

*Climate Innovation Insights* offers a platform for reflections and lessons from renowned climate innovation experts to spark discussion about the process of tackling climate change through innovation. The independent opinion pieces discuss best practices, different methodological approaches towards climate innovation and implications for business, society and politics. The series is supported by Climate-KIC, Europe's largest public-private climate innovation partnership.



# Stimulating the Growth of Climate Innovation Clusters

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## Key messages

- The current pace of climate innovation is too slow to avoid dangerous climate change.
- Climate innovation clusters have a vital role to play in increasing the rate of change to a low-carbon, resilient society and bringing local economic benefits.
- Successful climate innovation clusters are most likely to grow where certain 'ingredients' are present and the 'recipe' involves investment in research and development (R&D), a 'whole society' approach and strong national regulatory frameworks.
- Some cities with these ingredients offer particularly good opportunities for climate innovation clusters to evolve, but even here, success is not guaranteed.
- Stimulating climate innovation clusters should be a foundation of the economic development and sustainability plans of governments at all levels.

## Introduction

Barely a week goes by without a chilling prediction about the pace of climate change. What Lord Stern called "the greatest market failure ever"<sup>1</sup> is wrecking lives and threatening economies. Humanity's only chance of avoiding the worst is to strengthen resilience and limit warming to 1.5°C by reaching zero net carbon emissions as soon as possible.

Limiting warming to 1.5°C is the target of the Paris Agreement, which was signed in December 2015 by the 197 members of the United Nations Framework Convention

on Climate Change (UNFCCC) and which came into effect in November 2016. It is a collective commitment to a different future. It is also celebrated as the greatest market signal ever: achieving the Paris Agreement will require a raft of innovations, providing considerable business opportunities for those offering solutions.<sup>2</sup>

At present, though, the pace of innovation is too slow to avoid catastrophic climate change. This realisation triggered Mission Innovation,<sup>3</sup> a global initiative of 22 countries and the European Union (EU). Launched in Paris in 2015, it is designed to dramatically accelerate global innovation in clean

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energy. Evidence suggests that the fastest innovation can be achieved by those located in innovation clusters – with Silicon Valley in the USA being the most celebrated – but the idea of ‘climate innovation clusters’ has received relatively little attention up to now.

Climate-KIC, Europe’s biggest climate innovation agency, is exploring whether it can help stimulate the growth of innovation clusters, to accelerate the pace of innovation and bring positive benefits for the climate and the economy. This brief is one of a series of *Insights* that examine how to stimulate the growth of climate innovation clusters. By drawing on the experience of Climate-KIC staff, partners and external organisations, these offer guidance to Climate-KIC and other organisations with similar aims.

### Box 1. Defining climate innovation clusters

Climate innovation clusters<sup>4</sup> consist of a dynamic mix of start-ups, small and medium-sized enterprises, larger businesses, research organisations, community actors and public bodies. To form a cluster, these organisations are:

- Physically located close together, for example within a city district
- Committed to learning from each other
- Focused on turning ideas into solutions that are positive for the climate and the economy.

We use ‘climate innovation clusters’ as a generic label that includes ‘cleantech clusters’, ‘eco-innovation clusters’ and ‘climate-resilience innovation clusters’. Such clusters focus on innovations in one or more of carbon reuse (circular economy), climate-smart agriculture, ecosystem services, energy efficiency, energy storage, financial or data technologies, flood/heat-risk technologies, low-carbon mobility and renewable energy, as well as any other areas that help to tackle climate change.

## Benefits of climate innovation clusters

Clusters help to accelerate innovation because they increase direct competition, promote cooperation, attract talent and expertise to one place, encourage experimentation with new knowledge, and attract government support. In addition to the climate benefits, prosperous city-based climate innovation clusters can drive productivity gains that create dividends for the economy, as the example of Copenhagen highlights (see Box 2). They attract talented, high-earning people, which generates higher tax revenues and increases the demand for cultural goods; this also offers the city a chance to brand itself as ‘cutting edge’.

City governments have further incentives to establish climate innovation clusters. Mayors and other city leaders

commonly have ambitious emissions targets to meet, and are under pressure to create jobs. They are also responsible for the key societal systems in their cities: mobility, the built environment, waste and energy. As a result, they play a pivotal role in their city’s transition to a zero-carbon, resilient society, and possess the convening power to draw together the diversity of organisations needed to form a climate innovation cluster.

### Box 2. Copenhagen’s climate innovation cluster

Copenhagen’s climate innovation cluster, known as the Cleantech Cluster, has created over 1,000 jobs, helped over 120 new businesses to establish and attracted 12 international cleantech companies to Copenhagen. It was established in 2009 as the biggest cluster project in Europe, with financing of approximately \$24 million from the Danish government and EU structural funds.

Initiated by a consortium of energy companies, research institutions, and governmental and non-governmental organisations, its founding mission was to create continuous growth for existing cleantech companies, to support and assist new cleantech companies, and to attract more foreign cleantech companies to the Capital Region.

The Cleantech Cluster focuses on five areas: (1) facilitation; (2) innovation and entrepreneurship; (3) international outreach; (4) matchmaking; and (5) testing and demonstration. It aims to define clear and measurable goals, and involve everyone in contributing to the shared mission. It sought international exposure from the start, focusing on long-term financing, and has a comprehensive exit strategy.<sup>5</sup>

Through the cluster, there have been 64 new research collaborations and 38 new formal company partnerships. In a 2014 Global Survey of Cleantech Innovation, Denmark ranked number one globally for commercialised cleantech innovation – well ahead of any other country – and number one for the best cleantech innovation support structure.<sup>6</sup>

## Selecting the right ingredients

Accelerating the growth of innovation clusters is not easy and often depends on good fortune. However, the chances of establishing a globally significant cluster can be improved by the presence of some key ‘ingredients’ in a location.<sup>7</sup> Box 3 lists these, adapted for a climate change context, which provide a useful guide for identifying the places with the greatest potential for nurturing successful climate innovation clusters, and where governments and organisations such as Climate-KIC may need to strengthen the ingredients.

### Box 3. What makes a good climate innovation cluster?

Climate innovation clusters benefit from:

- Strong, climate-oriented technical research bodies
- A competitive advantage in terms of pre-existing clusters, skills, resources or market access
- Existing large businesses with significant, relevant R&D investment
- Existing climate-oriented start-up communities and business support programmes
- Access to appropriate markets and clear demand
- Financial incentives and access to business finance
- Consistent political leadership
- Relatively high population densities
- Strong competitiveness characteristics, such as open trade and easy labour migration
- High levels of postgraduate education in the local population
- Good quality of life
- A low-cost environment for doing business
- Strong networks to help organisations learn together
- Fast and reliable transport connections within the cluster.

Some of these are easier to strengthen than others. As Bright identifies in *Insight 1.4*, it might be difficult to improve a city's quality of life quickly or create a world-renowned technical university, but easier to identify strong networking agents, develop a start-up accelerator, support entrepreneurship training or strengthen access to business finance. More research is needed to determine which are the most important ingredients and whether a missing element will be fatal to the growth of a climate innovation cluster.

### A recipe for success

Even with all these ingredients, there is no guarantee that a successful climate innovation cluster will develop. Other *Insights* in this series draw on practical experiences from London and the West Midlands in the UK, and Europe more widely, presenting research findings and comparing innovation rates between sectors and businesses. So, what do these say about finding the right recipe for establishing a climate innovation cluster?

- Support R&D, backed by strong regulation. Dechezprêtre (*Insight 1.2*) suggests that R&D spending on climate-positive technologies that are further away from the market is crucial for cluster growth, coupled with higher and more stable carbon

prices. He shows that innovation is most energetic in the most regulated sectors. Delis and Temouri (*Insight 1.7*) also identify R&D spending as a major factor, as this investment generates significant benefits and returns.

- Don't start from scratch. Izsak (*Insight 1.10*) argues that climate innovation clusters are difficult to create from scratch; instead, she encourages creating incentives for existing industrial or innovation clusters to adopt a stronger focus on climate-positive goods and services.
- Use local demand to shape a cluster's growth. Izsak also points to the importance of local demand in helping to prompt and guide innovation clustering, suggesting that persistence and clarity of demand are more important than public support for R&D.
- Think of clusters as social animals and don't be put off by political change. Templer, Tennant and Burford summarise the experience of trying to energise a cleantech innovation cluster in London (*Insight 1.8*), which points to the need for cluster visionaries who are not swayed by political change. They also recognise that clusters are essentially 'social animals', in which personal relationships between a few committed 'shapers' are the foundations for the intensive learning required to succeed.
- Involve all elements of society in the climate innovation process. Sources of innovative ideas are diverse, originating in community groups and public bodies as well as in research departments and businesses. Bloomfield and Steward (*Insight 1.5*) and Larsen and Diercks (*Insight 1.6*) call for clusters that recognise climate innovation to be behavioural and



Clusters form when all elements of society connect around innovation.



social, as well as technological. They find that considerable innovation value can be gained from the transferral of skills and practices across traditional organisational and sector boundaries. Miedzinski (*Insight 1.3*) suggests that innovation should be treated more systemically, explaining how, for example, energy efficiency, energy reduction and carbon reuse can be achieved simultaneously by more fundamental transitions.

- Invest in the talent pool. Mohamed and Bansal (*Insight 1.9*) emphasise the importance of developing the entrepreneurial skills and competencies needed to accelerate the new economy. They call for a hands-on, interdisciplinary and holistic approach to skills development, one that offers the raw 'labour' materials on which climate innovation clusters can thrive.

## Conclusions

The threat and scale of climate change means that all avenues for accelerating the pace of innovation must be explored. Climate innovation clusters are an attractive prospect, bringing jobs and growth locally and solutions for tackling climate change globally.

To help the growth of such clusters, governments and agencies must identify the places where the ingredients for success are strongest, strengthen the weaker ingredients in those places where possible, and work with others to identify the right recipe. Given the urgency of the climate crisis and the



Pick strong ingredients for success.

need to transition to a low-carbon, resilient future, governments should focus on stimulating climate innovation clusters as the foundation of their economic development and sustainability plans.

## Endnotes

- 1 Stern, N.H. (2007) *The Economics of Climate Change: The Stern review*, Cambridge: Cambridge University Press
- 2 The EU's *Roadmap to a Resource Efficient Europe* (2011) states that the key to the transition to a low-carbon economy is "significant innovation" (p. 8) and "our economy will require a fundamental transformation within a generation in producer and consumer behavior" (p. 2).
- 3 See: <http://www.mission-innovation.net>. Mission Innovation members are the governments of Australia, Brazil, Canada, Chile, China, Denmark, Finland, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, the Netherlands, Norway, the Kingdom of Saudi Arabia, Sweden, the United Arab Emirates, the United Kingdom and the United States of America.
- 4 'Clusters' have been discussed in economics for decades, but the idea of innovation clusters re-emerged on the policy scene more recently, as a way to stimulate growth in times of economic hardship. Traditionally, innovation clusters do not exactly overlap industrial clusters; they tend to encompass a wider range of activities.
- 5 Schomacker-Hoff, M. (2015) 'Copenhagen Cleantech Cluster – proving that clusters matter', Copenhagen/Nairobi: Quercus Group (<http://www.quercus-group.com/single-post/2015/03/18/Copenhagen-Cleantech-Cluster-%E2%80%93-proving-that-clusters-matter>)
- 6 Parad, M. with Henningsson, S., Currás, T.A. and Youngman, R. (2014) *The Global Cleantech Innovation Index 2014*, San Francisco/London: Cleantech Group; Gland: WWF
- 7 Economist Intelligence Unit (2016) 'Destination Innovation: where next?', London: The Economist (<http://destinationinnovation.economist.com>)

### Climate-KIC UK and Ireland

Climate-KIC is Europe's largest public-private innovation partnership focused on climate change.

Our partnership consists of dynamic companies, the best academic institutions and public authorities. We drive innovation in tackling climate change through creative partnerships large and small, local and global, and between the private, public and academic sectors. The UK and Ireland is a core geographic region within Climate-KIC and is home to some of the most energetic climate innovation clusters and businesses in Europe.

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