Transcript of ‘The Wonders of Sand!’

Season 1, Episode 14, Transforming Tomorrow

[Theme music]

Paul: Hello, and welcome to this special bonus episode of Transforming Tomorrow, the podcast from the Pentland Centre for sustainability in Business here at Lancaster University Management School.

I'm Paul Turner.

Jan: And I'm Professor Jan Bebbington.

Paul: We're joined once again today by Dr Jean-Baptiste Jouffray, JB, from Stanford over in California, and we're going to talk to him Jan, what are we talking to him about?

Jan: Sand.

Paul: Sand!

[Theme music]

Paul: We didn't want to remove sand from our, you know, discussions entirely, but we'd run out of time last time. So, we're going to have a special episode now just talking to you about sand. JB, just do that, just talk to me about sand!

Jean-Baptiste: Oh, careful what you wish for Paul [laughs] this, this could become a very long bonus episode. Now, sand, what's to say about it? Well it's everywhere. Look around you. You have sand everywhere in the room you're sitting now.

Without sand there would be no electronics. There would be no glass. There would be no concrete. In fact, if you go out of the room where you're sitting there would be no building. There would be no asphalt, there would be no roads, there would be no offshore wind, there would be pretty much nothing.

And I think that's all I can tell you about sand. It's everywhere. It's a fundamental resource of the modern society. We are literally built on sand, and we're extracting it at a rate that, of course, is much faster than the natural replenishment rate.

So you, you have issues of scarcity, local scarcity of sand. 'Are we running out of sand?' is a headline you can come across quite frequently, and increasingly frequently on the news. Um but beyond local scarcity issue, sand extraction of course also has a lot of social and ecological impacts, and I think that's, that's a lot of the work I'm looking into now is, is trying to understand that.

Paul: I hadn't realised sand was so commonplace. I know it's in the glass, that it, you know, you know, helping us to be able to see outside - it's pitch-black outside, I'm not seeing very much at the minute, but you know if it wasn't pitch-black outside at the moment I would be able to see something.

And, you know, that's where the glass is a [inaudible] sand. But then you mentioned so many other things there, JB. What, where, what is sand being used for? What are some of the things that people might not realise sand is being used for, because, yeah, I could understand in building, concrete, cement, I can understand in windows, but what other things is it that, that sand is being used for?

Jean-Baptiste: So, the biggest use, of course, is concrete, right? So you, you, there is no concrete without sand. And then if it's enough to look around you once (laughs) you will have light again to understand that concrete is everywhere around us, and not just like, you know, big dams that actually block rivers and so on and, and trap sand ironically, um behind those but, but any kind of buildings out there.

So it's used a lot in construction. It's used a lot in, in land reclamation as well, manufacturing land. If you you've seen those incred, incredible satellite imagery of the Palm Island for instance in Dubai, well this is sand. Funny enough that, part of that sand had to be imported from Australia, because they ran out of sand resources in, in Dubai.

And you cannot use desert sand for most of those application, because desert sand has a wind-weathered shape, because it's been rolled by wind for so long. Which means that the grain are really well spherical, and they don't bind together. And if they don't bind together you do not use them for concrete, where you definitely want them to bind together.

So instead you have to use sand from land quarries, or crushed rocks. You have to use sand from rivers, which comes with a lot of detrimental environmental impact and social impact, so you're dredging rivers and, and lakes. And

increasingly you're turning towards the ocean as well, because there are a lot of sand there, and it is, uh you can use it.

It's also a lot of salty sand. So in cases you have to use a lot of fresh water to take away the salt from the sand before you put it into your concrete, otherwise in reinforced concrete if you add sand and salt it doesn't end well. So you have a lot of those dynamics going on.

Um, this is construction. But then you're going to have minerals and metals that are find in those sands, uh including heavy mineral sands, what's called heavy mineral sands, where you're going to have very specific, um minerals, with weird names like zircon, for instance, that you may have heard of which we're using in a lot of high-tech electronics, including renewable energy.

You're going to have titanium, that requires sand, you're going to have silicon sand like for silicon chips, so you need some very specific type of sand for silicon chips. Rare earth is another example of things that you find in sand, or specialty silicas that are used in various application.

So a long list of application with sand. Very different use, very different type of sands and their derivatives that are used in pretty much everything we do.

Paul: I, I was just about to say it seems like there, there doesn't sound like there's anything in the world that doesn't involve sand, now that I've heard this.

Jan, I can't believe that sand is everywhere.

Jan: It is, and I think this is one of the real clever, um approaches of JB, but also part of his brilliance, is to notice things that are everywhere that no one else notices. And then to start unpicking the relationships, and the, particularly the business relationships that that around the mobilisation of, of that resource.

Paul: What's your work then with, with sand JB? What research are you doing and how might it affect how sand is used, and how it's treated?

Jean-Baptiste: Yeah, so for me, it almost started as a hobby or as a fascination. So I, I watched a documentary many years ago that was called 'Sand Wars' by Denis Delestrac. And it was a fantastic documentary, which I would recommend to, to your listeners, if they have the opportunity, that really laid out some of the challenges and description that I just mentioned to you.

And this was back in 2013 already, so it's been known for, for a while. At the time though the scientific literature on it was, was none, [laughs] was non-existent. There was not a single paper on those challenges, on those systemic challenges.

Now, over the past five years, there has been a rapid search in academic publication on the topic, which is really encouraging because it means different teams across the world working on it from different angles, and we're going back to the, the value of multiple disciplines looking at it.

For me, the awakening moment was watching that documentary, and at the time I was doing my masters studies and about to start my PhD in, in sustainability science, with that very strong social ecological lens ingrained that we discussed earlier.

And realising, well here is a resource that I, I had never even imagined the challenges that could, you know, apply to it. And through which the social ecological lens makes so much sense. So looking at sense from a social ecological perspective, I thought, [laughs] was the most interesting thing I could do.

Um, except that I wasn't supposed to do that,, neither for my master nor for my PhD so I had to wait a little bit and, and it's only recently over the past few years that we managed to get fundings and, and the ball rolling on applying some of those questions.

And so I look at it very much from that angle. Trying to, like from a system thinking perspective, where is the sand coming from? Who's mining sand, how much, where, for what purposes? Who's financing for, for that sand extraction?

And in particular I look at it in the ocean, of course. [laughs] Because that's where my heart belongs, and it's also where academically there's a bit more of a of a gap in knowledge. There's been more studies coming out on sand lately but, but not so much when it comes to ocean sand.

Paul: Is sand sustainable? Does sand replenish after a while? Is it like a fossil fuel, that once it's gone, it's gone? Is it like, something like trees, say, that we can replant and regrow trees? Can we artificially generate sand, or encourage sand to grow, I don't know if you'd say grow, or develop, or multiply…

Jan: …emerge, emerge…

Paul: …emerge, yes. I'm assuming that there isn't some kind of reproduction process here, that sand isn't alive and reproducing. But how do we get more sand?

Jean-Baptiste: Huh, that's an excellent question! And, and of course sand is a renewable resource at geological times. So very similar to fossil fuels. If you look at geologically, you know, it's the, it's the process of erosion. Like start from the top of that mountain, that piece of rocks ends up a grain of sand, and and it, it goes over and over and ove.

The problem is we're not operating at geological time, [laughs] otherwise we would know it by now, um and so of course at human scale sand is absolutely not renewable. Um, and so the answer to your question is no there's no way of, of making sand or of planting sand out there and waiting it to grow and, and harvest it. It doesn't work like that.

Now there are different type of sands and, and mostly there are different alternatives to sand, so the question is more how can we replace sand? Not how can we grow or manufacture more sand, but how can we replace sand with components that act like sand, behave like sand, sound like sand but are not sand?

And, and I think that's more of an engineering research, and I certainly do not have the, the answer there. But there are many different initiatives ongoing trying to find alternatives like, you know, can we recycle glass? Yes, we should.

Can we recycle concrete? Very difficultly. Once it's been bonded together you're losing kind of that primary material.

Paul: If not recycled, could you repurpose concrete to be used as something else, as a different type of sand product in in somewhere else? So it might not be suitable for making as concrete, but it could be used somewhere else where sand would have been used otherwise?

Jean-Baptiste: That's right. And, and I think there you need to create economic incentives for that. And, and what we're seeing right now is there much higher economic incentives for building from scratch, rather than even refurbishing.

So we're taking for granted a kind of an infinite sand supply, because indeed globally, I mean we're nowhere close from running out of sand as, as some of the headlines might imply, right.

The scarcity issue is locally. You're going to have local scarcity of sand out of over-exploitation. But globally, there's no such scarcity. The problem is not just the scarcity, but the consequences of dredging that sand. Is sand sustainable? Well, that very much depends how you're extracting it. And you can intuitively think of a many, many different things that are going to go wrong as you start mining sand, and, and transport it across the world.

Paul: A final question for me about sand is, I don't let my kids play with it because it makes a right mess around the house. Kinetic sand. Is that uh, you talked about you know artificial or substitute substances from natural sand. Is kinetic sand actual sand, or is kinetic sand something that people have made…?

Jan: …what on Earth is kinetic sand?

Paul: It's sand that children play with that kind of sticks together. I can tell, actually I'm the only one here who seems to know what kinetic sand is. It's like a toy that children have, and it comes in all bright different colours, and it's called sand but it doesn't necessarily feel like it. But it's meant to be a less messy version of sand. So that children play with it, they can mould it into shapes, you know, you can have it, but at the end of the day you haven't got a house full of sand. Yeah, I'm looking at…

Jean-Baptiste: …so we need, we need a grownup version of that. Whatever it is Paul you're talking about [Jan laughs] we need a, the description you just gave, we need a grownup version of that applied to modern society.

Jan: Well our listeners can, can know it started here.

Paul: But I don't know if it's actual sand or artificial, or what! I have no idea…

Jan: …well, you can go home and read the packaging.

Paul: No, no, we don't allow it in our house. We had it once. It still creates a mess, and it's still a right pain in the backside. I'm quite happy not to have kinetic sand, it just suddenly came to me, 'cause I thought, oh you talked about artificial alternatives, maybe that's what kinetic sand is.

Maybe it's not, maybe they've just taken all of the bad bits as far as they're concerned out of sand, it still makes a mess. It, it doesn't do what it says on the tin.

Jan: But I think that's a nice, uh hook for some listeners to come and tell us what, what is in kinetic sand, if there's any out there. The other hook I noticed, and we've had a query from somebody asking us to tell them a bit more about rare earth, and rare earth metals, and that's come up again today as well. So there might be a bonus…

Paul: …a bonus bonus…

Jan: …a bonus bonus, in the future…

Paul: …we're not going down that rabbit hole. We're not having a bonus to the bonus episode. Maybe, maybe another week. Do, do we know someone who knows about rare earth metals?

Jan: I'm trying to meet someone.

Paul: You're trying to meet someone. [Jan laughs] Is there a dating app for people who are interested in rare earth metals?

Jan: Unlikely. [laughs]

Paul: I, I thought so. Yeah, it's not, not the kind of thing you're going to put on your Tinder profile to get lots of people to, I'm going to say swipe right, but maybe it's swipe left, I don't know, I don't have one.

[Theme music fades in]

Paul: There's a road we weren't expecting to go down. [smothered chuckles from Jan and Paul] JB, thank you very much for swiping right…

Jean-Baptiste: …thank you so much…

Paul: …and agreeing to be on our podcast.

Jan: I agree. Lovely to see you, and um keep in touch.

Paul: Yeah, and we'll be back with a normal episode, as normal as these episodes ever get, of Transforming Tomorrow next week ,which will be with Georgiana Allison from Lancaster University talking all about the sustainability efforts of Lancaster. Until then, I'm Paul Turner.

Jan: And I'm Professor Jan Bebbington.

[Theme music]