Climate-KIC's Climate Change Adaptation Innovation Approach

Climate-KIC

Climate-KIC is supported by the EIT, a body of the European Union

1 Introduction

Take urgent action to combat climate change and its impacts: Goal 13 of the 2015 Sustainable Development Goals, and the rallying call to all signatories of the Paris Agreement – and the wider world.

Climate change adaptation's place on the European political and economic agenda has risen sharply in recent years and continues to gain momentum and prominence. As part of the 2015 Paris Agreement, countries agreed a goal of 'enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of [the agreement's] temperature goal'. And this is being met with a set of associated targets focusing on adaptive capacity, finance, education and planning.

This is coupled with predictions for unprecedented growth for the 'adaptation to climate change' economy. Currently worth €279 billion (2015/2016), the adaptation economy is forecast to have global growth rates of 11% annually by 2020[1]. Businesses, cities and governments are rapidly realising that they must plan and build for resilience to climate change, channeling procurement towards adaptation-related products and services. Similarly, **climate change adaptation is becoming a major business opportunity,** especially for companies active in the built environment, water infrastructure, health, finance, and climate services.

Europe faces significant threats from climate change, now and in the future, increasing its vulnerability and putting further strain on resources. With the extent and severity of heat waves expected to grow with climate change, already 4,000 Europeans die on average every year due to extreme heat[2]. Without sufficient adaptation, this figure is expected to grow to at least 60,000 per year by 2080[3]. Consequently, the demand for cooling, already rising by 2 percent per year in Europe, is expected to accelerate quickly; placing additional demands on energy supply. Similarly, projections from the Intergovernmental Panel on Climate Change (IPCC) offer warnings about declining water availability and increased drought risk in Southern Europe, though current evidence suggests Europe's agriculture sector is only making limited preparations[4]. Innovation, bringing new ideas to meet needs, offers a critical approach to removing the supply and demand-side bottlenecks that currently inhibit progress.

Climate-KIC, as Europe's leading innovation catalyst for tackling climate change, is actively engaging partners, projects and start-ups in innovation for adaptation. Over the last five years, we have helped to nurture over 50 adaptation start-ups and supported over 40 multi-partner adaptation innovation projects. Over the next five years, Climate-KIC intends to further target its approach, by tackling some of Europe's most urgent and significant adaptation challenges (see section 5).

1 Climate-KIC commissioned Acclimatise and K-Matrix to assess the 'adaptation to climate change market'. The results of this study will be published in the second half of 2017.

2 European Environment Agency. 2017. Climate change, impacts and vulnerability in Europe 2016. An indicator-based report. EEA Report No 1/2017. Publications Office of the European Union, Luxembourg.

3 p. 25: Watkiss P., Horrocks L., Pye S., Searl A. and Hunt A. 2009. Impacts of climate change in human health in Europe. PESETA-Human health study. JRC Scientific and Technical Reports. Office for Official Publications of the European Communities, Luxembourg.

4 Our forthcoming publications will review innovation progress and adaptation markets by sector.

2 Tackling Europe's Climate Adaptation Challenges

The negative impacts of climate change are already taking their toll in different ways across Europe. Recent reports by the European Environment Agency (EEA) (2017) on climate change impacts and vulnerability in Europe indicate that:

- Climate change has substantially increased the probability of various recent extreme weather and climate events in Europe.
- In Europe's forests, climate change is enhancing the success of invasive alien species and disease outbreaks. Animal and plant species are migrating northwards and to higher altitudes.
- Increases in heat waves are negatively impacting human health, particularly in cities and increasing the risk of electricity black outs and forest fires.
- The extent of climate change impacts on Europe from mid-century onwards depends on the success of climate change mitigation and adaptation efforts now.

Climate change will interact with other socio-economic trends in Europe to create a range of complex problems. Aging populations, increasing urbanisation, decreasing population size in eastern Europe and migration will combine with climate change impacts on water, agriculture and biodiversity among others to cause a range of interrelated impacts. Hotspots include south-eastern and southern Europe, where multiple severe sector-based impacts are predicted. Economic costs, even for modest levels of climate change, are also expected to be high across Europe, but highest in Southern Europe. The coastal areas and floodplains of western Europe are another multi-sector hotspot, along with specific ecosystem services in the Alps and human activity in the Arctic. Similarly, the impacts of climate change outside Europe cannot be ignored, especially with interconnected economies and flows of people and money.

Early indications suggest European countries are making progress in adapting to climate change but more work is required. The EEA report judges that adaptation strategies are being mainstreamed at all governance levels across Europe, but could be further enhanced by improved policy coherence between environmental and sector policies, transnational cooperation platforms, private sector engagement and combining 'hard' and 'soft' technology measures. The European Commission is due to publish an 'adaptation preparedness scoreboard' in 2017 that assesses the adaptation progress of Member States using process-based indicators. This is part of a wider 2017 review of progress against the EU Adaptation Strategy and will supplement work to develop indicators of progress against the 2015 Sendai Framework for Disaster Risk Reduction. Together, these reviews will help to reveal the degree of success Europe is having in tackling current and future climate change impacts.

The European Union Adaptation Strategy, agreed in 2013, seeks to strengthen Europe's resilience to the impacts of climate change.

It focuses on three key objectives:

- **Promoting action by Member States:** The Commission encourages all Member States to adopt comprehensive adaptation strategies (currently 21 have strategies) and provides funding to help them build up their adaptation capacities and take action.
- **Climate-proofing' action at EU level** by further promoting adaptation in key vulnerable sectors such as agriculture, fisheries and cohesion policy, ensuring that Europe's infrastructure is made more resilient, and promoting the use of insurance against natural and man-made disasters.
- **Better informed decision-making** by addressing gaps in knowledge about adaptation and further developing the European climate adaptation platform (Climate-ADAPT) as the 'one-stop shop' for adaptation information in Europe.[5]

The strategy includes an eight-point action plan, covering capacity building, inclusion of adaptation into the Covenant of Mayors framework to support cities, tying adaptation needs to research and innovation support through Horizon 2020 and cost-benefit analysis among others.

5 Drawn from https://ec.europa.eu/clima/policies/adaptation/what_en, accessed 22nd May 2017

3 Climate-KIC's Role in Supporting Adaptation Innovation

Climate-KIC's 2017-2021 Strategy commits to strengthening our role in catalysing and facilitating innovation for climate change adaptation. Climate-KIC has the ambition to be a leading catalyst of innovation for climate change adaptation in a way that creates jobs, growth and greater resilience to the impacts of climate change in Europe and globally. In this context, our mission is to bring together, inspire and empower a dynamic community to build a climate-resilient society.

We:

- convene the main innovation actors from business, academia and public agencies to convert more leading intellectual property into climate adaptation solutions.
- accelerate the rate at which innovation is deployed and scaled to create adaptation-related impact.
- enable European innovation to be applied at a global scale, as well as source global innovation that can be applied in Europe.

We will focus our efforts to achieve the greatest impact. While we have supported a range of adaptation innovation projects, start-ups and education initiatives over the last six years, adaptation has been secondary to Climate-KIC's mitigation activities. This is for multiple reasons, including the uncertainties of climate change impacts and the influence this has on the weakness of compelling adaptation-related business models; an immature market for adaptation goods and services, and insufficient engagement with adaptation-oriented universities and businesses across Europe.

Over the next five years, Climate-KIC will strengthen its work on adaptation innovation, taking an outcome-oriented approach. We will use innovation as a tool to lever changes that help to tackle key European and global adaptation challenges; aligning with existing international initiatives and policy framework.

4 Our Adaptation Innovation Action Plan

Between 2017 and2021, Climate-KIC will:

Action 1 Increase our focus on tackling Europe's climate change adaptation challenges through innovation, to help unblock the development and growth of adaptation markets and solutions. This will involve working through the lens of our themes[6] and developing theories of change to ensure we create tangible impacts. Where appropriate, we will integrate adaptation innovation challenges into our existing calls for proposals and funding portfolio, building on our knowledge and partner base[7]. We intend to maximise synergies between adaptation and mitigation innovation and give preference to no/low-regrets/win-win adaptation innovation[8].

Action 2 – Deepen and expand our partnerships with leading European and international innovators in climate change adaptation, aligned with our theories of change and focus areas. In doing so, we will place demand-side organisations (e.g. municipal governments, regional bodies, sector associations) at the core of our approach, to ensure Climate-KIC is acting as an innovation broker to tackle real world adaptation challenges. Furthermore, Climate-KIC will seek to collaborate with international agencies to share knowledge, join forces for greater impact and attract further resources for adaptation innovation. Where appropriate we will forge strategic alliances with key international actors in the adaptation innovation market to accelerate the uptake of adaptation innovation.

Action 3 – Upgrade our ability to nurture the creation and accelerated growth of start-ups and SMEs offering adaptation-related goods and services. This will include enhancing our current entrepreneurship and start-up support programmes – our Journey and Start-up Accelerator, for example – by engaging business coaches with adaptation expertise and working with leading 'adaptation' courses across Europe's top universities. Additionally, through our graduate and professional education programmes, we will increase the understanding and capacity of supply and demand-side actors to tackle climate change adaptation.

Action 4 – Strengthen our ability to assess the results of our work and the performance of adaptation innovation solutions. In doing so, Climate-KIC will develop its monitoring and evaluation

framework. As uniform guidance for assessing the performance of adaptation innovation projects is absent[9], Climate-KIC will collaborate with international organisations to share knowledge and ensure our contribution to international adaptation targets is registered.

Action 5 – Improve our knowledge management and thought leadership convening capabilities with respect to adaptation innovation. This will include collaborating with leading knowledge agencies to assess the latest trends and progress, sharing what we are learning and providing access to and analysis of our own portfolio. We are committed to constantly reflecting on our approach and modifying it depending on emerging needs, trends or challenges.

Action 6 – Enhance our own capacity as a catalyst of European adaptation innovation, including improving the level of adaptation-related expertise within Climate-KIC and formalising management and co-ordination approaches. We will reinforce the understanding that adapting to the impacts of climate change involves strengthening resilience to both changing extreme weather and climate events and the creeping changes (such as changes to ecosystems or disease patterns).

In the second half of 2017 Climate-KIC will develop an implementation approach for each action area.

6 Climate-KIC's four themes are urban transitions, sustainable land use, sustainable production systems and decision metrics and finance.

7 It is not our intention to create new pillars or themes within Climate-KIC's current work, as climate change adaptation (as with mitigation) can be included within our existing programme structure that is designed to progress innovation.

8 The EU's Climate ADAPT platform suggests "No-regret" adaptation measures are activities that yield benefits even in the absence of climate change. In many locations, the implementation of these actions constitutes a very efficient first step in a long-term adaptation strategy

9 J.I. Uitto et al. (eds.) (2017): Evaluating Climate Change Action for Sustainable Development, DOI 10.1007/978-3-319-43702-6_18

5 Our Focus: Adaptation Innovation for Impact

In deciding our focus[10], we have considered a range of factors including (i) key European sector-based climate impact and adaptation hotspots, (ii) our thematic focus and existing portfolio, (iii) the magnitude of market size and growth and (iv) the rate at which innovative goods, services and approaches are being purchased annually as a proxy for innovation.

By focusing on a smaller number of outcomes we have the potential to concentrate our limited resources more effectively, combine strands of our work, create a niche for Climate-KIC and treat our role as an innovation catalyst as one in which we can continually learn, reflect, modify and experiment. In each area, we identify intended outcomes and levers of change, but our understanding of how to create change will improve over time as we learn more. We are also conscious that innovation – both technological and in wider systemic forms – is just one factor that contributes to change happening.

5.1 A Substantial Increase in the Climate Resilience of Urban Infrastructure

Cities are particularly vulnerable to extreme weather events, typically severe floods, heat waves, drought or exceptional storms. These can cause health impacts, damage to homes, increased energy use and costs, and lead to failures in transport and water supply. Recognising that a high proportion of the infrastructure and building stock in Europe's cities in 2050 in already in place, we will seek ways to strengthen resilience of the existing built environment to mediate heat extremes, reduce flood risk and promote health and wellbeing. Many of the changes required to achieve this outcome do not necessarily require innovation in a traditional sense (e.g. policy prioritisation, regulation, skills/training, application of existing technologies), but we believe there are several ways in which innovation can influence change. These include but are not limited to:

- Technologies to increase the effectiveness and reduce the costs of retrofitting existing infrastructure/built environment.
- The development of financial products – such as mortgages, insurance policies, loans – which incentivise practical climate change adaptation measures within urban areas.

- Nature-based solutions that interact with urban infrastructure and the built environment to reduce long-term climate change impacts and improve health and wellbeing.
- The use of innovative financial and communications approaches that reduce impacts in urban areas following the forecast of a specific threat.
- Innovation in city financing instruments, such as resilience bonds, to raise capital for adaptation actions.
- Crowdsourced climate risk information that is accessible, useful and used in the context of taking decisions around retrofitting priorities and specifications.
- Innovation in the accuracy, simplicity and utility of cost-benefit and other decision-support tools.
- Capacity building programmes that help demand-side players understand adaptation challenges and the need for innovative solutions.

We believe this area constitutes a large existing market for adaptation goods and services, one which is predicated to grow substantially and one where innovation in terms of goods, services and approaches appears to have strong potential for market penetration.

Examples of where Climate-KIC is already catalysing adaptation innovation to support this outcome:

- **Blue-Green Solution** (BGS) project is a methodology and set of tools, developed by Imperial College London and other Climate-KIC partners, that helps city planners and developers integrate green space, trees and natural flood management into their projects. The initiative, now completed, is evolving into consultancy, and has achieved commercial successes including the University of Zagreb Bongoraj campus, where because of the BGS approach, the campus has achieved energy reductions of 92 percent on cooling and 68 percent on heat, compared to conventional heating and cooling systems. Blue Green Dream was awarded the Business Green Technology Award for Research and Development Programme of the Year in 2015.

- **Water2Invest** project developed a free web-based service that allows users to assess the demand and availability of water resources, and subsequent effectiveness and costs of adaptation actions to secure water access in the context of climate change. A water marginal costs-curve allows decision-makers to quickly evaluate the various technological and infrastructure adaptation measures. The tool can be applied globally and helped the project team to conclude that a water circular economy that reduces, re-uses and retains water will help alleviate, but not full eliminate, water stresses in a changing climate.

- **Climate Risk Information Flagship** works to increase availability and application of data and models for adaptation decision-making, currently through facilitation of the Oasis HUB and Future Danube projects:
  - The Oasis HUB is an online portal/marketplace for publishing and accessing environmental data, adaptation planning tools, models and services. The HUB assists data providers in getting their work to market, quickly and cost effectively; reducing time and costs to take adaptation from academic theory to actionable outcomes.
  - Future Danube, an open multi-hazard and risk model which estimates costs and benefits of different adaptation measures and investments on the Danube River Basin, was co-designed with local stakeholders and practitioners to ensure uses beyond the insurance sector, by industry and the public sector.

A substantial improvement in the climate resilience of agriculture and forestry sectors and value chains

According to the EEA, recent heat waves, droughts and floods have greatly reduced the yield of some crops in Europe. The projected increase in the occurrence of such events would be particularly detrimental to crop production in central and southern Europe, where climate change impacts will occur more frequently and add to current stresses. Demand for irrigation is expected to increase, especially in southern Europe where there is already considerable competition between different water users and where increasing droughts are likely to

impact water availability. With effects expected to differ between crop types and livestock categories, short- and long-term adaptation efforts will need to be tailored accordingly. Beyond Europe (though also in Europe too), food security is threatened by climate change, agricultural practices are often poorly adapted to current and future climate, and agriculture-land use does not maximise its carbon sequestration value. In a similar way to *5.1 Urban Infrastructure*, many of the changes required to achieve this outcome do not need require technology or product innovation per se, but do need a systems-wide innovation perspective and an innovation ecosystem on which to tackle some of the barriers to action. We believe several levers of change may benefit from an innovation-led approach. These include but are not limited to:

- Technologies to enhance the adaptive capacity of agricultural and forestry sectors, including methods to grow crops in low water conditions, new seed varieties and climate and weather information products to aid decision-making.
- The development of financial products – such as mortgages, insurance policies, loans – which incentivise practical climate change adaptation measures within the agriculture and forestry sectors.
- Crowdsourced climate risk information that is accessible, useful and used in the context of taking decisions around larger scale agriculture and forestry policies and investments.
- Combined mitigation and adaptation solutions that both increase the carbon sequestration value of land and aid longer-term resilience to the impacts of climate change.
- Value chain approaches that engage businesses in strengthening the climate resilience of supply-side actors and processes, for example climate vulnerable food producers and local markets.
- Innovations that aid transitions to urban agriculture and more localized food production and consumption systems.
- Innovation in the accuracy, simplicity and utility of cost-benefit and other decision-support tools.

Examples of where Climate-KIC is already catalysing adaptation innovation to support this outcome:

- **The Winners project** is developing a series of adaptation tools and mechanisms that make agriculture and associated value chains more resilient to climate change. Using cutting-edge technologies, it has developed insurance mechanisms that benefit entire food supply chains actors. To achieve this, their insurance products are combined with other tools such as credit mechanisms and technical support aiming to help farmers anticipate and adapt to climate change. Initiated in Africa in partnership with the World Food Programme and the World Bank, the project is now expecting to deploy its approach in Europe.

- **Through our start-up accelerator programme** – Over 50 'land-use and adaptation' oriented start-ups have been supported in Climate-KIC's start-up accelerator programme since its inception in 2010. Most these address water and biodiversity related issues (drought, land degradation, reinforcement of natural infrastructure), climate smart agriculture (precision agriculture, agriculture risks) and data management (remote sensing, big data).

- **Climate-Smart Agriculture Booster Flagship** aims to identify, develop and scale climate-smart solutions across Europe and beyond. It is developing an open innovation platform, a community of practice and various services to engage and help agriculture actors and associated value chains. It is identifying, assessing and implementing concrete solutions that address mitigation, carbon sequestration and adaptation issues. On the latter, the emphasis is (i) on perennial crops, which are particularly affected by climate change, and (ii) on agricultural risks and insurance products.

10 To renew our approach to adaptation innovation, we have commissioned a series of analytical reports covering: (i) the Adaptation Economy, (ii) a mapping of Climate-KIC current adaptation innovation portfolio, (iii) a review of our adaptation innovation project assessment tool, (iv) a learning review of our major adaptation innovation projects and (v) an assessment of how to better integrate adaptation within our Journey programme. These reports have been prepared by Acclimatise, K-Matrix, the Global Climate Adaptation Programme and an independent consultant. Results will be published by Climate-KIC in phases through 2017.

About Climate-KIC

Climate-KIC is the EU's largest public private partnership addressing climate change through innovation to build a zero carbon economy.
We address climate change across four priority themes: urban areas, land use, production systems, climate metrics and finance. Education is at the heart of these themes to inspire and empower the next generation of climate leaders. We run programmes for students, start-ups and innovators across Europe via centres in major cities, convening a community of the best people and organisations. Our approach starts with improving the way people live in cities. Our focus on industry creates the products required for a better living environment, and we look to optimise land use to produce the food people need. Climate-KIC is supported by the European Institute of Innovation and Technology (EIT), a body of the European Union.

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