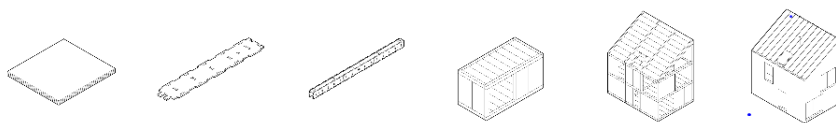


Housing 4.0 Energy Newsletter 5

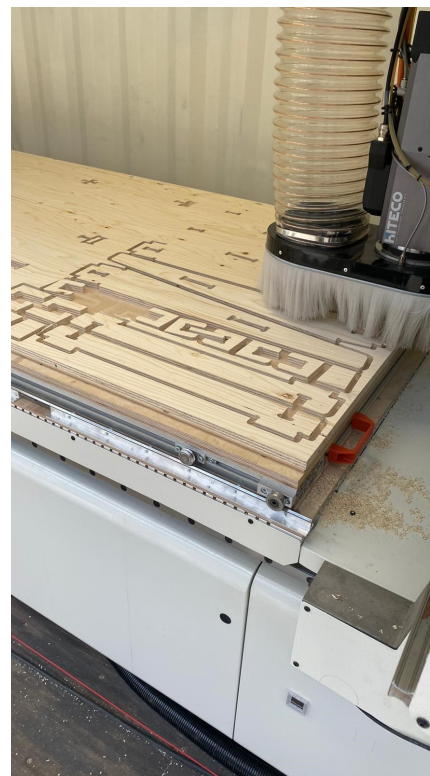
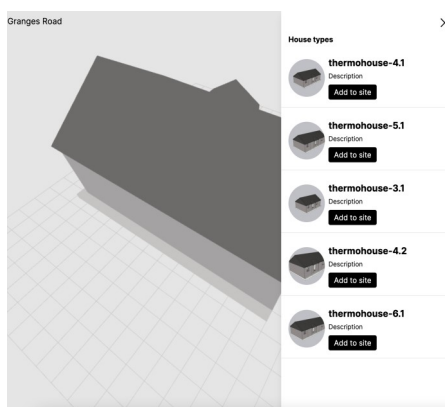
Developments to the H4.0E Digital Platform

The Open Systems Lab team have been developing the digital platform, which aims to make it easier to adapt and replicate affordable, low-carbon housing based on H4.0E pilot models. The H4.0E Digital Platform will help contribute to the main project goal of **reducing home building costs by 25% and carbon emissions by 60%**. The platform allows the construction industry to optimise a building design based on key metrics for the structure, such as building cost, labour cost, mass and embodied carbon.



For the H4.0E platform to be able to replicate and customise house type designs it has to 'read' a variety of different building systems (from the pilots these include: closed panel timber, Insulated Concrete Formwork, post-and-beam, volumetric modules), and generate a reconfigurable 3D model based on the unique parameters of each system. To put it simply, the platform does this by creating a number of grids within the building envelope specific to the building system being used, and then automatically loads in the corresponding subassembly geometry from a building system database. OSL has utilised a series of 2D grids to do the heavy lifting rather than individual parametric components, which require

a lot more processing time. This platform will allow a user to design a variation of one of the stakeholder's building systems in the browser. It will also give real-time information about cost and embodied carbon metrics of the design.



WHAT'S INSIDE?

H4.0E Digital Platform	1
H4.0E in the News	2
New German Pilot	3
H4.0E Ambassadors.....	3
Regional Updates.....	2-5
Long-Term Effects.....	5
About H4.0E	6
H4.0E Partnership.....	7
Contact.....	7

PROJECT DETAILS

Total Budget: €4.23 Million

ERDF Funding: € 2.54 Million



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HOUSING 4.0 ENERGY IN THE NEWS

The Almere H4.0E pilot appeared on **VPRO Tegenlicht**, which is an informative Dutch television series that investigates innovations and trends. This episode in particular focused on the effect of the housing crisis on young people in their 20s and 30s, struggling to find affordable housing. **VPRO Tegenlicht** identified innovative solutions for this problem, which included the Housing 4.0 Energy pilot site in Almere.



In addition, some interviews were held and articles published in several media sources, including national newspapers and a news platform for the construction industry. Partners and a WikiHouse architect from Almere also participated in two online meetings: the winter webinar for the **Northwest Territories Association of Architects**, with about 100 attendees from Canada, the USA and several other countries, as well as a breakout session at the Dutch online congress, **Building Holland**.

Pilot updates from The Netherlands

The self-builders of the Almere H4.0E pilot sites are progressing steadily, following the launch of the second building phase in July 2020. The first WikiHouses are expected to be inhabited in May 2021, after which monitoring of the tiny homes for reduced building costs, comfort of living and carbon reduction can be evaluated. Before construction, the self-builders helped each other with designing, measuring and joint purchasing of building materials. One self-builder, Sebastiaan, had this to say about the H4.0E pilot: "It's great to design your own house and build it completely by yourself. Now we're helping each other with construction. It's really special to experience."

In addition, Almere's Maker Space is ready! The mobile milling unit pictured above is ready to produce WikiHouse elements. It will be trans-



Almere Maker Space milling unit

ferred to the Almere pilot location for the production of phase two of the WikiHouse production.

The milling machine is computer controlled (see adjacent photo) and as the unit is mobile, it can be moved to any place to produce WikiHouse elements.



Making strides in Flemish Brabant

The construction of the pilot dwellings of the Belgian partners, the Province of Flemish Brabant and Kamp C, is complete. The modular houses are not built on the pilot site itself, but rather in the workshop of InHout, a local construction company. Once the walls and roof were built, the module with a technical space, bathroom and kitchen—the Smart Adaptable Module, or SAM—in the four smallest houses, and the recap kitchen in the two larger units were installed. The installation of the units took place at the end of April 2021. This way of construction has the advantage building regardless of the weather and other unforeseen circumstances is possible.

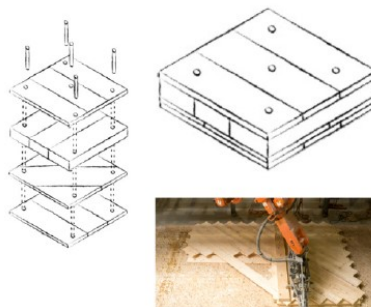


Modular low carbon homes constructed for the Flemish Housing 4.0 Energy pilot

On the May 20th, the Province of Flemish Brabant and pilot partner, Kamp C, are organising an open house day—followed by a press conference—for professionals, social housing companies and local authorities at the newly completed pilot location, a former campsite in Huldenberg. The small-scale pilot houses demonstrate the production of modular homes with a low CO₂ footprint and energy consumption at a lower cost than the current market price.

Introducing the new German H4.0E pilot

The new German Housing 4.0 Energy pilot shall explore how to build modular, low carbon homes to reduce building costs and carbon emissions in the German context. Led by **Thoma**, the new German pilot site, is also based in Baden-Württemberg in place of that originally planned to be built in Schwäbisch Gmünd.



The new H4.0E partner, **Thoma**, is specialised in working with real timber, which is mechanically bonded and free of toxic chemicals. Therefore, the material can be used again and again—a true circular product that produces no waste for future generations—and is able to heat and cool houses of all sizes all year round using only the sun, thanks to the excellent structural-physical values of the wood envelope. Real timber construction is transforming the building industry: it's more stable, sustainable, durable, fireproof, earthquake-proof and quiet than mainstream-built houses, thanks to major technical developments in the last 20 years.



Modular system construction

The new German pilot will contain a modular system prototype will be a basis for planning and constructing buildings in system construction with reproducible components, maximised design freedom and a high degree of prefabrication ex works. Therefore, planning reliability

will be significantly increased, execution and implementation will be facilitated and the costs for sustainable timber construction will be significantly reduced.

Self-sufficient building services concept

In real timber construction, the heating and cooling load peaks in buildings are massively reduced. With an appropriate design of building services, it is therefore possible to achieve very high levels of self-sufficiency with low investment costs. In the prototype, the combination of the world's first and patented thermal component activation in solid wood construction by Thoma and an adapted and innovative building services system for solar-powered homes.

Circular economy

In order for a renewable material to be recognised as real CO₂ storage, the function of the building must be guaranteed for at least 50 years and at the end of the life cycle 50% reuse must be possible on the same usage cascade. Thoma will go further and develop the prototype in such a way that it can be completely dismantled at the end of the project and rebuilt at another location in a different form, enabling closed cycles for entire components and opening up new possibilities for urban mining.

H4.0E AMBASSADOR PROGRAMME

This April, 3 Counties Energy Agency (3CEA), along with guest speakers from Open Systems Lab, presented the H4.0E project and digital platform to select stakeholders, with the hopes that they may sign on as Ambassadors to the H4.0E project. The H4.0E Ambassador programme was presented to the attendees of a tailored workshop, the guest list for which included industry professionals/leaders, academics, and Local Authority members.



Furthermore, 3CEA has contacted and is in discussions with 3 key groups that have all been part of the Regional Stakeholder Committee (RGC); Irish Green Building Council (IGBC), Southern Regional Assembly (SER) and BRE Group. 3CEA is also working with the other Pilot Partners to ensure they also recruit Ambassadors in both technical and non-technical roles.

ENGINEERS IRELAND'S SUSTAINABILITY GRAND TOUR

Engineers Ireland's Sustainability Grand Tour is a series of 12 webinars and panel discussions taking place throughout January to April. This series aims to educate and empower engineers across all sectors to be drivers of climate action and will focus on topics ranging from road design to sustainable housing and energy-efficient design. Irish H4.0E partner, 3CEA, participated in the programme, presenting the project to relevant stakeholders on behalf of the partnership.



ECOCEM PRESENTATION

On the 14th of April, 3CEA staff participated in a 3CEA internal webinar on GGBS presented by Ecocem as part of the Continuing Professional Development. The focus was the role of ground granulated blast-furnace slag (GGBS) as a substitute for Portland cement in concrete mixes and its use on the construction site. GGBS plays a major role in saving embodied CO₂ emissions in the ICF projects at the H4.0E pilot projects in Carlow and Kilkenny.

Offsite & modular methods of construction: Elfl-Tech's European networks

Elfl-Tech (DE), the Communication Manager of the Housing 4.0 Energy project, is currently working on innovative projects across multiple funding programmes and regions that aim to reduce carbon emissions through the modernisation of the housing sector and/or building stock – which all starts with education and training of the future labour force. One project to which Elfl-Tech contributes is the Erasmus+ project, [EMIC-GEM](#).



The international EMIC-GEM consortium in 2019

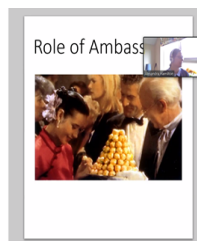
Off-site and modular methods of construction (OSM) have proven to be cleaner, safer and more productive than traditional building methods, hence the need for the H4.0E project. OSM will provide affordable housing stock, so there is a need to now move from traditional to modern methods of construction. Therefore, there is a requirement to change the way the construction sector operate across all regions of the EU, hence it is essential to develop appropriate skills and training. Elfl-Tech and its partners in EMIC-GEM are working on the development of such skills and training packages and shall disseminate these throughout the H4.0E networks for implementation.

For further information, please contact [Chris Ashe, Director of Elfl-Tech](#).

Long-Term Effects of H4.0E

3CEA is currently developing the cooperation of H4.0E stakeholders and ambassadors to ensure replication and dissemination of the H4.0E philosophy and H4.0E Digital Platform after the end of the project. 3CEA has been working with members of the supply chain in Ireland to ensure that the H4.0E model and platform will be sustainable after the project end. Activities include ongoing discussions and partnership building with some of the local suppliers and designers, to see how we can link their products to the H4.0E Platform. Several attendees following the workshop contacted 3CEA to express interest and we have been engaging with them to see who they can participate with and how they can contribute to the long-term viability of the H4.0E philosophy.

- Gain understanding of technical aspects of H4.0E model
- Disseminate developed H4.0E methods, processes and results
- Be present at local stakeholder events where possible
- Visit demo homes & invite relevant network connections
- Knowledge sharing with industry peers in informal settings
- Influence decision makers in Housing industry to adopt H4.0E model
- Tweet & post regularly about H4.0E project (Facebook: @Housing 4.0 Energy, Twitter: @H4E_NWE)
- Promote the H4.0E Newsletter
- Attend the final H4.0E event (Almere, NL - June 2022)
- To serve Ferrero Rocher at all events... ☺

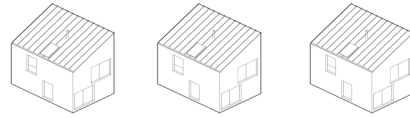


3CEA members also attended a number of workshops and Continuing Professional Development (CPD) webinars regarding Low Carbon Building materials, EU-Levels, Life Cycle Assessments (LCA) and Circularity. In cooperation with Engineers Ireland, 3CEA presented the H4.0E project and a pre-LCA of the Irish pilots within the Engineers Ireland

Sustainability Grand Tour, which supported in stakeholder engagement and approaching potential members of the H4.0 Ambassador Programme.

Innovative techniques and tools in Ireland

3 Counties Energy Agency (3CEA) has been cooperating and supporting South West College (SWC) with their work on the training material, having provided reviews of the existing online training sessions. Through market research, 3CEA were able to identify organisations that may be able to feed into our targets and goals and assist us in achieving them. There were already meetings set up with individual suppliers of sustainable low carbon building materials to discuss possibilities of integrating their products into the platform supply chain. 3CEA has continued with this vital activity to ensure they identify partners who can assist with this project and future work. It is also useful in terms of comparing potential technological solutions against others to see where the best value and contribution may be.



By this continuing research, 3CEA are gathering further information about the supply chain and technical solutions of system suppliers. 3CEA also searched for renewable low carbon wood fibre insulation from suppliers and for low carbon solutions of monolith structural timber wall systems like Cross Laminated Timber (CLT) and Dowel Laminated Timber (DLT). As part of this research, 3CEA took part in several Continuous Professional Development (CPD) webinars and meetings. The research work also covered relevant Irish building regulations and guidelines. This is an integral part of our work throughout.

Irish Pilot Updates

All Local Authorities in Ireland are still dealing with the impact of the ongoing global pandemic, which results in delays in their work on the pilots. Furthermore, Ireland was under Covid-19 restrictions level 5, which means a full lockdown, from the end of December 2020 until May 2021.

Nonetheless, the pilot teams are working on detail design, site investigation (Wexford County Council), and tender for construction (Kilkenny County Council and Carlow County Council). The Irish H4.0E pilot, overseen by 3 Counties Energy Agency (3CEA), will be located in South East of Ireland (Carlow, Kilkenny and Wexford), with each region committing to the delivery of four zero energy homes (ZEHs) each — twelve in total. Each of the Irish pilot sites will utilise digitisation and 4.0 technology and integrate renewable energies. The main construction principles will be prefabricated Timber Frame and Insulating Concrete Formwork (ICF) with the aim to use renewable building materials. Innovative technologies for sourcing renewable energy will be Air to Water Heat Pumps, Mechanical Ventilation with Heat Recovery (MVHR), PV and Thermal Solar Panels. Local Authority Social Housing tenants are the intended end users, with the aim of addressing fuel poverty.



The visualised Graiguenamanagh site of the Kilkenny pilot

Issues Addressed

The EU 2050 Framework for climate and energy sets targets for a carbon neutral economy, which can be reached by increasing the share of renewable energy to greater than 27% and providing at least 27% energy savings across Europe by 2030. 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 the Interreg North-West Europe **Housing 4.0 Energy** project is to offer small (1-2 person) households in North-West Europe access to new affordable near-zero energy/low carbon homes (NZEH) and zero energy/low carbon homes (ZEH), ultimately **reducing home building costs by 25% and carbon emissions by 60%**. Housing 4.0 Energy (H4.0E) will develop an affordable ZEH market by adapting and applying new technologies, thus creating both consumer and supplier interest. Digitisation (4.0) techniques and the development of a H4.0E digital platform 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.

PROJECT DETAILS

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



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COLLECTING ENERGY USE DATA FOR IMPROVEMENT AND UPSCALING OF H4.0E FRAMEWORK

In cooperation with TU Delft, partners have continued to promote an online survey to understand the current housing situation to help identify the needs and expectations of potential future residents for these innovative low carbon homes. Data from all H4.0E pilots is necessary to feed into the monitoring report – however, this data is currently only available to a very limited extent. Accordingly, 3CEA worked closely with the H4.0E partners and sub-partners on feasible solutions on a monitoring model, which includes an “Open House” solution for a showcase for the relevant stakeholders and the public.

H4.0E SPOTLIGHT

The architects and self-builders of H4.0E have a lot to learn from. Head over to our website to hear architect Lode Goethals (BAST Architects & Engineers) and others discuss their experiences with building modular homes in a series of [interviews](#) (in Dutch).



H4.0E: een kleinschalige woning ontwerpen

SELF-BUILDER SPOTLIGHT

On the 19th of March, Dutch newsource, Nu.nl, published an article highlighting the work of self-builder, Linda Slots, who is one of the first people in the Netherlands to build their own H4.0E WikiHouse homes.

[Check out the exciting article \(in Dutch\).](#)



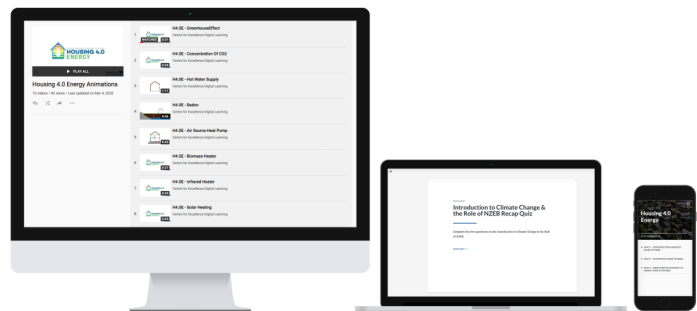
Linda zet eigen huis met bouwpakket in elkaar: 'Heel veel vrijheid'

Photo via Nu.nl (March 2021)

Housing 4.0 Energy Online Course

The development of the H4.0E Online Course, overseen by South West College, covers both the Construction Industry and the Occupants Guides to Near-Zero Energy Homes (NZEH). The course will include three units: Construction Industry Guide to NZEH; Occupants Guide to NZEH; and User Guide to Housing 4.0 Energy User Platform.

Animated videos have been designed to complement the content, which, like the rest of the module content, will be available in various languages with subtitles and accessible from various devices.



Project Partners

The Housing 4.0 Energy partnership includes various organisations from five different countries in North-West Europe. The H4.0E consortium consists of:

- **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)**
- **Thoma (Germany)**



VLAAMS-BRABANT



Gemeente Almere



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