Transcript

Sustainable Places: Partnerships for Green Design

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Joe Welch: Hello, everyone. Welcome to the sustainable places series at the Bartlett faculty of built environment here at UCL. I'm the KTP programme manager for UCL innovation and enterprise department and I will be hosting this event.

Joe Welch: Sustainable places is the new monthly online event series led by the Bartlett where we invite specialists in explore the crisis and how it is in the built environment. Today you have joined the September eventest series, sustainable places, partnerships for green design.

Joe Welch: Before we begin, some housekeeping. The session is captured live by a professional human captioner. If you wish to view the caption on a separate browser window. Please click on the link shared in the chat. The recording will be added to the Bartlett YouTube *channel and forwarded to attendees after the event.*

Joe Welch: For the format for today, we're going to present for the first part of the session and then followed by a quick Q and A before ending at 2 p.m .. we encourage you to submit a question for the panel at any point by clicking on the Q and A function at the bottom of the screen.

Joe Welch: In this event we are going to be exploring partnerships for green design. There are many roots for external organisations to partner with UCL academics in order to find solutions to the challenges they face. Today we will be focusing on the knowledge transfer partnerships mechanism.

Joe Welch: It turns out I am much more concise when heavily edited. will cheat slightly by starting off the presentation with a short video explaining the KTP scheme and then following that with an even short video describing the benefits that the partners seen.

Joe Welch: It is my pleasure to welcome to the virtual stage the associate professor at the Bartlett school of environment of school and science, and then a building architect and a former KTP associate and finally we will have an associate professor at the school of sustainable construction UCL.

Joe Welch: Hopefully you're able to see that and let's just start with the first video.

Joe Welch: Then the next video is a case study on our KTP with HMM.

Joe Welch: In any of those sound interesting to you, please get in touch with the team.

Joe Welch: I will stop sharing here and hand over to the first of our talks.

Dr Esfandiar Burman: Hello, everyone. Thank you for this very nice introduction to KTP schemes. I'm an associate professor in UCL institute for environmental design and engineering. I was involved in this project as it was explained in the videos as academic executor supervisor.

Dr Esfandiar Burman: It was a partnership between UCL and HMM architects to understand the pathways to achieve net zero greenhouse gas emissions in commercial developments.

Dr Esfandiar Burman: The rationale for the partnership really came from the fact that I suppose for the purpose that was useful to tap into UCL. For us the project provided an invaluable opportunity to look into real work case studies, the latest trends, the state-of-the-art, technological measures available to get to net zero but also to have a better understanding of the challenges ahead and needs to be done research-wise to overcome these challenges.

Dr Esfandiar Burman: Throughout my brief presentation I will try and provide context and then Simon in his presentation will delve deeper in. In terms of the definition of net zero carbon in the context of buildings, it is best to start with operational carbon. Put simply, net zero carbon likelihood operationally means that the balance between direct and indirect

greenhouse gas emissions and the displaced emissions through site or carbon credits and offsetting emissions is effectively zero.

Dr Esfandiar Burman: On balance there won't be any burden in terms of excess greenhouse gas emissions related to the operation of performance of buildings.

Dr Esfandiar Burman: Basically, it is to electrify services, gas boilers are heat pumps, other technologies and so on. So phase out fossil fuels gas or oil and rely on electricity and we are trying to decarbonise electricity generation further.

Dr Esfandiar Burman: There are different scenarios for decarbonising the national grid. What is depicted here in terms of expected decarbonisation of the grid by 2050. It is a simple illustration of a conservative estimation of what is achievable by 2050.

Dr Esfandiar Burman: The supply is basically here and ideally throughout that realistic and conservative scenario not even our central estimate is a conservative estimate you would speck to be able to get to this level of energy generation by 2050 based on the technology, with services of mixed renewable energy generation and, of course, increasingly utilising different types of energy storage to be able to be responded to demand.

Dr Esfandiar Burman: At the same time the demand, of course, needs to come down to meet the supply at this point. We are dealing with transformation of the grid, as you can see within less than a decade we managed to go decarbonise our electricity grid by almost 70% and we are further decarbonising the grid. At the same time we need to appreciate that this relies on a combination of upstream measures.

Dr Esfandiar Burman: These will hopefully get us there and again the proceed jokes is not the best case scenario attacks conservative one, so we might be-- it is a conservative one. We will develop hydrogen infrastructure, and thereby we will be able to further decarbonise the grid.

Dr Esfandiar Burman: As things are now, it is basically based on a conservative estimate that we are fairly confident we will be able to be achieve.

Dr Esfandiar Burman: Based on that, if we follow a top-down approach based on what we believe is fairly achievable 2050, we would be able to develop targets within the building secretarior for different types of buildings based on the economy and the weight of buildings, so sectors of the economy. This is for example the targets for energy used intensity developed and you can see of the values there the left-hand side related to schemes on the right-hand side.

Dr Esfandiar Burman: What we do in addition to this top-down calculation is based on the capacity of the grid for zero carbon electricity is to complement them with calculations, realistic calculations, in each building secretarior to see what is achievable given the functional requirements in every specific building topology.

Dr Esfandiar Burman: What I have explained and described is to do with operational carbon emissions. It is very important to understand that operational stage of buildings is only one stage within the lifecycle of each building. It is important to consider the upfront car boon that we use when a new building is developed but also the greenhouse gas emissions associated with demolition based on disposal. The relation between operational and embodied carbon is something that you're aware of.

Dr Esfandiar Burman: The industry is trying to control both and there are institutions and bodies that are trying to go develop key metrics, key performance indicators and target for these such as the target set out by the royal institute of British Architects. We see that they're applied in isolation. It is important to understand the intricate relation and develop the approach.

Dr Esfandiar Burman: I don't think a whole lifecycle assessment methodology. This is what we're trying to do with AHMM through the project and now we have embarked on a PhD programme, a research project, after the completion of the project. It is a long term around very nurturing working relationship.

Dr Esfandiar Burman: We're trying to develop this approach to say that through the development of a new building or, indeed, a refurbishment, we are dealing with upfront carbon, for example we have, new carbon with new material. After completion we have to deal with the operational, and we will have a number of refurbishment rounds to do with building services because they typically have shorter lifespan compared to the large expectancy of the core of the building.

Dr Esfandiar Burman: Then gradually throughout the building lifecycle of 60 years a typical assumption we need to have other refurbishment with material as well. We need to add all these elements to the operational problem and then when it comes to dismantling and admission, when it comes to material recovery, if you have adopted and deployed resource circular economy principles, we will be able to recoup some benefits.

Dr Esfandiar Burman: Nltd we have some excess greenhouse gas emissions. We need to use offsetting schemes to overcome those to have a truly net zero carbon building in the end. This distinction is important. If you see buildings through this lens, you miss the building of greenhouse gas emissions throughout the whole lifecycle.

Dr Esfandiar Burman: We tried to basically come up with a working prototype based on this framework and develop a net zero guide for architects around this framework to appreciate and basically adopt this holistic approach.

Dr Esfandiar Burman: This was published last year. It is available to everyone interested through their website. There are a number of case studies also in the guide. We tried to identify different pathways no net zero pathway. I will show a slide that identifies a pathway to zero carbon emissions in an existing office buildings in London. This is a project that we are involved in right now.

Dr Esfandiar Burman: It represents a typical office building between typical and good practice standard air conditioned office building in the UK. As you can see on the left-hand side, even if the allow for the carbonisation of the grid and energy figures based on projections for climate change, we have savent emissions. The green curve shows the ideal pathway to net zero, but we are well above that.

Dr Esfandiar Burman: We figure engine this building in which building services systems are almost at the end of their useful lives, there is a good opportunity to renew the strategy, but at the same time reduce the demand for energy, To put together we would be able to bring down greenhouse gas emissions significantly and delay the point at which the asset will be stranded, they will be above the ideal pathway, to 203 #.

Dr Esfandiar Burman: We can delay to that stage, to that year, but still as you can see, there will be some residual emissions, and so beforehand that stabling we need to deploy other measures or start thinking of behavioural strategies to further decarbonise the building.

Dr Esfandiar Burman: I wanted to highlight this to show how difficult it is to get to the targets I mentioned before. It is not easy to get there, it is quite challenging. What I am illustrating here is to do with operational Carl bon. The replacement of building service technologies, fabric, adding insulation, adding to the carbon as well.

Dr Esfandiar Burman: We need to think of offsetting that carbon. This approach and view to operational function is important and we are working on the case studies such as ... we have a researcher working on this building to see how we can deemployment management techniques and utilise, for example, smart ready technologies to further decarbonise this building and hopefully achieve net zero carbon targets.

Dr Esfandiar Burman: I highlight the fact that we are dealing with a very complicated problem especially when it comes to this type of large scale commercial buildings. It is not only a technical problem. It is a tech social problem and we need different organisations to collaborate on with each other. This type of partnership represented by knowledge transfer

partnerships and the funding available has been really fundamental to further develop our understanding of net zero building.

Dr Esfandiar Burman: buildings and what it entails to get to that level. The vast majority of projects even within existing buildings ... so we need to do a lot to facilitate to net zero. I'm sure Simon will provide details and go through the guide that was developed as a result of this project. Thank you for your attention.

Joe Welch: Thank you. That was very interesting. Moving swift live on our next speaker is Simon.

Dr Simon Hatherly: Thanks. I would encourage you all to download the guide. It is freely available.

Dr Simon Hatherly: AHMM is the fourth largest architecture practice in the UK. It is the founding signatory of architects declare which is part of the background to the KTP and that was seen as I one way to fulfil the requirements or the aspirations of architect declare.

Dr Simon Hatherly: It was a collaboration between AHMM and IDE and the guide-- IEDE around it is the main output. We're in the process of developing a tool kit and that builds on some of the key diagrams from the guides, the net zero carbon diagram that was shown by Esfan which I will be touching on, but also the carbon square.

Dr Simon Hatherly: It makes those tools, those diagrams live and in a way that can be applied to bespoke specific projects.

Dr Simon Hatherly: I will be talking about the context of the guide, how it is a portal to other sources of information that is fundamentally based on the use of a whole of life carbon approach, some of the strategies advocated within the guides, the link of net zero to other systems, some of the key principles and some of the summary and key points that come out of the guide and the research in general.

Dr Simon Hatherly: Essentially one of the guide drew on a number of different sources, including modelling by the performance team. We had input from UCL students, their research and their dissertations, we had over the course of the research we had four MSE students who provided support. We had a series of workshops and architects and an investigation of net zero carbon building standards and some of the literature around net zero.

Dr Simon Hatherly: As touched on, we are at a point where industry was part of the responsive industry to this requirement for a net zero carbon built environment was the

development standards and frameworks such as the challenge and LET iflt and we're in the process of cross industry initiative, the UK net zero carbon building standard which is due to be published at the end of the year.

Dr Simon Hatherly: Also you had a whole range of guides and publications that were out there, kind of advocating or kind of investigating net zero carbon approaches, and the net zero carbon guide was intended both to draw on those sources but also be a resource that would support the reader in taking the reader to those sources.

Dr Simon Hatherly: Essentially it could be read at several different levels, at the level of a scheme so you could find if looking for key pieces of information but if you wanted to do a deep dive into something like decarbonisation, you could do that.

Dr Simon Hatherly: The guide has highlighted the challenges of delivering net zero and because it was grounded in a real-life project, it did consider some of the trade-offs and strategies and some of the challenges of delivering net zero with reference to a real world case study.

Dr Simon Hatherly: A challenge of the research was defining net zero. The approach we took was one of a whole life carbon approach recognising that you have got this emission of the outset of a building's life through construction, through the manufacturing of mining, of materials and taking at home site, which we refer to as the upfront carbon.

Dr Simon Hatherly: You have got the operational emissions, those from both direct and indirect, from the bushg of fossil fuels over the course of the build's life from the operation of the building but also things like the FGAS, fugitive gasses that might come from, for example, AVHR equipment.

Dr Simon Hatherly: As mentioned, you have got those up ticks from the changes that occur over the life of the building, things like refurbishment and retrofit, refits and all of those things, those changes that occur over the life of a building.

Dr Simon Hatherly: Then you have the emissions associated with demolishing or addition man telling a building at the end of the life. You have your mitigation measures such as recovering the building at the end of its life around the offsets.

Dr Simon Hatherly: We explored that we were able to start looking and considering that actually at each one of those points there is scope for a performance gap and kind of an important part of the research was getting that out there abdomen kind of recognising that.

Dr Simon Hatherly: With reserve to a real world case study and also reference to the work of AHMM we were able no start look attack at or investigating some of the key strategies that designers can employ to achieve net zero. Fundamental to that was establishing benchmarks at the start for both operational embodied carbon and use of iterative design approaches.

Dr Simon Hatherly: When we're thinking about the upfront, employing the principles of economy and efficiency and elegance, that's using only as much material as is needed and kind of getting rid of superfluous material, things like suspended ceilings. It's about saving where people substituting materials such as GGBS for cement or carbon sequestering materials.

Dr Simon Hatherly: In terms of the operational general, it is considering the form around envelope and also the relationship of the building users to control systems and also approaches to monitoring performance.

Dr Simon Hatherly: When we are thinking about the in useless carbon, this is the thinking about future, considering future flexibility at the outset and also considering, adopting a mindset that views the building as a future resource bank. That is tied to recording the characteristics of the building abdomen materials and considering end of use and material recovery.

Dr Simon Hatherly: Escalator, there is of the offsetting bit. One of the things we try to get across was the fact that this is the final step and this is one of the elements where there is most risk. You have risks of reversal associated with us, that from things like when you are considering tree planting and those sorts of things, that you've got trees can die from disease, you can have fire around all of those other things that mean that that carbon that you-- and all of those other things.

Dr Simon Hatherly: Can be locked away and released. This is one of the things that we wanted to get across is we shouldn't be relying on this but really going as far as we can to adopt those other strategies first.

Dr Simon Hatherly: It was also important to recognise that the building is part of a wider system and a system that is connected to systems of production and systems of energy production and transmission.

Dr Simon Hatherly: Those systems will play a kind of key part in a building achieving net zero. As I said, we are used to the idea of building systems such as ventilation, NVHR systems, but when we're thinking of net zero, we have to go beyond that and start engaging or considering the systems of production, the fact that decarbonised manufacturer is

playing an important part in the kind of products that we specify and the information that we ask for from manufacturers. Also important is the systems of energy generation and transmission and the decarbonisation in the grid is one of the most significant factors feeding into net zero, but with that come significant risks as well. We have risks around variability of supply and there's a question about how we respond to that.

Dr Simon Hatherly: Another interesting aspect to come out of the research was to recognise that there might be different approaches to achieving net zero. The approach that is kind of initially outlined is called net zero now where you're building essentially you design it ain a way that you minimise all of the emissions at the outset. Then you apply your offsets or close to or at practical completion, but there have there are different approaches depending on the nature of the building, so if you have got, for example, an existing building, it might be the case that you implement a series of approaches over the life of the building that would get it to net zero.

Dr Simon Hatherly: You might blend approaches in order to get to that point. A key take away of the research was when we're thinking about net zero, or really that compare bon is such a significant-- carbon is such a significant component of delivering buildings now, that it shaub up there alongside time cost abdomen quality as one of the constraints on development. It led to this idea that the golden triangle should be redefined as a carbon square.

Dr Simon Hatherly: We also thought actually this square might distort in relation to these kind of different drivers and that is something that is captured in the toolkit that we have developed.

Dr Simon Hatherly: It is also important that there was a data component to delivering net zero and that was to do with things like digital twins and materials passports and the relationship of the model to the upfront and whole life carbon calculations and those sorts of things.

Dr Simon Hatherly: Another key part was circular thinking, recognising that design process, fundamental for delivering net zero as is kind of taking lessons from post-ouch see evaluation-- occupancy.

Dr Simon Hatherly: Summarising this, in the guide we have ten key points for delivering net zero and the first is as I have mentioned, fundamentally about taking a whole life carbon approach. The second is that when we're thinking about operational, it should be tied to monitoring and tracking rather than simply a design for a set level efficient performance and then walking away.

Dr Simon Hatherly: It's also recognising that embodied car born and understanding of carbon is fundamental to it and that as designers we should be substituting materials or using carbon sequestering materials where possible.

Dr Simon Hatherly: Tied to that is the idea of the economy and efficiency and elegance that should be using only as much resource as is needed.

Dr Simon Hatherly: The next one is recognising that the performance gap is now much more than just operational energy. When you take a whole of life carbon approach there is a gap along each stage. The upfront stage, the operational, when we're considering changes of use and those sorts of things.

Dr Simon Hatherly: It is also we need to recognise this design that there are these different systems that will be feeding into our spobs to delivering net zero and that is things like be the national grid but also systems of manufacture and construction.

Dr Simon Hatherly: You need to recognise that building users will pay a fundamental part in delivering net zero strategies E carbon should be viewed alongside time, cost around quality as key constraints.

Dr Simon Hatherly: There was another final key point was recognising that we as designers have - we were able to influence clients beyond the brief and we have a capacity to steer and shape the expectation of what is achievable when we're thinking about applying net zero.

Joe Welch: Thank you very much. Just to let the panellists know that there are a couple of questions in the kwflt and A in—Q and A.

Joe Welch: Next up is Qiuchen.

Dr Qiuchen Lu: Hello, everyone. I'm from the school of sustainable construction. My research is related to how to use digital technologies especially digital ... to improve the current built environment to be sustainable, resilient abdomen smart. Actually I just start a KTP project with BSI British Institute, so I didn't have anything to show at this stage, but I will show what my current research looks like and how it connected to the KTP opportunities and how it will improve the built environment.

Dr Qiuchen Lu: I have been working on digital things for many years, but not only focus on the theory and framework and behind it and also cover the values and also the implementations. Firstly, how to create build and then to have digital things, from the sustainability, from the smart and resilience aspect.

Dr Qiuchen Lu: So the next level is how to jump beyond the digital things and to benefit for the societies and also the broader.

Dr Qiuchen Lu: The first one is how to develop a convenient way to generate dij that will things. The method developed by our research team has used the current existing drawings and also the images by digital cameras, iPhones and others, so convenient devices.

Dr Qiuchen Lu: Combined with the characteristics and also the images collected by this equipment and generate the building information model.

Dr Qiuchen Lu: Firstly, we will use the OIC algorithms detection and build the coordinations of the whole layout of the buildings and use the images abdomen basic under image processing technologies detect objects such as windows, doors, columns, walls and beams. This method is the kind of practical efficient and accurate way to generate geometry and update it.

Dr Qiuchen Lu: The next case I would like to show is how to benefit to build relationships between the buildings, neighbourhood status, and how to improve through the steps.

Dr Qiuchen Lu: This is the case I did when I was a reempbl associate. I tried to create the digital twin building. These were used. To organise all different models in three layers. The first layer is the canvass layer. Then detailed aspect such as plant rooms and pumps and other equipment used to scan and also drawings to generate the detailed model.

Dr Qiuchen Lu: Besides the modelling layers and for the information layers we used the extension integrated different database such as real-time sensitive data that the AMS as a manual system and space system and also linked it with the new established QR code systems.

Dr Qiuchen Lu: We developed an extension structure behind that. We built between different databases. That means we don't have to recreate or regenerate different kinds that all the data saved in there, and build a link between the centre with other database. We used different datasets for different purposes. It covers different layers.

Dr Qiuchen Lu: What kind of applications or implementation can be supported that digital can support.

Dr Qiuchen Lu: We have predictions here in the levels and some asset detections and projections in the building levels Ethe project should build a link between the theory, research and also the implementation research. This is a project that I work with and eye tried to develop commercial products. You can come to a different kind of projects in

around the whole country. Also it covers different functions for the site such as space management and security operation and also other controls in real time and achieve the sustainability and smart targets.

Dr Qiuchen Lu: It can be linked with different technologies, so we extend with the AR technologies and to generate the more virtualised environments. Another project is how it can improve the thing for carbon footprint using open social and technical ways. This is the five stage method that was decided how to determine the carbon footprint for the different structures.

Dr Qiuchen Lu: We use one particular part of the highways in the UK. It had five stage.

Dr Qiuchen Lu: From the initial project stage to the method and to choosing data collections and carbon footprint analyser and came to the presentation operation stage.

Dr Qiuchen Lu: It can cover different from the material structures to the behaviours of the high uses. This is what we generated combined with the materials and structure also of the behaviours of the buildings.

Dr Qiuchen Lu: This is how it looks like.

Dr Qiuchen Lu: The next step is to analyse how the changes can impact the infrastructure systems. I did a case funded by the WTW research networks toable lies how the climate changes, especially the flooding factors and especially in the transportation system. We choose the London as the case studies. So specific area of London. It will be developed a kind of thofd - so combined with the climate change especially flooding and raining of land, whereas the technologies and how it can be shown die nam particular strategies for our transportations.

Dr Qiuchen Lu: and how to reduce the travel times and how to design the dynamic open and close strategies for our road systems.

Dr Qiuchen Lu: Currently my research is not only focused on ... but also on how to transfer my knowledge research knowledge to the implementations and also the different kind of implementations. For instance, our digital model has been used by an awe Australia company called Aerocom.

Dr Qiuchen Lu: This is the basic introduction about our current projects. We would like to consider the current market economies around analyse how the sustainable and low carbon adapt to manufacturings in constructions and combine the current business with BSI. Hopefully we can show some research results basically on this KTP projects.

Dr Qiuchen Lu: That's the end, thank you.

Joe Welch: Thank you very much. We're running out of time but have so we need to finish promptly. Everyone is ending their lunch break. Of the Q and As have been answered in the live answered box and we can always follow-up later.

Joe Welch: So, thank you, to everyone for joining is today and a big thank you to the panel for their time and contributions to the discussion. Sustainable places is back next month. Sign up details will be in the chat and we hope to see you there. Thanks very much and goodbye.

END OF SESSION.