

Climate Emergency and Net Zero Carbon

Knowledge bridging between research, teaching and public outreach



Professor Aoife Houlihan Wiberg RIBA

The studio uses an integrated research and teaching approach to facilitate learning of net concepts and strategies at both building and neighbourhood scale for their design, planning, construction and management in communities centred around our new Belfast campus. The students learn the key principles from The Norwegian Research Centre for Net Zero Emissions Neighbourhoods in Smart Cities which they then deploy into their own carbon neutral studio design which also aims to improve stakeholder engagement and health and well-being of the citizens, users and neighbouring communities. Such an innovative, challenging, integrated sustainable teaching and research approach in studio will further enhance and build upon our existing vibrant cross-disciplinary community of knowledge, skills and research and encourage transfer of net zero knowledge to the next generation of practitioners. This transfer of knowledge is facilitated and supported by our two new Net Zero PhD researchers, Ryan Johnston and Ben James.

Impact & Outreach

Supporting Belfast's Resilience Strategy's ambition for 'an inclusive, low-carbon, climate-resilient economy in a generation', the Architects of Change Phase I project puts our net zero PhD researchers and ZERO Belfast students at the heart of the development of a student led training manual and workshops delivered to business leaders across the region which aims to identify and address gaps in net zero knowledge and skills. A collaborative effort between Belfast City Council and Ulster University, this ambitious project aims to sustainably bridge the Green Agenda skills gap that has faced Belfast for generations.

'The Greta Affect' has already captured minds across the globe, with more and more young people engaging in environmental activism and climate change mitigation. In line with the Northern Ireland Housing Executive's Children and Young People Programme, Architects of Change Phase II will aim to develop cross-community engagement aimed at children and young people in Belfast. Ulster University researchers and students will develop content and organise a series of workshops tailored to the needs of children in KS2 and KS3. The workshops will be delivered by the ZERO Belfast students (with support from our PhD researchers and other academic colleagues) and will take place at the Belfast campus. Another public outreach initiative involving the expertise of the ZERO Belfast students, will be to provide input to the forthcoming The Belfast Destination Hub / Belfast Stories project in the coming years in collaboration with Belfast City Council. ○

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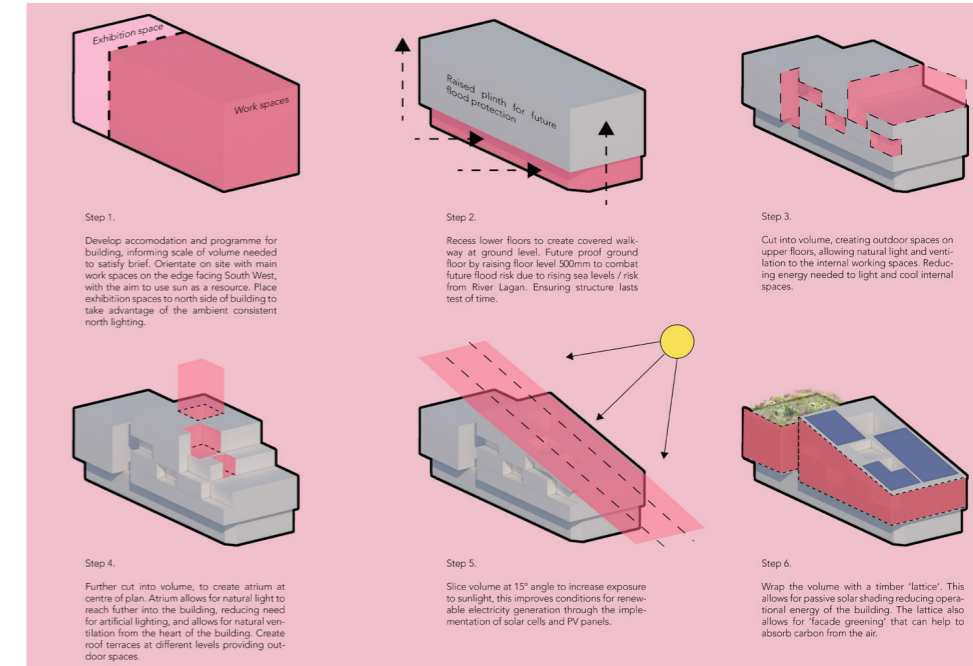
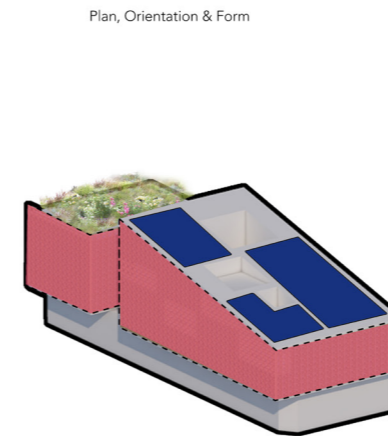
According to recent IPCC and World Green Building Council (WGBC) reports, the entire building sector must operate at "net zero carbon" by 2050, while all new buildings must operate at net zero carbon by 2030, to keep global temperature rise below 2°C above pre-industrial levels in line with the Paris Agreement on climate change. Such projections indicate a rapid growth in n-ZEBs around the world as the best climate mitigation pathway. Following on from COP26 and our current climate emergency necessitating an urgent decarbonisation of the built environment, this article highlights some initiatives I am leading within the School involving the integration of net zero knowledge to bridge the gap between research, teaching and public outreach for our next generation of architects.

Research

I am involved in The International Energy Agency (IEA) EBC Annex 72 which defines international approaches to net zero and climate neutral buildings as a key mitigation pathway and which builds upon the previous research of Annex 57. A key outcome and impact of our research work is The Monte Verità Declaration on a built environment within planetary boundaries which contains recommendations addressed to several different stakeholders in the building and construction sector.

Teaching

Through research led design in the ZEN Architecture III SuperStudio - Zero Belfast, the BArch and MArch students learn about different net zero pathways. The studio is in its third iteration and investigates two approaches to bridge the gap between research and design in a mainstream architectural studio context: 1) to increase knowledge and skills to decarbonise the built environment; 2) to improve the integration of sustainable and zero carbon concepts and strategies early and throughout the design process and the curriculum.



Collab Lab ZEB Strategy

The Collab Lab is part of an overall ZEN masterplan, with the overall aim of zero emissions on a neighbourhood scale. Therefore it shares energy as part of a synergy with a neighbouring masterplan building, as the neighbour has less capacity for renewable energy production than the larger Collab Lab building.

Embodied material emissions are reduced in part due to the reuse of the large blank facade of the MAC as well within the Collab Lab building envelope. This method has a potential carbon saving of ... in addition to using the low embodied emission material of MASS Timber as a main building structure.

A large atrium at the centre of the plan allows for natural light and ventilation reach deeper into the building, reducing the need for artificial lighting and ventilation systems and therefore reducing operational emissions.

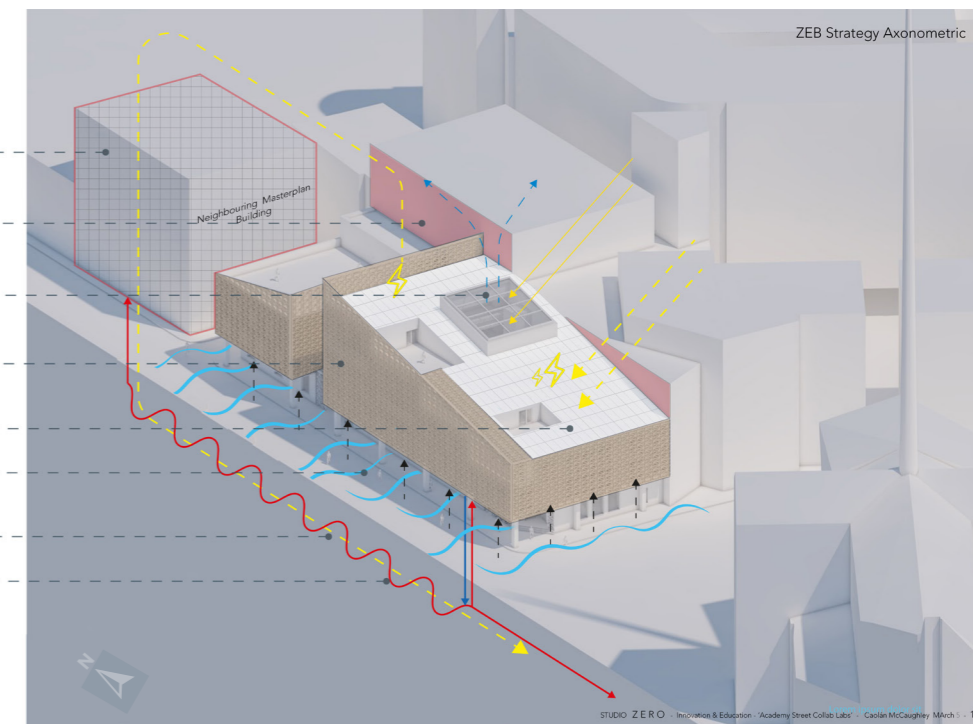
The building is wrapped in a timber lattice that acts as a passive solar shade, reducing unwanted solar gain in the summer and therefore reducing the energy required to cool the building. Planting can be grown on the lattice to further add solar shade as the planting is dense in the summer and dies off in the winter allowing solar gain from the low lying winter sun.

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Energy shared back to the grid from the solar panels on the roof on very productive days. The buildings energy can be supplemented on the grid on days where production is not high in the winter.

The building has a renewable thermal energy system in the form of a ground to source heat pump that takes heat from the earth and uses it to heat water that is then used to heat the internal spaces. This system, like the solar energy system, is part of a synergy with the neighbouring masterplan building as using both sites creates a larger catchment area for thermal energy. Excess thermal energy can be diverted to the proposed district heating system.



Caolán McCaughey MArch 5