HOUSE PLANNING HELP

Episode 261

Reducing construction waste and reusing materials – with Duncan Baker-Brown

The show notes: www.houseplanninghelp.com/261

Duncan: I'm a practicing architect, have been for nearly thirty years, and for twenty five of those thirty years I've had my own practice called BBM Sustainable Design. So we're architects that focus on environmentally friendly solutions to architectural challenges.

In addition to that, because in a way that's been quite cutting edge, we've researched and taught around those issues as well. I teach at the University of Brighton in the School of Architecture and Design. I run research projects and I've got a life practice as well. So we use the research to inform our practice and vice versa.

Ben: Today we'd like to focus very much on waste and reuse. Where does this topic begin really? What's a logical beginning?

Duncan: Well, for me it begins in the fact that we're trying to reduce the amount of stuff we use in the construction industry when we're making things. And why am I interested in that? It's not just to save money, to reduce the amount of things you have to buy at the end of the day, but it's also from the environmental angle. So deforestation and destruction of the natural world to facilitate the mining of raw materials. And the construction industry pretty much consumes fifty percent of the annual materials that are mined and deforested etc around the world. So we are a huge consumer of raw materials, so if we can reduce the amount we consume, we can help the environment.

Ben: How much longer can we go on mining? Let's just pretend there weren't any issues, it seems like we're going crazy at the moment at a time when everything should be going the other way, we say 'I tell you what, do some more!'

Duncan: Yeah, we're in a really scary time at the moment. We've got a lot of neo-liberal, populist leaders at the moment showing off about how quickly they can chop down the Amazon rainforest for example.

However, soon after President Trump announced that the USA wouldn't be part of the Paris Climate Change Agreement, you've got California which is now the fifth largest economy in the world, and New York State forming an alliance to do otherwise and commit to being net carbon zero by 2040.

I think it is quite interesting times. You've got a lot of positivity as well as the negative stuff going on.

It feels to me like a lot of national governments and leaders are ignoring the climate emergency, but at the same time a lot of city states, I'd say and regions, are doing the opposite. So I think for me the hope is with the city states and regions just getting on with it, because they're the people suffering from the effects of the climate emergency at the moment.

And in the world of constructing things we've got problems of resource security, whether that's because of environmental problems or war zones or whatever. Materials are more and more difficult to get hold of, so if you're in a situation where you can reduce the amount of stuff you need for a construction project, you're going to be in a beneficial situation.

I'm looking at lots of real projects across Europe and some in the UK where people are using second hand materials from old buildings to create new buildings, and this is quite inspiring for me.

Ben: Now this is the idea of almost a circular economy isn't it, where you go from cradle to cradle? How easy is it? I know from my own experience just thinking ahead of how I might have done that on my own project, it just gives me another headache on top of all the new things that we're learning!

Duncan: Well it is difficult I think to start these things up, but I think a lot of large corporate businesses are seeing the value in this. And I think until you've got larger organisations and local government legislation and supply chains assisting, it's very difficult for individual builders to embrace a circular economy. Just to define what I think that is, that's in a world where there's one area's waste is what you might call the food or the valuable resource for another area. So there's no such thing as waste, it's just stuff in the wrong place. That's the sort of phrase I've come up with.

Now again, with one-off houses, between ten and fifteen percent of all the materials and stuff that arrive on stuff get thrown away. So you're talking about the demolition waste on a typical project as

well as the new materials arriving on site. So basically for every six or seven houses we build in the UK, one house worth of stuff at the moment goes to landfill or incineration.

In the UK at the moment every year we buy 600 million tonnes of stuff. That's not just in the construction industry, that's just as UK citizens. And 200 million tonnes of stuff is thrown away every year. 120 million tonnes is from the construction industry, so sixty percent of everything thrown away every year is because of the construction industry, so we've obviously got to do something. And we need to do it at a sort of national / regional local level.

Now, for the self builder, if you're in control of your building site, you're project managing it, I think that's in a way more straight forward, because in a way you're deciding what's coming onto the site and how that stuff is managed.

But typically, since the 1960s and 70s, it's been cheaper to throw material resources at a building site to keep it busy, rather than for example on a Friday morning running out of plaster and having your plasterers hanging around on site and having to pay them.

So this is traditionally why we always over-order. We're really keen if you're ordering tiles, carpet, whatever it is, you're always putting an extra 10 percent for wastage. And that's cumulative. You end up with this ten to fifteen percent of everything arriving on site being thrown away. That's what we've got to avoid.

So some of it in a way is quite straight forward. Order the material you need, plan your projects better so there's a tighter schedule so you're not hanging around waiting for stuff, and really value the stuff that's arriving on site. It's all precious, you've paid for it.

I mean at the moment we say that developers are hard-nosed, but at the moment with the industry, we've been able to convince developers to buy fifteen percent more materials than they need just to throw away. Fifteen percent might be quite a good margin to get on a development in terms of profit. At one level it's quite strange that it's such a difficult sell to say don't create waste on site, when you're just throwing away the money you've invested in a project.

Ben: Yeah, when you say it like that it makes a lot of sense, but I suppose they're thinking, money, I know a lot of developers don't really even care about that final product, so it's about finish it, get on with the next one. And there's been no consequence has there,

for waste? So the explanation that you've just given is very much about almost how you shop well, full stop isn't it? Would that be a way of saying it?

Duncan: Yeah, it is. It's about shopping in a sort of smart way. We talk at BBM about doing a sort of resource map for a project, so understand where your project's sited, where the actual site of the project is, and then we literally using Google Earth, we sort of do a radius from that site of one to ten, twenty kilometres, and we look at resources nearby. Whether that's a factory producing stuff, or a woodland that's managed for timber, or whatever, and look at plugging in to local resources.

And some of that with, in a way our more radical projects, there could be a building site being deconstructed where we can get material off that construction site. So we're already doing it with real projects for one-off houses and such like. But it takes a different mentality and sensibility. And the big deal is the time to educate yourselves around the potentials of a circular economy to provide a better product at the end of the day, and have this amazing double whammy of being able to be beneficial to the environment as well.

Ben: If you're trying to be slightly clever and source closer to home, is it ever at the cost of performance?

Duncan: Well, you want to make sure that it's not! In 2014 we completed the Brighton Waste House, and that's made out of, it's not a house but it's the size of a house and it's a house that performs to Passivhaus standards. 90 percent of it is material that other people threw away, and it only took a year on site which is from our experience at BBM, about the time that a one-off house does take.

And to add to that it was students building it. They were managed by experienced adults as it were, but it was built by students.

So we got a high performing built project in the middle of Brighton and it's 90 percent of it's material other people threw away or overlooked and were going to throw away. I've got experience to say it can be done. You have to use your time in a different way, looking for material and then there are real issues around insurance and guarantee of using second hand materials, so I think you really do need to be an experienced architect or building contractor to understand the potentials for using second hand material at the moment, because at the moment we don't have the legislation or the networks to support everybody doing it easily.

So if you're doing a self build project now, I would say just look at reducing waste to zero on site. That's the best thing to do. So don't throw away the materials that are arriving on site. Use techniques like pre-fabrication, whether it's Structurally Insulated Panels, or whatever, look at pre-fabrication.

Avoid what we call the wet trades on site whenever possible. So as soon as you're mixing stuff with water on site, that's where you start to create a lot of waste. So often a skip is full of lots of different materials that are loose, until the Friday afternoon where the plasterer or the bricklayer or the person pouring concrete pours the waste concrete all over the other loose materials in the skip and suddenly you've got this homogenous lump which there's no way you can re-use any of that. But until that point, say on the Thursday afternoon, it would have been material that could have been reused. Indeed when we were doing the Waste House, we were actually getting material out of skips to use.

So it's all perfectly doable, but like I said, the message for self builders is to reduce the waste on site.

Ben: So, take SIPs that you mentioned in there. I mean how does that have a second life after it's finished?

Duncan: That's a really good question. I think if something arrives flat-packed on the back of a lorry onto your site and then you in effect screw it together, then one day it can be unscrewed. That's my point and this is why pre-fabricated panels are I think really useful.

At the end of the day, however individual we want our houses and buildings to look, a lot of them are built on various modules. And for you to take it to the scale of offices, floor plates, the sort of size of floor plates that are being built at the moment to house offices are pretty standard at the end of the day.

So why am I saying this? Because one day those buildings could be deconstructed and reconstructed for other projects and they'll probably be the right sort of dimensions for reuse. If you're building your house out of a pre-fabricated system, it's bolted together at the end of the day so one day it can be unbolted and reused.

Ben: The circular economy, let's just focus on this for a second. Is this just part of the process or can you describe what it is?

Duncan: Well for me the circular economy is a sort of re-brand of sustainable design. Because it's got the economy word in it, but it's to do with this idea of being able to design things for perpetual reuse.

So at the moment we build things and in the worst case when you're constructing buildings in financial districts around the world, they might only have a business plan of twenty, twenty five years. So currently at the end of the building's twenty five year life, you can imagine the buildings that go up and down in the City of London, after twenty five years they're looking a bit tired. And so successful financiers will want those buildings stripped and thrown away. Stripped down or demolished and a new flagship tower showing off how prestigious the business is, built.

Now I know of the ABN AMRO Bank, which is a national bank in Amsterdam, they've just built something called their Circle Pavilion, which was an eighteen million pound circle pavilion, and that is a building that is a material store for the future. It's designed so it can be deconstructed in twenty, thirty, forty years time, and the bank has seen that as an investment. So at the end of that building's life, instead of being a financial deficit where it's just something that you need to pay for to be demolished, it's actually a pile of materials and systems and components that can be sold off to other people, or reused for other projects.

So it makes financial sense at the end of a building's life that you can deconstruct it, because then you've got the material assets to sell or to reuse, therefore you'll save money, instead of sending it to landfill or whatever which is the old fashioned way of doing things.

So it makes financial sense, a circular economy, and I think for a lot of people they're intrigued by it, literally because it's got the economy word in it.

For me it's this idea of in a future circular economy there'll be these two spheres – the biosphere and the techsphere. And the biosphere is everything that is made out of natural materials and ultimately those natural materials can be designed to be remade again and again and again, but one day they'll become compost for the natural world. Timber will rot in the ground and become compost.

The other sphere is the techsphere, so that's all the technological gadgets that we've got: smartphones etc. And obviously they're not something that's going to decompose, so these are the things

where we've really got to work on how to design them so they can be deconstructed and reused again.

What's interesting, just a couple of little facts, is that at the moment we have the technology to reuse and recycle ninety five percent of our smartphones. We just choose not to. And another nice statistic, which goes back to this idea of mining the anthroposcene, re-working what's out there already. You can get more gold out of a tonne of smartphones than you can get out of a tonne of the best gold ore from mines. So why send people underground in those dreadful conditions to mine more ore, gold ore, when actually all those rare minerals and composite materials, including gold, that are in our smartphones that are thrown away every year, just collect those and get the rare metals out of those.

Ben: So how is landfill management changing, or how has it changed? Because if I understand you correctly there, what you're saying is actually there's a lot of gold that's just going straight into landfill?

Duncan: Well actually there's a lot of gold that's just going to India and the Ghana and places in Africa that you've got children and other people just trying to tug out of the old smartphones in a very informal, environmentally unfriendly way.

What I am actually saying is another thing about the circular economy is this idea of corporate responsibility. So for example, if you make something, if you're a manufacturer of a car or a phone or whatever it is, you have the responsibility of taking back the thing at the end of its first generation of use. So that's something that needs to happen.

Ben: That's good isn't it. That really puts the onus back on them.

Duncan: Yeah. Because at the moment it's the responsibility of the end user to informally or formally get rid of the product.

Ben: That would be good for developer houses wouldn't it! "You get it back at the end!"

Duncan: Exactly, but that's this idea of buildings as material banks, because if they were designed as material banks they'd want them at the end of their life because they'd be an asset. So at the moment they're just seen as something that it's a three, four year plan where they buy land, build something and get rid of it and have no responsibility over it, apart from a little bit of liability for six years or whatever.

So there are people out there, and this is especially it's getting leverage and traction in Europe, especially in the Netherlands, where people are looking at the idea of leasing facades on buildings. And the idea that you would lease the materials of a building, so the supplier of the materials, in effect, would lease them to you.

At the moment you can lease light fittings from Philips and they call it their lease-lux scheme. So the owners of the buildings don't own the light fittings, Philips do. What the owners have is a lease agreement with Philips, that guarantees the level of lux, the sort of brightness of a room, and it's up to Philips for ten or fifteen years to provide that correct level of light.

Now what's that all about? Why is that a benefit to anybody?

Well to Philips they've got these lease agreements for quite a long time which is good, but what it does for the end user is make sure Philips probably supply you with their best, most robust light fitting, because they don't want to be coming to your building every six months to change a lightbulb. But also, at the end of that light fitting's life, Philips take the light fitting back. They want the resources to make new light fittings.

So what will eventually happen, and is already happening, is that Philips will design light fittings that are easy to dismantle, easy to take apart so they can recycle some of it and reuse other components. And from a design point of view, and that's whether you're designing a light fitting or a phone or a building, it needs a different way of designing. You need to think about it differently, because you're thinking about how to take apart the thing that you're assembling as you're designing it.

Ben: It makes sense for them, and you've talked about the financial benefit because they're leasing it, it's their own material, why are more people not going down that route? What is stopping them? Is it just they're not innovating enough?

Duncan: Well, it's just a really interesting time at the moment, because I wrote a book called The Re-Use Atlas, subtitled The Designer's Guide Towards a Circular Economy, two years ago, and it had about thirty five case studies of different products and buildings, all as examples of going down this circular economy route.

So I was interested in people who were actually doing it, and not just talking about it. And there were examples of buildings in the UK that did this, but a lot of it is happening in the Netherlands. And what my point was actually, that since that book was published two years ago, there are so many more amazing projects doing just this.

So there's a project in Denmark called Resource Rows, which is I think about a seventy unit housing scheme. Because it's in Denmark they're all leased. Nobody's owning them. This building is clad in brickwork from old buildings, so these are 1960s buildings where the mortar joints of the brickwork are cement based so they're stronger than the bricks. Traditionally if you had to demolish or deconstruct a 1960s brick building, you can't reclaim the bricks. You just get rubble. If you're looking at a 19th century or 18th century building, because they've got lime based mortar you can re-use the individual bricks really easily. So what the Lendager Group do, that's the name of the people that have done this building, they literally got a diamond headed angle grinder and they cut these one metre by one metre square panels out of the building that was going to be demolished, and then they re-use those panels which stick together as square panels of bricks and stay together because the mortar is so strong, and put them on the new building.

Ben: Wow.

Duncan: And this is quite a big building! And there are other ones. I've got colleagues at the moment in Brussels who are deconstructing the part of the Brussels World Trade Centre. Big buildings that no one has ever liked them, they're just a financial proposition built twenty years ago. They're out of fashion now so the owners want them to be rebuilt. These guys called RotorDC, standing for deconstruction, they're in there carefully dismantling the building and they're selling the components.

Ben: Let's say there is something on our site then that for one reason or another has to go. Now this might just happen automatically via our contractor or whatever, but how can we make sure that gets used again or as much as possible? Is there a way?

Duncan: Well there is a way but, yeah, there is a way. If you're talking about re-using stuff on site instead of throwing it away, if you've got the normal time constraints, ie you're in a rush and every day matters, and the building site is live, I think it's very difficult to do that.

But there are networks out there that will accept second hand material in the UK. So Freecycle is one, and Freegle is my preferred one. And Freegle were the organisation we used when we were building the Waste House.

So there are emerging networks out there and I think there'll be others coming on board really soon, because we are suddenly in a quite a different environment from the beginning of the year. Our parliament has declared a climate emergency and okay we've got the Brexit distraction at the moment, but actually there's a lot of people out there who are thinking right, we've got to respond to this.

And the way the construction industry can do this is by reducing its consumption of stuff. So I think that we're going to have an update in building regulations, British Standards etc that will demand and facilitate the re-use of stuff.

So for example, at BBM, we're specialists in this, we've got a project on that's about to go on site, where the original house unfortunately burnt down. It's at the top of a hill, there's a sort of lane to it, it's really difficult from the point of view of access, so we've had really large quotations for taking the burnt bricks, because it was a brick and timber house, taking the burnt bricks off site. And it's actually easier if we just crunch up the bricks on site and make new tiles out of those bricks, which is what we're going to do.

So in that case, because of the particular situation it is more advantageous to recycle the damaged material on site rather than take it off site. But I have noticed on larger projects that a lot of demolition companies are sort of rebranding themselves deconstruction companies.

Ben: That's what I was wondering, if that sort of service existed. So yeah, starting to.

Duncan: It's happening, yeah. So for example, there's a large development in Brighton of new student housing etc etc, big development. It's called Preston Barracks and I think over ninety five percent of the material that was on that site is still on that site. It has been recycled. And by coincidence there was a Victorian barracks building that was deconstructed quite slowly and the tiles off that building we used on a project of our own at BBM. We didn't even know it was the Preston Barracks' tiles, but we were doing an extension on a listed building and they needed second hand tiles,

and they got them from Preston Barracks. So that was really interesting, the site I was watching being deconstructed actually supplied material to one of our new build projects.

So it is happening, and WRAP which is the government organisation, waste and recycling organisation, has sort of rebranded themselves as experts around the circular economy, which they are. They'll say that twenty percent of the construction industry is already circular.

So there are already networks and systems out there for reusing materials, and for example large contractors, really large ones, the sort of Wilmott Dixons and Robert McAlpines of this world, they will be swapping materials internally. So they will have large sites and it's so easy to have surplus materials on big sites. You could easily have two hundred sheets of plasterboard or whatever that you don't want, and traditionally it would have been easier to throw them away. But actually because of their internal networks now, I know that Murphys are doing it as well, they're swapping surplus materials amongst their own sites.

And I think it's only a matter of time, literally a couple of years, before these large contractors will start swapping with each other. If you imagine in the City of London where there's a tower going up and another one going down, those two sites just need to talk to each other.

Ben: Can you tell us in a little bit more detail about the Waste House, and whether if you were doing it today it would be identical, or whether anything would have changed?

Duncan: Yeah, a lot would have changed. I think the Waste House was designed as a concept in 2011 / 2012, and initially it was going to be the rebuild of something called The House that Kevin Built that I did on Channel 4 over ten years ago.

And The House that Kevin Built was a prefabricated house that was built in six days using, whenever possible, just organic, replenishable materials, so straw, wood, reeds, hemp, everything was organic. The issue behind that is organic stuff when it grows locks carbon and also there was a big rush to burn logs and stuff, log burning stoves that people were thinking that was a green thing to do, which we all know it isn't now because of air pollution, and also the amount of carbon in our air.

So what we were doing is promoting the fact that these organic materials can be sophisticated, prefabricated etc. And we did that and we were going to, it was only assembled for two days and then deconstructed. It was zero waste on site, but the idea was to rebuild it at the University of Brighton where I teach, and that didn't happen. It went off to the University of Bath. So we had a site for the house but we didn't have the house.

So then we had the opportunity to look at something else and it was then that we looked at trying to build something out of what was in 2012, for every five houses that we were building you got one house worth of landfill, or waste going to landfill or incineration. The amount of waste we make in the construction industry is actually reduced by about thirty percent in the last ten years which is good.

So we then thought why don't we just prove that we can build a high performing sort of passive house out of this material that normally goes to landfill and incineration.

So we did that, and one of the big deals was that we were using it as a learning exercise, a teaching tool for students. So we had one or two adults with lots of experience plus lots of students.

And that was good, but while we were developing the design and on site, we partnered Freegle UK, who are this online swapping of unwanted stuff agency, and they have nearly three million subscribers. And Cat Fletcher who is one of the founders of Freegle UK, she said why don't we raise awareness of the stuff that we throw away on a day to day basis, so not just in the construction industry but in our everyday lives.

And so that ended up being just a cut to the chase awareness raiser of plastic bags that we throw away, toothbrushes, all the nasty plastic stuff that everybody is very well aware of now. So what happened with the Waste House is it changed from being a project that proved construction waste was valuable, to a project that became more of a polemic and a thought-provoker.

So for example, we designed the house so it's like a container for these waste products. So we used all these plastic waste products as low grade insulation and we got these sort of what we call cassettes which look like wardrobes that form the walls, and in these walls we've got things link four thousand VHS videos, from the 80s and 90s. Things that you've forgotten about but that are still there. Most plastic ever produced is still with us, we've just forgotten where it is, or turning a blind eye to it. So this is before

Blue Planet II with David Attenborough and the greater awareness of plastic in our oceans etc.

So the Waste House became this sort of polemic and thought provoker. It's not a house, it's a teaching studio on campus at the University of Brighton. We have schools coming to use it, it's open to whoever wants to use it, and we use it ourselves. So it's basically this vessel holding lots of products that have been designed without an end of life strategy.

So we have a lot of design students and architecture students at The University of Brighton so they can come to the Waste House and see things. Like we've got twenty five thousand toothbrushes that we collected in only four days from Gatwick airport, so we got these toothbrushes that were being cleaned out of airliners as they landed at Gatwick airport. In only four days we got twenty five thousand toothbrushes. All of them never used. So from our point of view these are daft products with no end of life strategy. The Waste House at the moment is a thought provoker.

Your question was, would I do it the same again. No I wouldn't. If I did it again I would do the resource map for construction and other materials to make a building that is a material store for the future that can be dismantled for the future. The Waste House can be doing that, but I'm not saying we should be building our houses out of toothbrushes and things like that, because at the end of the day, plastic is toxic waste. So even though weirdly the DNA of the Waste House is treated timber plus plastic, which is what a lot of houses are made of, I'm not a big fan of plastic in our buildings. I'm certainly not saying that's what we should do.

What I would like to do is a project where maybe we find a building that is unwanted, and we deconstruct it and then reconstruct it with new owners, new use, new site. And the architectural challenge, apart from the deconstruction and reconstruction, would be how to tweak the building so it accommodates the new criteria – our new standards for insulation and energy production and that sort of stuff. So that's the project I would like to do next.

Ben: Well it's fantastic to hear that you're still thinking of new projects, and you seem to pop up everywhere at the moment. You're obviously doing a good PR circuit.

Duncan: Yeah, well a lot of people are wanting to understand what to do, because so many local authorities, NHS trusts, like I said, not our

government but our parliament declared a climate emergency, so it's all very well to do that but what do you do next?

So my real message is if you want to benefit the environment, is to reduce the consumption of stuff in your everyday lives, as well as if you're in the world of construction with the materials that are arriving on site and going off site as well.

I'm trying to communicate a really clear message because a lot of people are going to be crunching carbon numbers etc and trying to be carbon neutral and all that sort of stuff. And I just think that's really difficult I think to understand how to really do it, and I think it's a lot more straightforward just to say carbon is one of the things that we've got to reduce, but we've really got to reduce the amount of water we use, the amount of energy we use and the amount of materials and components that we use when we're designing, building, inhabiting, maintaining, and ultimately deconstructing the built environment that we live and work and play in.

Ben: Duncan, thank you very much.

Duncan: Thank you. Nice to speak to you.