

Housing 4.0 Energy Newsletter

ISSUES ADDRESSED

The EU 2030 Framework for climate and energy sets targets for cutting 40% of CO₂ emissions, increasing the share of renewable energy to greater than 27% and providing at least 27% energy savings across Europe. The North-West Europe (NWE) region is the most industrialised region—as well as the most prolific CO₂-emitting region—in Europe. Within this region, the private housing sector alone accounts for nearly one-third of all CO₂-emissions, as there is currently no great push within this industry to achieve EU targets. Meanwhile, decreasing household size, changing patterns of regional population density and other social factors have led to a significant decline in demand for large, expensive and energy-inefficient homes; and in turn, this has led to the increased desire for smaller, more affordable energy-efficient high quality living spaces.



PROJECT GOALS

The main goal of Interreg North-West Europe (NWE) **Housing 4.0 Energy** is to offer small (1-2 person) households in North-West Europe access to new affordable near-zero energy/low carbon homes (NZEHS) and zero energy/low carbon homes (ZEHs), ultimately **reducing home building costs by 25% and carbon emissions by 60%**. Housing 4.0 Energy (H4.OE) will develop an affordable ZEH market by adapting and applying new technologies, thus creating both consumer and supplier interest.

The transnational H4.OE project will facilitate the uptake of low carbon and digital technologies, products, processes and services in the housing sector across North-West Europe to reduce carbon emissions and improve quality of life and affordability for residents in the region and beyond. Digitisation (4.0) techniques and the development of a H4.OE digital platform—designed to make building homes easier and more affordable on a large scale—will ignite fundamental changes in design, manufacturing and construction within the housing industry to meet both EU climate targets and the needs of residents in North-West Europe. Using a client-based approach, H4.OE partners will work with local stakeholders—especially local authorities, housing associations, architects, self-builders, construction companies and current homeowners—across North-West Europe to design the best possible affordable, low carbon housing solutions that can be easily replicated across the region to address Europe's major housing and environmental concerns, ultimately reducing costs by 25% and carbon emissions by 60%.



WHAT'S INSIDE?

What is H4.OE?	1
H4.OE Digital Platform	2
Partner Meetings.....	2
Regional Updates	3-6
Company Highlight: Skilpod.....	4
News Corner.....	7
H4.OE Partnership.....	7
Contact.....	7

PROJECT DETAILS

Total Budget:	€4.23 Million
ERDF Funding:	€ 2.54 Million



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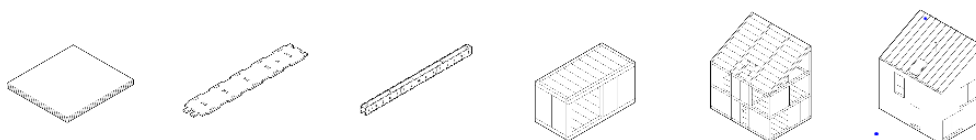
H4.0E kick-off meeting in Leuven

The Housing 4.0 Energy project will open the door for a whole realm of possibilities in the current housing sector and in turn improve energy efficiency and quality of life throughout North-West Europe. On the 18th of June 2018, the eight different H4.0E project partners convened in Leuven, Belgium—home base of Lead Partner, the **Province of Flemish Brabant**—to kick-off H4.0E and outline the next steps for implementing this exciting new project.

The project, including the H4.0E digital platform, will be tested and monitored for viability in six pilot sites representing varying levels of industry and carbon emissions, ranging from cities in low carbon regions to rural areas in less carbon conscientious regions.

The six pilot sites are located in:

1. **Schwäbisch Gmünd, Germany:** Multiple NZEH/ZEH buildings for student accommodation
2. **Huldenberg, Belgium:** NZEH/ZEH units in rural areas to be let to candidates on the waiting list of the local social letting agency
3. **Almere, Netherlands:** WikiHouses in urban areas, demonstrating digitised (4.0) self-building
4. **Carlow, Kilkenny & Wexford, Ireland:** NZEH/ZEH units for low income groups in rural areas & monitoring user behaviour



THE H4.0E DIGITAL PLATFORM

Transnational development, **digitalisation (4.0) techniques** and a **digital platform**—designed within H4.0E to facilitate the digitalisation of building homes and transferability of these techniques—will ignite fundamental changes in design, manufacturing and construction within the housing industry to **reduce building costs by 25% and carbon emissions by 60%**. On the 28th-29th of November, a transnational workshop regarding “Work Package 5 - Develop, use and improve the digital H4.0E platform” was held in Almere, Netherlands. Pilot partners were invited to brainstorm together on topics such as design, backend features and upcoming challenges. The workshop also allowed partners a peek into virtual reality designing.

The partnership reconvenes in Almere

The H4.0E partners convened in Almere, Netherlands on the 4th-5th of March 2019 for the third international Housing 4.0 Energy Steering Group meeting. The partners discussed what is going on generally in the project and the focus of the project deliverables of the coming period. A main part of this meeting was the discussion on the second Regional Stakeholder Group (RSG) and implementations of the recommendations of the RSGs.



In addition, a significant amount of time was set aside to discuss “Techniques, Materials & Building Systems” used in the four pilot regions. This workshop was led by South West College (SWC) as well as the four pilot regions, with each partner contributing to the output.

On the second day of the project meeting, the H4.0E partners were joined by **Joost Nieuwenhuijzen**, Director of the [European Federation for Living](#), a unique network in Europe which combines the expertise and core activities of over 50 (social) housing companies, private companies and academic institutes.

To conclude the meeting, the partners were able to enjoy the beautiful Almere weather at the **Grondstoffen Collectief Almere** (Raw Materials Collective Almere), organised by hosting institution Gemeente Almere. By touring the multifaceted Raw Materials Collective (*photo right*), the partners were able to explore how excess, unwanted aquatic plants are processed into city furniture and paper by **Millvision BE**, and how concrete is recycled into Almere city bicycle paths by **Cirwinn**. The “field trip” was particularly relevant to H4.0E, as the focus of the tour was on circular building and circular building materials.





Some Flemish H4.OE team members in front of a Smart Adaptive Module at Bao Living, a pioneer in small and affordable modular housing, where they visited for inspiration.

REGIONAL UPDATES

Since the start of the project, H4.OE has taken on different shapes and forms depending on varying socioeconomic and political situations in the partner regions. The following section will give brief updates from each partner/partner region since the foundation of the H4.OE project last Autumn.

Province of Flemish Brabant

Provincie Vlaams-Brabant, or the **Province of Flemish Brabant (PFB)**, is the lead partner organisation of the H4.OE project. PFB develops economic, environmental and social policy and coordinates or funds regional projects and cooperation between the 65 municipalities in central Flanders. Climate, innovation and housing are particularly important policy fields for the province, and PFB aims to become carbon neutral by 2040. PFB has the goal to improve housing conditions by providing subsidies and loans for purchase or renovation and supporting social housing companies and inter-municipal information points. PFB also tackles energy poverty.

H4.OE Pilot Site in Flanders

The location for the Flemish pilot houses is a former private camping site and area for weekend stays in the rural municipality of Huldenberg in the Province of Flemish Brabant, with a large percentage of the inhabitants living permanently in their chalet or caravan. A few years ago, this recreational zone had been re-allocated into a zone for small-scale housing. The pilot site is now a place in transition where, little by little, the old caravans and chalets are replaced with small scale newly built houses that are offered for rent in a mix of private and social rent. As a part of this project, six affordable small-scale houses with a low CO₂ footprint will be built.



The Rustenberg pilot site in PFB

REGIONAL STAKEHOLDER GROUPS (RSG)

A **Regional Stakeholder Group (RSG)** refers to a group of interested stakeholders that are kept fully updated of project progress and contribute to overall project success. Each partner country has identified their own RSGs, which range from builders to engineers to policymakers.

RSG MEETINGS IN THE PROVINCE OF FLEMISH BRABANT

On **November 14th 2018**, the H4.OE RSG for Flanders held their first RSG meeting. The RSG consists of **regional and local public authorities, sectoral agencies, (social) housing companies, private investors, architects and engineers, construction companies, universities and expertise centres**. The RSG discussed in this first meeting questions concerning techniques, materials and building systems that can and should be tested in small pilot houses in Flanders, taking into account the actual knowledge level, innovations, regulatory changes, the political and societal climate, changing housing needs and wishes, etc.

The second regional stakeholders group for Flanders took place on **April 2nd 2019** and consisted of moderated discussions on:

- Housing policies, renewable energy policy, construction regulations, land use regulations;
- Upscaling within social housing sector.



COMPANY HIGHLIGHT: SKILPOD

Skilpod is a seven years young company in Belgium that produces movable modular houses, which are tastefully decorated living units, available in various designs.



The houses are built with predefined building elements in a building workshop. The building elements they use are perfectly matched to each other and ensure a fast, qualitative and cost-efficient realisation.

The company takes flexibility into account in the development of the building elements, creating not just one type of building, but a variety of solutions, from care and holiday homes to complete apartment buildings. The main material used is “laminated veneer lumber (LVL)” (i.e. “cross-laminated timber”) that meets the highest ecological, social and ethical standards, but also has many additional benefits like energy efficiency, strength, and fire safety. The Flemish pilot team visited **Skilpod**, along with **Bao Living**, which designs systems that make houses more affordable and sustainable with a Smart Adaptable Module that bundles all utilities into one adaptive module, this February.

(Province of Flemish Brabant continued...)

Out of the six dwellings, four are intended for 1-2 person households, and the remaining two will have a total floor surface between 60m² and 80m² for 2-3 person households.

All of the small houses will be given to current residents of the pilot site **Rustenberg** who are on the waiting list of social housing agency, called **SPIT**. The six dwellings will be used as a testbed for the social housing sector and the aim is to build public confidence to develop the market later on. In the long term, the Flemish pilot wants to convince the large group of 1 & 2-person households for whom housing in current/regular energy-efficient houses is not (yet) affordable, as well as the elderly for whom the high maintenance and energy cost of their large, energy-consuming homes have become a burden.

The pilot will be finalised in August 2021. The pilot houses will be built by the second half of 2020.

Kamp C

Kamp C is a Flemish expertise centre, incubator and living lab for innovation and sustainability in the building sector, supported by the province of Antwerp. Kamp C's site has several demonstrators for sustainable building, an information area and a business park. **Kamp C accelerates transition towards a sustainable build environment, with a focus on renovation, circular building, modular building and 3D-printing in construction.**

In the Housing 4.0 Energy project, Kamp C will supply advice to the homeowners and all construction partners throughout the building process. Kamp C will at the same time act as a strong network partner, reaching the five Flemish provinces, the Flemish government and the Belgian construction sector. The number of small, affordable zero energy/low carbon houses can dramatically lower the CO₂ emissions in the Province of Antwerp, in Flanders and in Europe.

European Institute for Innovation - Technology

The **European Institute for Innovation—Technology (Eifl-Tech)**, H4.OE's German partner, is an applied science organisation supporting the adaptations of regions to respond to the fast pace of development in a variety of sectors. Eifl-Tech is responsible for the overall communication and dissemination of the H4.OE project, as well as rolling out a German H4.OE pilot to supply sustainable and affordable student accommodation in the city of **Schwäbisch Gmünd** in Baden-Württemberg, Germany. With its regional stakeholder group—including Einhorn Projektbau, the City of Schwäbisch Gmünd, as well as local engineers, architects and construction companies—Eifl-Tech will also provide favourable business models reducing costs to the end user as well as CO₂ emissions in the process of near zero energy construction.

The pilot will produce more energy than is used through the installation of renewable energy technology to supply electrical energy to the student accommodation, which will continue to support the integrity of Schwäbisch Gmünd's 13th century historically-protected (“Denkmalschutz”) inner city zone. Innovative construction techniques will be



The German pilot, Schwäbisch Gmünd

developed; for example, the implementation of **4.0 digital techniques**, providing availability and short delivery time with effective storage management, and extending the period of use and reuse with processing of high-quality building materials and components.

The pilot is ambitious with high requirements on the sustainability, energy efficient planning/construction and end use energy consumption—all integrated via the open source H4.OE platform. Working with the other H4.OE regions, the Schwäbisch Gmünd pilot will provide for knowledge and technology exchange, which will deliver evidence post-project life for rollout and scalability.

Municipality of Almere

The **Municipality of Almere** (Gemeente Almere) is a known Dutch testbed for new housing concepts. As one of the fastest growing cities in Europe, it has attracted 200,000 residents and 16,500 businesses since 1976. Building upon European projects like **CrRRescendo**, the City of Almere introduced the integrated energy policy programme “Energy works” in 2015, with the goal to become an energy neutral city by 2020. Almere has also organised the “**Woningbouwatelier**”, an international hotspot for experiments and innovation in housing.

Almere is beginning the recruitment for self-builders for the first phase of the H4.0E project. The first informative meeting for those interested in joining the group will be held

mid-April, with a second one to be held at the end of the month.

During one partner workshop hosted by Almere, the H4.0E partnership visited Almere's tiny house building expo, where **WikiHouse** stood out as being a wonderfully innovative building system with a high-quality finish. The H4.0E pilot of Almere adds to the 60% CO₂ reduction project objective through implementing the **WikiHouse building system**, which is more sustainable than traditional building systems, as it is a self-building system (less use of large construction machines), using local materials and services as often as possible and wood as a building material instead of bricks (less CO₂ caused by transportation of materials).



The modular WikiHouse in Almere

“Our technology can be used to construct a building in a quarter of the time used in traditional masonry and half the time involved in building an offsite timber-framed structure.” - Paul Glavin, founder & managing director of modular building company, **Glavloc**

TU Delft

The **TU Delft CHEC (Comparative Housing Research Expertise Centre)** is a Dutch university and research centre with more than 20 years of experience in international comparative housing research. CHEC has developed a research team with a mix of highly experienced and new researchers. It has a huge network and has published many articles, reports and books. Moreover, TU Delft-CHEC regularly organises meetings in order to exchange knowledge.



The TU Delft CHEC Building

In regards to Housing 4.0 Energy, the TU Delft team consists of senior staff members and two PhD candidates with expertise in energy efficiency, post-occupancy evaluation and market research, plus a project manager from the Faculty of Architecture and the Built Environment. TU Delft is involved in evaluating the international H4.0E pilots in order to formulate recommendations for policymakers and providers. The evaluation involves energy consumption, the embodied carbon, consumer satisfaction and affordability. Moreover, TU Delft explores the possibilities for upscaling by doing surveys among potential future residents, by identifying institutional barriers and exploring business models.

3 Counties Energy Agency

The 3 Counties Energy Agency (3CEA) is an organisation with the mission to “lead and support Co. Kilkenny, Co. Carlow & Co. Wexford and beyond to reduce its CO₂ emissions by stimulating, driving and contributing to the implementation of best practise in the field of sustainable energy”. The 3CEA is a member of all relevant national energy networks in Ireland.

The Ireland pilot of Housing 4.0 will be located in southeast of Ireland (Carlow, Kilkenny and Wexford), with each region committing to delivering four Zero Energy Homes—twelve homes in total. This pilot will develop and utilise digitisation and 4.0 technologies and integrate renewable energies into affordable social housing homes for the public who are awaiting housing.

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(3CEA continued...)



The lovely 3CEA team promoting H4.OE

A joint pilot team has been developed—including **3CEA, Carlow, Kilkenny and Wexford County Councils** and industry experts—to engage with key stakeholders such as contractors, research institutes and public representation to assess current barriers faced, understand the housing market better and create knowledge sharing networks.

Sites have been selected for the twelve homes and planning applications have commenced. The design team have had training on the digital platform to allow them to integrate their current design process. The actual technologies and techniques to be implemented

in the pilot homes are not yet confirmed, the reason being that the team is currently analysing studies and research that other project partners have completed in order to guide them and make informed decisions. It is envisaged that the homes will be a timber frame construction, built off-site with integrated services and utilising **Passive House standards**. Under H4.OE, 3CEA has participated in the Energy Symposium Ireland, the FutureBuild Networking & Research Conference, a Digital Training Workshop, Monthly Ireland Pilot Team Meetings, the National Construction Summit Networking & Research Conference, the National Engineering Summit Networking and Research Conference, and so on—all of which contribute to H4.OE's success and future roll out.



3CEA & H4.OE at the Carlow Sustainability Festival in April 2019

South West College

South West College (SWC), a further and higher education college in Northern Ireland, UK, is a driver for innovation in sustainable development and renewable technologies. Its **InnoTech Centre**, a business support facility, has become a significant resource for advice, training and support for the renewable energy sector. SWC's **CREST Centre** facilitates R&D projects in small businesses providing industry R&D, demonstration, prototyping and testing for new renewable energy products and sustainable technologies.



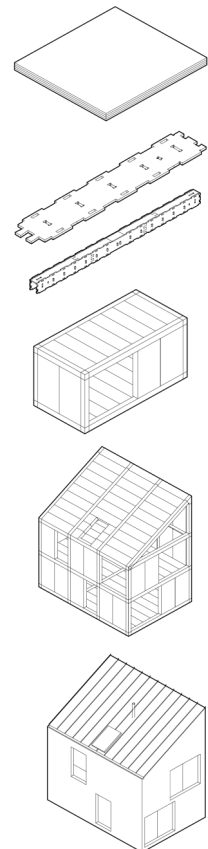
The H4.OE partnership building outside the SWC CREST Building in Enniskillen after the WP5 workshop in November 2018

Since the H4.OE project began in Summer 2018, SWC has been promoting Housing 4.0 Energy at a number of internal and external events—including the GREEN ROOM conference hosted by the Irish Green Building Council, the Sustainable Energy Authority of Ireland's Quality Ventilation conference, and more. The H4.OE project is being received very positively at an internal and local level for SWC. SWC's work carried out to date has involved primarily desk-based research to produce a comprehensive report to correspond with the outputs of Work Package 4. The partnership is looking forward to the next few months in the project, as South West College is beginning to formulate the topics for the training materials....stay tuned!

Open Systems Lab

Open Systems Lab (OSL), formerly known as **WikiHouse Foundation**, is a non-profit open technology company based in the UK. OSL allows companies, organisations and governments to work together to develop new open technologies, standards and common infrastructures for housing and sustainable development.

OSL's role in the H4.OE project is to develop a



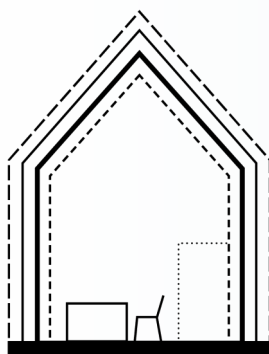
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(OSL continued...)

NEWS CORNER: Modular home company purchased by construction giant BAM

The Dutch giant in construction, **BAM**, is taking advantage of the Europe-wide housing boom with their recent purchase of a minority stake in **Modern Homes Ireland (MHI)**, which builds prefabricated, modular steel-frame dwellings and commercial units. In one statement, BAM explained that increased demand for homes and state and private investment in housing creates an opportunity for modular construction of dwellings, student apartments and hotels.

(From *The Irish Times*)



OSL's 7 systems of a house: site, structure, skin, services, seal, space, stuff (original concept by Frank Duffy).

The H4.0E platform will eventually help construction companies in making the right choices in materials, techniques, etc. to reduce building costs by 25% and CO₂ emissions by 60%. Data and calculations from the H4.0E pilots will be used to assist H4.0E partner OSL in the production and implementation of the H4.0E digital platform.

digital platform that will help future builders to reproduce and optimise the house designs used in the H4.0E pilots. The platform will allow parametric models of the international pilot technologies to be created, so that the cost of subsequently replicating each design (with variations) can be radically reduced. This platform will also be able to take datasets provided by the partners—such as cost of building materials and labour, measures of operational energy and embodied carbon, projected energy usage in a home—and link these to the parametric models to support future optimisation and ultimately **reduce building costs by 25% and CO₂ emissions by 60%.**

OSL is involved in this Interreg NWE project to create a completely new and open digital platform so that parametric models of low energy homes can be accessed by anyone.

Project Partners

The Housing 4.0 Energy partnership includes eight organisations from five different countries in North-West Europe. The H4.0E partners are:

- **Province of Flemish Brabant (Belgium)**
- **European Institute for Innovation-Technology (Germany)**
- **Gemeente Almere (Netherlands)**
- **TU Delft (Netherlands)**
- **3 Counties Energy Agency (Ireland)**
- **South West College (United Kingdom)**
- **Open Systems Lab (United Kingdom)**
- **Kamp C (Belgium)**



Gemeente Almere



Contact Information

Provincie Vlaams-Brabant

Lead Partner

H40E@vlaamsbrabant.be



@Housing4.0Energy



@H4E_NWE



www.nweurope.eu/h40e

Interreg 
North-West Europe
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