



Opening-up the Sustainable City

Towards an Open Innovation Framework
for Future Low Carbon Cities



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



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Foreword

In October 2017, Climate-KIC published an Open Innovation White Paper to showcase six concrete Open Innovation cases. This publication builds on that foundation, presenting an additional seven cases of Open Innovation processes that Climate-KIC have facilitated and supported globally throughout 2017 and 2018. Climate-KIC will continue this work in the coming years, and aims to run Open Innovation in 50 cities around the world by 2020.

Climate-KIC's work with Open Innovation was commissioned to emphasise the value of integrating Demand-led Innovation into the business and operational models of city and municipal administrations. Cities and metropolitan areas have been singled out in the Paris agreement as key players in dealing with the threat and effects of climate change. By 2050, it is predicted that nearly 70% of the world's population will live in urban areas. Consequently, it is vital that we make every effort to create sustainable, low-carbon, and climate resilient cities. In order to facilitate this transition, Climate-KIC has been promoting, developing, and co-organising Open Innovation events with city administrations across global cities since 2016. By actively adopting the concept of Open Innovation into cities' business models, we believe that city administrations can simultaneously improve their sustainable innovation process, achieve valuable co-benefits, and create blue-green economic growth.

Our co-hosted events across the globe in cities including Copenhagen, Hamilton, Sofia, Malmo, Singapore, and Trondheim, in addition to promotion through our pan-European partner network, have enabled the most progressive cities to establish themselves as frontrunners in the field of urban sustainability. Having now achieved proof of concept for City-led Open Innovation, our objective is to spread our knowledge and learnings to other cities across the EU and beyond.



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About Climate-KIC

EIT Climate-KIC is a knowledge and innovation community established and funded by the European Institute of Innovation and Technology (EIT) in 2010. Our purpose is to tackle climate change through innovation to build a zero-carbon economy. We are Europe's largest public-private partnership with this purpose – a growing pan-European community of diverse organisations united by a commitment to direct the power of creativity and human ingenuity at the climate change challenge. We bring together large and small companies, scientific institutions and universities, city authorities and other public bodies, start-ups, and students. With over 350 formal organisational partners from across 25 countries, we work on innovation to mitigate climate change and to adapt to its unavoidable impacts.

We address climate change across four priority themes: urban areas, land use, production systems, decision 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.

Since 2015, Climate-KIC has been promoting, developing and co-organising Open Innovation events with city administrations across the global. Through these collaborations we have gained proof of concept for city-led Open Innovation, which we wish to build on further and expand its use to municipalities all over the world.

We are always on the lookout for new cities to collaborate with and welcome all enquiries regarding our City-led Open Innovation services. For more information about our activities, please contact:

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Or visit our homepage [HERE](https://climate-kic.org/where-we-are/nordics/)
climate-kic.org/where-we-are/nordics/

What is Open Innovation?

Open Innovation is an approach commonly described as the antithesis to traditional innovation methods. Thus, instead of research and development (R&D) being pursued internally, and distributed later, Open Innovation encourages the acquirement of both internal and external ideas, knowledge, technologies, and competencies by working with customers, users, citizens, and others. This collaboration is characterised by the cross-fertilisation of knowledge from stakeholders with different backgrounds. Furthermore, Open Innovation processes also allow un- and under-utilized ideas, technologies, and information to be incorporated into active innovation processes.

Open Innovation is fast becoming a mainstream way of facilitating innovation. This is evidenced by an observed increase in the proportion of innovations which are created through processes based on using, doing and interacting.

Why is it needed?

In June 2015, the EU Commissioner for Research, Science and Innovation named Open Innovation a political priority for the EU

Commission . In recent years, Open Innovation has become a priority for the EU Commission due the realization that our promotion and utilization of new innovative processes and technologies is simply too slow. This is despite the fact that as a block, the European Union can consider itself to be a research powerhouse, and remains the world leading producer of scientific knowledge ahead of the United States.

“Europe is excelling at many things, but we are not good enough at investing in innovation at speed and scale”

– Carlos Moedas, Commissioner for Research, Science and Innovation (2015)

Open Innovation represents a new mechanism through which we can take advantage of Europe’s extensive research, innovation, and solution development resources. With inclusion at the heart of the concept, Open Innovation can act as the platform through which individuals from a wide variety of stakeholder groups can convene and co-create ideas that maximise value for society as a whole.

Why is Open innovation important for cities

As a group, cities represent one of the many types of institutions that fail to adequately take advantage of Europe's innovative potential. Typically, the "closed" business models of cities and municipalities often prevent administrators from utilizing the newest technologies, knowledge, and processes for the benefit of their citizens – no matter how motivated they are to do so.

Open Innovation, however, represents a way in which cities can open up their business model and create a variety of benefits for them as the instigator, as well as for other stakeholders more widely. The most obvious of these benefits relates to the efficiencies and added value it can bring to the process of developing solutions, both with regards to the resources used and the results achieved.

It does however, have further benefits for the instigating party in the context of cities. Open Innovation can be utilized as an efficient approach to solving complex multi-faceted problems such as sustainable waste management, flood protection measures, renewable energy generation, and other forms of climate action, which are difficult to overcome in cities due to the complexity of the socio-economic systems they tend to harbour.

Through adopting an open approach, cities can ensure greater public involvement, widen its economic base through the cultivation of entrepreneurs, start-ups and SMEs, and capture the most up-to-date knowledge, thinking, and competencies. Furthermore, given their role within their own jurisdiction, administrations possess significant influence in determining the direction of Open Innovation processes.

Thus, the concept, when managed well, can be used to provide solutions to problems that the city and its public deem important. Finally, a lesser appreciated aspect of Open Innovation is its "inside out" benefits. This relates to the longer term, harder to quantify value achieved through opening up municipal information, knowledge and data for incorporation into external innovation processes.

From a city's perspective, doing this can nurture its own "ecosystem", providing it with access to information through which solution providers can create better products and services than would have been otherwise possible. When this occurs, the city stands to gain two-fold. First from the increase in economic activity largely originating from its entrepreneurial and start-up landscapes – and secondly, from access to better solutions, hopefully tailor made for their purposes.

“Being part of open innovation processes is important and inevitable for cities today. The technical development is moving very fast and as a municipality we have the possibility and responsibility to actually create real change, and co-develop green solutions in close collaboration with start-ups and universities and our citizens”

– Per Boesgaard, Coordinator of partnerships & Sector Counsellor for Sustainable City Development, Danish Embassy, Beijing (2019)

Examples of Open Innovation

Open Innovation processes, like more traditional forms of innovation processes, do not have a fixed structure through which they occur. In the boxes below we have outlined briefly three actual examples of different Open Innovation processes organised by Climate-KIC. The intention here is to provide an understanding of what can realistically be achieved through instigating Open Innovation as a city administration and what are the likely results, both immediate and long term, that you can expect to achieve.

Open Innovation competitions:

Solution co-development and crowdsourcing across borders – Case studies of Circular South Harbour District in Copenhagen and Urban Food from Residual Heat (hosted by Malmo, Lund, Oskarshamn, and Bjur

Open Innovation competitions are a relatively new concept designed to source and co-develop new solutions. Originally used as a tool in the private sector, especially the tech sector, the format has recently made the successful transition into the public and municipal domain. Over the last three years Climate-KIC has been running events across global cities like Copenhagen, Hamilton, Sofia, Singapore, Malmo and Trondheim who are seeking new innovative ways to achieve their ambitious climate targets.

Sizeable events have already been conducted in each of the cities. The events were designed to source solutions in response to a number of “challenges”, all of which were designed to help assist the respective cities meet their climate strategies. These events began with an open call for solutions and formally culminated in a pitch event for the most promising ideas.

Following the event, the best ideas and solutions were further co-developed through interaction between the solution provider, business developers from Climate-KIC and the city in question in order to maximise their potential suitability for implementation. These interactions represented a continuation of an ongoing process that took place before, during and after each competition’s formal pitching event.

In the case of Urban Food from Residual Heat, four cities have identified a common opportunity to reduce waste from their industries and establish synergies for the purposes of urban food production. In all these cities, clean residual warm water emitted from industrial sites represents a waste of both energy and resources. These four municipalities plan to capture wasted residual heat which is emitted as clean warm water and use it to produce fish and vegetables in food production units located in their respective urban areas. Their aim is to incorporate the



concepts of sustainability, the circular economy and zero waste into the establishment of a new service in their localities, one which provides positive socioeconomic benefits such as employment, education and urban gentrification.

In this process, the requirements demanded from submissions are somewhat stricter than in Copenhagen and the four cities in South Sweden, as the cities here know exactly what they want to do with their waste. However, the call has been issued not only because the cities don't know how to pragmatically achieve their aim but they also wish to explore how to extract the most value from the project. The open call therefore, is not just seeking technological and

production relevant solutions but also business models in order to make sure that the project can be qualified as a success beyond the quantity of food produced.

The competition hosted by the four Swedish cities is slightly different from Copenhagen as the process is planned to be longer. Launched in March 2017, this Open Innovation competition has three distinct stages – the usual submission stage and two pitching events – however, in between these stages participants will be actively encouraged to collaborate and co-develop so to ensure that at the end of the process several full system solutions (solutions which cover all aspects of the project) are produced.

Case #8

Urban Food from Residual Heat

Turning excess heat
into local produce for
greener cities

Project period	March 2017 – September 2018
Location	Malmö, Lund, Bjuv and Oskarshamn, all in Sweden
Theme	Urban Transitions
Lead contact	Bengt Persson, Project Manager at Swedish University of Agricultural Sciences
Stakeholders	Private and Public



Case Overview

Malmö is growing. Looking at the biggest city in the southern part of Sweden – and number three nationally – it is hard to see that 25 years ago this was an ailing industrial hub with rising unemployment, a falling population and a general feeling of being caught in the economic slump of the early 1990's.

Since the turn of the century Malmö has seen an almost 25 % increase in population fueled in part by the opening of the bridge across the Oresund linking the city to neighboring country Denmark and its capital, Copenhagen. The university of Malmö was opened in 1998 and has contributed to making Malmö a young city with almost half of residents being under the age of 35. Today the city is as known for its biotech and startup scene as it is for its shipbuilding and industrial past.

Malmö's industrial past and high-tech present shows very clearly in municipality's plans for the harbor and port area. To the north is the industrial harbor that also is the core of the city's district heating and waste management facilities. To the south, a new development called Nyhamnen – New Harbor – aims to create 6,000 new homes and varied 13,000 workplaces over the coming decades.

Tying these two areas together is no small challenge. Therefore, the municipality of Malmö chose to make open innovation competition to explore the opportunities arising from the area. The purpose of the competition was to seeking new inspiration on how utilize the residual heat from the Northern part of the harbor with the district heating and waste management

facilities for creating a local urban food production. Several Gigawatt hours are wasted each year. Using that energy to create local food production would tie the stories of the old and new Malmö together.

This is an opportunity Malmö share with the other three cities connected with the Open Innovation competition "Urban Food from Residual Heat" organized by a consortium of thirteen partners and supported by grants from Climate-KIC and the Swedish national innovation agency, Vinnova.

In nearby Lund, the construction of one of the largest research facilities in Europe, the European Spallation Source (ESS), is underway. Close to that, Max IV the world's strongest electron microscope has been built. Together the two facilities will be a global leading research facility, but also the center of an entire new part of town called Brunnshög. The high temperature excess

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Malin Norling, Malmö municipality

heat from the research facilities will be utilized to heat the new homes and offices keeping up to 40,000 people warm, when Brunnshög is fully developed. But the low-temperature excess heat fraction is harder to utilize, and the city planners in Lund hope to use it to develop facilities for growing local produce. The ambition is, that it will add to the sustainable character of the new development, adding to the attractiveness of the area. But it will also act as a showcase for how to create a highly efficient production of



biological products making up for some of the farmland taken up by the expanding city.

Moving a bit north, to the medium sized town of Bjuv, highly efficient food production is at the center of towns economy. The town is located in the middle of the productive farm lands in south-western Sweden, and the agricultural focus in the business in and around Bjuv will be strengthened with the establishment of the Food Valley of Bjuv, a cluster of companies that work in food production and related activities. At the center of the Food Valley of Bjuv is the Foodhills Industrial Park, a large scale industrial food production site focused on sustainable climate-smart food production at industrial scale with highly efficient fish farms, greenhouses and cold storage facilities

To connect the town center to the new facility the municipality joined the Open Innovation competition looking for solutions on how to create a “Miniature Food Valley” in the city center, using excess heat from the towns district heating system to create facility combining food production with markets and exhibitions demonstrating the circular and sustainable nature of Food Valley.

Moving from south-west to the south-east coast of Sweden, the fourth challenge owner, the town of Oskarshamn shares both opportunities and challenges with several of the other challenge holders. The inner harbor district is to be developed as a new housing area, where urban food production is seen as a key element. The nearby closed down airfield is being developed as a new business area with a focus on sustainable food production and finally the

nuclear power plant OKG a bit further north along the coast generates huge amounts of excess heat. Each site contains specific opportunities and challenges that had to be addressed in the competition.

Fresh perspectives

The great variety in the challenge sites was not the only challenge for the competitors. Their solutions had to be feasible not just technically but also socially and financially. It had to fit in and be a valued part of the urban scenery wherever it was to be placed, and it had to be able to generate enough revenue to pay for the investment and provide an income for the people it created jobs for. That meant that the competitors had to take both business plans and design into account also.

That called for outside inspiration, says climate strategist and project manager from Malmö municipality, Malin Norling:

“Our imagination only stretches this far, so we said: “let’s see if someone else can think of something that we cannot think of,” she says.

The municipality had already been part of one open innovation process for how to use the residual heat in the harbor, but the results were mixed. One idea – heated pavements at bus stops and other places for greater safety – is being implemented in another town, but for Malmö there was a smaller payoff. Only a handful of ideas looked realistic and – perhaps more importantly – they were not new.

“We thought there would be more new ideas. We had more or less thought of these ideas before, so we were not like: “Wow, surprised””, she explains.

But when Vinnova indicated that they would support a new and larger competition, now with 13 partners and access to Climate-KICs international network, they decided to go along. That changed the picture. While the new competition was longer – in three stages over 18 months – the focus was narrower – the residual heat had to be used for urban food production and associated activities. But the main factor was that the number of competitors rose – from 13 to 46 and international competitors now joined.



"It was a huge increase. I would say it came from the access to Climate-KICs international network," says Malin Norling.

The best ideas evolved

Bengt Persson, senior lecturer at Swedish University of Agricultural Sciences (SLU) was the initiator and project leader of both innovation challenges. He also noted the change in the breadth in the field of participants between the two challenges.

"I've been involved in quite a few competitions of different kinds. I know that it's very, very hard to get over 20 participants. I was very happy when we reached 46 from 21 different countries. The Climate-KIC network has been extremely important to spread the word and to find partners," he says.

Because the challenge was quite specific and complex – requiring both technical, financial and architectural competencies to work together – the participants entering the competition were given the choice of entering with either a full solution describing the entire setup or a partial solution focusing on one aspect of the challenge. All 46 proposals submitted were partial, so following the first phase, five teams were formed to continue the process. Teams were formed to give the ideas that passed the first phase as strong a base on which to develop. The first round of prize money was invested in the further development of the proposals towards stage two and three. At the end of phase two the five teams were narrowed down to the three finalists to enter the final stretch of development and refining. During the process the partial solutions were developed into full scale project plans. And that was tough work, notes Bengt Persson of SLU:

"It's such a pain to develop these kinds of solutions. The parts may exist and be on the shelf somewhere, but the system is not designed, there are so many steps. But we definitely saw some real rise in quality for some of the teams during the following process of stage two and especially stage three. It was the projects that developed the most that went on to the final round," says Bengt Person.

Patience pays off

On September 19th, 2018 during the Food and Cities festival in Malmö, the winner was announced. The winning consortium – see separate box – was the consortium Season5 presenting a modular installation combining fish farming, greenhouses and social function. The modular nature allows it to be designed and scaled to meet the needs and opportunities of the different challenge sites. The fish growing tank is not yet fully developed, but that is not a problem says Erik Borälv, program manager at Vinnova, the main funder, of the competition.

We definitely saw some real rise in quality for some of the teams during the following process of stage two and especially stage three.

Bengt Person, SLU

"We are patient in the sense, that we do not require the solutions to be ready off-the-shelf when the competition ends. We have a number of opportunities to support the development of the best ideas towards completion via our other programs, and that is perfectly expectable that the very innovative approaches that we aim for with an open innovation competition will not always be ready for deployment from day one," he says.

Vinnova has a specific program for developing and disseminating open innovation tools to wider use. One reason is the obvious successes from some open innovation platforms for example Apple's app store. Another is that the open innovation approach can provide other types of solutions that more traditional approaches.

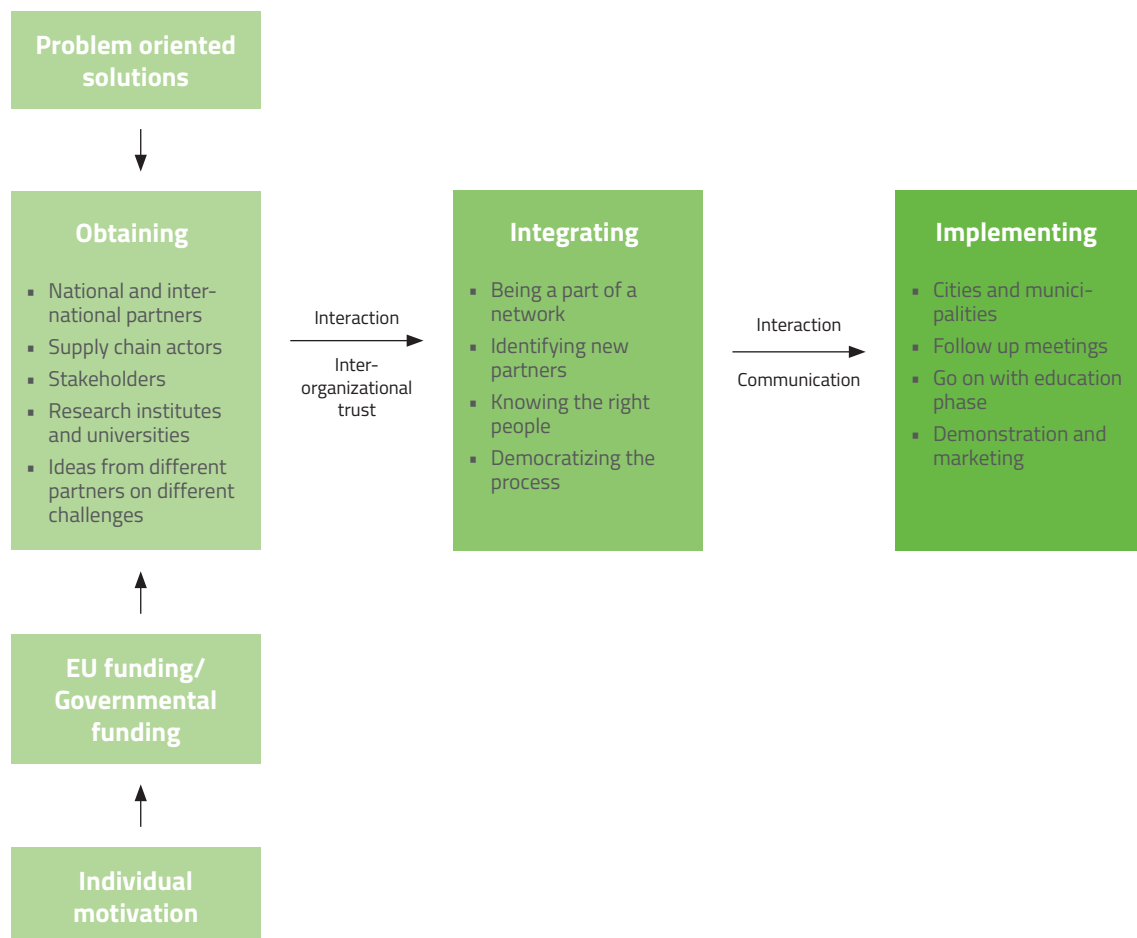
"Some problems, the grand societal challenges and other complex issues for example, benefits from an open innovation perspective. For us, it is about having more tools in our tool box. Even though the traditional open call will probably be our most used tool for a long time to come, open innovation in different forms is a very useful tool to have in our toolbox also," says Erik Borälv.

And in Malmö the municipality got the new ideas and inspiration they were hoping for, says Malin Norling.

"The upside of the open innovation competitions is that you get some "crazy" ideas, that – eventually – you realize, isn't that crazy after all. A few years later it's normal," she says.

Bengt Persson of SLU also looks back at a process that successfully attacked an opportunity – the enormous amounts of residual heat wasted today – and succeeded in bringing together ideas and talented people from several countries to do so.

"I think that the most remarkable is that we got this huge, international interest. I didn't really expect that. It was successful, a very beautiful result I'd say."





Modular fish farm and green house that can fit in everywhere

Season5's winning proposal is a modular construction partly based on reuse of old shipping containers. The containers contain a fish farm. A number of glulam greenhouse modules can be added, and wooden containers for staff functions and social spaces from a café to a classroom or market stalls. All of it is clad on wood giving it a pleasant and distinct Nordic feel.

I would like to think that we won because we as architects could provide a holistic vision that kept it all together.

Fredrik Olson, Tailor Made Architects

Circling nutrients, heat and water turns the modules into a highly efficient food production facility that, along with associated teaching and commercial activities should generate enough income to pay back the initial investment in just over 5 years and create a few jobs on the side.

The jury noted the simplicity and flexibility of the solution and the ability to customize it to fit different competition sites.

The consortium behind the solutions was led by a number of architects, but the open innovation format had pushed them to develop a solution with a lot more attention to other aspects of the solution than pure architecture and building structure, said Fredrik Olson, architect with Tailor Made Architects and team leader for Season5 at the ceremony.

"It was tough to meet the demand for figures on how much fish and vegetables can be produced, building cost estimates, operating cost estimates and business model. Behind our illustrations we have large excel-sheets. I would like to think that we won because we as architects could provide a holistic vision that kept it all together," he said.

Case Study Summary

The challenge:

To utilize the vast amounts of energy wasted today as residual heat from e.g. energy production, waste management and research facilities. The energy is often bound in low temperature water that is hard to utilize. The emphasis on biological production was added to give focus to the competition as well as to address growing pressure on the global food production. The challenge was described in three questions:

- How can biological production units using low temperature residual heat – and possibly other residual flows for biological production – be organized so that they can be located in dense urban areas whilst also having the potential for side functions such as in-house shop, food processing area, opportunities for employment and spaces for community events and social meetings?
- How can the production process be organized to be space efficient whilst maintaining profitability?
- How can the technical challenges such as heat storage, heat distribution and cycles or residuals be solved alongside the project's ambition to create social value in the local community through the creation of employment, social meeting places and local distribution, sales, and processing?

Participants in the competition could choose to enter with a complete systems solution describing a fully operational plant or a partial solution addressing one of the key technical, social or financial aspects of the challenge.

The process:

The project was organized by a consortium on 13 partners. Main financial support came from Vinnova and Climate-KIC. It was set up as a global joint open innovation competition calling for innovative solutions to use the wasted heat energy in the production of food or other biological products within the urban environment. Prize money of 2 million SEK was made available in increments during all phases of the project.

The open innovation competition was structured in three phases spanning approx. 18 months:

Phase 1 – defining challenges and sourcing solutions. The challenge holders (municipalities of Malmö, Lund, Bjuv and Oskarshamn) defined and described the challenge and an international open call for solutions was put out via Climate-KICs network. 46 competitors from more than 20 countries entered the competition. Phase 1 ended at a combined pitch and match-making event. Based on this, five consortia (or teams) were formed by combining competing teams for a fuller set of competencies to address both technical, social and financial aspects of the proposed solutions.

Phase 2 – developing teams and proposals. In phase 2 the newly formed teams worked together with professional guides from the partner organizations to develop their proposal to the next stage. Again, the phase ended with a pitch event in which the 5 remaining teams were reduced to 3.

Phase 3 – piecing it together. In the third phase, the teams develop their final proposal and pitch, incorporating feedback from the challenge

holders and the other partners in the competition consortium. The winner was decided by the competition panel based on the which proposal answered the competition question and criteria the best.

Criteria for selection

The proposed solutions to the challenge were judged on a number of criteria spanning technical, social and financial aspects:

Feasibility

- Technical feasibility
- Economic feasibility
- Replicability

Innovation and genius

- Level of creativeness
- Level of innovativeness

Use and function

- Functionality and attractiveness
- Form and design

Social sustainability

- Creating social cohesion
- Creating job opportunities

Results:

- 46 competition entries from more than 20 countries
- Technically and financially feasible solutions
- Competition teams now in dialogue with city planners

Challenges:

With the relatively long process (18 months) and the large consortium of 13 partners, it has proven a challenge to keep up momentum at times. It is suggested to design for a more condensed process.

Challenges	Solutions
Managing many different partner Managing many different partners with different ideas	Building managerial and organizational capabilities within ecosystems
Aligning expectations	Expanding communication channels
Time constraints	Constant communication with partners

Sustainable Development Goals addressed:

- #7: Affordable and Clean Energy.
- #9: Industry, Innovation and Infrastructure.
- #11: Sustainable Cities and Communities.
- #12: Responsible Consumption and Production
- #13: Climate Action

Case #9

Sofia City Air Pollution Challenge

Finding clean air
solutions that work

Project period	July 2017 – October 2017
Location	Sofia, Bulgaria
Theme	Urban Transitions
Lead contact	Mariyana Hamanova, executive manager, Cleantech Bulgaria
Stakeholders	Private and Public



Case Overview

Hiking up w has been a long-time favourite when residents of Sofia or visitors need a quick getaway from the bustling streets of the Bulgarian capital. The dome-shaped mountain is visible from most parts of Sofia and in return offers visitors stunning views of the city.

One of the most popular routes up the mountain is the trail to the Golden Bridges (Zlatnite Mostove) and, since the late summer of 2018, a new method of transportation has been available to people seeking the views and solace of the mountainside: electric bikes.

A start-up company, Eljoy Bikes, has opened its first charging station at the National Museum Ophistocy close to the start of the dead route to the Golden Bridge. This is the first of hopefully many such stations, bringing an easy, cheap and above all clean transportation alternative to Sofia.

The shared e-bike system provided by Eljoy Bikes is the result of an open innovation competition run by Cleantech Bulgaria in collaboration with Climate-KIC for the municipality of Sofia. The Sofia City

Air Pollution Challenge was aimed at developing innovative solutions in three areas: transport and mobility; energy use; and retrofit solutions – all combined by the need to address the capital's air quality.

Sofia is located on a high plateau surrounded by mountains to the north and south. This reduces air circulation in periods, bringing air pollution levels way past international recommendations. In the heating season 2017 to 2018, pollution exceeded recommended levels on 70 days. On one day – 27 January - the levels were six times

higher than recommended according to the Sofia Globe newspaper. This has given Sofia the very undesirable position as the most polluted EU capital, and the municipality wanted to act fast.

“Air quality has been a big topic in Sofia in the past few years, and the municipality is trying to do a lot of things in order to change the way people use public transport, for example, or heat their homes,” says Mariyana Hamanova, executive director of Cleantech Bulgaria, a private business network focusing on clean technologies, innovation and sustainable development.

With much of the pollution coming from distributed sources like private homes using solid fuels for heating and heavy traffic dominated by older private vehicles, the municipality understood that simply trying to regulate the emissions of

It's not about a solution being good or bad, it's about having the right ecosystem around in order to develop this technology or this solution in the best way

air pollutants would probably not be enough. Instead, they turned to EIT Climate-KIC's 'Urban Challenges' programme and Cleantech Bulgaria to find innovative solutions and start working with the hearts and minds of the Sofian residents to solve the air pollution problem.

“It's not just about regulating large buildings, it's also about addressing thousands of owners of small homes and millions of car owners and changing their mentality and people's understanding,” says Mariyana Hamanova.

Fast track from idea to solution

The Sofia City Air Pollution Challenge was a condensed process running from July 2017 to October 2017. At the end, Eljoy Bikes and their bike sharing system was chosen as the proposal to go to a pilot phase, but before that there had been a period of intense work to source solutions from across the EU through Climate-KIC's network and – not least – to develop and shape the proposals to the local context at a prior two-day bootcamp.

The bootcamp was a necessary step to make certain that proposals were applicable, says Mariyana Hamanova.

"Sometimes very good solutions are not suitable for a specific country or problem. There are just too many things that will make the implementation process very difficult. It's not about a solution being good or bad, it's about having the right ecosystem around in order to develop this technology or this solution in the best way," she says.

Several local and regional stakeholders were invited to take part in defining the challenge and honing the proposals. Not just in order to shape the proposals in the right way, but also to create buy-in from the relevant stakeholders and pave the way for easier implementation.

"This is why we needed this co-creation process. Each of the stakeholders gave their point of view and we were able to catalyse simple solutions which will be accepted by everyone," she says.

A bumpy road to implementation

In Sofia, electric bikes are now an easy option for hikers wanting to go up Mount Vitosh

ta and with less exertion. But the past year's implementation phase has not been as easy as the innovation process itself. After being picked for the pilot project spot, Eljoy Bikes struggled with the unforeseeing issue of getting electricity to the charging station.

Mariyana Hamanova explains that Eljoy Bikes faced some administrative challenges on the way to implementation: "There was a very long procedure of obtaining the permits and doing the whole construction work. It was a very small thing to do but in the end it took months,"

Having a newly organized start-ups at the head of the process also meant that they had to push harder to get things through and the relatively small team had to devote a lot of time to simply getting their product ready.

"It's very nice to work with start-ups, but when it's about deadlines and concrete implementation steps, having a two- or three-people team is not the easiest thing to manage. These people were overloaded by tasks, so until the last moment it wasn't clear if they would manage to produce and bring all the bicycles, install everything, and really put it into practice. But they did," she says.

Next step – no cars on Mount Vitosh

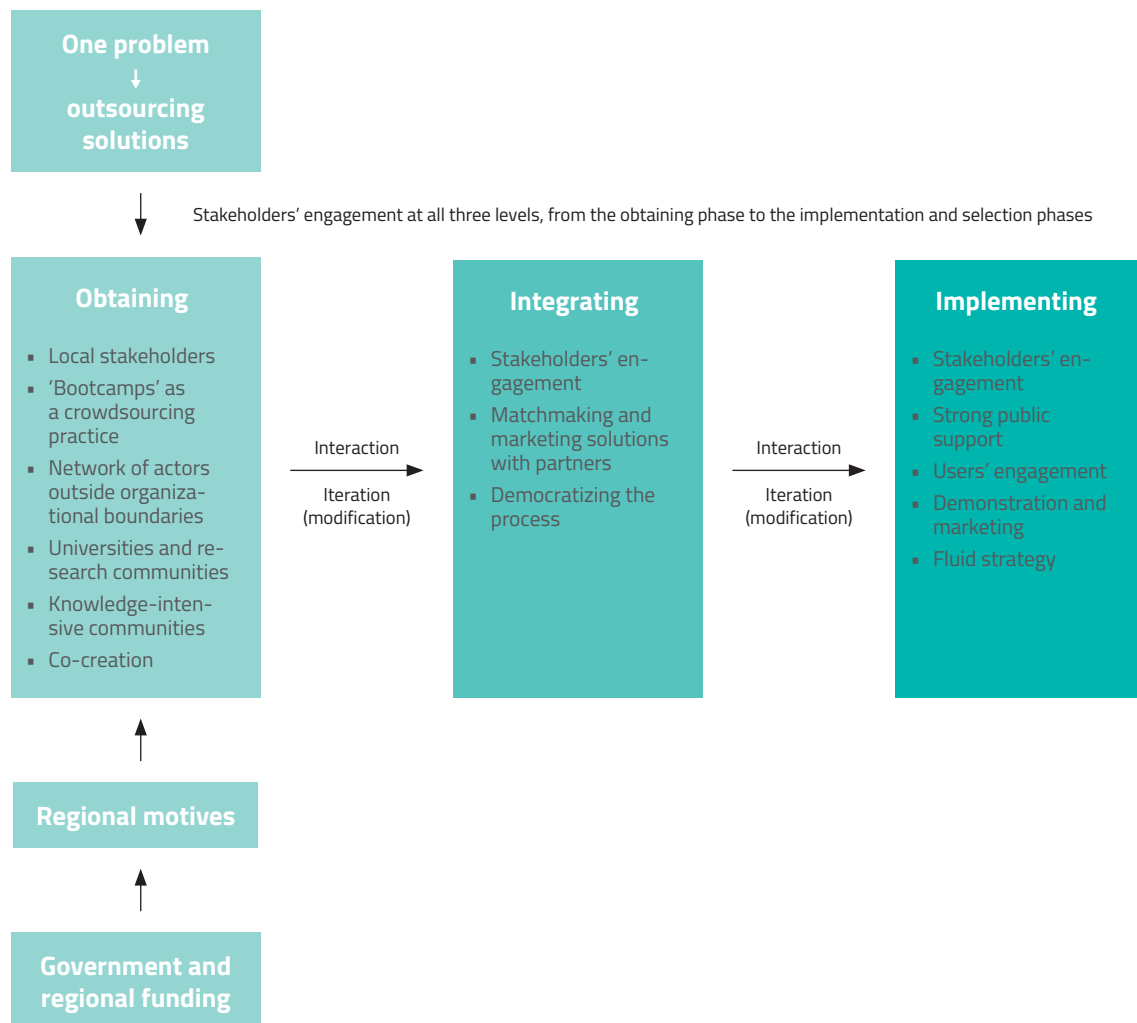
With the bike-riding service up and running, the effects are slowly but steadily building. The bikes are popular, but the main effect is perhaps the new regulation proposed by the city council to close Mount Vitosh access roads to car traffic at the weekends. The courage to propose that owes a lot to the open innovation process, says Mariyana Hamanova.

"I believe the process was a key issue here. Everyone understood this initiative as being

their own contribution to addressing air pollution, it was not the kind of regulation that creates a negative reaction from the people who wanted to drive to the mountains. We showed that this is possible,” she says.

A part of her is also happy that the team which went to the pilot phase was a local Bulgarian start-up, because this emphasized one of the key values of an open innovation process; that everyone can be part of a solution.

“The key is that there is often existing knowledge on how to address a challenge. The people usually know how to do it, but there is always some small part missing in the whole value chain. We try to connect this knowledge and put it together, and therefore the open innovation process is very suitable for these types of challenges: it shows people that it’s not difficult.”





Electric bike sharing

Eljoy Bikes is a Bulgarian company based in Varna that sells electric bikes. As a competitor in the Sofia Open Challenge, it proposed a public system of electric bikes for hire similar to solutions seen in other cities such as Paris or Copenhagen.

The placing of the pilot site in Sofia close to the National Museum Ophistocy and the route to

The project's ambition was not just to provide transportation but also to encourage a shift in attitudes in favour of emission-free and healthy methods of transportation. Thus, reducing the volume of cars travelling to Mount Vitosha was an integral part of the project idea.

The project is a pilot project aimed at testing both the system and users' attitudes. The ambition is to grow in both Sofia and other cities.

The first year was very much focused on getting it up and running, but I think we have changed the attitudes of many people in Sofia towards bikes and what they can expect

"The competition allowed us a chance to develop the system on the go. The first year was very much focused on getting it up and running, but I think we

the scenic Mount Vitosha allows users pleasant yet emission-free access to the mountain. It also allows for smooth behavioural transition towards Eco Maas.

have changed the attitudes of many people in Sofia towards bikes and what they can expect. Many people experienced for the first time that they could take a bike from the city straight to the top of the mountain, and were overwhelmed by the feeling," says Galin Bonev, the CEO of Eljoy Bikes.

Case Study Summary

The challenge:

Sofia is considered the EU capital with the most severe air pollution due to a combination of factors: the city is surrounded by mountains creating a prolonged period with little air circulation, private cars in Sofia are often old with relatively high emissions of pollutants, and many homes are heated using solid fuels, creating an even higher intensity of pollutants - especially particulate matter.

The bureaucratic nature of traditional regulation prompted the municipality of Sofia to look for innovative approaches and ideas that put air quality and clean energy/transport on the agenda in a positive way and provided a fast response to growing concerns.

The process:

The project was organized for Sofia municipality by Cleantech Bulgaria with support from EIT Climate-KIC's Urban Challenges programme. The main financial support came from Climate-KIC. The project was set up as an international call for solutions in three areas:

Challenge areas:

#1 Transport and mobility

#2 Energy use

#3 Retrofit solutions for cars and houses

Following the open innovation process, a pilot process to implement one of the chosen winning solutions has been under way.

Phase 1 (July to October 2017):

A condensed phase of scoping, calls for solutions, training and the pitching of solutions.

Steps:

- Defining the scope and establishing a roadmap of the Sofia City Air Pollution Challenge
- Spreading the call throughout the EU – 15 proposals were received
- Selecting solutions for a two-day bootcamp – seven proposals went on to this step
- A two-day bootcamp (10-11 October 2017)
- Final pitch event at the SOFAIR international air quality conference (13 October 2017).

Phase 2:

Since choosing Eljoy Bikes' electric bike-sharing proposal as the winning proposal.

Seeking to deliver an actual impact within the city-specific context and mitigate the city's air pollution. Conducting a pilot-test of the solution of installing a public bike rental system using pedelecs (also known as an electric bike or e-bike sharing system) as an alternative to privately owned cars for trips within the city.

Three winners were chosen and from them a single project was picked for a pilot phase.

Results:

- 15 competition entries from across the EU
- Technically and financially feasible solutions
- Winning team now in pilot phase

Challenges:

Implementing the Eljoy Bikes solution has proven more difficult than expected, especially from a regulatory standpoint. Getting permission to place the first bike-charging stand and the

cabling for chargers took quite a lot of work not anticipated in the open innovation process.

Challenges	Solutions
Implementation phase	Societal readiness prior to implementation
Legislation and institutional conditions	Government involvement in policy making
Vision and mission misalignment	Strengthening communication channels among members ut by Maral Mahdad

UN Sustainable Development Goals addressed:

- #7: Affordable and Clean Energy.
- #9: Industry, Innovation and Infrastructure.
- #11: Sustainable Cities and Communities.
- #17: Partnership for the Goals

Case #10

Circular South Harbour

Developing a new future
for the Copenhagen South
Harbour district

Project period	August 2017 – December 2018
Location	Copenhagen, Denmark
Theme	Urban Transitions
Lead contact	Øystein Leonardsen, Business District Manager, City of Copenhagen Karin Dam Nordlund, Project Manager, City of Copenhagen
Stakeholders	Private and Public



Case Overview

There are two sides to the Copenhagen South Harbour District. There is the old working-class neighbourhood with its traditional red and yellow brick buildings. Built by cooperative housing associations, many of these 4-5-storey buildings were erected in the first half of the 20th century when the South Harbour was seen as a model for how a growing working class could unite and create healthy, thriving neighbourhoods. The district still has the buildings of that age and also a good portion of the “South Harbour Spirit”. Perhaps the neighbourhood’s most persistent claim to fame is the fact that a former Danish prime minister, Anker Jørgensen, lived there with three kids in a two-bedroom apartment for most of his adult life. This “man-of-the-people” politician wanted to stay with his roots and roots run deep in that part of South Harbour.

Across South Harbour Street, a densely trafficked approach road to central Copenhagen, lies the other – newer – part of the South Harbour District. In the old industrial harbour, new developments have risen in the past decades, offering airy apartments close to the water with all the amenities of modern family life and with their own harbour swimming pool – a new Copenhagen symbol of clean urban living. Living standards and life expectancy are markedly higher, apartments are bigger – cars too. The new developments are both literally and metaphorically on the sunny side of the street.

Between these two poles runs a small band of autoshops, toolmakers, home renovation stores and other smaller businesses in the old industrial zone close to the harbour.

This disparate area is the focus for one of the municipality’s integrated urban renewal initiatives. These initiatives are aimed at developing parts of the city that have special challenges and doing so in a way that involves and engages the local residents, says the local business district manager, Øystein Leonardsen:

“Integrated urban renewal is community-based development. It’s a five-year initiative creating a better standard of living by pushing the community forward through trying not only to encourage projects, but also to co-create and co-develop the community together with the community,” he says.

There were local entrepreneurs within the circular economy and, together with the community, we decided that there was a potential to work with in that field

So when the integrated urban renewal initiative wanted to populate a new Circular Economy Hub in the South Harbour District with innovative new circular economy startups, turning to an open innovation process was the straightforward choice.

“We work with the assets already present in the neighbourhood. There were local entrepreneurs within the circular economy and, together with the community, we decided that there was a potential to work with in that field. If the local mix had been different, we would probably have chosen something else to focus on. But because this is a strong point locally, this is an asset. And we work asset based in our community development,” says Øystein Leonardsen.

At that time, they were approached by EIT Climate-KIC with the suggestion that they should help organize an open innovation competition, and as Øystein Leonardsen puts it:

“We said ‘Let’s try it’. Being innovative is very much part of our DNA. Instead of drawing up plans at our desks, we go into the field and perform local experiments with local actors, so we went for it.”

The open innovation competition added several benefits, says Karin Dam Nordlund, the municipality’s project manager for this specific project.

Firstly, the competition created inspiration that spilled over into other parts of the integrated urban renewal initiative.

“The whole concept of having an open competition and having a finale where people could come and see the projects inspired some of the steering committee members to become very engaged in the projects. They are helping the competitors to find and establish local partners,” says Karin Dam Nordlund.

Secondly, Climate-KIC added an international aspect that brought some unexpected new energy to the area.

“I think the fact that it is international really helped this project. It created this feeling of something new and inspiring coming in to the South Harbour District. Some of the steering committee members have said very openly that they felt that finally something exciting was happening. It brought some good new energy into this area,” she says.

MR: Vital role for local resource group

In the first phase of the project, the call for circular economy projects was prepared and put

forward. After that, participants used two workshops to prepare their ideas for the final pitch event in December 2017. During that phase, the local stakeholder the South Harbour District was already an integral part of the process.

“A local resource group was with us in the process of both recruiting and interviewing the different innovation or startup teams that applied for the challenge. This group was part of the panel that selected the seven startup teams that went through to the competition finals in December 2017. And was also part of the brainstorming on who could be part of the professional judge panel that picked the three winners,” explains Karin Dam Nordlund.

At the pitching event, three proposals were selected to go through to phase two, which is still (as of December 2018) ongoing. In this phase, the City of Copenhagen is working with the successful participants to find ways to implement their solutions in the South Harbour District. And even though projects are sourced and anchored locally, ambitions stretch much wider. One of the winning solutions called Bygaard (“City Farm”) will be situated on top of a car park and become the largest urban farm in Europe.

“This is large scale, and that’s important,” stresses Øystein Leonardsen. “It needs to attain a size where it can actually generate an income and exist independently of support from the municipality. When Bygaard gets up and running, it will create new jobs for about ten people and produce not only on a small scale for high-end restaurants but also for local stores, markets and restaurants.”

The project is currently applying for a building permit and sorting out both legal and technical matters for a farm of this size in the middle of the Danish capital. The farm will have three different kinds of produce: mushrooms, micro greens and greens, and will also seek to open a

restaurant in connection with the farm, and top it all off with market days.

"There are a lot of issues right now that require professional help," says Karin Dam Nordlund.

Despite this, the municipality has a fixed deadline for the project – it has to be independent by August next year.

"If we can anchor it to South Harbour residents by then, it will be a great success," says Øystein Leonardsen.

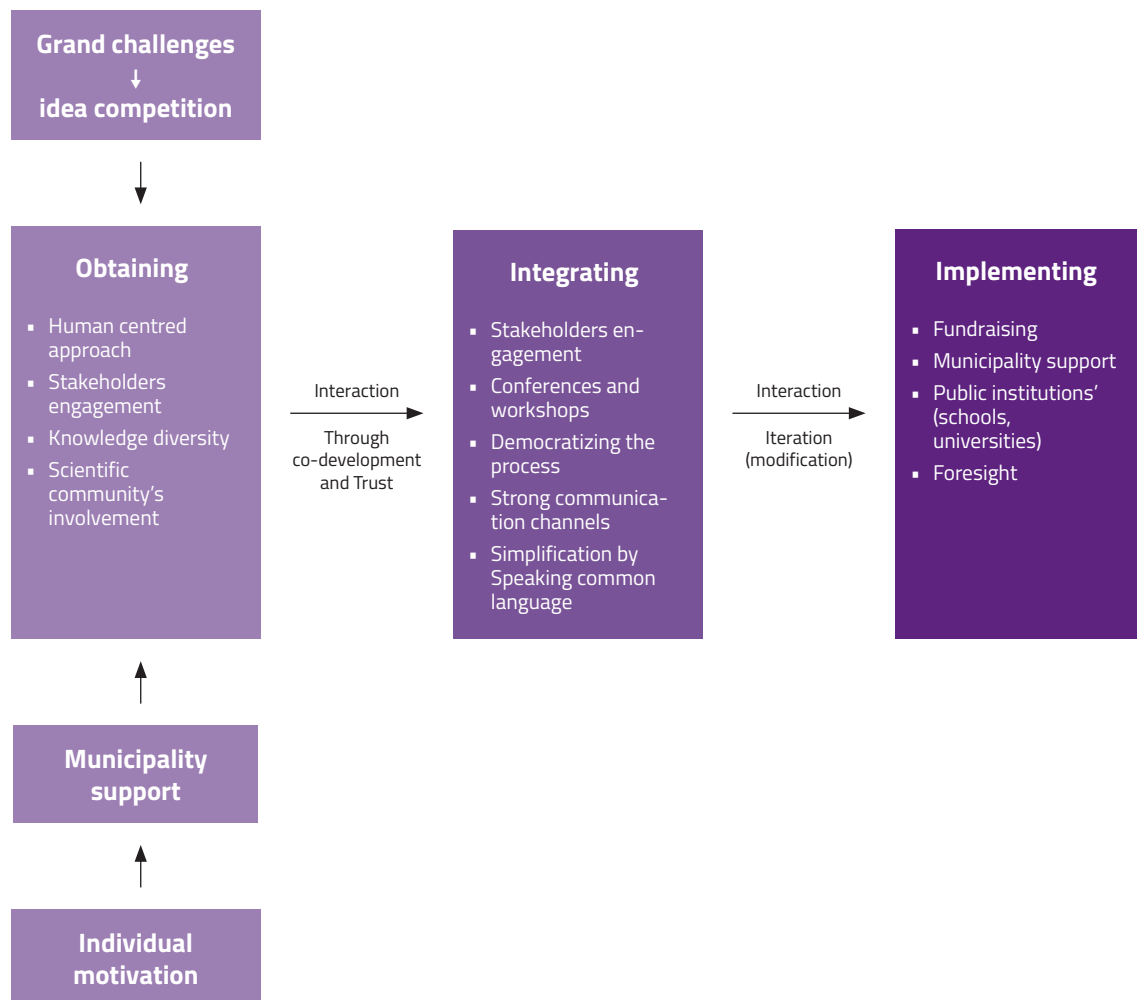
The fast pace of, and limited time assigned to, the open innovation process can be seen in both a positive and negative light. On the negative

side, these factors can be stressful and setbacks from developments outside the projects can be hard to plan for. On the other hand, the understanding that there is a firm deadline for a project also motivates partners to make the most of the support they can get while it is there, says Øystein Leonardsen:

"People know they have to use us while we're here. It produces an energy that goes into the projects and motivates people."

Karin Dam Nordlund adds:

"It also motivates our partners and collaborators to take ownership of the future of their projects. They have to learn to get these projects going by themselves."





The three winners

NetRepair:

NetRepair is an app that helps people who want to have a product or item repaired or otherwise extend its lifetime. The app connects them with a person capable of doing the repair job at thus saving CO₂ emissions by reducing waste and extending the lifetime of products. It also creates jobs following the sharing economy principles. NetRepair has partnered up with the local Repair Café in the South Harbour District to find capable persons to do the repairs and to get insight into the habits of the residents South Harbour when it comes to repairing their products.

Bygaard:

This large scale urban farm is situated on top of a local car park, growing a variety of food at high productivity throughout the year. Besides being the largest rooftop farm in Europe and first profitable urban farm in Copenhagen, Bygård will feature a first of its kind harvest-to-plate restaurant in Denmark, giving the visitors

an opportunity to experience the potentials of urban farming first hand.

Moreover, weekly workshops and farmers market will attract a consistent flow of visitors eager to get a taste of locally grown organic food. Bygaard has the potential to serve not only as a flagship urban farming project in Denmark, but as a model to be replicated in cities worldwide.

Zero 3:

A closed-loop bio waste-management solution helping South Harbour community groups who want to build a local green economy by monetising food waste and growing healthy food rather than paying for municipal waste disposal. At its core, the system uses commercial kitchen waste food from restaurants and green garden waste as feedstock for a scaled-down containerized anaerobic digestion (AD) unit. It has the capacity for the zero-waste conversion of local organic food waste and gardening waste into high-value food crops, mushrooms, marketable compost and probiotic liquid plant fertiliser.

Case Study Summary

The challenge:

The Integrated Urban Renewal Initiative of the South Harbour (the Municipality of Copenhagen) wanted to create a Circular Economy Hub South Harbour as part of the efforts to promote circular economy business in the South Harbour district. To populate the hub, together with Climate-KIC they organized an open innovation challenge, inviting citizens, students, entrepreneurs, local organizations and other people with a circular business idea to participate.

The winners of the competition will be part of the foundation where a circular economy hub in the South Harbour will flourish.

The challenge focused on circular economy business ideas for three specific waste streams:

- Unsorted wood
- Tyres
- Plastic and packaging

Besides the specific waste streams, the challenge asked for ideas that could facilitate a closed loop production model that specifically:

- Democratized food production
- Improved product design

The process:

Phase 1:

During the autumn of 2017, an open call for circular economy ideas was developed and launched with a deadline for submissions of 31 October 2017. At two workshops, the participants were coached on developing their ideas and pitches before the eight competitors to go to the final pitch event were chosen. At the final pitch event on 15 December, three winners were chosen (see box).

Phase 2:

In the second phase of the competition the project have assisted the three selected winners of phase 1 and the City of Copenhagen to co-develop the circular economy business ideas by aligning them with the district and city priorities and helping them to strengthen their local anchoring and connect them to collaborators. A group of resource partners has been established offering strategic advice and knowledge sharing.

Results:

Three projects (see separate box) have been chosen to go to phase two where they will receive support from the municipality for a limited time to establish their idea as a true integrated South Harbour circular economy business.

Challenges:

The ideas need to be developed in a relatively short timeframe, and some mandatory processes – like obtaining building permits – are lengthy. This can make it hard to create the progress desired in the timeframe given.

Challenges	Solutions
Mismatch of timeframes	Support by municipalities
Technical know-how	Creating a common language

UN Sustainable Development Goals addressed:

- #7: Affordable and Clean Energy.
- #9: Industry, Innovation and Infrastructure.
- #11: Sustainable Cities and Communities.
- #12: Responsible Consumption and Production
- #13: Climate Action



Case #11

Future of Hamilton

Raising ambition for
environmental sustainability
and social cohesion

Project period	April 2018 – September 2018
Location	Hamilton, Ontario
Theme	Urban Transitions
Lead contact	Edward John, Senior Project Manager, Urban Renewal, City of Hamilton
Stakeholders	Quercus Group, (Danish sustainability consultancy), Global Utmaning (Swedish thinktank), International Federation of Housing and Planning (IFHP), Climate-KIC Nordics.



Case Overview

The city of Hamilton is doing well. The inner city is reviving, people are moving in – people with well-paid jobs in nearby Toronto – and this typical small Rust Belt city of little more than half a million inhabitants is in many ways moving away from its steel-town heritage and gaining a more cosmopolitan identity.

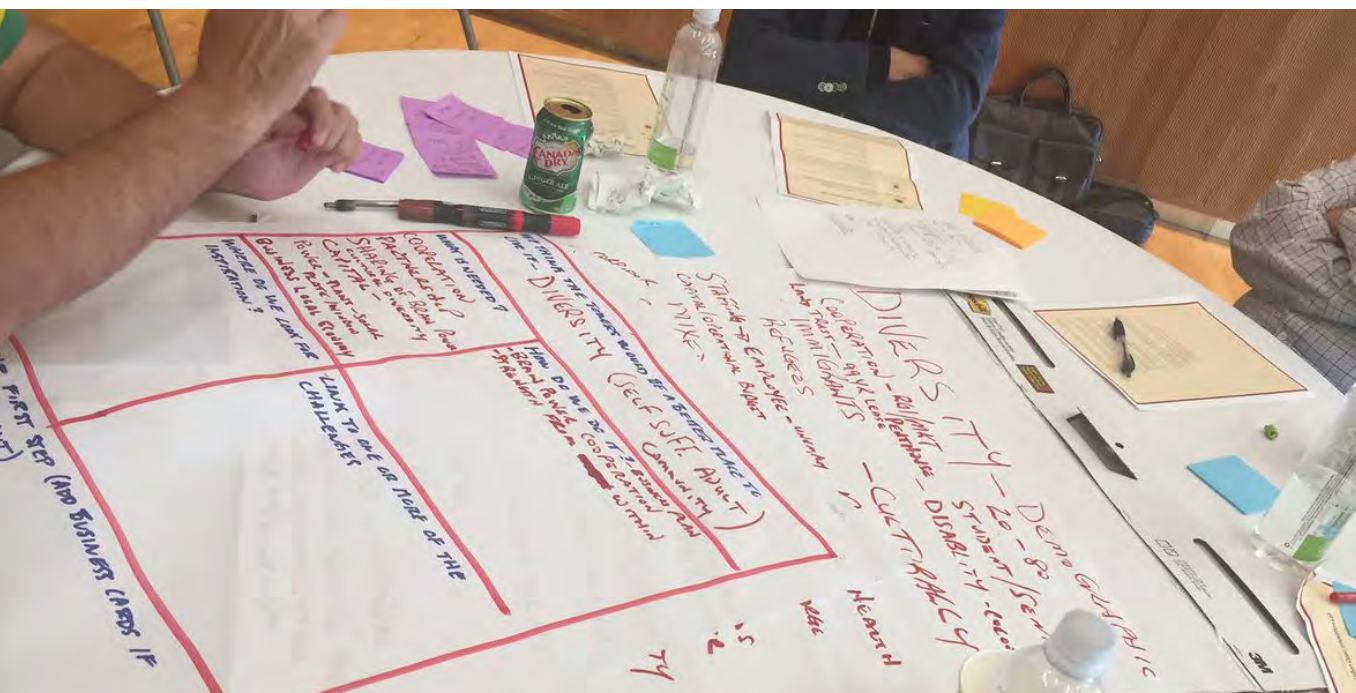
That is good for city finances and for the people seeking a relatively affordable and quiet place to settle close to Toronto. The downtown area in particular is experiencing a renaissance. People are moving in, the area that was slowly being depopulated now has a growing number of residents.

“Our downtown areas have seen a lot of investment over the last ten years but before that they had really experienced a significant downturn,” says Edward John, Senior Project Manager for Urban Renewal with the City of Hamilton. “We had very little residential density in the

downtown area. A lot of counter-urbanization was occurring, so our suburbs were relatively stable and healthy, but there really weren’t many people living downtown,” he says.

Over the past ten years, the city has tried to ignite investment in the city centre with a number of programmes, and these have been very successful but have led to the next challenge.

While city officials do want to revitalize the city centre, thus must not be at the expense of the existing residents, many of whom are subsidized tenants living in social housing buildings from the 1960s or 80s that are close to the end of their lifecycle. These tower buildings have required retrofitting for quite a while and at the same time room is needed for more people moving in to the city centre. Creating an environment in which the city centre can be developed and take in the newcomers without pushing the existing residents out is a challenge



high on the agenda in Hamilton. Edward John explains:

“We’re starting to see jobs and greater job creation in the downtown area and we have this increasingly valuable real estate that these towers sit upon. So we need to figure out how we can not only best deal with the amount of units that we have in a sustainable way, but also grow the number of units that we can provide.”

Demolishing the towers to make room for new expensive developments is perhaps the most common way to address this situation, but it is not what the City of Hamilton wants to do. Many of the people living in the social housing towers have built Hamilton to what it is today and now they are reliant on the city services that they cannot access if they are pushed out of the city centre by rising housing costs.

“Certainly we don’t want to move those subsidized tenants to the suburbs, because we would move them away from access to your typical urban services: transit, hospitals and jobs. They’re not upwardly mobile – often they don’t have their own private car – so that kind of infrastructure is important in terms of how they’re able to succeed in what they’re trying to achieve,” says Edward John.

New solution on offer

So when, in late 2017, the city was approached by Quercus Group, a Copenhagen-based consultancy specializing in sustainable urban development, offering to – together with Climate-KIC – bring some of the most innovative Scandinavian urban solutions to Hamilton, the city accepted the offer with great expectations.

“It became this perfect timing of relationships. We wanted to make sure that we used the influx of money in the downtown area well and responsibly also for those already living there who’ve effectively built this city over the past 50–60 years. We were trying to be innovative and think outside the box but that’s as far as we really got. Then Quercus Group and Climate-KIC

We’re starting to see jobs and greater job creation in the downtown area and we have this increasingly valuable real estate that these towers sit upon

really proposed this perfect partnership that just made sense. Much of the work with the Nordic countries is interesting, and in Canada there is a great narrative about the Nordic countries as places where you prioritize the environment and dignity,” says Edward John.

Dream bigger

The project was started soon after with a definition of four specific challenge areas (see the case study summary). Based on that, a call for solutions was distributed in Climate-KIC’s Nordic network in March 2018, with a deadline for proposals of June 2018. Nine of the teams that submitted proposals were chosen to go to Hamilton and work with the city and local developers in a two-day workshop ending with a final pitch session to choose the best solutions.

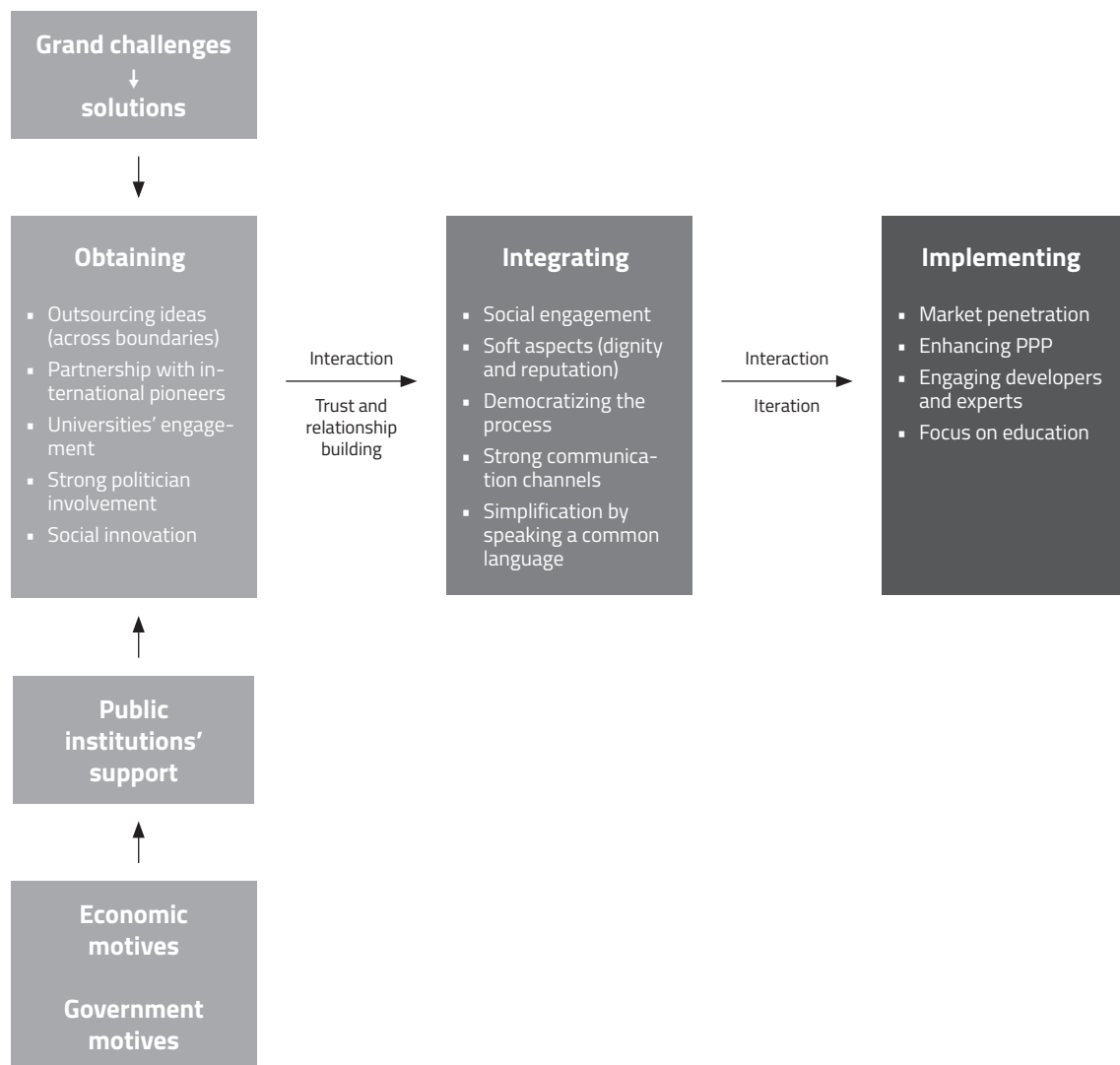
The solution chosen as the winner, however, was far from the only beneficiary of the process. All nine solutions that went to Canada will be invited to bid for tenders issued by the City of Hamilton in collaboration with local developers. And the Hamilton stakeholders got a healthy dose of ambitions for creating a more

socially just, green and liveable city, explains Edward John.

"It inspired people. The number one outcome was allowing people to dream bigger. To do more than the knee-jerk reaction of fixing the problem without taking the time to think bigger. People are no longer just thinking about how many houses are available and how many people are on the waiting list. Now we're discussing the quality of those houses and how they give dignity to the residents, allowing them to self-actualize, to get out of the cycle of poverty. It's that kind of excitement and inspiration that really came through this," he says.

From a climate perspective, one very positive outcome is that some of the housing providers managing the social housing have committed to no longer building anything but passive house units.

"Before this type of activity, people considered it almost a waste of resources to go that deep, to invest that much in a unit. They designed the cheapest unit they could, built it and moved on. But now there's so much momentum and that's probably the biggest shift that's happened in the past couple years, particularly with the assistance of this open innovation competition," says Edward John.





The three winners

AquaGreen (Winner)

A suite of technologies to treat waste-water sludge to produce energy, agricultural fertilizer and active coal that can then be reused in waste-water treatment.

WoodUp

Upcycling of wood to create a number of products, from insulation materials to cloth. Especially useful in a forest country like Canada.

AquaGlobe

A hub of smart water technology companies that can radically reduce the energy used for water distribution by suppliers.v

Case Study Summary

The challenge:

The City of Hamilton wanted to source innovative solutions for affordable and sustainable housing in order to open up the field of opportunities for developing inner-city living areas. These areas that have traditionally housed blue-collar workers are seeing a new influx of people and money and the municipality wants to develop the area in a way that will allow existing residents to benefit too and not be pushed out of the area by the gentrification, as has often been seen in other city centres. The project had a special focus on how to retrofit a number of downtown social housing buildings.

The challenge areas combine diverse technical and social perspectives:

- #1 Smart and Sustainable Building Technologies
- #2 Circular Economy Solutions
- #3 Stakeholder Engagement
- #4 Decision-making and Analytical Tools

The process:

Phase 1:

The scope of the challenge was defined together with the City of Hamilton before a call was presented in March 2018 with a deadline of June 2018.

Phase 2:

The received proposals were evaluated and nine finalists were chosen in August 2018. Following that, an online pitch bootcamp prepared the participants for the innovation lab and pitch session to take place in Hamilton.

Phase 3:

In September 2018, the nine chosen proposals were invited to Canada to participate in a two-day workshop in Hamilton. The workshop was organized to connect city officials, local businesses, citizens and other stakeholders with the Nordic participants to make certain that they understood the local context.

After the workshop – on the second day of the trip – the participants in the challenge presented their solutions to a panel of four judges representing the city and private developers based in Hamilton. The three most promising and implementable solutions were chosen.

Results:

All nine solution owners that were invited to Hamilton will also be invited to bid for tenders issued by the City of Hamilton in collaboration with local developers.

Challenges:

Opening the discussion with local stakeholders on how to do things differently from what they are used to and fighting misconceptions on what can be done in terms of renovating older buildings was a significant challenge.

Challenges	Solutions
Not-Invented-Here (NIH) syndrome	Enhanced communication across all levels in society
Geographical distance and time difference	Relationship management
Actual implementation	Continuous dialogue

UN Sustainable Development Goals addressed:

- #1: Smart and Sustainable Building Technologies
- #2: Circular Economy Solutions
- #3: Stakeholder Engagement
- #4: Decision-making and Analytical Tools



Case #12

Smart City World Labs

Connecting sustainable
solutions across borders

Project period	September 2017 to September 2018
Location	Singapore and Copenhagen
Theme	Urban Transitions
Lead contact	Jens Dahlstrøm, Innovation Consultant, Technical University of Denmark
Stakeholders	Private and Public



Case Overview

The city state of Singapore is in many ways a modern marvel. In little more than 50 years, it has gone from a relatively poor developing country to one of the top three richest countries in the world measured by GDP per capita. Singaporeans take pride in their economic achievements since the “City of Lions” proclaimed its independence as a republic in 1965. And even more so considering that the tiny state of 723 km² has no natural resources to speak of and close to no farmland to feed its population of more than 5.6 million people.

Being wealthy, but also almost completely reliant on imports of vital commodities such as food and energy, has created a desire to lessen the dependence on the world around them and sparked a search for new innovative solutions for energy efficiency, clean energy and food production in an urban and peri-urban setting.

The Nordic countries Denmark, Sweden, Finland and Norway are 10,000 km away, but despite the distance they share some vital traits with Singapore. They are also among the world’s wealthiest nations and though their rise to affluence has not been as meteoric as Singapore’s, the wealth was largely created in the second half of the 20th century. Their total population is roughly the same size as that of Singapore and these countries share the Singaporean ambition of creating clean and resilient economies. Cleantech has been a fast-growing business here for the past 20 years.

So when Climate-KIC, the Technical University of Denmark (DTU) and the consultancy Quercus

Group launched the Singapore Urban Challenges – a call for innovative solutions to some of the challenges facing Singapore – more than 70 companies, universities and organizations from the Nordic countries responded with proposals for solutions.

The large number of proposals delighted Jens Dahlstrøm, Innovation Officer with the Technical University of Denmark and the university’s project manager for the challenge. Having also been on the other side of the table, defining the challenges with the Singaporean challenge holders, he saw an immediate value in the broad scope of proposals:

One of Climate-KIC’s core strengths is that it has a very developed network of more early-stage clean-tech startups on account of all the startups that have been through their accelerator programme

“There is a real knowledge gap between what is available in the market and what challenge holders initially believe is available. So they had an eye-opener about some of the things that are going on that they were not aware of. That is one reason to do these kinds of challenges: to really broaden the stakeholders’ horizon,” he says.

That the project succeeded in sourcing in as many as 70 solutions especially comes down to the call being disseminated through Climate-KIC’s network of close to a thousand clean-tech startups and SMEs, says Jens Dahlstrøm.

“One of Climate-KIC’s core strengths is that it has a very developed network of more

early-stage clean-tech startups on account of all the startups that have been through their accelerator programme. That was definitely valuable in this process,” he says.

The Singapore Urban Challenges were launched in March 2018. Prior to that, the partners behind the call had worked with three Singaporean challenge holders to define the challenges: Surbana Jurong – one of the largest Asia-based urban, industrial and infrastructure consulting firms; PSA Unboxed – the venture capital arm of PSA International, one of the leading international port operators – and finally, NTUEcoCampus, a flagship sustainability programme of the leading Nanyang Technological University. Each challenge holder had a specific challenge, ranging from reducing water use to creating new efficient window designs (see also summary box).

After the initial call, the 70 applicants were screened and 15 were chosen to go on to a virtual pitch session – five for each challenge. After the pitches, six solutions were chosen to proceed to the next phases of the project; a business development programme run by the Technical University of Denmark that aligned the solutions better for the Singaporean context and a four-day workshop where competitors met challenge holders, investors and experts in Singapore.

The business development programme was novel compared to the way in which many of these challenges are conducted, says Jens Dahlstrøm. The chosen six companies first spent a full-day session together with all the companies present. Then researchers from the university had one-on-one sessions with each company, and the extra effort paid off, he says:

“We could see that the companies really benefited from these sessions with DTU researchers. There were marked developments between the

stage that they were at when entering the programme and the stage that they ended up at.”

Neelabh Singh, the project manager from Quercus Group, a Copenhagen-based consultancy that facilitated contact with the challenge holders and developed the go to market roadmap for the implementing companies, also sees the business development programme as a valuable addition to this kind of project:

“You have to remember that most of these companies are rather small. Three, five, perhaps ten people. They don’t necessarily have the capacity to do this kind of market expansion by themselves. So I believe it was very useful for the companies to understand their own value proposition with respect to the market in Singapore,” he says.

Solid business case would catalyse action

Following the programme at the Technical University of Denmark, the six selected companies went to Singapore in late June 2018 to meet and pitch their ideas to the challenge holders, local investors and experts during a four-day workshop. The dialogues have so far resulted in a number of opportunities to pursue further collaboration. In addition, as part of the Open Innovation Project, road maps for the Nordic companies to commercialize their products and services in Singapore have been developed. The road maps consider each company’s readiness in aspects such as business, economy, fundraising, intellectual property, legal, technology, and partnerships.

The road maps have been developed to help the companies, which are now entering the hardest phase in these kinds of projects: going from the flirtations of the matchmaking phase to a much

more committed relationship with new possible partners, customers or investors.

"The matchmaking phase necessarily comes with a rather low level of commitment from either side. This allows you to test the waters, which is positive. But going into the second phase of actually implementing the projects is much more ambitious," says Jens Dahlstrøm.

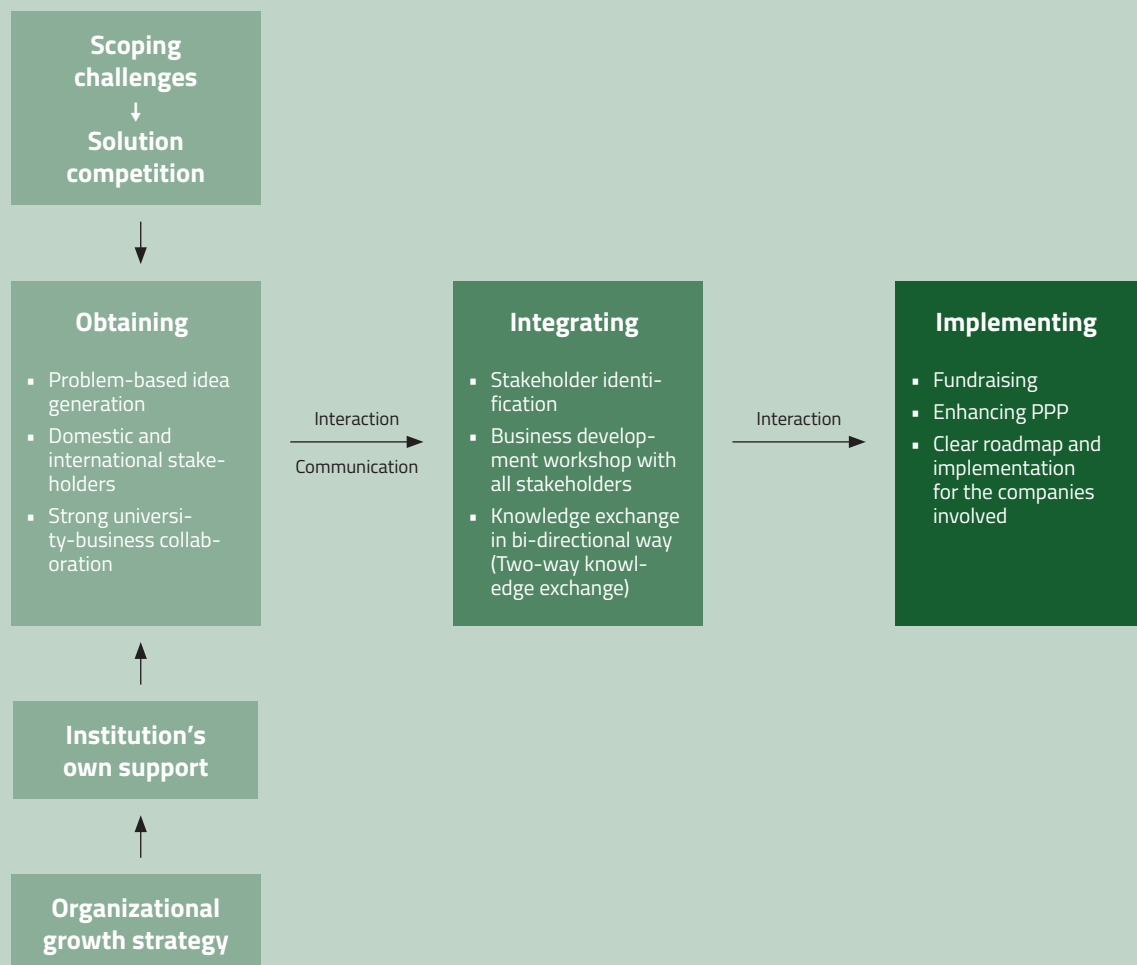
Neelabh Singh also acknowledges that the phase straight after the matchmaking and pitching is where the grit of the companies is really tested.

"I have been in this business for eight years now, and sometimes I wish companies were a bit more adventurous. Sometimes they simply need to jump into the water and start swimming, but that is hard for them. You have to

remember too that they are often small companies. It can be a big resource drain for them to do a pilot project, especially if it is far away from their base," he says.

Jens Dahlstrøm believes that adding the opportunity for some extra funding to take the fledgling collaborations a step further would be useful.

"Often challenge holders want something very innovative, but also want to see proof that it works as expected. That is not always easy to combine. One thing that I think could help speed things along would be proof-of-concept funding within the project: rather small amounts to create a proof of concept, for example using researchers or a willing third party. This would help provide a more solid business case for the companies," he says.



Roadmaps to growth

Of the 70 companies entering the competition, six were selected to meet investors and businesses in Singapore. All are in contact with Singaporean investors to bring their innovations to life. Each of the businesses has received a roadmap for implementing its business model or product in the Singaporean context.

Status (as of December 2018)

Airlabs

Solution: Air purification and HVAC energy savings.

Next step: Airlabs is cooperating with Surbana Jurong's roster for Hospital and Airport solutions and is in addition holding discussions with the National Environment Agency on a national pilot project. A potential partnership with a big Danish company is also on the agenda.

AquaGreen:

Solution: Sludge to thermal energy and fertilizer.

Next step: AquaGreen is in discussions with challenge holder Nanyang Technological University (NTU) to further develop the solution, and is installing a test facility and establishing AquaGreen Singapore as an incubator company at NTU.

Arctic Systems:

Solution: Poison-free rodent control using AI.

Next step: Arctic Systems is planning a pilot project with Nanyang Technological University and the Technical University of Denmark at

the beginning of 2019. The company is in close dialogue with two major pest control companies in Singapore.

Microshade:

Solution: Invisible shading for window facades.

Next step:

Microshade is cooperating with Surbana Jurong's roster for upcoming projects and have sent samples of products to Surbana Jurong. Microshade has also opened a dialogue with a Singaporean glass manufacturing company about a potential fulfilment partner agreement.

Nerve Smart Systems:

Solution: High-power charger with battery buffer.

Next step: Nerve Smart Systems has replied to a Singaporean invitation to respond to a tender. The company is currently in a dialogue about partnering with Scandinavian multinationals. A dialogue about a pilot facility has been started with Nanyang Technological University.

Urban Ecosystems:

Solution: Urban rooftop community gardens.

Next step: Urban Ecosystems is now a part of Surbana Jurong's roster for rooftop community farms. The company is in dialogue with three investors.



Case Study Summary

The challenge:

The three challenge holders each brought their specific challenges:

Surbana Jurong asked for two things:

1. Designs for windows that let in more light but block out heat and convert solar energy to electricity and,
2. Designs for solar energy modules for roof-tops that also provide shading for urban farming crops.

PSA Unboxed needed novel battery solutions for a new fleet of electrified and independently operating container trucks for its future Tuas Port. Batteries are needed to extend the vehicles' operating time beyond the 4-5 hours achieved today.

NTUEcoCampus asked for solutions that could help the programme meet the goals of a reduction in water use and waste intensity and increased use of renewable energy sources other than solar.

The process (all dates in 2018):

2 April	Application deadline
11 April	Kick-off workshop in Denmark
17 April	Virtual pitch/meet NTU EcoCampus
May - June	1:1 Session with DTU business developers
25-29 June	Workshop in Singapore
July-September	Implementation roadmap developed

Results:

All six of the companies chosen to go to Singapore are in dialogue with local investors or customers. See also the box in winners.

Challenges:

Moving from the matchmaking to the pilot phases has led to some challenges and not all contacts are likely to develop into the next phases of collaboration.

Challenges	Solutions
Cultural differences	Open communication and enhanced facilitation
Timeframe and geographical distance	Workshops in the home and house institutes
To be filled out by Maral Mahdad	Negotiation and communication

UN Sustainable Development Goals addressed:

- #4: Quality Education
- #6: Clean Water and Sanitation
- #7: Affordable and Clean Energy.
- #9: Industry, Innovation and Infrastructure.
- #11: Sustainable Cities and Communities.
- #12: Responsible Consumption and production
- #17: Partnership for the Goals

Case #13

Smart Cities Accelerator – Indoor Climate Call

Smart sensors for
smart buildings

Project period	September 2017 to May 2018
Location	Hoeje-Taastrup, Denmark
Theme	Urban Transitions
Lead contact	Morten Koed Rasmussen, Climate Consultant, Hoeje-Taastrup Municipality
Stakeholders	Private and Public



Case Overview

If you visit a Danish school in the last few hours of the school day, there is a reasonable chance that you will encounter tired kids that are finding it hard to concentrate. You might write it off as a natural reaction to a long day in school, as a sign that teachers should be better at engaging pupils or simply as “kids being kids” and spending too many late night hours on social media.

In fact, while any of these might be true, often a contributing factor to the general lack of focus in the classroom late in the day is that the indoor climate is poor, making pupils and teachers alike unfocused and drowsy. As the school day winds on, the level of CO₂ in the classroom air goes up, the temperature might be too high or too low – sometimes both in different sections of the same room – and the amount of natural light might be limited, especially in winter. All these factors are known to make people – adults and kids alike – feel sleepy and find it hard to concentrate.

In this context, the public schools in the municipality of Høje Taastrup are no different to most Danish schools. What is different is that the municipality is trying to link an effort to create a better indoor climate for pupils and teachers to another strategic goal, to reduce the energy consumption in public buildings.

“The indoor climate often falls between two stools. A lot of people say it is a serious problem – especially in our schools as we want the kids to be alert and learn something – but it’s often hard to figure out who’s actually going to do something about the problem. It’s not really

the core job for the building department, in fact they might see it only as an added cost. Nor is it a natural job for the municipality’s schools section,” says Morten Koed Rasmussen, climate consultant with Høje-Taastrup Municipality.

His job is to create energy savings in the municipality and, even though drowsy pupils are not one of his responsibilities, linking energy savings to the indoor climate might be a way to push initiatives through the administration that can create energy savings and at the same time make the climate more conducive to learning. He says:

“There is a lot of political focus right now on the indoor climate in our schools. But doing something about it is expensive, so if I can provide the building department with a relatively good business case, showing how energy savings can pay for a lot of the investment in a better indoor climate, we can get things moving.”

This might sound too good to be true, but often, when renovating a building to improve energy efficiency, the indoor air quality and access to natural light are key factors

This might sound too good to be true, but often, when renovating a building to improve energy efficiency, the indoor air quality and access to natural light are key factors. First of all, there is a common misconception that energy efficient buildings have a poor indoor climate, with small windows and a stuffy atmosphere. Most often the opposite is true, an energy renovation creates the savings needed to invest in a renovation to create lighter and airier surroundings – if it is done properly. Actually, the improvement

in indoor climate is often a winning point when discussing whether to carry out an energy renovation with the owner or users of a building.

Open innovation provided a neutral platform

In the case of the schools in Hoeje-Taastrup Municipality, Morten Koed Rasmussen tried to link his remit of creating energy savings to the political focus on indoor climate and the already tight budgets of the building department. The glue to keep all this together was an open innovation competition organized with Climate-KIC, the Technical University of Denmark and the University of Copenhagen as part of a larger smart-city project.

"It's a question of how you get the different levels of the organization to work together. On the one hand, we have to apply some pressure to achieve a greater focus on bad indoor climate. On the other hand, we don't want to be too aggressive. The competition was a way to establish neutral ground for the discussion on how to proceed," he says.

A key challenge is that even though most buildings today have systems that regulate heating and ventilation for optimum efficiency and comfort, these systems are often flawed, Morten Koed Rasmussen says. A shutdown in electricity systems can, for example, mess up the system so that it regulates heating and ventilation as if it is a weekend in the middle of the week. A system based on sensors would in theory be able to regulate the building much more efficiently and to the benefit of its users.

"Eventually we would like to be able to control the heating and ventilation so we can adjust it to the users. For example, we don't want to ventilate the heat out of rooms that are empty anyway," he says.

The municipality has been working with the Technical University of Denmark to develop a browser-based platform which gives facility management and school staff an opportunity to control the indoor climate and energy usage. The aim is to be able to use sensors and actuators to set up modern smart control strategies for a building's entire heating, ventilation and air conditioning (HVAC) system. The problem, however, is that the available sensors are still too expensive and unreliable. They have a lot of downtime and batteries last for too short a time. The cost of having to change batteries would be too much. Connecting sensors to the building's main grid has its challenges too, says Morten Koed Rasmussen.

"If they are connected using the classroom's power sockets, the children take out the adapters and use the sockets for charging their phones instead. If we had an electrician install the sensors and connect them directly to the building's power grid, it would be very expensive and then you can't move the sensors," he says.

Therefore, the open innovation competition focused on new sensor technology. The organizers were looking for sensors or systems that at a relatively cheap price could coordinate heating and ventilation to save energy and create a better indoor climate. The proposed solutions were to be judged on connectivity (open source required), low installation costs, minimal running costs and durability.

High quality proposals

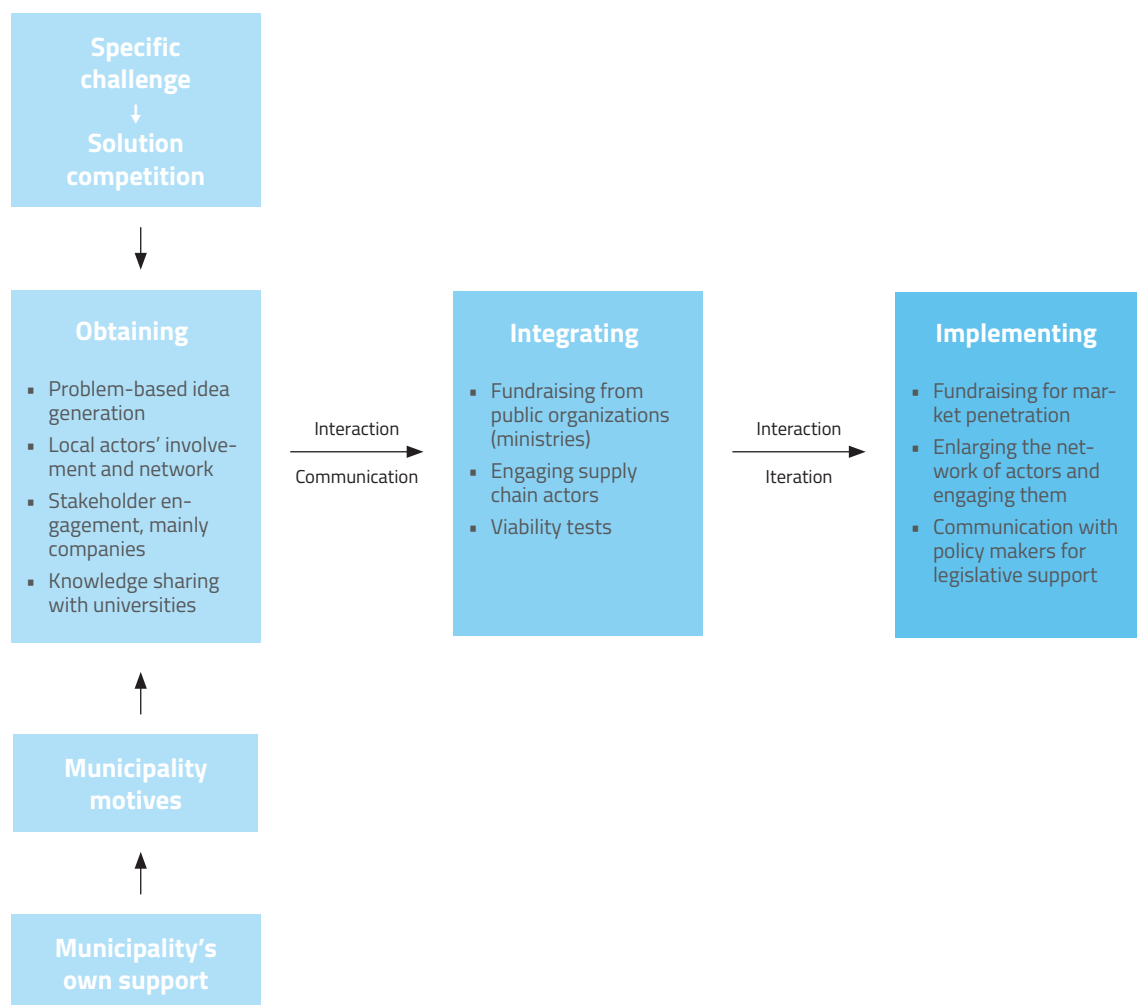
The organizers received five proposed solutions to the challenge. All of them of high quality, says Davide Cali, postdoc at the Technical University of Denmark and part of the organizing team.

"The quality was quite good, and we had a winner which we are quite satisfied with. The

winner is a very innovative company, so we are actually cooperating a lot with them and we also have a new project that we want to run together," he says.

And from an organizational perspective, the open innovation challenge gave impetus to the work of raising awareness of the indoor air climate and how it can be addressed within the municipality.

"We had multiple objectives. We were looking for sensors but, at the same time, we were also interested in finding out what other people were doing and maybe have some input from some of the companies that came in. Lastly, it was also about communication. By holding this open innovation competition, we found a way to connect with the politicians and different stakeholders in the municipality," says Morten Koed Rasmussen.





An integrated suite of sensor and building-management technologies

The winning proposals came from NorthQ, a company that specializes in creating energy- and building-management systems that integrate data from a range of sensors in a single online platform. The company was already involved in the three-year Smart Cities Accelerator (SCA) project, which the open innovation challenge was part of.

Case Study Summary

The challenge:

Like most municipalities in Denmark, Høje-Taastrup Municipality is struggling to create a good indoor climate in its public schools. The air quality is often bad due to inadequate ventilation. At the same time, classrooms can be too hot or too cold for comfort. 90% of the primary schools in Denmark have poor indoor climate conditions. As a consequence, pupils are less concentrated, learn less and have more sick days.

As part of the three-year Smart Cities Accelerator (SCA) project, researchers at the Technical University of Denmark have developed a browser-based platform (in Danish) which gives facility management and school staff an opportunity to control the indoor climate and energy usage. However, the sensors needed for that project are often not suited to the school environment or are too unreliable or too expensive to install or service. The challenge was to achieve new sensor solutions that would enable a much more controlled indoor climate.

The process:

- Inception phase: defining the scope at partner workshops in Lund, Copenhagen and Høje Taastrup.
- Spreading the call throughout the Nordics (April 2018)
- Q&A webinar for potential participants (April 2018)
- Selecting solutions (May 2018)
- Virtual bootcamp
- Final pitch event in Høje Taastrup (18 May 2018).

Results:

The competition participants NorthQ (the winner) and SmartVent are now cooperating. They are also exploring opportunities for working with the Finnish Climate-KIC partner Fourdeg.

Participants Develco and Leapcraft would like to further develop and be involved in future Smart City Accelerator activities.

Challenges:

There are not a lot of suppliers of the relevant sensor technology, and few new players were identified.

Challenges	Solutions
Translating research into business understanding	Expectation alignment and interest-matching communication
Not-Invented-Here (NIH) syndrome	Strengthening communication channels
Attracting the main actors as a source of ideas	Marketing and trust building practices

UN Sustainable Development Goals addressed:

- #4: Quality Education
- #6: Clean Water and Sanitation
- #7: Affordable and Clean Energy.
- #9: Industry, Innovation and Infrastructure.
- #11: Sustainable Cities and Communities.
- #12: Responsible Consumption and production
- #17: Partnership for the Goals

Case #14

Energy- Smart Nidaros Cathedral

Historic and cultural
landmark as a beacon for
sustainability

Project period	February 2018 – August 2018
Location	Trondheim, Norway
Theme	Urban Transitions
Lead contact	Chin-Yu Lee, Climate Adviser, Trondheim Municipality
Stakeholders	Trondheim Municipality Nidaros Cathedral Restoration Workshop (NDR) The Common Church Council in Trondheim (Kirkelig fellesråd) Technoport



Case Overview

Standing in front of Nidaros Cathedral in the city of Trondheim in Norway, it is not uncommon to feel awestruck. The huge cathedral is a medieval masterpiece built upon the grave of King Olaf the Saint, a national hero and the patron saint of the otherwise firmly Protestant Norway. And then you get a bit puzzled. Because, how on earth did anyone get the idea to build a roughly 100-metre-long Romanesque/Gothic cathedral here, in a modestly sized town slightly further north than Anchorage in Alaska?

The locals of course will tell you about Trondheim's huge importance in the Middle Ages and how the immense stone cathedral has been a city landmark for almost 1,000 years. Norwegian kings are crowned here and the crown jewels reside in the cathedral and not in the capital Oslo, 400 km to the south. The cathedral is a defining building, not just for the city of Trondheim but also for the entire country, and now it is hoped that the historic landmark can serve a new role – as a beacon for sustainability.

Since the cornerstone was laid in 1070, the cathedral has been constructed, expanded, ravaged by fire and

rebuilt numerous times. The latest renovation ended in 2001. And now it is perhaps headed into a new era, says Chin-Yu Lee, Climate Adviser to Trondheim Municipality. She headed an open innovation challenge with Climate-KIC support, looking for ways to leverage the cathedral's huge cultural significance to push the municipality's ambitious climate strategy.

"We have the quite ambitious goal of reducing the city of Trondheim's direct greenhouse gas

emissions by 80% by 2030. I'm responsible for reducing the energy use in the building sector, and we have been engaged in some smart-city initiatives involving new and flashy smart-office buildings, but it is just recently that we started thinking about what we could actually do with the most iconic building in our city, the cathedral," she says.

The challenge is tremendous. The cathedral is located just 350km south of the Arctic Circle and is not exactly built for energy conservation. Every year, the building consumes approximately 1.5GWh of energy for heating, lighting, dehumidification and other purposes. Also, as it is one of the most culturally significant buildings in Norway, there is very little you can do to the building that changes its appearance in any way. You do not just stick solar panels onto the roof or start insulating a more than 900-year-old cathedral. In addition, the grounds around the cathedral are heavily protected.

The challenge is tremendous. The cathedral is located just 350km south of the Arctic Circle and is not exactly built for energy conservation.

Given the number of challenges to overcome and the lack of off-the-shelf energy conservation solutions for medieval cathedrals, the municipality and Climate-KIC decided that the best way forward would be to seek outside inspiration via an open innovation competition.

A call for solutions that could reduce the cathedral's energy consumption and use the city's most famous building as an inspirational example of Trondheim's climate ambition was sent



out in early 2018 during the Technoport Festival. Unfortunately, the response was limited.

“Normally, if you’re working with Climate-KIC, you would get 30 to 40 proposals in a competition like this. We got seven by the deadline in June,” says Chin-Yu Lee.

The organizers went over the project: they had their stakeholders mobilized, the challenge was clear if difficult, the setup was tight, and they had activated their networks in the search for solutions. Things should be looking better, but perhaps the challenge was too unique? After all, not many startups build a business model around the need for energy renovation of cultural heritage buildings.

The project’s timeline could not be extended either – the final event was already scheduled.

The project team found a solution when digging into the proposals received.

“Luckily, when we went over the proposals, there were a lot of qualities to them,” says Chin-Yu Lee.

“We managed to select four very qualified teams for phase two.”

The four teams were invited to go to Trondheim for a development workshop and the final pitch event. The activities were part of the innovation festival Trondheim Playground. The workshop would give the teams behind the proposals a chance to get a first-hand feel for the cathedral and develop their proposal to better fit the challenge.

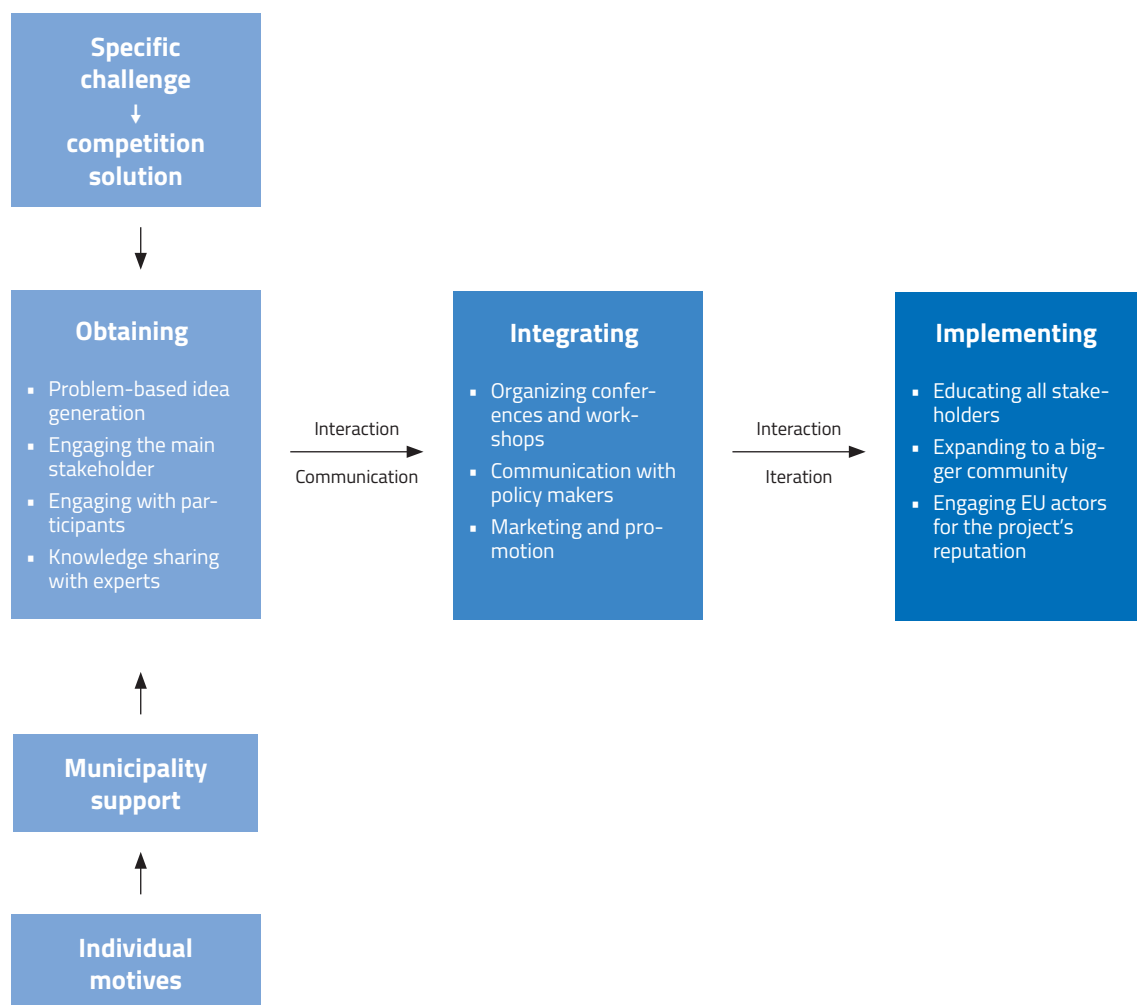
“When you are holding an international competition, people can’t know the building all that well. We try our best to describe the problem, and point out what kind of solution we are aiming for, but they need to see the premises and meet the stakeholders and the local community here,” says Chin-Yu Lee.

The proposal that won first prize at the final pitch event was a heavily technical solution that reduced energy consumption by focusing on heating the cathedral rooms in zones, so that the heating system follows groups of visitors around the cathedral.

But other approaches got a very favourable mention too, like the app that allows the city’s citizens to create energy savings in their own

homes and “donate” them to the cathedral. This was about leveraging the local significance of the building to mobilize citizens, and plays on some of the project’s important cultural aspects, explains Chin-Yu Lee. The Nidaros Cathedral has been a centre for learning for centuries, and Trondheim is now in the process of positioning itself once again as a centre of technology learning, with its strong university and startup environment.

“Nowadays, we are promoting Trondheim as the technological capital of Norway, built on its tradition of knowledge gathering, knowledge production and knowledge dissemination over several hundred years. The cathedral was a very important centre for this. It is simply where things started,” says Chin-Yu Lee.





The three winners

No. 1 – Stone by Stone, Norway

The solution reduces energy consumption by lowering the general temperature throughout the cathedral but keeps the areas where people are currently sitting warm through a zone-controlled heating system. The team also investigated opportunities for using heat wells and solar cells to make the cathedral more self-sufficient in energy.

No. 2 – WE power, Serbia

An energy-awareness mobile phone app that lets users “donate” energy savings in their own

homes to the cathedral, offsetting the energy use there. This community-powered initiative leverages the cultural significance of Nidaros Cathedral to raise awareness of climate change and inspire people to create energy savings in their daily environment.

No. 3 – PD Energy, Poland

This proposal focuses on retrofitting the building envelope and modernizing the heating system and energy management system.

Case Study Summary

The challenge:

Nidaros Cathedral is a landmark building in the Norwegian city of Trondheim. For more than 900 years, the cathedral has been one of the most culturally significant buildings in Norway. Trondheim Municipality is now looking for ways to leverage the cathedral's importance in order to fulfil its ambitious climate plan of reducing the city's greenhouse-gas emissions by 80% by 2030. The cathedral itself uses 1.5GWh of energy a year, approximately the same as 75 Norwegian homes, but apart from the direct savings the municipality wanted to use the initiative to create awareness of the need to reduce greenhouse gas emissions. The big question is: can historic landmarks be transformed into smart and climate-friendly powerhouses?

The process:

Stage one:

- Define the scope and collect background information
- Launch of OI competition during Technoport conference (February 2018)
- Spreading the call (from March 2018)
- Q&A through open webinar (May 2018)
- Submission of solutions online (June 2018)
- Jury selection of up to five solutions for stage two (June 2018)

Stage two:

The selected finalists were invited to a bootcamp, site visit and final pitch in Trondheim on 27-28 August 2018, during the Trondheim Playground innovation festival.

- Bootcamp and final pitch in Trondheim (August 2018)

Results:

The winners are in dialogue with cathedral officials on possible next steps.

Challenges:

Working with a heavily protected building and area placed many limitations on what could be done. The very limited market for the energy renovation of landmark buildings like the cathedral was probably also a reason for the relatively low number of proposals.

Challenges	Solutions
Attracting participants	Marketing and promotion from big actors
Prize and compensation	Inviting potential angel investors

UN Sustainable Development Goals addressed:

- #7: Affordable and Clean Energy.
- #9: Industry, Innovation and Infrastructure.
- #11: Sustainable Cities and Communities.
- #17: Partnership for the Goals



Findings and key learnings

Result of City-led Open Innovation

First and foremost, City-led Open Innovation can be utilized to assist cities in meeting ambitious sustainability goals and targets. As a framework for sourcing and co-developing solutions, City-led Open Innovation can achieve results both in the short and the longer term. In the short term, one can expect to source relevant solutions more efficiently than with more traditional “closed” methods as the city’s needs are broadcast to a much wider audience of solution providers.

The variety, ambition and experimental nature of the solutions sourced is often significantly greater. Moreover, through engaging in Open Innovation processes, city administrations can expect to become more up-to-date with regards to the newest knowledge and ideas available. Cities often find themselves falling behind when it comes to participating in the latest ways of thinking, Open Innovation represents a tool through which they can rectify this.

In the longer term, City-led Open Innovation can help facilitate a number of co-benefits including blue-green growth, and the enhancement of cities’ innovation ecosystems and entrepreneurial sectors. By engaging start-ups and other actors often poorly represented in traditional

processes, a city can, in effect, nurture its budding entrepreneurial/start-up ecosystem.

Through the provision of resources such as information, data and feedback, cities can encourage and support individuals and start-ups whilst reaping the benefits of improved solutions tailor made for use in their situation.

Furthermore, by reaching out to these sectors through open events such as Open Innovation competitions, the city administration can find itself more closely engaged with its public, promoting participation in city issues and increasing awareness of the climate and sustainability in general. Finally, through adopting the Open Innovation concept and taking the lead in sustainable innovation processes, cities will be able to brand themselves as front-runners in the race to achieve their climate goals on the international stage.

Barriers to successful Open Innovation

Implementing Open Innovation processes into the operations of a city isn’t necessarily straightforward. In past cases – i.e. Copenhagen and Gothenburg – it has been observed that public administrations, can struggle with learning how to deal with the new actors brought

forward by Open Innovation. Furthermore, in larger Open Innovation processes which seek to source ideas originating outside the host city, it has been noted that the often substantial differences between the policies, regulations and ways of working between cities can either deter or delay non-local solution providers from getting involved.

Barriers such as the fragmented administrative landscape can also be difficult to overcome. This is especially the case when the differences between cities are so great that solution providers would be required to completely reassess their business model in order to be competitive and/or relevant in the new environment. Moreover, certain solution providers find that the time frames that administrative municipalities commonly work to can be problematic with their own. Small businesses often have a tight cash flow. This can put them in conflict with city and municipality administrations who often take significant amounts of time to approve and act on agreements.

It is apparent that a large proportion of the barriers to Open Innovation arise due a city's lack of resource capacity and or mismatch in skill set. Even larger administrations who possess a wealth of resources can conceivably lack the necessary knowhow and expertise to coordinate co-development activities to make

the transition to a more open business model, without initially falling into the usual traps and pitfalls.

In many cases, it is useful for progressive and ambitious administrations to enlist the help of experienced facilitators who can assist with the planning and organisation of the process. In doing so, cities can acquire knowledge and experience of Open Innovation and avoid making rookie mistakes that can lead to initially unsatisfactory results and a general loss of momentum. In all three cases stated above, the cities co-organised the event with Climate-KIC. Thus, they had on hand professionals who specialise in open innovation processes and understands the working practices of both public administrations and private businesses.

Best practices

In order for a facilitator to both overcome the barriers to successful Open Innovation practices and maximise the value of its practice, it is important that one is completely in control of proceedings. In particular, it is important to bear in mind that:

Stakeholders need to be kept motivated.

Open Innovation, by definition, involves large numbers of actors, stakeholders and

collaborators. Large consortia can be difficult to manage, particularly when motivation to engage with the process is driven by the desire to create differing forms of value. In processes with an environmental theme, it is often the case that consortia members view value differently. Some – generally SMEs and big businesses – will desire value to be largely economic, whilst others – universities and certain start-ups for example – may also value the idea of creating a societal or environmental impact. The differences in outcome desired by each stakeholder needs to be appreciated by those overseeing the innovation process, as without a tangible end result that is satisfactory to all parties, members of a consortium may be reluctant to continue.

A varied stakeholder consortium often produces the best results.

Open Innovation is often more effective when it includes actors from different backgrounds in the innovation process. Having access and exposure to the different knowledge, experiences and thoughts typically held by different types of individuals and organisations – i.e. start-ups, SMEs, big business, universities, the public sector etc. – ensures that certain new, more alternative or up-to-date thinking, applicable to

the desired solution(s) aren't missed. As such, Open Innovation events and processes should be designed to act as an "multi-actor" platform which is as inclusive as possible.

Successful Open Innovation processes requires supporting actors who connect and match stakeholders together, build bridges between them and act as brokers between the different sub-divisions of the collaboration.

Traditional stakeholder roles become blurred.

As the above point states, it is beneficial to attract a wide variety of stakeholder types into the innovation process. Furthermore, having done so it can be beneficial to let the typical roles of the stakeholders become "blurred". This can be achieved by allowing stakeholders to be active in areas of the process which would traditionally be outside of their responsibility area. By blurring the lines of responsibility, one encourages greater levels of information exchange between the parties which can lead to improved results and more valuable process outcomes. This "blurring" can come about in the form of a solution provider suggesting changes to municipal policy which may enable the integration of

certain types of solution. Furthermore, city administrations shouldn't be afraid of contributing to the solution development process by making suggestions or highlighting how certain features could be improved or tested to enhance the end products usability.

Match-makers help, a lot.

Successful Open Innovation processes requires supporting actors who connect and match stakeholders together, build bridges between them and act as brokers between the different sub-divisions of the collaboration. These match-making nodes are essentially acting as civic accelerators, building bridges between players. They are key in keeping the overall process in motion. Bespoke match-making events represent one bridge building activity used to enable Open Innovation and are being increasingly used by supporting actors. Match-makers are crucial in not only bringing different cultures together but also in developing and establishing the models through which collaboration will take place. The role of match-makers can vary between the different approaches to Open Innovation. In short, in events such as hackathons, they are very "hands on" where as in longer and less intense settings they can operate more subtly. Typically, match-makers are typically found to be business developers and intermediate organizations. However, they have also been known to be progressive municipality

offices, forward thinking officials and business mentors. Regardless of who the match-maker is, it is important that they perform the role of facilitator within the process.

Clustering and post-event follow up is very beneficial.

There can be some debate as to when an Open Innovation process is finished. Is it when a product or service has been developed, placed on the market, or at the point of its first sale or installation? There is no correct answer to this, however it is worth bearing in mind that follow up actions "post-event" can lead to further value creation. Clustering is one form of follow up action which involves putting groups of interrelated solutions together and encouraging them to apply their now comprehensive mix of competencies to create joint solutions. By cleverly selecting well-suited solutions to cluster, one can ultimately achieve the creation of a more complex innovation with a greater impact than the collective impact of the previous standalone solutions. By doing this, one is essentially initiating a new innovation process from the results of several previous ones.

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This Open Innovation White paper is the results of Climate KICs activity climate Innovation partnership with cities, universities and private sector, an sincerely gratitude to all which have supported and contributed with interviews, comments and suggestions – thanks you!

1. Edition, 1 print, 2019 – Published by Climate KIC

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Supported by EIT



Climate-KIC is supported by the
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