In partnership with

eit Knowledge & Innovation Community
Climate-KIC

Building Technologies Accelerator

Welcome

Dear Reader,

We welcome you to our Climate-KIC flagship: the Building Technologies Accelerator (BTA). We are proud to have on board outstanding partners in education, private enterprise and government. All our partners and team members are involved in working towards one goal: creating a future worth living in.

Find out who we are, how we work and why our flagship team will be a success in the future by visiting our website: www.bta.climate-kic.org. Learn more about our technological innovations and projects including our Living Labs. As an important stakeholder in our projects, we invite you to come up with ideas on how you can contribute to, profit from and collaborate with our team.

Katrin Hauser, BTA Manager

Our vision

Expectations are that the global construction industry and building-related activities will continue to grow in the coming years. This sector represents approximately ten percent of global Gross Domestic Product and employs eight percent of the global workforce. Not only is the economic impact considerable, the environmental impact of these activities is huge. This sector is responsible for 40% of global anthropogenic greenhouse gases and 70% of landscape change. This means that the potential for improving and safeguarding the environment is enormous. BTA, a flagship project of Climate-KIC, aims to successfully capitalize on these opportunities by focusing on four innovative areas.

Contents

BTA's four main focus areas

Innovative Structures for Sustainable Buildings

Structural elements comprise a significant percentage of the total material used in both office and residential multi-storey buildings. Choosing better materials and construction methods for these structures will help improve sustainability and the environmental footprint as a whole. Wood is an alternative construction material that can be used to reduce energy waste. It is renewable and can store CO^2 for a long period of time.

Innovative Façade Systems

The building façade acts as the boundary between interior and exterior environments. A wide range of technologies can be integrated within the façade. To determine whether the envelope is suitable for certain climate conditions, prototyping and testing has to be carried out. Our Living Labs can help establish whether an exterior envelope is the right choice for a specific building environment and climate conditions. Access to Living Lab's knowledge and facilities can save you money and ensure high performance.

Energy Management Systems

How consumers and residents respond to and interact with building technology plays a major role in its success. A user's behaviour influences building technology performance. To optimize efficiency and a technology's effectiveness, users' living preferences and comfort criteria have to be taken into account. This is why understanding user behaviour is essential when developing interfaces.

Innovative Work Environment

The work environment also plays a significant role in the construction industry. A more efficient work environment can be developed by optimizing office buildings' hardware (the building and technical infrastructures), software (office devices such as remote communication), energy systems and work space. Progress in this field can be achieved by investigating user behaviour and integrating appropriate technology to increase comfort and productivity of employees.

User Involvement

Human behaviour influences the performance of buildings and building technologies. This in turn has a major impact on the environment and business investment.

During the open innovation process, prototyping projects are defined together with end-users and relevant stakeholders. We learn from co-creation pilots how to improve sustainable consumption and what market needs are. When actual consumer energy usage is not in line with estimated demand, business cases (such as energy contracting) are at stake. This is why BTA finds that the user plays a large role in a project's ultimate success.

About BTA

The dissemination of new and sustainable building technologies into downstream sales channels is currently slow. Both for new buildings and renovations. It's hard to stimulate investment in renewable energy when the current price for energy remains low. Research and development of new technology often requires long-term investment. Stakeholders are often reluctant to do so due to uncertainty about the Return on Investment (ROI). They prefer investing in new technology with a proven track record. On top of this, potential buyers are often not even aware of new technological solutions. And even if they are, sometimes buyers such as builders lack the necessary expertise to implement new technology.

Reduce Time2Market

To enter the market, new technologies need to be scalable. So they have to be adapted to meet specific climate conditions, remove transformational barriers as well as meet various user needs and preferences. BTA's objective is to reduce the time needed to conceive, develop and market new sustainable building technologies and services. In order to accomplish this, under the lead of ETH Zurich an Open Innovation Ecosystem, a network of next generation Living Labs and real world test beds, are provided. Extensive scientifically-based field tests that go far beyond case studies are carried out. Once technical, climate and user aspects have been tested and evaluated in the BTA Living Labs, larger field tests take place involving multiple building environments such as integrated neighbourhoods. Within this Ecosystem, key participants and stakeholders involved in technology development closely engage with one another and actively share and discuss results.

BTA GOAL:
Support innovative building technologies and construction services to reduce CO_2e and create new businesses and jobs in the European building sector.

BTA Partners

Chalmers University of Technology

Delft University of Technology

EMPA Zurich

ETH Zurich (BTA Lead Partner)

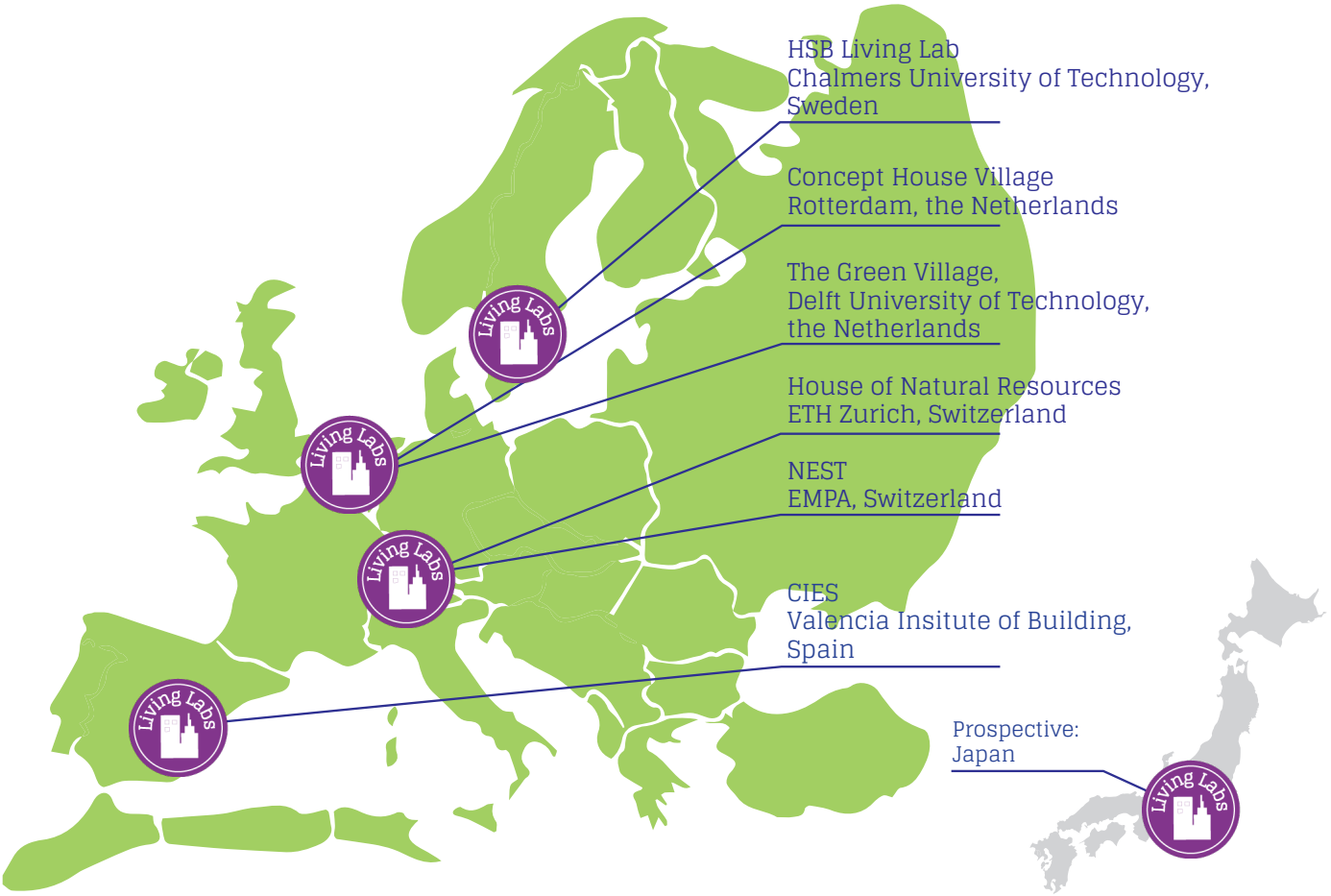
Knight Frank

Valencia Institute of Building

Living Labs

The BTA Living Labs are living laboratories. These are real-life buildings of home or work environments, not simulations. They are used for testing energy efficiency and sustainability. These labs are set up as real homes where research participants use new products and systems for a short or long period of time. They provide an ideal environment for testing new products, systems and processes.

Participant feedback is also collected and objective data is analysed. The BTA Living Labs are located in important climatic zones: dry and Mediterranean, Scandinavian, mountainous and continental European.
There are six living labs in total; located in the Netherlands (Concept House Village, The Green Village), Sweden (HSB Living Lab), Switzerland (House of Natural Resources, NEST) and Spain (CIES).



HSB Living Lab

Sweden

The HSB Living Lab will be built on the Chalmers campus in Gothenburg, Sweden. The building consists of 25 apartments and has a total ground space of 400m2. The first students and guest researchers will move to this three-story residential building in 2015.

Visualization by HSB

Approach

In developing systems and engineering solutions at HSB Living Lab, design and behavioural aspects are taken into consideration. Sustainability and well-being are key research topics.

Services

- A basic infrastructure (25 student units)
- Knowledge on Living Labs, sustainability, energy systems, flexibility, movability and deconstruction, architecture and design

Partnership Concept

The HSB Living Lab is a cooperation between three organizations: HSB Housing Corporation, Johanneberg Science Park (JSP) and Chalmers University of Technology. Chalmers, Interactive Institute and NASA are members of the management team. The partnership in charge of development funds is HSB Living Lab Utveckling HB.

Visualization by HSB

Technology focus

- Smart offices
- Innovative façades
- Home energy management systems

Project:

Residential building

- 25 apartments for students and guest researchers
- Facilities: exhibition area, common laundry room and meeting area

Website: http://www.hsb.se
Contact person: Prof. Greg Morrison **E-mail:** greg.morrison@chalmers.se

Concept House Village

The Netherlands

Concept House Village is a model village located in the 'New Village of Heijplaat' in Rotterdam. This model village houses temporary, permanent and existing buildings for research and development. Both new and retrofitted buildings. Here innovative houses, products and systems are tested with and by occupants. The first prototype was completed in 2012 and is currently being used as a Living Lab for researching occupant needs and preferences. Other houses are undergoing construction or are in the design phase.

Approach

Concept House Village aims at shaping sustainable behaviour through innovation. This Living Lab is a perfect environment for developing leading-edge methodologies and portable tools for field studies. It also assesses sustainable housing concepts in relation to human behaviour, product services and building technology. The user plays a central role in a house's design and development. The focus is also on the occupant's interaction with products, systems and services.

Services

- Prototype 1 (TU Delft): Living Lab R&D infrastructure
- Concept House Village: range of different housing units for research and development
- Intensive student involvement
- Communities of Practice (network of businesses, public and academic organizations)

Partnership Concept

Concept House Village is a cooperation between businesses and academic partners. There are 21 business partners involved in this flagship project, among which: RDM Campus, Woonbron (social housing corporation), ENECO (energy provider) and BAM (building contractor). The academic partners are: Delft University of Technology (TU Delft) and the University of Applied Sciences Rotterdam.

Technology focus

Test, evaluate and validate:

- technologies
- services
- processes.

Project:

Concept Houses on three kinds of plots

- Temporary houses
- Permanent houses
- Existing houses

Website: http://www.concepthousevillage.nl
Contact person: Dr. Sacha Silvester
E-mail: S.Silvester@tudelft.nl

Visualization of Prototype 1 by TU Delft

The Green Village

The Netherlands

The Green Village is a sustainable, lively and entrepreneurial community based at Delft University of Technology (TU Delft). The concept unifies clever, imaginative strengths of scientists and entrepreneurs and turns ideas and visions into experiences and commercially viable products and services.

Approach

- 'Radical innovation'
- Clean energy producer
- Waste as resource
- Clean water producer
- Clean air producer

Partnership Concept

The village is a 'science park'. Funds from TU Delft, the city of Delft and other organizations, will be used for the 'backbone' development of the park. Each plot of the park will be developed and independently financed by a consortium of academia, companies and students. Income from space rental, shop, restaurant and events, will be used for the exploitation of the village. Part of the overhead will be funded by TU Delft and other public funds for a period of ten years. Business partners add in-kind and financial contributions.

Services

- Strong connection industry and university
- Future labs, lively environment
- Equipped with the latest sustainable technologies
- Prêt-à-Loger (see page 23)

Technology focus

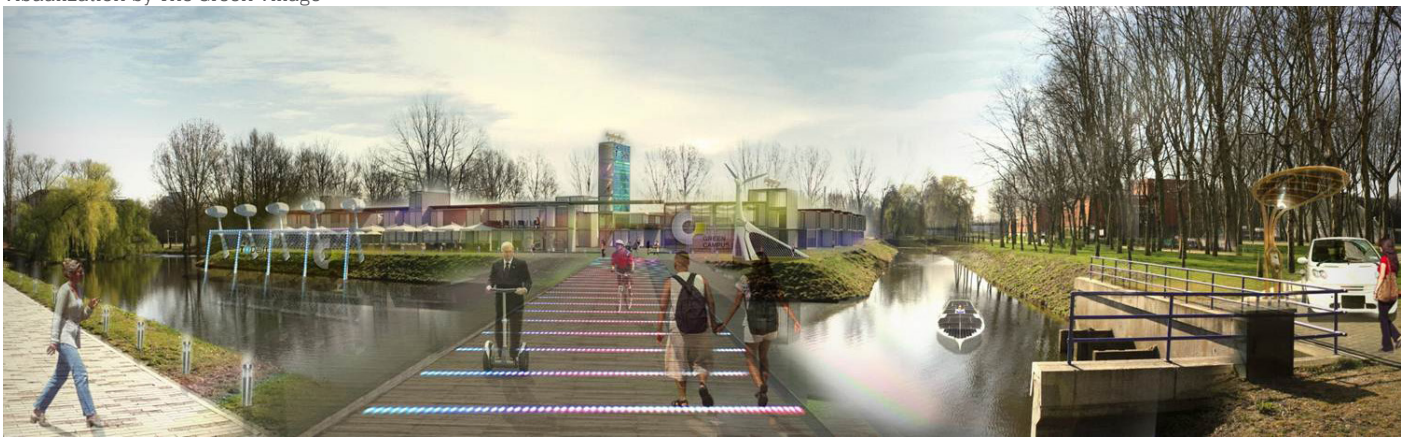
Green buildings, electric transport, circular buildings, smart heat grids, energy efficiency and more

Other facilities

Restaurant, event centre, 'interactive shop', outdoor space, evolve into an autarkic area, shop window of TU Delft

Website: http://www.thegreenvillage.org
Contact person: Prof. Dr. Ad van Wijk
E-mail: A.J.M.vanWijk@tudelft.nl

Visualization by The Green Village



House of Natural Resources

Switzerland

The ETH House of Natural Resources (HoNR) develops, implements and monitors in-situ novel façade elements and innovative structural elements made of wood at original scale, including: post-tensioned timber frames using hardwood and timber-concrete hybrid floors made of beech wood.

Approach

'Sustainable Wood Constructions and Innovative Façades'

- Development & implementation of innovative and efficient hybrid timber structures
- Field campaign of in-situ tests at different construction stages
- Implementation of a permanent sensor network for long-term monitoring
- Development and implementation of innovative façades

Services

- Showcase for sustainable construction using wood
- Living lab for testing and demonstration of new building technologies
- Local communication
- Student education

Partnership Concept

Stakeholders and investors, real estate managers, project developers, total and general contractors, timber construction companies, for example: ETH Foundation, Häring & Co. AG, Hess & Co. AG, Pollmeier Massivholz, Swiss Federal Office for the Environment (FOEN) and Swiss Commission for Technology and Innovation (CTI).

Visualization by ETH Zurich

Technology focus

- Post-tensioned timber frame using hardwood
- Hybrid beech concrete floor
- Adaptive solar façades
- Improved wood façade performance (UV-stability, flame retardancy)
- Autonomously moving and sun-tracking wood façades

Project:

Enhancement of structural health monitoring. A building that will provide unmatched knowledge about the behaviour of this innovative timber structure including façade elements.

Website: http://www.honr.ethz.ch
Contact person: Prof. Dr. Andrea Frangi
E-mail: frangi@ibk.baug.ethz.ch

NEST
Switzerland

Next Evolution in Sustainable Building Technologies (NEST) is a modular building with interchangeable living and work units. It is a meeting place for academia, architecture and innovative firms to develop and evaluate new living concepts. NEST will be constructed near Zurich and is available at the end of 2015.

Approach

- 'Speed up science2market'
- Develop larger innovation units together with industrial partners
- Users live and work in innovation units
- Innovation units change over time

Services

- Basic infrastructure / backbone
- Funds for technology development (partial)
- Management of local community
- Student education

Partnership Concept

NEST has partners in these sectors: industry, government and academia, including: EMPA, Eawag, Swisscom, Suissetec, ETH, Swiss Federal Office of Energy, State Secretariat for Education, Research and Innovation (SERI), Canton Zürich, City of Dubendorf and Foundation Göhner.

Technology focus

- Lightweight constructions
- Modular constructions
- Glass architecture
- Natural construction
- Digital living
- Office of the future

Project:

Solid backbone with interchangeable living and work units. NEST is used as a residence and office building - all modules are tested in everyday life and thus evaluated by 'real' users.

Website: http://nest.empa.ch/en/
Contact: Reto Largo
E-mail: Reto.Largo@empa.ch

Visualization by EMPA

Visualization by EMPA

CIES
Spain

CIES is an office building complex located near the Spanish city Castellón. This Living Lab focuses on innovative façades and innovative work environments.

Approach

- 'Developing innovative façade systems and smart office concepts'
- Brand-new building that provides the opportunity to test new technologies for new offices and for office refurbishment. Develop measures and methodologies for assessing smart office concepts in relation to human behaviour, innovative products and building technology.
- Constructed with conventional building technologies – opportunity to test technical refurbishment of office buildings in Mediterranean climates.

Services

- CIES: Living Lab R&D infrastructure to test new and innovative materials with focus on ceramic industries for the refurbishment and design of office buildings in the Mediterranean region.
- Will provide start-up entrepreneurs of low-carbon projects with technological support so that their products and services can be marketed.
- The Centre shelters the Energy Efficiency Foundation for the Valencian Region and hosts meetings and seminars focused on energy efficiency, including Climate-KIC initiatives.

Partnership Concept

CIES has partners in both industry and academia, including Valencia Institute of Building (IVE), KERABEN, ACCIONA, ACTIU and DEVIOD.

Visualization by Valencia Institute of Building

Technology focus

- Innovative façades: ventilated façades, new innovative materials, ceramic/stone panels and galvanized steel panels as exterior skin, new insulation materials, innovative bricks etc.
- Technologies focused on innovative work environments: passive (ventilation, daylighting etc.) and active strategies (intelligent materials, energy management systems, efficient thermal areas: HVAC systems, efficient lighting design, HVAC systems etc.)

Project:

Office building complex. Built area of 2700 m2 located at the City of Transport ('Ciudad del Transporte'), the logistic and trade area of Castellón (SMEs and industrial area). 22 offices of 25 m2 - 50 m2 and 6 sheds of 150m2 each

Website: http://www.five.es
Contact person: Carolina Mateo Cecilia
E-mail: cmateo@five.es

Market players

Introduction

BTA brings together the offer and demand side in a virtual marketplace. Our innovators include researchers and businesses across the world. We facilitate various market players such as entrepreneurial decision makers in their efforts to mitigate further climate change. The recent IPCC Working Group III report published in April 2014 warns us once again of the urgent need to forge ahead. Top European innovators collaborating with Climate-KIC say new solutions and investments are needed to reduce greenhouse gas emissions.
An important Building Technologies Accelerator partner is leading global property management company Knight Frank. Knight Frank has plans to retrofit existing buildings and will engage its client network in testing technical innovations in their properties.

Technology Pool

The Technology Pool is a virtual marketplace that brings together the demand and supply side of technology. BTA will develop a clear business plan during the second half of 2014 aimed at bringing building technologies and innovations from Living Lab to market. Publishing our testing activities and successes is essential for bringing innovations to scale swiftly and fittingly. Therefore we will publish Living Lab testing on the Technology Pool.
Besides the products itself the information to be found on the Technology Pool include:

- measurement and visualization techniques for real-time monitoring of energy, water and resources in homes and businesses
- energy management solutions for commercial and residential buildings
- impact of user behaviour
- testing results of new combinations of façades, sustainable structures and materials
- materials in real-life situations such as: vacuum insulation panels, aerogels, polymer concrete and phase-change materials
- smart office solutions.

Get involved

BTA invites you to get involved. Reducing CO_2e worldwide requires a combined and concerted effort on the part of public, private and academic partners.

BTA Living Labs actively seek new partners, projects and technologies which contribute to reaching BTA's strategic goals. Partners may be private businesses, academic partners or government bodies (local, regional, national).

The objective of the Living Labs is to stimulate the development of new building products and technologies, raise various desicion makers' and beneficiaries' acceptance as well as accelerate the upscaling possibilities in different markets. Products and services of the BTA programme are expected to have a major impact on climate change mitigation in the European built environment. This is only possibly by generating high volumes in the construction market. Living Labs offer the opportunity to test technologies in a real-life environment. This allows improving product settings much faster towards market needs and effective eco-friendly solutions.

Once a year there will be an open call for new BTA partners. But you are always invited to contact us via our website.

About BTA products

BTA's goal is to support innovative building technologies and construction services to reduce CO_2e and create new businesses and jobs in the European building sector. We achieve this by concentrating on four main focus areas:

- Innovative Structures for Sustainable Buildings
- Innovative Façade Systems
- Energy Management Systems
- Innovative Work Environment

BTA products fall under these focus areas (explained on page 2). BTA partners develop products in real-life environments which incorporate cutting-edge energy management technologies, sustainable façades, renewable building structures and innovative work environments.

Climate-KIC has a proven and successful track record across Europe. BTA has established a unique partnership with leading research institutions, government bodies and industry. The BTA consortium is a combined initiative aimed at developing low carbon goods, products and services. These innovations will not only improve our environment, they will be instrumental in creating new markets and employment opportunities. Global property consultant Knight Frank, for instance, is one of our valued partners and has an established international network in the built environment market.

Dr. Andrea Frangi, Professor for Structural Engineering and Timber Structures at ETH Zurich:

'ETH Zurich has defined Sustainable Construction as a key strategic area and as leading partner of BTA, fully supports innovative strategies for a sustainable development in the building industry.'

David Goatman, Partner, Head of Sustainability and Energy at global property consultant Knight Frank:

'Climate KIC is making an unprecedented investment into climate innovation via these flagship programmes.

These investments will deliver game-changing CO_2e reductions and catalyse the development and upscaling of new low carbon technologies across Europe. This in turn creates new jobs and economic growth across multiple countries.

The flagships bring together a wide range of private, public and academic organizations in a unique combination to develop new goods, products and services that address the climate change challenge.'

BTA Product ©

Post-tensioned timber frame construction using hardwood

Visualization by ETH Zurich

Less energy is required in constructing timber buildings when compared to concrete ones. Timber buildings are also eco-friendly since they act as a storage unit for carbon dioxide. Post-tension timber frames are an alternative solution to reinforced concrete structures. Apart from the tendon and anchorage no additional steel elements are required.

Product Description

- A straight tendon connects glulam columns to glulam beams
  - Hardwood glulam columns
  - Hardwood and softwood hybrid glulam beams
- Fast assembly, only two workmen and light machinery needed
- Easy building instructions
- Pre-fabricated elements guarantee high quality
- Analytical tools provided to design post-tensioned timber frames
- Engineering consultancy services available
- Analytical tools provided to design post-tensioned timber frames
- Engineering consultancy services available
- Pre-fabricated elements guarantee high quality

Target market

- Building developers (public, private), construction companies, architectural and engineering companies
- Switzerland/Europe

Success

(Swiss) timber construction companies can gain from replacing steel and concrete with post-tensioned timber frames. Estimated investments in new and old buildings indicate that both production volume as well as revenue could increase substantially.

Climate Relevance

To significantly reduce CO_2 emissions by replacing concrete with eco-friendly renewable timber.

Leading Institution: ETH Zurich
Living Lab: ETH House of Natural Resources
Contact: Prof. Dr. Andrea Frangi
E-mail: frangi@ibk.baug.ethz.ch

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab	■							
Prototype ready to build in Real World Test Beds			■					
Product Launch - local					■			
Product Launch - European					■			

BTA Product ©

Hybrid composite slabs using beech wood

By using beech wood for both formwork and steel reinforcement in timber-concrete composite slabs, energy consumption can be significantly reduced. This composite slab is made up of a thin LVL beech wood plate (thickness 40-60 mm) and a concrete layer (thickness 120-160 mm). Notching is used for connection instead of steel fasteners. The timber and concrete are connected with 15 mm deep notches in the LVL beech wood plate, which transmit the shear force through the compressive contact of the two materials.

Visualization by ETH Zurich

Success

A cost-competitive and effective alternative to reinforced concrete.

Climate Relevance

To significantly reduce CO_2 emissions by replacing concrete with eco-friendly renewable timber.

Leading Institution: ETH Zurich
Living Lab: ETH House of Natural Resources
Contact: Prof. Dr. Andrea Frangi
E-mail: frangi@ibk.baug.ethz.ch

Product Description

- Technical advantages in comparison to timber floors:
  - higher strength and stiffness under gravity load
  - better seismic resistance
  - improved sound insulation
  - high fire resistance
- Strong and stiff beech LVL plates (when compared to spruce) have a higher load-carrying capacity and ensure satisfactory load-deformation behaviour
- Slender layout saves concrete and timber material
- Less steel reinforcing needed

Target market

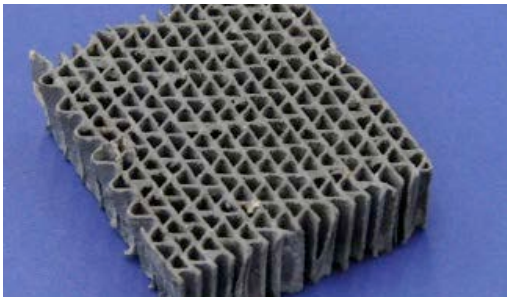
- Building developers (public, private), construction companies, architectural and engineering companies
- Switzerland/Europe

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds			■					
Product Launch - local					■			
Product Launch - European					■			

BTA Product ©

Internal Walls Made from Cardboard



Visualization by ETH Zurich

Eco-friendly cardboard is used to construct novel walls. The recycled materials used in producing structural cardboard elements are abundant and readily available. These materials are inexpensive and have a lower impact on the environment than current wall materials. Studies are being done on how to make these structural elements fire and moisture resistant. The production process of impregnated, corrugated and honeycomb cardboard cores is also under development.

Product Description

- Coated core sandwich cardboard elements
- Lightweight, high resistance, stiffness
- Inorganic coating and chemical admixtures are not critical to the environment

Target market

- Construction sector, building developers, architects and engineering offices
- Worldwide

Success

This eco-friendly novel wall system can be used in building developments in fast growing areas. It is an efficient and cost-competitive solution for sustainable construction.

Climate Relevance

By using recycled materials, primary resources and energy are consumed less. A sustainable solution for the environment.

Leading Institution: ETH Zurich
Living Lab: ETH House of Natural Resources
Contact: Prof. Dr. Andrea Frangi
E-mail: frangi@ibk.baug.ethz.ch

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch - local						■		
Product Launch - European								■

BTA Product ©

Solar tracking by autonomously moving wooden elements

Success

Fewer investments required and potentially higher yields when compared to electrically-driven actuators. Longer life cycle of the solar power unit since the wooden actuator does not use control units or a motor.

Climate Relevance

Significantly reduces CO_2 emissions by using eco-friendly renewable wood. Longer solar power unit life cycle has a positive impact on the climate.

Leading Institution: ETH Zurich
Living Lab: ETH House of Natural Resources
Contact: Prof. Dr. Ingo Burgert
E-mail: iburgert@ethz.ch

Wooden actuators for self-tracking solar panels are not electrically-driven but move autonomously, powered by ambient humidity during the course of the day.

Product Description

- Panel moves towards the sun autonomously
- Wooden actuator works without electrical power, control units, cables and motors

Target market

- Companies distributing solar panel systems
- Mass market, worldwide

Visualizations by ETH Zurich

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch - local						■		
Product Launch - European							■	

BTA Product ©

Innovative Façade Systems

Adaptive solar façade

Visualization by ETH Zurich

Success

Lightweight, easy to install, the solar façade can be adapted for both new and existing buildings. This product is suitable for mass production.

Climate Relevance

No need for fossil fuels in generating electricity. Solar façade enables buildings to become energy independent. This helps reduce the built environment's CO_2 footprint.

Leading Institution: ETH Zurich
Living Lab: ETH House of Natural Resources
Contact: Prof. Dr. Arno Schlueter
E-mail: schlueter@ethz.ch

The solar façade generates electricity and provides good daylight distribution and shading. This lightweight photovoltaic system can be installed on new and existing buildings. The product is suitable for mass production and for building a scalable business.

Product Description

- Solar façade consists of thin-film PV modules and a lightweight structural frame
- Façade's lightweight structural frame is easy to install on building surfaces (windows, roof)
- Solar panels track the sun using a lightweight pneumatic actuator
- Architecturally unique designs for environmentally conscious companies

Target market

- Homeowners, commercial building owners (banks, insurance and real estate agencies, hotels)
- Europe

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds						■		
Product Launch								■

BTA Product ©

Innovative Façade Systems

Next Generation Building Envelope Systems

Visualization by Chalmers University of Technology

Next generation building envelopes rely on high-performing and smart materials and incorporate novel building technologies. They are lighter, thinner and more durable than traditional building envelopes. These innovative materials and envelopes are now being developed to meet stricter building regulations in the future.

Success

Cost-effective alternatives to traditional solutions and potential to create new competitive markets.

Climate Relevance

Example: ultra-thin concrete wall panels. The use of blast furnace slag in concrete, a waste product from the iron industry, is an eco-friendly alternative. It fully replaces Portland cement, a common binder in concrete, whose production is among the most CO_2 intensive industrial processes. The use of textile reinforcement instead of steel additionally reduces the amount of cement in concrete walls.

Leading Institution: Chalmers University of Technology
Living Lab: HSB Living Lab
Contact: Dr. Angela Sasic
E-mail: angela.sasic@chalmers.se

Products Description

There are four parallel developing tracks:

- Low-carbon materials (green concrete, with 100 % slag cement, and sugar alcohols as phase-change materials)
- Climate adaptive and user interactive envelopes (incorporate phase-change materials for thermal storage and temperature regulation)
- Envelopes without borders (sorption-active and permeable wooden-based wall systems for subtropical regions including those of Japan, Brazil and India)
- Ultra-thin envelopes (integrate green concrete, textile reinforcement and high-performing insulation)

Target market

- Materials producers, building contractors, technical managers, designers, builders, consultants, tenants, energy supply system businesses
- Worldwide, developing countries

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch								■

BTA Product ©

Innovative Façade Systems

2nd Skin Façade System

Success

Existing buildings can easily be upgraded at a low cost by adding a second skin to their façade. When retrofitting the building, tenants will not have to relocate during construction activities. The envelope is easily installed within a short period of time.

Climate Relevance

By renovating existing building stock such as multi-family post-war buildings, energy consumption and CO_2 emissions can be reduced significantly.

Leading Institution: TU Delft
Living Lab: Concept House Village
Contact: Prof. Dr. David Keyson
E-mail: D.V.Keyson@tudelft.nl

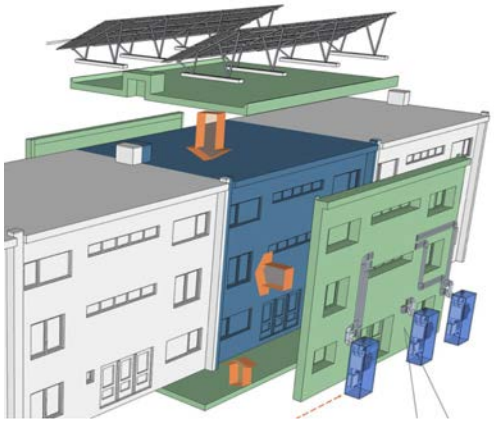
This pre-fabricated and lightweight building envelope acts as a building's second skin. With this low-carbon solution, existing buildings can be easily upgraded and meet eco-friendly building requirements.

Product Description

- Pre-fabricated, lightweight building envelope is independent from underlying building structure
- Heating, cooling, ventilation and energy-generating technologies are integrated in the envelope
- Fast and easy installation
- Minimal and temporary construction disturbances during installation, a bonus for both tenants and housing associations

Target market

- Housing associations in the Netherlands, Europe



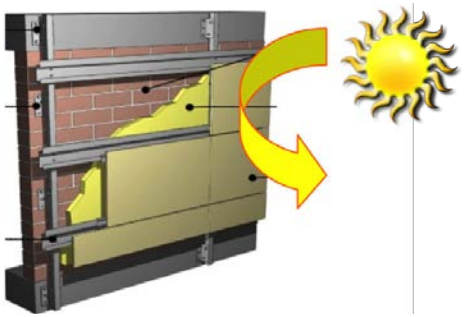
Visualization by BAM Woningbouw

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■	■			
Product Launch - local						■		
Product Launch - European							■	

BTA Product ©

NIR Reflective Ventilated Façade System



Visualization by ITC-AICE

NIR Reflective Ventilated Façade System is a ventilated façade system with NIR (Near Infrared) reflective tiles. These reflective tiles help improve the building envelope's thermal behaviour. To accurately evaluate the envelope's thermal behaviour, EnergyPlus software has been integrated in these innovative façades.

Product Description

- Ventilated façade system
- NIR (Near Infrared) reflective tiles form part of this façade and improve the building envelope's thermal behaviour
- EnergyPlus software accurately estimates the energy savings generated by innovative systems

Target market

- Architects, manufacturers of the construction systems, users of commercial, residential and office buildings
- Hot climate zones inside and outside Europe

Success

Huge potential growth opportunities in Europe due to the fact this technology has not yet been widely implemented.

Climate Relevance

Reduce energy consumption and CO_2 emissions by using ventilated façades to refurbish existing and new building façades. NIR reflective tiles improve the envelope's thermal behaviour, amounting to an even greater reduction in energy.

Leading Institution: ITC-AICE
Living Lab: CIES
Contact: Gonzalo Silva
E-mail: gonzalo.silva@itc.uji.es

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch - local						■		
Product Launch - European							■	

BTA Product ©

Innovative Façade Systems

Light Ventilated Façade System

Success

The costs involved in processing this high quality product are low including the components used to make the product.

Climate Relevance

Recycling and using industrial wastes as basic façade components reduces the exploitation of natural resources and waste disposals. Current methods use higher processing temperatures, thereby releasing more CO_2. Since the product is not made using clinker, a main component of Portland cement, far less energy is wasted in producing this façade when compared to traditional façade manufacturing methods.

Leading Institution: AIDICO
Living Lab: CIES Living Lab
Contact: Dr. Irene Belenya
E-mail: irene.belenya@aidico.es

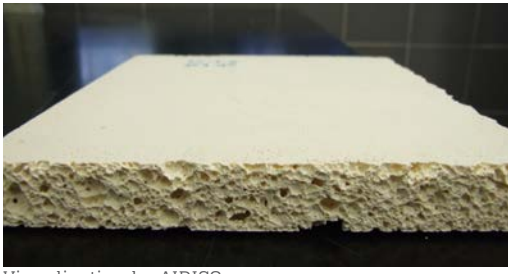
The Light Ventilated Façade System is an innovative solution using a sustainable cellular panel of low thermal conductivity and made with natural or industrial waste and zero Portland cement content.

Product Description

- Lightweight blocks of cellular concrete using aluminosilicates alkali (natural or industrial wastes) instead of Portland cement
- Foamed alkali activated material (geopolymers) offer good thermal insulation and are fire resistant
- Inorganic foams:
  - do not burn or release toxic fumes and smoke
  - when compared to organic foams exhibit a higher compressive strength
  - are acid resistant, fungi and micro-organisms are minimal.

Target market

- Cellular concrete and pre-cast manufacturers, big construction companies, other manufacturers (for example, HVAC systems, fire doors)



Visualization by AIDICO

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab			■					
Prototype ready to build in Real World Test Beds				■				
Product Launch - local				■				
Product Launch - European					■			

BTA Product ©

Wood façade surface protection

Success

A new surface technology for high quality and durable wood coating so that surfaces and façades can be maintained longer.

Climate Relevance

This is a sustainable product since approximately one ton of carbon dioxide is stored in every cubic meter of wood. It is also a natural and renewable building material.

Leading Institution: ETH Zurich
Living Lab: ETH House of Natural Resources
Contact: Prof. Dr. Ingo Burgert
E-mail: iburgert@ethz.ch

This wooden surface protection technology intends to offer a high quality alternative to current traditional wood impregnations and coatings. The new coating aims at protecting the original wood colour for a long period of time. It also repels water and is durable.

Product Description

- Protective coating of the original wood colour is easy to use
- Coating technology based on charged polymers and UV absorbing particles
- Hydrophobic surface properties mean fewer cracks or deformations

Target market

- Manufacturers of wood façade products
- Mass market

Visualization by ETH Zurich

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch - local						■		
Product Launch - European							■	

BTA Product ©

Innovative Façade Systems

Prêt-à-Loger

Visualization by TU Delft

Success

Post-war row housing which makes up a large part of the residential building market can be transformed into energy neutral homes. This 'skin' system also improves the quality and value of these homes.

Climate Relevance

To create a sustainable urban environment. By upgrading existing building stock, a real contribution can be made in achieving energy-neutral targets.

Leading Institution: TU Delft
Living Lab: The Green Village
Contact: Prof.Dr.Ir. Andy van den Dobbelsteen
E-mail: A.A.J.F.vandenDobbelsteen@tudelft.nl

This modular 'skin' system transforms the row house into an energy neutral unit. Integrated in this 'skin' system are innovative interventions ranging from basic passive solutions – insulating the house, adding a greenhouse – to extremely advanced technological add-ons – heat recovery systems, solar panels and PCMs. Designs for 'a home with a skin' use standardized parts as well as customized solutions.

Product Description

- Toolbox for the sustainable transformation of existing row houses into energy efficient homes
- Tools proposed are:
  - a thermal insulation and heat recovery unit
  - a greenhouse that functions as a garden and is used for heating purposes
  - photovoltaic modules on the roof to generate enough energy for operating all systems.

Target market

- Inhabitants and private owners of row houses, housing corporations
- Privately-owned individual (post-war) row houses, (post-war) row houses owned and managed by housing corporations
- Immediate target group: 1.4 million Dutch homes, expand to include millions of row houses in other countries

Prêt-à-Loger
Home with a Skin

Milestones

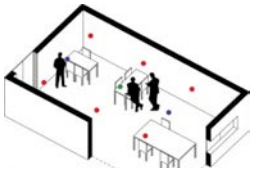
	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Product Launch - local					■			
Product Launch - European								■

BTA Product ©

Innovative Work Environment

Smart and sustainable offices

A smart and sustainable office incorporates all three dimensions of sustainability, economic, environmental and social, providing better performance than a conventional office. For optimal indoor environment quality, a sustainable office guideline is being developed for selecting appropriate smart and sustainable designs for new and existing offices. Besides reducing energy consumption, the ultimate objective is to improve health, wellbeing and productivity in an office. The sustainable office guideline supports lead office owners in their decision-making processes.



Visualization: by Chalmers University of Technology

Success

By using more innovative technologies and systems in buildings, offices become more sustainable and productive. Businesses can gain economically from increased productivity.

Climate Relevance

CO_2 emissions can be reduced by creating comfortable office spaces that are energy efficient.

Leading Institutions: Chalmers University of Technology, Valencia Institute of Building (IVE)
Contact: Prof Dr. Holger Wallbaum
Carolina Mateo Cecilia
E-mail: holger.wallbaum@chalmers.se
cmateo@five.es

Product Description

- Design guideline and services for new offices and for retrofitting existing ones in different climate zones in Europe:
  - to justify additional building investments when it comes to quality
  - for decoupling human comfort from high energy consumption
  - for increasing employee productivity by decreasing the number of sick leave days.
- Various service packages available: performance assessment tools, educational materials and coaching for suppliers, building and interior design concepts

Target market

- Lead office owners, investors, manufacturing companies of innovative building technologies and systems, product managers
- SME offices, educational buildings, hospitals etc.
- Construction companies and major consultancies in the planning and construction sector as well as interior designers

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype set up ready to test at Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch - local						■		
Product Launch - European								■

BTA Product ©

BOCS: building occupancy certification system

Visualization by TU Delft

BOCS, a building occupancy certification system, provides rich data sets for understanding and influencing occupancy patterns and their impact on energy use and indoor climate. This knowledge is helpful in reducing energy consumption in these investigated contexts. By analysing big data sets on occupancy in commercial EU buildings and using this information to draft certification policies, an independent certification standard for assessing building energy occupancy can be established. This standard can be referred to as a European 'energy occupancy label', comparable to other existing energy label standards. This data can also be used to solve energy-related occupancy problems.

Success

The Building Occupancy Certificate will reduce uncertainty about expected energy savings. This will encourage financial institutions to finance low carbon technology projects and allow building owners to secure their return on investment.

Climate Relevance

The Building Occupancy Certificate and direct feedback from the Occupancy Monitor will help to significantly reduce the amount of energy being consumed in buildings.

Leading Institution: TU Delft
Living Lab: Concept House Prototype 1, Concept House Village
Contact: Prof. Dr. David Keyson
E-mail: D.V.Keyson@tudelft.nl

Product Description

- The Building Occupancy Certificate ('energy occupancy label') is a standard developed to evaluate the influence of occupants' behaviour on the energy performance of buildings, which requires the use of the Occupancy Monitor.
- The Occupancy Monitor is a hardware and software system for real-time monitoring and analysis of building occupancy patterns in relation to energy consumption, factors specific to building type and function, occupants' comfort preferences and satisfaction.
- Spin-off products and services for stimulating energy-saving occupant behaviours will be developed as extensions of the occupancy monitor..

Target market

- Multinational companies with offices in Europe, building management companies, building managers, product and service spin-offs
- Commercial buildings, residential buildings

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab	■	■						
Prototype ready to build in Real World Test Beds		■	■					
Product Launch - local					■			
Product Launch - European							■	

BTA Product ©

Cluster-based energy consumption prediction tool

Success

Large property managers can negotiate better with energy and resource suppliers knowing how much and which energy resources are needed, enabling them to purchase energy at a cheaper rate. Tenants are assured price stability and energy mixes with higher renewable shares.

Climate Relevance

By being able to predict substantial fluctuations in the energy supply precisely, a larger share of renewables can be provided. By promoting renewables, substantial carbon emission savings can be achieved.

Leading Institution: Chalmers University of Technology
Living Lab: HSB Living Lab
Contact: Prof. Dr. York Ostermeyer
E-mail: york.ostermeyer@chalmers.se

This tool is a cheaper alternative to smart metering devices and empowers property owners in their negotiations with energy suppliers. This enables large scale property owners to be supplied with renewable energy mixes at comparable prices. After a self learning phase, it predicts precisely tenants' energy consumption.

Product Description

- The final product is an adaptable prediction model for large scale property owners
  - a plug-in tool for large property owners generating data regarding energy consumption, takes defining frame conditions (building parameter, user habits) into account
- (Commercial) by-products of the final product are:
  - visual sensors, optical information regarding behavioural and consumption patterns
  - HSB Living Lab database, identifies analogies within the data cluster for the prediction model and can be used for commercial reasons.

Target market

- Large scale property owners such as (social-) housing associations, banks, insurance companies, retailers
- Countries with diversified energy markets and interested in increasing their share of renewables
- Markets with high energy prices

Milestones

	2014		2015		2016		2017	
	H1	H2	H1	H2	H1	H2	H1	H2
Prototype ready to build in Living Lab		■						
Prototype ready to build in Real World Test Beds				■				
Product Launch - local						■		

About Climate-KIC

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

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

Climate-KIC currently has centres in France, Germany, The Netherlands, Switzerland, Denmark and the UK and is represented in the regions of Valencia, Central Hungary, Emilia Romagna, Lower Silesia, Hessen and the West Midlands.

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

www.climate-kic.org

If you need more information on BTA or would like know how to get involved, please contact:

Katrin Hauser, BTA Manager
Climate-KIC Switzerland
katrin.hauser@climate-kic.org
www.bta.climate-kic.org