Drivers for Change: ESG | Can Lighting Really Boost Environmental Performance?

Shelley James: I'm Shelley James. I'm the founder of Age of Light Innovations. I am privileged to be co-hosting with John Bullock, who is a lighting designer and who speaks and writes extensively about the lighting industry with many years experience in that field.

Our keynote is Fred bass, who is a UN and EU advisor on lighting and sustainability and environmental issues. He's also has many years experience in the lighting industry and a very good man to talk to about repairing your antique lights!

Paul Foulkes works with Theben in the UK. He's also a keen cyclist and represents KNX which is an open source international integrated building control platform which delivers some amazing results, both in terms of building performance and particularly energy efficiency and sustainability.

Gauri Talathi-Lamb wears many hats. She's a developer. She also runs the engineering company FHP engineering. She's also one of the leading lights in the mentoring circle. She runs an interior design company. So she brings our end user perspective and our developer perspective.

And last but not least, Paul Garbett. Paul trained in automotive engineering. But he is now an MEP consultant for Arup. So when you look at his LinkedIn profile, it says cost, cost all the way through. He's the guy who everybody blames for lighting specifications not being held because the guy has value engineered it.

It's an absolute privilege to have such an illustrious team coming at this from so many different perspectives. And I'm now going to hand over to John.

John Bullock: Thanks Shelley. Yes, we've been looking forward to this one. It's only really in the last decade that we've started to look at the environmental costs of what we do. Because energy efficiency is about doing stuff as efficiently as we can using as little energy as we can to do it. It's all wrapped around cost. And it's all wrapped around ripping things out of the earth with little thought about what that means.

I'm now going to ask Fred to do his keynote: the world as he sees it. Because the nice thing is that Fred sees the world as a world, which is why he is working for the United Nations and various people because he tends to get us a rather wider perspective.

[00:02:19] **Fred Bass:** Thanks, John. And greetings to everyone on the call. As a consultant in lighting after 40 years experience in the industry my main work is environmental issues with different organizations. The key one that's mentioned UN role as a technical policy officer. I am looking at model regulations for lighting across emerging markets for lighting efficiency as part of the U 4 E programme.

[00:02:43] And that drives a regulatory process for encouraging emerging markets to adopt the latest technology. So leap frog to the latest technology. So they might be using oil lamps, literally oil lamps, and they might move directly to L E D. And so we develop market model regulations. For that we define minimum energy performance requirements. Typically based on lumen per watt but also other quality based performance criteria. So they not only get an efficient light, but one that is suitable for purpose. I also work with ECOS in Brussels which is an environmental coalition on standards funded by the EU.

[00:03:21] It's an umbrella organization for 50 NGO's. And as part of that, I sit on the IEC, TC 34, that's the international electrotechnical commission for lighting and the committee TC 34. And I sit on there as a liaison for that. And I'm co-chair of an environmental aspects advisory groups.

[00:03:43] And this one is really interesting because it defines specific standards for the whole world for lighting. And many countries follow that. 60 countries are signed up to IEC another nearly 30 or so, I think it's just less than 30 are affiliates and then another 80 or so are associated. But it's a driver for standards across the world.

[00:04:09] And it drives today not only the safety standards and performance standards that you might be familiar with. But we're now starting to think of environmental aspects and that's the advisory group I'm part of. And we are trying to make sure that the IEC adopts environmental considerations as part of its remit.

[00:04:31] And I have to say TC 34, the lighting part of the IEC is really ahead of the game here that they've got the advisory group on environment, we're looking at what we need to do to get environmental aspects, incorporated in the standards. My background is 40 years in the industry. And now working in environmental issues with the UN and the IEC through a European organization.

[00:04:53] I would say that the opportunity for this discussion today is to encourage lighting professionals, to see themselves with a possibility to really push an environmental agenda in the lighting industry. And I would say that to do that, you'd need regulatory support.

[00:05:13] I detect a resistance to this from the professional community. They don't like being told it has to be so many lumen per watt but the reality is a lighting professional really wants to specify and buy a product in its project brief or whatever, but they get challenged, usually at the last minute, by an alternative product proposed. And without a regulation or a guideline that they can quote, they won't be able to stick to it.

[00:05:42] So the quantity surveyor will come on the project and say: ‘I can get a cheaper one down the road, mate’. And your spec is lost. But if there's a regulation or as a guidance that they can quote in their spec, it's not so easy because that alternative has to comply. And I think that's where I would love to see the professional lighting community lead the way on environment on the environmental agenda. As much as my UN work is about the mass market, about making sure that a light bulb is a certain lumen for watt globally or whatever, the lighting community, the professional lighting community can actually support a much

greater push on specifying an environmental agenda with much more than just lumen per watt: all the other criteria that come into lighting. I've got a list here.

[00:06:32] First thing I've got, is it avoidance of waste? Durability repairability material efficiency, remodelling? You may not know what that means. Energy conservation course is key. But what about control and automated power management of the lighting that you are installing?

[00:06:50] This is all about saving the environment in terms of carbon footprint, in terms of energy consumed, and then this pollution prevention, public health, avoiding hazardous materials. Did you know that fluorescent, of course you probably do know, uses mercury, which is actually not good. It's a neurotoxin. We can get rid of it. Now in, in discharge lighting, you have radioactive thorium driving the Igniters. Then we have minimizing carbon footprint and so on.

[00:07:21] There's a real opportunity, but the professional community can help us communicate and educate the end user as to what they can do with lighting to actually be green and environmentally conscious, sustainable, et cetera.

[00:07:39] There's a massive opportunity here for the professional to to really lead the thinking. Because those flagship projects that are specified will be published, they'll be talked about, and if you've done the right thing environmentally, then the rest of the community will follow.

[00:07:56] So I really think in my work as with the UN and with the IEC, the education and communication of the end user is key. And the the end user will be persuaded by professional users, specifying the right materials and It will work if you have the support of the standards, organizations with guidelines and regulations.

[00:08:19] So that, that's my agenda

[00:08:21] **John Bullock:** Paul, give us a couple of minutes of where you stand in all of this.

[00:08:25] Paul Foulkes: I represent a manufacturer of building automation products or building automation control products. And a key part of that is lighting control and always has been. Lighting and heating control are the two largest energy saps within our buildings.

[00:08:40] The two sides of this is making sure that not only do people fit the right product, but they get the information to fit the right products. There's a saying, which is very simple, it is that if you don't know, you don't know! It doesn't matter if you're talking to an architect or lighting designer or whatever but if they have not heard of that particular solution or a particular product, they're not going to fit it. They're not going to put it forward into the tender spec either. So it's getting that information out to them that is important.

[00:09:04]There is a key difference between information and education. You can get information off the internet. But it's just information. That's all it is. It's not having that discussion with an expert. It's not talking to a skilled consultant, the lighting designer, the controls designer, and it's the start of a massive “funnel” for me. We all must be sitting around the table at the beginning of the project. And then that funnels down, we've got to listen to the client. But we need to educate the client in the first place. Let them know what is available. Fo me, that client might be the end user, but also might be the architect or the lighting designer.

[00:09:38] It's about information and education. It's understanding that. What things to do, what is possible? All of the different elements within the whole scope of the project, whatever it happens to be. Whether it's the scope of the building, the scope of the tender, the scope of the design. It's looking at the broad broad picture and making sure that people have that information and education to make the right decisions.

[00:09:55] **Paul Garbett:** I think for me it's understanding what the client's brief is. Having these wonderful technologies that will contribute to supporting decarbonization and energy efficiency. And of course the consultants need to implement these or least consider these as we go through tenders and specs and so on, so forth. But you've got to have somebody listening. And what I mean by that is that it's got to align with what the client is looking for.

[00:10:20] Now. I'm not suggesting that not all clients are looking to implement more sustainable technologies into their building. They are. But it's about listening to where they are in their process and what they're trying to get out of that asset and how much money they have.

[00:10:35] Of course, I've got to come to that. That's the elephant in the room, isn't it? In my room certainly. As long as things have a cost it will ultimately at some point in the decision making become the most important thing. And it's about how it's articulated and it's defining or establishing where the important part of that cost.

[00:10:53] Is it upfront? Is it the long term costs? But those things will come hand in hand with the type of client and what they are aiming to get out of that work on that asset. A developer wanting to purchase, upgrade and sell on, for example, then their interest in the longevity of a product is not necessarily as important as somebody who's intending to move to a facility and run it for the next 50 years because it's just a different kind of take on the ownership there.

[00:11:24] Of course the regulations and everything else that kind of the accreditation that comes with it will all be a feature in this. But again, it needs to be enforced and it needs to have a broader impact as well. Lighting is one aspect of a lot of different MEP services, as well as obviously the building itself. And there are wider environmental accreditations that will influence decisions and it all has to tie in. We'll come to debating whether the QS can actually use the term: ‘I can get a cheaper one' because we can't spec anything. But maybe we'll come back to the detail on the QS's role when we get there.

[00:12:00] **Gauri Talathi-Lamb:** I've been a client, so I've sat in that seat deciding where I'm going spend my capital and what pressures I have from the investors and the business leaders, where the money is spent and being in the construction industry, you do end up spending majority of the capital for any company. And so you come into the scrutiny of your investors quite a lot.

[00:12:23] In project, in any projects, you're looking at quality you're looking at time and you're looking at budget. And I'm seeing more and more in the future, you're going to be looking at sustainability credentials of your project as the fourth element.

[00:12:38] So normally you would have this golden triangle of three deliverables. And now you're going to be adding that fourth one. And how that affects the other three key deliverables is going to be what we are talking about here today. If I'm sitting from client perspective, FHP is leading for advisory from M and E perspective to most of the clients as well. You are hoping that you get educated. What I have noticed from client perspective would be that education also comes from how it is relevant to me as a client today and how it helps me.

[00:13:11] You might say Paul, for example, this is the state of the world control system, and it's gonna be amazing for controlling your lighting. But in my head as a client is like:

[00:13:23] 'Yes, but it's going to cost me X amount right now. And what is it adding to my life other than sustainability, because I need to sell it to my stakeholders as well'. What I've realized is the way, which the penny drop moments, which most of the clients has been: 'if you do this, you would be able to save this much money on the long term and making it into a business case'.

[00:13:47] We, as the advisors for the clients have to take that ownership of educating in the sense of a business case for the client. We are educating them that if you do this is the business case, and we are giving them the business case for the planet. And something which all of us know has happened is Patagonia has said, 'Earth is our client' which is absolutely amazing.

[00:14:09] And we need to start thinking like that as advisors to our clients as well, that what you gain out of it today, tomorrow 10 years down the line. Paul, you rightly mentioned most of the times, it's a five year business plan and they are thinking 'As long as I get through those five years and I flip it and move on, that's fine by me'.

[00:14:30] But it's also regulations which Fred was talking about, which are going to be put in that. 'Hang on a minute. In five years time, you won't be able to flip it anymore because as long as you don't have a certain credential, you can't move on Mr. Client, Miss client, Mrs. Client, have you thought about this? And have you planned for it?

[00:14:49] So regulations are going to help us as consultants or advisors. The most recent one is the store doors being closed during winters to keep the temperature, so we are not

using too much heating. Those are the things we need to look forward for and advise our clients well in advance because they're designing for today, but that will give them that longevity for the future.

[00:15:11] You are educating them for the future and they will get it a lot more as a client because you are selling it to them in the language they understand,

[00:15:21] **John Bullock:** if anyone who hasn't heard the news about Patagonia, which has always had very sound sustainability credentials, this was announced today that the founder has given the company away to its workforce, which is incredible. Just wonderful to hear. So a private company becomes a co-op. They are around, there's a few around. If you eat organic vegetables, you might know about Riverford who are down in Devon. And they did the simple thing a few years back, and it's almost like a new sustainable sector that instead of letting your kids inherit the company and then running it to rack and ruin you actually give it to the people who's who are actually putting their life force into. It sounds great news.

[00:16:07] I got scared when you mentioned a fourth leg from the triple leg. I thought, hang on - a three-legged stool stands up very well, but a four sided square becomes a parallelogram just slightly before it falls over. And then I thought, a tetrahedron, which has got to be the most solid figure that we can imagine.

[00:16:26] What we've heard is we're talking about people who don't know and therefore need somehow to be told. Fred is on for regulation of one sort or another, because if we are told that this is what we've got to do, then this is what we've got to do.

[00:16:42] **Fred Bass:** The point I'm trying to make here is that if you are going to avoid the QS, switching your spec when you want to get an environmental agenda through on the project and you are doing all the right things, let's say from a green point of view, how are you going to make that stick? And I would say that a guideline or a regulation from an international body, like the IEC would mean you could quote that on the spec and that would give you the baseline below which no one can go. So that will cut out the possibility for a lot of alternative products that could mess up your spec. So I think regulation and guideline from reputable standards organizations are critical to give the ammunition to the lighting professional to lead the way on an environmental agenda.

[00:17:30] If you just say, oh, I like the idea of such and such green thing or that and the other, but if you back it up by saying, and it must comply with technical memorandum, X or regulations, Y, then others cannot mess you around. They've got to comply. So I don't think professionals should be afraid of using regulations and shouldn't shy away from it.

[00:17:52] The building regulations are actually very poor in UK. They are full of phrases, like 'alternative approaches', they're very gray. So it, it's actually rare that when you get into, whether it be a large commercial or even a residential building, you're actually dealing very closely with the building regulations there.

[00:18:11] Paul Foulkes: Can I just take five minutes and talk about the new Part O? Part O covers overheating. And we're probably all sitting here thinking “what's that got to do with lighting design?” Actually this is where the lighting control becomes really important. Part O is talking about less glazing. Now I know Shelley will be horrified to think that Part O is going to stop natural light. But fundamentally that's what the new Part O regulation is saying. Part O says, reduce glazing. So no south facing glazing, less natural light into your building.

[00:18:44] Now that's going to mean smaller windows. So that could actually be a big tick for a lighting designer - now they need more interior lighting, but by looking at integrated control, by looking at the “alternative approaches”, that it does allow, it says it, in one line in the entire regulation: you can use alternative approaches. But it doesn't say what they are.

[00:19:06] This comes back to my initial point of information and education by using something like dynamic shading, you are talking about blinds and angle of blinds. With large glazed facades, you're talking about a potential for energy saving because you can have passive solar gain in the winter, but you're also talking about the need for tracking the sun position. You also need to know your lux levels inside and out to effectively control your dynamic shading, to make the most of your natural light and your best interior lighting design. You also need to know your inside and outside temperatures. You need to know the temperature at the ceiling, the temperature at your body level, the temperature at the floor, and probably the temperature of your slab.

[00:19:49] So if you're running under floor heating or cooling, you also need to know about your ventilation levels, boost and purge, and also your occupancy levels. So by simply saying Part O is 'reducing the amount of glazing', now, we've all of a sudden got ourselves looking at ventilation heating, lighting, dynamic shading, sun position. And all of this is going to affect the interior lighting design as well.

[00:20:13] What you are actually going to design, because that light inside is going to change dramatically throughout that day. OK, it's a slight side step from what we're talking directly about, but it's that point of integration and that point of maximizing your natural light. Making the most of your lighting design is much more than just looking at what luminaire you're going to fit.

[00:20:35] To what extent are we looking at not just if you like philosophical improvements as in, 'we need to be more sustainable, we need to do doing the things properly because we're all human beings and we're all sharing the same planet' to the point where you go: We can't do that. We mustn't do that. Fred wants it all regulated. I've got a feeling that we can't regulate everything because we need to be able to understand why the regulation is there and then to interpret it in interesting ways.

[00:21:04] **Gauri Talathi-Lamb** Can I pick up on the regulation point as well? It's it's a space of flux. We've got some coming from Australia now. There's Neighbours there's MEES. There's BREAM there's LEED. Most of the times we see our clients confused. 'We don't know where to start. We want a sustainable building. We are happy to put the capital behind it. What do we go for? Where do we start with?' And retrofitting is another place where you

get what you get pretty much with the building and you just have to work with it. So when you are even working with those kind of buildings where you're just given a space and you have to help the client get the most out of it no matter how many specifications we add to help Paul with regards to going out to tender with the clients.

[00:21:52] It's 'what is the starting point from regulation perspective?' So which one is the best suited for a retrofit building? Which one? So BREAM and LEED are very well suited for new build, but what do you use for a retrofit build and so on? It's quite a challenge for the client to navigate it. So many times the client come to us and say 'we want to start our decarbonization journey.

[00:22:13] And we know we want to reach this level, where do we start?' And that's where we start taking part in advising the client. Most of it is related. First one would be lighting. The way we are heating the building way we are cooling the building and what can be done. At the end of the day, working with what you have is a lot more important than ripping everything out and starting again.

[00:22:38] So there is that common sense element everyone needs to look at: can we work with it and can we make better? Or do we really need to rip everything out? So it's bringing everything together, sitting down with the client, sitting down with the QS of the client and working it out together as a project, right at the beginning when you're designing and bringing out the scope at that point in time and working as a team or collaborative team. So the client knows exactly what they're going to get right at the beginning. Most of the efficiencies are at the design stage. And most of them, when I say most it's up to 80, 90%, where you design everything properly and then you fine tune it during the delivery stage.

[00:23:19] Planning right at the beginning where you bring all the teams together to lay out the map out the process, lay out what kind of specifications are we are going at? BREAM building LEEDS building and what we are going to get at the end and how we are going to look after the building following on is the key at the starting point.

[00:23:38] **John Bullock:** Are you seeing the quality of specifications change to reflect what we are talking about here? And the big difference, I think, is we are not just talking about how much the contractor is going to charge to build the thing, but how much the client is going to have to pay to keep that thing going for a number of years. And I know you said sometimes the client doesn't know, but are we seeing a shift? Are we seeing a qualitative shift in the way that money is being organized around a project?

[00:24:10] **Paul Garbett:** Definitely. I must say that in the last eight to 10 months, my workload has been predominantly helping clients get onto and progress through their net zero journey.

[00:24:21] Along with our designers here and other consultancies there’s been a lot of focus from a lot of different types of client as well. So in terms of space coming through and even in, in terms of whole projects. Because I think it's quite important to say is that.

[00:24:37] A lot of these things that we're talking about here about upgrading lighting, replacing lighting, the type of lighting, and the regulations, a lot of it is part of a wider project. And this is why I say right at the beginning, you've got to understand what the client is looking for.

[00:24:49] It doesn't matter whether you sit in a room when you've got the full attention of that client and they completely grasp everything you've said, and it's wonderful and magical. And that's great. But they're not just considering lighting. 95% of the time, it's not just lighting.

[00:25:02] And then what Gauri just said, there are so many regulations that touch on a lot of other systems that we'll sit with MEP, but obviously building fabric as well. In terms of the value of focusing capital in a particular place, for example, changing a gas boiler to a heat pump will have a significant impact on your carbon output and your energy savings.

[00:25:27] So as a client, they are considering all aspects of a building and the project. And as consultants, you have to consider all those things, because that is what the client is faced with. So taking a step back, they being the client, they can't spend all their capital on the lighting. It has to go to other aspects that are potentially going to give them a bigger reward in terms of not only their sustainable credentials, because that's key as well. And they are aiming for that. They really are. And if they can tick through BREAM and NABERS and SKA rating and achieve the highest they possibly can, it might not necessarily involve lighting.

[00:26:01] And actually if the lighting is already L E D, if they've already been through a process of converting existing luminaires, then they've already made a significant step from the previous into L E D. So the next step, and forgive me, because I'm not an engineer if the difference between going from a high quality L E D light fittings and lamps to a more sustainable ones in line with these latest regulations is costly, but actually isn't a massive jump in terms of carbon reduction or even consumption, then it does not feature as high up on the list.

[00:26:39] **John Bullock:** Arup has gone public on its sustainability manifesto in terms of the work it's doing. Does that mean that there are components that are now red flag? Could something appear on your desk, that's been done in house, but you look at that and you go: 'you can't do that...!'

[00:26:54] To be crude about it, somebody comes in and they've done a fluorescent lighting scheme. We know that's a crazy thing to do because where Fred's coming from is they say we don't put mercury into our lighting anymore, but you can still buy them. Red flags? Or is everything relative to a broader brief?

[00:27:10] **Paul Garbett:** There have been, Gauri mentioned it quite well, where you are given an existing site or building or campus or whatever that's quite substantial. To rip out all the boilers, for example, is expensive. Again, it comes down to money. If it didn't cost anything, of course everybody would just change everything. But certain institutes and businesses have a particular budget and they have to work with that as well. So there have

been instances where you have to do it in a phased manner. So some of the boilers get retained. They're used to take the peak load off a heat pump, for example. So it's still that fossil fuel, there's that compromise, but it's a phase process.

[00:27:47] **John Bullock:** Paul we're talking now about moving buildings on from 'this is what the building costs to run.... To what extent is your work actually looking at the way that lighting or whatever other power, the items that you are controlling are actually going to be used?' And I'm thinking about the LENI calculations that we have in part L that can actually say, 'if you do this, it will take this amount of energy, but if you do that, it's going to take twice as much energy'. Are you engaged with it on a design level?

[00:28:17] Paul Foulkes: So the problem with building regulations is they are a starting point. Where I come in, at controls, we are way beyond looking at building regulations. We're talking about the greater nuances. But it's certainly something that a level of control accounts for. We are assuming that they've got the decent light bulbs in, they've got the decent heat emitters in. We're talking about the further control element. And we're talking about making the absolute most of those control elements, whether it be heating, whether it be air conditioning or lighting control. It's certainly part of our remit.

[00:28:48] **Gauri Talathi-Lamb:** One of the key facts is business as usual for any one of us is not an option. Change starts here. Whether it be within our own organizations or advising our clients, not hesitating to question 'why are we doing this? could we do it better?' I guess that's always a starting point. And then to make it better for everyone not. Asking the client those questions right at the beginning can give you a better idea of what they're aiming to achieve and not waiting for the client to tell you, but you can take a proactive approach: 'Have you thought of this? Can I think of that? Can have you looked at this product because this will get you the opportunity of what you're looking for, but also a cost benefit, or a good supplier with great credentials. So it's just opening up and talking to the clients and they are looking for advice from all of us.

[00:29:39] So not having that hesitation in the background: 'will they use me again? if I give this more expensive option? Ask, they might say, no- it's fine! So I guess for me, opening the door and having those open conversations is important.

[00:29:52] **John Bullock:** I've always liked the idea that value engineering can actually increase the price of a project if the value is there!

[00:29:58] **Paul Garbett:** Value engineering has never been about cost cutting. That's a misconception that almost everybody has. Value engineering is exactly what you just said there, it's about establishing and determining and addressing what is value and value is subjective. It's different for every client and every professional that works on a project. It's about establishing what the value is in that particular instance, and then maximizing on the value. You can't fight it. So you have to work out what it is and go with it. I'm not an engineer, so I can't stipulate and nor, I'm afraid, can I take it away! If something has not been written down and defined, then, yes, there's the risk there. But I think for me, from a commercial perspective in supporting the engineers and this development, we, as QS's,

many people need to understand, how much these things cost and where is the key cost drivers? How can we help you sell that? We're not the baddies!

[00:30:44] We can be a massive support in this environment because you are going to get asked about money. It doesn't matter how wonderful the design is. You are going to get asked about money. And so if you can help us understand and you are flexible, we are flexible, then we can get it through to our clients and get it on the ground.

[00:30:58] Paul Foulkes: Three things that I've taken away and some that I want to bring forward as well. First, it's avoid the silos. Avoid the MEP services, the architects, the lighting designers, all operating in independently. We are, and I do mean literally in the same space, we will be operating and working physically in the same space, work together, integrate from the start. So from my point as an integrator, as a controls integrator, we should all be sitting around the table to begin with.

[00:31:25] That “planning team” is essential from the beginning. If we miss that then we are just throwing opportunity away. Because as Gauri said, it's 80, 90% of where your savings are and where your energy efficiencies are, it is at that planning stage. So everyone must be involved. So planning, avoid silos and integration.

[00:31:44] **Fred Bass:** Just like to point out that regulations should just be a baseline, right? So from regulation becomes is the minimum standard. For UN, we're talking about a rating system above that, where you can specify higher, like the energy label on domestic products. And as a specifier, you can say, 'I don't want baseline. I want energy level three, four', whatever. So regulation is not about setting a maximum it's a minimum, right? It's not about just lighting. I think Paul just said holistic approach. Absolutely vital. U4E, that's the energy division of United nations environment, they're talking about refrigeration, air conditioning and so on. All the electrical consumption in a building, it's not just one thing. Lighting should not be looked at alone and control should not just be looked at alone. It should be a combined effort and regulations need to follow that. Education is vital. And the environmental values need to be defined. So when you talk about value engineering, the value of what? The value of the minimum requirement defined by regulations, that's the value you're targeting. It shouldn't be the lowest possible thing. It should be a value for the minimum level that's required in every aspect of the building.

[00:32:55] So I would say regulation is not an enemy. It's a baseline above which you must achieve more and the environmental criteria should value the project. And it's not just about the cost of the project. It's about the environmental cost.

[00:33:12] **John Bullock:** Regulations have got just about the same positive rep as quantity surveying: that they always just seem to get in the way of people who want to do something else. But we are going to be obliged to take care and we are going to be obliged to do better. And by we, I mean all specifiers of all equipment in the whole construction environment. As Fred said, these are not maximum. These are minimum.

[00:33:37] It's like saying I want to design a building where I'm not gonna bring any doors or windows in it. I don't think so. Because it's a daft thing to try and do and we will reach a stage where daft things to do will include things that are not environmentally sound things to do because we have to move this thing forward as quickly as we can.

[00:33:58] Thank you all so much for your time today.