10 Environmental Design Myths

The show notes: www.houseplanninghelp.com/85

Intro: Sophie Pelsmakers, a doctoral researcher at University College London, has recently released the second edition of The Environmental Design Pocketbook. Although it's aimed primarily at architects and architecture students that doesn't mean that there's not a lot that we can all take from it.

So Sophie has put together a list of ten environmental design myths and we're going to explore those now.

I started my conversation by asking her to tell me a little bit more about herself.

Sofie: So I'm trained as an architect and I worked in practice for over 10 years and was also teaching at university and I just realised that people always have the same questions over and over again. I got pretty annoyed that we didn't have one source that had all the information in it so that I ended up writing the book with the idea that I could use in practice, use as a syllabus for students to say "go to that one and it'll tell you where else you have to find the information."

And so yeah, I'm just very passionate about contextual design. I couldn't design any other way. And it's all about minimising our impact on the planet and I just found that there's a lot of information out there that just tended to confuse a lot of people in practice and at universities and I just wanted to dispel some of the myths and give the information out that is useful to people in practice and when they're studying.

Ben: And you've given me 10 environmental design myths to look at today. I'm quite intrigued, because they're all very different. Let's just dive straight in - you can tell me all about this. But the first one you've put is "Climate change is in the future".

Sofie: Yes, I mean there is a notion that, and this is obviously a myth, climate change is already happening, there is a notion that we are always working towards "oh this might be happening in the future if we don't design better buildings today, if we don't actually cut our

energy use, if we don't actually at all the kind of industry levels cut our carbon emissions." And actually what's happening is that climate change is already here.

If you look at some of the data from the Met Office, from NASA, all the warmest years have all been in the last decade. The warmest summers have all been in the last decade. Again 2014 was considered the warmest year globally on record and of course last year we had mega floods in the UK so we are already witnessing some of these predictions that have been made 10 and 20 years ago about more extreme weather events, greater occurrence of hot summers, greater storms and for example and also these flood events are associated with it so this notion that we're designing for this distant future is actually really wrong.

We're already facing some of that and of course it's only going to increase either in intensity or in occurrence. I do think that makes a big difference to how we approach our clients or how we inform our clients and the public about what is happening, but also our own duty as designers. How do we make sure that buildings that we know will be standing by 2050/2080 still perform up to the standard that they were designed for and that they're fit for purpose? And I think that's a very interesting question academically but a very pertinent one from a social point of view and a cultural point of view. We need to have buildings that are safe to be occupied then and not to be demolished further down the line.

Ben: Unless they were designed to be demolished. Could that be another approach to it?

Sofie: I mean yes, there's quite a lot of work going on sort of design for deconstruction. So that means that if they need to be demolished that components can actually be reclaimed, recycled or reused again, but still none of that is ideal. Ideally we actually design buildings that either take into account the future change in climate or that can actually be adapted further along the line in the future.

And my view is that a lot of the issues that we need to do today for say for our climate in the UK which tends to be cold winters, we have to minimise heat loss from the building fabric. That those strategies that we need which is good insulation, super-insulation I would call it, good airtightness, they're the same strategies that you need to reduce overheating in summer. Now of course you then have to make sure that that is alongside solar design and solar shading.

I always get worked up when people say "it's well-insulated buildings that overheat", when ultimately it's not well-insulated, or insulation, that makes buildings overheat, it's a well-insulated building with bad solar design, where too much sun comes in in the summer and there's no solar shading opportunities. Now some of that can already be designed for today for particularly these sort of events that will occur more often in these hot summers, but also to allow for that to be added in the future.

Ben: Looking at these points on your list as well, are we saying that a lot of designers, architects, aren't really taking this in? For example, if we move onto the next one, "What if global warming is not as bad as predicted"?

Sofie: Well I'll take the first part. I do think that there is actually the good architects are taking this into account and are very aware of it and it's part of how they design. And I do think Bill Gething's book "Designing for a Changing Climate" I think it's called, is quite seminal in that. Because this TSB (Technology Strategy Board) project funded architects and engineers to look at how can you include some of this, how can you model some of that. And it sort of, you can use already existing models and data that we have and future climate data to actually see how the building might perform and it's sort of this robustness check if you like.

It doesn't mean that this is what will happen in reality, in the long term, but it does give you a good view of what does happen or might happen when this building is facing very different environmental conditions and that's actually very telling and I know that a lot of the good architects are doing some of that work behind the scenes.

Unfortunately clients are reluctant often to pay for that, because it is extra work, there should be extra fees involved in that, and so that there is an issue there. But I think we need to remind ourselves about this aspect of global warming. If it's not as bad as predicted, so if it is as bad, global warming, climate change as we think it is, then we might see fewer winter deaths from cold, but we probably will get greater summer deaths from overheating and stress on the human body and from buildings, living and working in buildings that are actually not fit for purpose in those conditions in the UK unless we adapt them.

So actually currently it seems that the offset in health issues from fewer issues in winter is not going to help us from summers so there are these issues that we're facing. Likewise, flooding will

cause billions of pounds in economic losses and buildings are flooded let alone personal losses and psychological impacts on people when that happens and then of course health impacts as well so we can't really put numbers on that.

And my take always is if we're wrong about climate change, if things aren't going to be as dire as predicted, I mean I'm hoping this is the case because currently we're not doing enough to avert it and we're not doing enough to adapt our buildings. But if that is the case then really what is the worst that can happen? Well, then we've actually designed buildings that are decent, good, perform, function in this climate and in any future. And we've basically made a better world and better buildings for everyone at any time, for no reason, but that's still a good outcome I would say, so I think there is no losses there from adapting buildings and designing good buildings with the future in mind, and in a way the worst case future in mind.

Ben: Let's move on to the third point. We've touched on this on a topic before, but you've put "Green roofs - are they green, right?"

Sofie: Well, there is a fashion at the moment whereby, and also a demand from client, whereby if a building looks green, for example it's got renewables on it, green roofs, green walls which is one of the other myths I've got in here, that it must be green, right? And my point is that actually it depends what kind of green roof and in which part of the country and how well shaded or protected or unshaded it is in that part of the country.

And so it comes back to this issue that one solution or one technique isn't necessarily suitable for all the situations in different regions in the UK or across Europe. And particularly with green roofs you've got extensive very thin roofs that you can't walk on where usually the sedum is imported from places like Germany. If it isn't you need to actually order the materials, the sedum, well in advance to get it locally, something like 18 months, so you can reduce its environmental impact, but there is an environmental impact associated with this because a lot of it is imported. And then if you place these thin roofs for example in the south east of England in one of these drought periods, you will just have the sedum die off. And then clients are not happy and people are starting to look at replacing them which is additional costs and again additional embodied energy from these plants that you basically were slowly killing by putting them in the wrong position.

So really it depends on what kind of green roof you put where. For example in the South East you're much better putting in deeper intensive roofs or biodiverse and brown roofs where local plants can grow and there's a thicker layer of soil so that it can absorb more water and hold more water in cases of drought. Of course you can still collect rainwater from these roofs and you can argue that in areas, drier areas of the UK that perhaps you don't want that to be retained at the roof but you want it to be going back into the geological cycle, so there's other issues there as well. So it's not as simple as it seems basically, and we need to be more careful about how we apply these systems across buildings.

Ben: Nothing is as simple as it seems! Are you linking these two together a bit because green walls is something that I've never looked at? I like the feel of it but tell us what's wrong. Is it just because we're talking about something that's vertical that really just shouldn't be vertical?

Sofie: Well you've got again different kinds of green walls and I do agree with you there's something really nice, particularly in built up areas, to have greenery that we can touch and we're close to. The problem with the green wall systems that are currently quite fashionable and are used a lot are vertical systems, or I should maybe say horizontal systems because they require the roots of the plants to grow horizontally, they get put into small pockets of woollen kind of fabric, and what we then have is that we have a massive amount of energy gets used to circulate water and nutrients around these plants to feed them. And this is pretty much 24/7.

Now a lot of these systems that I've looked at they've failed. They've failed because the system is either not maintained, so the plants don't get watered or don't get the nutrients they need, which then means the plants die, or they're in very exposed areas, along rivers for example in Paris. Some of the plants are also tropical, imported from thousands of miles away across the world, and so none of them are really suitable to grow in those conditions, which means we're then forever spending money and resources and energy to keep them alive and if they die to replace them. It just seems insane when we should just be growing plants from the ground up, along trellising or along buildings and this can also be done beautifully. It's just that we won't get an instant green wall. It will take time for these plants to grow up and find their way but it's a much more robust way of doing it.

Ben: It does seem that an overall theme of everything that we've got to do into the future is simplicity. It's about going back to how things were done and taking a simple approach, not something that's over complex.

Sofie: Yes I think there's definitely something about that that we're either trying to reinvent the wheel or we try to make everything very innovative and special when actually people may have tried certain things already 20 years ago then we've forgotten about it and then we're trying it now again and it doesn't work and I think there is a real danger in sustainable design that we're going towards the gimmicky. Which kind of brings us to the kind of next myth I think which is about micro-renewables such as micro wind turbines that they're not really appropriate to put onto buildings but often they make a building look green. "Look I'm stating how green I am, I care about the environment", but actually you could be doing, well you might be doing more damage than good. The BRE (Building Research Establishment) found that the energy that goes into making the turbine and getting it onto site could actually be greater than the energy you ever get from the wind turbine, particularly when you put them on buildings in urban areas where there's just not enough consistent wind to create sufficient energy. So it's those kind of issues that we have a lot of technologies, it's just how we apply it. We have to be incredibly careful about and steer away from bolt on measures and gimmicky kind of solutions.

Ben: And quite often the case, as I've seen a picture in the PDF that we're hoping to run alongside this, you have these buildings where actually they switch off the renewables because, I'm thinking of the turbine here, it's too noisy!

Sofie: Yes, I mean absolutely. There's obviously implications of this, we're not used to it, we don't know necessarily the effects, so millions of pounds are spent on renewables in and around buildings and then there's these unintended consequences which we're finding a lot of. And this is one example whereby basically wind turbines catch the sun, they flicker, they make some kind of noise, we're not used to that, so people complain and they're switched off and then of course at that point we've spent millions and have completely no renewable energy anyway so there's all sorts of, it's quite complex. But I think if we step back to the basics which is sort of what you were saying earlier on, then I think actually we don't make our lives as complex as they need to be.

Ben: The next one that you've got on your list is "Greywater and rainwater harvesting - Is it always environmentally sound?" is the question you pose.

Sofie: Well again that's the issue, isn't it? If you want to just be concerned about water and saving water then of course installing greywater and rainwater harvesting systems will do exactly that for you. But then depending on the kind of system that you use, you could end up actually saving very little water for a great energy cost. To give you an example, if you've got a large building, quite complex, several units for example housing units or offices, and you collect water, for example from the roof, you probably will need to store it below ground or in the basement and then you need energy to pump this back up for other purposes.

Often rainwater gets used for toilet flushing, and I would argue that rainwater is of too high quality to just flush toilets with. Ideally you'd wash clothes with it or you'd use it for irrigation of landscape for example, and similar issues of course also with greywater recycling, so where we catch water from basins and baths and showers and we basically clean it. That can be done, is often done, chemically and then the water needs to be pumped around again to provide the water for flushing of toilets. Now that's a good use of already used water to flush toilets because the quality isn't as great, but the problem with it is you need dual pipework in all of these systems because if you have not enough rainwater or greywater you need another supply still which is the mains, which means the embodied energy massively increases in these systems. A lot of it is steel, plastic pipework so it does mean that actually the embodied energy is quite high in these systems and on top of that you also have some kind of chemical cleaning component.

So ideally the way we would do greywater and rainwater harvesting would effectively be very localised, and using gravity fed systems. So you just collect stuff, leave it in the roof and then by gravity it just can get used. And also what we call short retention recycling, so that the cleaning doesn't have to happen by mechanically, but small amounts of water can stay for example in a system and immediately get reused so there is no need to worry as much about bacteria and other build-ups in that water.

But a lot of people don't know this. They think "we've got a greywater recycling system we're providing a green system" when actually yes we're saving some water but at great environmental, particularly embodied energy and embodied carbon cost when we do so. So yes, there are definite issues.

And the other thing which brings me to the kind of seventh myth is that we also think when we apply eco-measures that we'll always save money, that we'll reduce bills, but of course for example if you've got systems like greywater recycling systems you actually spend more energy pumping the water around, cleaning the water, feeding that water back, than actually just using the mains water, so your bills would increase in that case.

Ben: I've got a question here because this is the issue isn't it, so many people want to do the right thing and I find this even in the podcast that you can interview one person and they'll say one thing and you can interview someone else and they'll contradict what you've already heard. So how, as the person wanting to do the right thing, can we make sure that we get as close to that as possible? Who do we trust?!

Sofie: You've got to get my book! [Sofie laughs.] No, that's a terrible plug! No, I think you're absolutely right. Of course also our field moves so fast, so sometimes for example we try one thing in a building and almost a building on its own is if you like a prototype. We're not like manufacturing of cars whereby thousands are produced, the first ones are all tested and they go through this rigorous process. If you like each building is almost its own prototype and we actually suffer then from these unintended consequences.

Ben: Yes but a lot of these new buildings are terrible, at least with cars they're driving things forwards, but we know a lot of buildings are just put up so that they can be sold for money.

Sofie: Yes and I do think that we're not ambitious enough from a legislation point of view. From the government as well, I think they can do a lot more to drive some of that innovation and these requirements but unfortunately there's a very strong lobby whereby industry is saying we're not ready, this is going to cost too much money, we won't be able to then build the housing that we need to which we're not doing anyway. And it means that a lot of the proposals are then watered down.

Also, researchwise there's been a huge gap in research between pretty much the 80s and late 90s up until maybe 5 years ago. So for 20 years there was almost no research going into how buildings really perform, what are the best solutions, so a lot of what we're doing now somebody's already looked at some time ago at an older system and then we're finding out today that actually solutions aren't quite what we thought they were.

And I think the other thing is, and this was mentioned in the February CIBSE journal as well, that there are real issues, a knowledge gap if you like, between getting the information off academia and practices who do this work, out into the broader industry. There is a real issue whereby we somehow aren't able to get this out to the bigger domain so that everybody's aware of these findings and can build on those, rather than make the same mistakes again. I do think that the Passivhaus Trust, the Good Homes Alliance, they're very good at for example sharing a lot of that work and that research across the wider public and I think there's a lot of good stuff happening there. But we need to do a lot more of this and at all sorts of different levels of technology too, material use and detailing. And I completely agree with you, too much mediocre stuff is built and we're still not quite sure what is right or not and again one thing could be right in one situation and not in another, so it could be that everyone's right or everybody's wrong, but it makes it quite complex from that point of view.

Ben: Number 8 is "Does a zero-energy building mean its environmental impact is zero?"

Sofie: Well very quickly no, because currently zero-energy building means we're just looking at the energy used in the building. And for example with the current definition of a zero-carbon building in the UK, you'd actually, and we're still waiting for confirmation of exactly what it will entail, but you'd actually have to build at such low density levels, less than the average of England at about 30 dwellings per hectare, that this means that you can no longer support public transport efficiently. It will just be too expensive to run trains and buses because the population density is too low. Schools will be located further away, shops etc, which effectively means that everybody will be commuting by car. So even if you live in a zero-energy building if then you end up having to commute by car and using fossil fuels to do that your impact would be quite significant actually.

Just briefly on the previous point about eco-measures and energy savings, there's another thing as well about unintended consequences which is basically that we think measures would save energy but actually in a lot of cases people might behave differently, particularly for refurbishment of buildings for example. It's what we call take-back, so there are issues there as well on that point.

But yes, on the zero-energy building I think it's a shame that we're not looking at it more holistically and that this is so difficult to provide energy from renewables on site and that as soon as you have to look at that you're looking at building a lot less dense or you're looking at technologies that are also limiting, such as bio-mass boilers for example.

Ben: I know I'm rushing you through these but it's okay, there's the book! Number 9 is "If I have clean renewable energy it doesn't matter how much I use".

Sofie: Yeah, I think this is a common myth actually. A lot of researchers particularly will say this, related to the existing housing stock. So we've got about 27 million buildings in the UK. They're built to pretty appalling standards, often because a lot of them are very old so energy then wasn't an issue, and they're still standing and still going to be standing by 2050 so a lot of people then say "well we shouldn't worry about upgrading these and reducing their energy use because we just have to decarbonise the grid and then it doesn't matter how much energy they use". Now that's actually really wrong. Basically if we have high energy demand from buildings it means that we need a substantial array to decarbonise the grid. So we need a huge number of renewables. This not only costs more but we should also not forget that a lot of the renewables are made out of steel and out of finite resources that the greater the array of renewables that we need, the greater the embodied energy of making these renewables is. And it also means that if renewables stop working you actually are back to energy leaking and energy demanding building and it doesn't provide thermal comfort to the occupants. And if for example on-site renewables fail and the resident cannot afford to replace the renewables for example or have them fixed, then the resident wouldn't be able to keep warm. So there is some real issues there.

So first, the first renewable to consider is always energy efficiency before you start looking at renewables who can then provide the remainder, because we simply don't have the resources and the amount of money or space to put this vast array of renewables to meet our current energy demand in buildings.

Ben: Finally, and I like this one, because it says "Retrofit of existing buildings equals unneeded and boring." Dispelling this myth that retrofit is boring I think it's anything if boring!

Sofie: Well it depends doesn't it? I think it's boring from the point of view of a lot of architects.

Ben: Really?

Sofie: Yes, I think a lot of architects like building new buildings because their name is more directly associated with it. [Ben laughs.] But of course when you have a retrofit of a building it means you're retrofitting a building somebody else designed.

It's also very complex and complicated so it actually feels a lot of the time quite unrewarding for the architect because it feels like they're tinkering at the edges and can't do substantial interventions because of the expense but also because of the existing structure and all of the other limitations of retrofit.

As I previously said there is about 27 million existing buildings in the UK built to a very bad standard and it's absolutely fundamental that these are upgraded because without doing that we have no chance of meeting any of our carbon budgets by 2050. Also, fuel poverty is a big issue and thermal comfort of people living in these buildings. So it's absolutely fundamental that we do so it's definitely needed, and I would argue I don't think it's boring. I think actually it brings the architect back to some of the base principles that we often forget which is airtightness, thermal bridging, insulation details, where exactly does the window sit in the frame, how do we deal with working for example, with residents who might remain in situ when the works happen? And I think we kind of need to get back to some of that knowledge again that we've long forgotten and so I think it's definitely not boring but I think a lot of people think of it that way.

Ben: Well Sofie, I want to thank you for going through these environmental design myths and blowing them out of the water, but I suppose I really want to know why you have done all of this? Why you've put the book together and what you hope might come from sharing all this knowledge and investigating a few of these different issues?

Sofie: Well aside from the fact that it's actually really good fun doing research in this area and it keeps myself up to date, the real reason is actually to make a change. Architects and self-builders don't have the time to read 30 books and try and wade through all of these arguments. So what I try to do is distil everything in one single source and then from there it has loads of pointers to other sources, so that if you know the self-builder or architect wanted to have more detailed information they can go directly to that primary source. But it really is to make a change to make sure that we as

architects can spend more time designing and making good architecture that's fundamentally sustainable, rather than spending our time trying to figure out what is sustainable or what isn't effectively.

Ben: This list that you put together, obviously the book going into a lot more detail . . . My question now is about the clients or people like me wanting to build an energy-efficient home. What advice would you have for us?

Sofie: Well firstly I would say that there's still a lot of information that's very relevant in my publication, but I would really say that you're in a way the ideal client. If you're wanting to design something environmentally sound you're the ideal client for many practices and I think if you inform yourself you will be able to find the right architect but also you will also be able to ask uncomfortable questions about, have you actually or can you model what/how my house will perform, because I would like to grow old in it? And so that when you're aware of these things you can actually ask these questions and really become part of that process and have a very interesting process and own your own dwelling I guess, and your own house that way and also make sure that all of the things that are in there are actually what you want and that the trade-offs you make are the trade-offs that you want to make so that you take some of that control back, if that makes sense.

Ben: Sofie, thank you very much.

Sofie: Thank you and good luck with the rest of the project.