate change then we need to create a consistent global environment for entrepreneurs so that they can generate the investment they need, deliver returns and maximise their chances for success.

If this is to be achieved then it is necessary to embrace collaboration and the virtues of “co-opetition” on an individual, company, country and international level. Climate change is not a problem that is going to be solved by individuals or unilateral action. The best and most effective solutions are only going to come from working together, sharing ideas between organisations and across borders, and utilising the power of the network.

This is no small challenge, and it is not said lightly. However, Climate-KIC truly believes that if we are going to confront climate change then this reimagining of the way we do business and entrepreneurship is fundamental.

**“The best and most effective solutions are only going to come from working together, sharing ideas between organisations and across borders, and utilising the power of the network.”**



## 3. THE WORLD'S NEXT ECONOMY

Ultimately Climate-KIC believes that entrepreneurs and innovators hold the key to responding to the climate challenge. Responding to climate change should not stifle innovation, but instead it should create new businesses, new economic models and new opportunities, ending our reliance on the economics and thinking of the last century – and Climate-KIC was created to fulfil that vision, truly creating the world's 'next economy'.

At the heart of this vision is the network – helping to establish creative partnerships between dynamic companies, the best academic institutions and the public sector. By forming these productive alliances ideas can flourish to create economically beneficial change – creating the opportunities for entrepreneurs and innovators to address climate change and shape the world's next economy.

### KEY LESSONS

Clearly this is not going to happen overnight, and there is a lot of knowledge and information that needs to be shared and absorbed if meaningful change is going to be achieved. Looking at the key regions of the US, China and Europe, Climate-KIC believes there are five key lessons to be learned for all three regions:

#### ▶▶ 1. Recognise the importance of consistent policy frameworks

Government and legislators clearly have a key role to play in the future of cleantech and there is much that they can do to improve the regulatory and policy environment for innovators and entrepreneurs. Deutsche Bank have detailed how the most attractive policy framework for investors is one that provides transparency, longevity and consistency ('TLC'). Clarity and consistency are crucial to successful policy frameworks as they are needed to steer public and private financing for cleantech. Europe has already shown the benefits that

this can bring. The EU's 2020 targets, and the recently proposed 2030 framework are the foundation stone of Europe's approach to cleantech. It has enabled Europe to lead the world in clean energy technologies, despite the deficit in VC funding compared to the US. For example, the EU has claimed 40% of all renewable energy patents over the last decade – more than the US – according to a report from the European Commission, and the European renewables sector today employs 1.2 million people.

As cleantech businesses come to the fore again, regional, national and international regulators must take note of the lessons from Europe on policy.

#### ▶▶ 2. Don't get hung up categorising things as 'cleantech'

The US has shown how perceptions of industries and sectors can shift very quickly and have very damaging effects. While before 2009 putting anything under the 'cleantech' banner was seen as a good thing,



since 2009 the reverse has been true for large swathes of time.

The cleantech banner has perhaps not been the most useful – after all clean energy technology is very different to energy efficiency systems or other sustainable businesses. The sector also suffered in comparison to rising digital stars like Facebook that received mammoth VC funding which coloured many investors views of what they should expect from cleantech companies.

Climate innovation is now a much more useful term to apply to the sector as it broadens its scope and reach. There is now a new cohort of ventures entering the market that are much more likely to align themselves with new industry trends like big data, home automation or the Internet of Things. As a result many entrepreneurs have managed to avoid the cleantech categorisation completely – but they are undoubtedly climate innovators. Investors around the world need to consider less whether a start-up is ‘cleantech’ or not, but look at the potential climate impact any business in any sector could have. Sustainable businesses are the future, but they are not all going to be in the shape of a classic ‘cleantech’ start-up.

### ▶▶ 3. It's not just about venture capital funds

VC funding of course gets a lot of attention, but in the US there is now greater recognition of the fact that there are other types of investors rapidly expanding their interest in the cleantech sector. As a recent Cleantech Group report has shown big corporates and ‘Big IT’ are increasingly making major investments in the cleantech sector. These investors include names like GE, BP, Google and Apple. These companies are recognising that cleantech can help them drive durable growth and create

differentiation while at the same time increase the sustainability of their businesses.

### ▶▶ 4. Support for innovators

Innovation is vital to overcoming climate change, but alone it is not enough. Innovation needs to go hand in hand with entrepreneurship. Of course there is no guarantee that a great innovator will be a great entrepreneur.

Transforming an idea into a commercially viable business is no easy task and innovators need all the support they can get. Networks like Climate-KIC can help connect the most promising start-ups with the right experts, to formulate their business plans, develop their entrepreneurial skills and fund their businesses through the early stages.

These things can't be left to chance, and if we are to foster greater knowledge sharing, partnerships and support for innovators then we need more organisations like Climate-KIC.

### ▶▶ 5. Dare to have big vision and ambition

Over the past decade China has experienced the most rapid cleantech growth – it is now the biggest manufacturer of PV cells, cleantech firms are booming, and China is now one of the top global investors in overseas renewable energy. The important lesson for other regions is that this has been achieved because China has shown huge ambition and commitment to supporting cleantech on a large scale.

Not only has China's use of renewable energy skyrocketed, but government funding for cleantech projects is still growing rapidly. A report from Pew Charitable Trusts last year highlighted how China's clean energy

marketplace has evolved from a scant \$5 billion invested in 2005, to become the largest and most diverse in the world. Schemes like the “New Areas” are hugely ambitious projects and the Chinese government is also keen for the country to become something akin to the ‘world’s test bed’ for clean technology.

When compared to governments elsewhere in the world, clearly there is much to be learned from China’s success. And when we are talking about a challenge as big as climate change we must all dare to have bigger vision and ambition.

## RECOMMENDATIONS

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**These lessons are important, and Climate-KIC is working hard to help spread these messages in its work. But this knowledge sharing must go hand in hand with practical action. So what can be done? We want to finish this report with three recommendations for practical steps that governments and regulators, academics and researchers, and businesses and entrepreneurs can take now to maximise the impact of cleantech innovation around the world.**

### ▶▶ 1. Make our horizons global

Too often the impulse of entrepreneurs and governments is to think locally first and globally later. But thinking nationally or regionally is not enough. Everyone involved in the cleantech sector needs to start thinking on a global scale first and foremost. The value of “co-opetition” is in ensuring that knowledge, skills, insight and best practice is shared across borders around the world. This needs to be our guiding principle, and with the UN’s COP 21 conference next year now is the time for it to come to the fore.

With COP21 on the horizon then we must also start thinking globally about policy frameworks. As we have said clear and consistent policy environments are crucial to maximising the success of climate entrepreneurs. We firmly believe that entrepreneurs and innovators need

to play the leading role in responding to the climate challenge, and so we need to have a global conversation about policy to ensure that market conditions are stable and consistent across multiple regions to give start-ups the best chance of creating solutions. Climate-KIC will be attending the COP21 conference and these issues will be at the top of our agenda.

### ▶▶ 2. An international network of partners

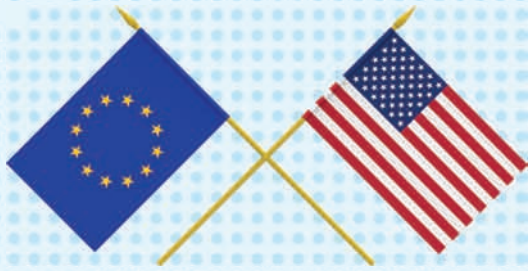
We need to maximise the power of the network by expanding partnerships and collaboration outside of our own countries and regions. Cleantech innovators need to reach out to every corner of the globe and to do that we need much closer public/private partnership within and between regions.

These partnerships are not just about closer ties between Europe, China and the US – they need to go further. Climate-KIC is already engaging in Brazil, and supports start-ups exploring the Indian and African markets. It is not only about closer ties between countries, but we also need to develop better ties between academia, finance and corporations. Climate-KIC is active in creating these partnerships – for example helping to develop connections between European innovators and Chinese financiers to help these start-ups to scale quickly and effectively.

There is a wealth of cleantech expertise and knowledge that has been built up in the leading regions – creating channels for that expertise to be shared globally will be crucial to the future success of climate change innovation.

### ▶▶ 3. Gaining the power of a real community

Ultimately we want to see a global community of cleantech entrepreneurs and innovators. But real communities are built on trust, and trust can only be established with real-world face-to-face interaction. To this end there is a vital role for governments and trade missions to play in facilitating these connections. This is the motivation behind Climate-KIC’s start-up tour programme. Our start-up tours provide



## More about the 2014 US Start-up Tour: [climate-kic.org/USA2014](http://climate-kic.org/USA2014)

European cleantech entrepreneurs with vital international experience, mentoring and networking opportunities. In September 2014, 13 European start-ups were taken to the US to meet entrepreneurs, investors and potential customers. In 2013, as part of the tour, three European start-ups were honoured at the Cleantech Open Global Ideas Competition, also known as the cleantech Oscars, in Silicon Valley.

These opportunities are a huge part of the future of cleantech. They are really a culmination of all of the lessons and advice we have provided in this report in a practical real-world experience – cross-border collaboration, knowledge sharing and global businesses. For cleantech innovation to grow we need to foster a global community through just these experiences.

## CLIMATE-KIC'S ACCELERATOR

Climate-KIC is very much at the forefront of the global efforts to maximise climate innovation and entrepreneurship. A major focus of Climate-KIC's work is in helping to develop Europe's start-up incubator ecosystem, and at the centre of this work is the Climate-KIC Accelerator.

The Climate-KIC Accelerator offers unique access to ideas, people and partners across Europe to help provide the most promising cleantech start-ups with the tools, opportunities and network to transform their ideas into commercial success – from connecting with the right experts, to formulating business plans, to developing entrepreneurial skills and funding a range of businesses through their early stages.

Through the Accelerator, Climate-KIC is already supporting over 120 start-ups in Europe each year. By giving start-ups access to its network, workshops and business coaches, Climate-KIC is helping to deliver investable cleantech start-ups to the market – helping to make its world a greener place one venture at a time.

[climate-kic.org/accelerator](http://climate-kic.org/accelerator)

# Transform ideas into commercial success:

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