>> Welcome to the podcast series of Raising the Bar Sydney. Raising the Bar in 2019 saw 21 University of Sydney academics take their research out of the lecture theatre and into bars across Sydney, all on one night. In this podcast, you'll hear Jacqueline Thomas's talk, Seeking Sustainability One Flush At A Time. Enjoy the talk.

[Applause]

>> So good evening, everyone. I love this space. I wish all my lectures could be like this. Imagine, beer and chaps. I actually think people would absorb more. So it's with great pleasure tonight that I'm here to speak to you. It fills my heart that everyone got excited about the value of human waste. I know we had some other titles in there, but really that's what I'm here to impart or share with you. I just hopped off a flight from Tanzania in East Africa. So I'm in that sweet zone between not fatigued and not yet jet-lagged. So let's see how it goes. So I was in Fiji recently where I have a project. And I went to the bathroom, and I pay a lot of attention to toilets. And as I was there I looked up and there was this lovely sign in black and white with a little smiley toilet picture at the bottom and it said, "Keep me clean, treat me well. What I see I'll never tell."

[Laughter]

So who else has seen a toilet sign like that somewhere in the world? Yes? Yeah, there's a few. But I'll never tell. You know, that end part. Basically, what happens in here is our little secret and it's going to get washed away somewhere and we never have to think about it. And this is very common amongst many different cultures. Hands up, who's, you know, perhaps been at a friend's place for dinner and you've gone and used the toilet and you've left something floating. It's devastating, isn't it? You're like, "Oh God, go away." You know, multiple flushings, the system doesn't fill quickly enough. You try to wash your hands twice to fill the time. But this is very common amongst many different cultures, is that human waste is something that, you know, we want to get rid of. It makes perfect sense biologically, doesn't it? You don't want to be around it. It's full of pathogens, it smells. You know, it doesn't look the greatest. But that is causing our society problems as we're now, what, 7.7 billion people. And that's really what I want to talk about, is that we need to think about it. You know? I'll never tell. We need to actually think about what happens to our waste once we flush the toilet. We can't ignore it anymore. And this talk I'll really go through and explain why that is. But it's not going to be a talk focussed on just Australian culture. I am Australian, but I live and work, or have lived and worked all over the world. So experiences in India tell me that in India "I'll never tell" translates to not having toilets. And as a woman, when there's not toilet, you have to openly defecate, you know, at night generally because it's not culturally acceptable to be seen to do it during the day. So that has massive implications. In cultures such as Fiji, "I'll never tell," basically what happens to this waste once the toilet flushes translates to open soak away pits where human waste often contaminates groundwater and results in epidemic

typhoid fever. In places like Tanzania where I just came from just recently, that "I'll never tell," I don't want to think about what happens to this waste means that action is not taken until that latrine or septic tank is full and overflowing. And perhaps it's overflowing into your house or down the street or where the kids are playing. And only then do suddenly people think, do I have the time or the money to deal with this problem? And so that's really where I want to come at, is that we need to think about it. And it's not just a developing country problem. It's, you know, right across the spectrum. But first, sort of my background, so you can have some understanding of my perspective, my first degree is in microbiology. And after finishing my microbiology degree, I was very interested in how can I use this in something more useful? You know, what can I do with this? And I really looked at that stage of the water crisis. The water crisis is very visible. Everyone's very aware of what a shortage is. People need clean water, all those type of things. But what gets forgotten is the only reason why the water's not clean is because someone's toilet is leaking into it, normally, or people are openly defecating in it, all those things. So the cycle's a little bit upside down. So I started working in the water sector. I did a PhD in environmental engineering. I'm a bit of a hybrid engineer-scientist. And at that point we really started to explore the water crisis. And when I say crisis, you know, shortages, contamination. And when I first went to Africa in – so I lived and worked in Africa in about 2012. I went bright-eyed, bushy-tailed like every other initial expat that goes to do work in sometimes other countries, especially developing countries. And I was very focussed on water. Right, let's test the water. Let's make sure there's no e coli in the water. We'll do bores and we'll test drinking water and those type of things. And it didn't take me very long to realise that even if we gave – and we've done a lot of research that shows this – even if we gave people the best clean water at a drinking point, often it's not piped into the home. You can't have these big distribution networks that we enjoy in places like Sydney with clean water that we can drink from the tap at any time of day. That water was then transported back to people's homes and every single time, no matter if it was a more wealthy household or a less wealthy household, that transport and storage component of them bringing water home meant it was contaminated. We recently did a study across three regions in Tanzania that was part of a large World Health Organisation project around how do we adapt water to fit with climate change? Because everyone's really focussed around what type of water sources do we need? Do we need more de-sal plants? Do we need more groundwater? Do we need more surface water catch? What do we need? And our research really showed us, it doesn't matter what source water you give someone – it can be the cleanest source water there is, but if we don't deal with the hygiene aspect, if we don't deal with what happens when the water comes home – because if we come back to my narrative about I'll never tell what happens in my toilet, that translates to lack of hand-washing, lack of hygiene in terms of perhaps the floor of the latrine. Which means that there's a lot of pathogens in the environment that are present that get contaminated through hands and feet and buckets and dipping and dogs and everything else. That comes back to that stored water in the household.

And so the risk of diseases is still there and still present. Anyway, so that's basically how I got to this journey, and I really realised that it doesn't really matter about the clean water while it's still being contaminated. And there's so many different paths to contamination, as I mentioned. Hands and floors and you know, just dirty buckets, dirty cups. But then also flies, flies that come to latrine and pick or you know, actually feed on your business. I'm going to start saying faeces now. Be prepared. Feed on your faeces, and then fly to your plate, which is one of the largest – a large contributing factor to cholera outbreaks and the like. So you know, this pathway for disease transmission is present, but the open defecation is particularly problematic because coming into contact with other people's faeces is really going to open you up for disease, especially if you're perhaps a small child who's you know, barely able to walk and crawling. Yeah? Everyone's good? Who's got kids here? Who's got toddlers? Yeah, they get into everything. But you know, kids get into everything. And in a country like developing countries, that everything will mean the faeces that might be openly defecated in the communities. Or being washed into the rivers where the kids are potentially playing. So you can see this avenue, the disease really being present. So some statistics, because I couldn't be an academic without a few statistics. This will be short but sweet. So sustainable development goal six is about clean water and sanitation and it's changed a little bit I'm thinking from the Millennium Development Goals. The Millennium Development Goals really did a good job of mobilising both governments and donors and these types. Sorry, I've got a little cold. Probably. Be careful. I was probably on something on the flight. It's not Ebola. They ask you that in the airport already. I don't have a fever. You'll be okay. So anyway, so NDG's did a really good job mobilising the development community around water and sanitation. But what happened is that everyone realised that water was easy. So I've got one of those annoying tickles now that's making me cry. So I'm not crying about sanitation. We should be. So what happened is the development community went, "Water is easy. You know, we can hit goals really quickly with water." And so you saw coverage jump from about 40% of people having access to a clean, safe water source to hitting around 78-80% globally. Which was really good statistics. So often from the Millennium Development Goals the statistics were the targets. The different countries were pretty much universally achieved in water supply. In sanitation was a different issue. Sanitation's complicated. It's more difficult. Quite frequently it costs more to build toilets. And we've got this "I'll never tell" factor about it. You go to a village and say, "What do you want: clean water or toilets?" They'll be like, "Clean water." We don't really want to deal with the toilet part right now. Or the toilet part is quite individual and proceed to be more difficult. And so then what happened though is that – so global access to what we call basic sanitation was at about 23%. I need deeper pockets or a clip. At about 23%. And then it jumps to about 45. But universally, the targets were not met. I've got it. So universally the targets were not met. And what that meant is everyone kind of realised – they're like, "Oh God, the sanitation thing is difficult." Targets were not met by like 50%. So targets to have people have access to basic sanitation. Basic sanitation for

most of developing countries just looks like a toilet that has a washable floor, a door and some type of superstructure, a little, you know, coverage around it. Because what we try to achieve with basic sanitation is that we want to remove people from the human waste. We want people not to come into contact with faeces. So in many countries, and just in terms of anywhere else, just working, they have pit latrines with an earthen floor. It's literally a hole dug in the ground, logs put across, earth on top. And what happens is obviously when people cone and do their business, you get faeces quite freely on the floor. And a lot of people are in bare feet or flip-flops and so you come into contact. And that's definitely a large transmission route for things like worms and other types of bacteria. So basic sanitation was about latrine upgrading. Let's just kind of make sure everyone has a concrete or a plastic or some type of floor that's washable. And you know, that it's private and – yeah, that was pretty much it. Which seemed quite simple, but it was not achieved. And then what also happened is that because we did such a good job of making more water available, water supply increased significantly, especially in – when talk about communities in developing countries, I'm talking about both rural and urban. But urban really around informal settlements. And so what happened is that, you know, in a lot of these areas your shower and your toilet is one. So who's ever been to an Asian country where that's the case? Yeah, you've got the shower hanging over often a squat plate, those type of things. And initially it's quite like, "Oh God, how do I manage this without stepping in things and whatever else?" But what happened is that because there's more water available which is great for hygiene, but suddenly we had more water going into these toilets. And where did that go? You know? There was more. What did that mean? And that meant that latrines are filling up faster. And you've got different types of communities, you know, flushers versus wipers. Is everyone with me on that? Should I do a quiz? No. I would say most people in this audience would wipe, toilet paper, yeah? We're a culture that uses toilet paper. But many other cultures around the world, especially sort of Muslim cultures use water. I'm a bit mixed to be honest. I've taken students to India and it's been hilarious trying to teach them about the washing versus wiping dilemma. I took a bunch of students to India and we stayed on a rural farm. And they actually said, the household said, "You can't use paper. You just can't. It's going to block the system. We've only got a very small pipe that goes into the tank. You can't use it." You should have seen the panic. And the panic on my students' faces. They're like, "Ahh! No paper?" We're like, "No paper." We even had to take tissue off them. You could see them sneaking their little tissues in their pocket as they went to the toilet. I'm like, "Are you taking tissue to the toilet?" They're like, "No." But it was a really big thing, like we have – there was like a dozen students. We were guests in this family's home. If we clogged up their toilet, we weren't going to leave a good legacy. So we actually had to have a little tutorial, which was quite funny. Because we realised with some of the staff, some of the academics and also some of the local staff who were with us, and we all started talking about how we did it – it was all so different. Oh my goodness! One of the guys said, "Well, what you actually do is you take off all

of your pants and just hang them on the door."

[Laughter]

And your shoes. No, not your shoes, but like keep your flip-flops on, keep your socks off. And then you walk in and you, you know, wash and you use your hand and whatever else. And we're like, "Wow, okay. A bit different." But there is as a skill. There's a skill. There's a skill to like the pouring or the spraying or whatever else. Can't say I've necessarily mastered it, but you know, it does feel fresher if you get it right. Otherwise you just end up with water everywhere. Anyway.

[Laughter]

But anyway, but this is why we're laughing. This is like business in the toilet, it seems to be so private. And so we can't talk about it, but we probably need to and we need to understand this. Because washing versus wiping has huge implications for how you treat that waste. You know, if everyone's washing, then there's a lot more water in the system. If people are wiping, there's a lot more toilet paper and other things, potentially. So some stats. So I sort of mentioned what's happened between the Millennium Development Goals and the Sustainable Development Goals. So where we're at now is it's no longer just about basic sanitation. So last statistics from the United Nations 2017 are that only 63% of the world's 7.7 billion people have access to basic sanitation. Huh? Only 63%. That's not a huge amount, really. That leaves billions of people without access to a basic latrine. There are 701 million people who don't have a latrine at all and openly defecate.

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>> So what happens with Sustainable Development Goals is we say, "Okay, we need to think a little bit more about this toilet thing. It can't just be the clean floor and, you know, those type of things. It actually needs to think about, where's all that waste going? Where is it actually going? Is it going straight into the ground? Remember, lots of places in the world extract groundwater from open bores or wells. And quite frequently the proximity of the toilet and the well is about two steps away. And it depends a little bit on soil type and depth and those type of things. But there is a large degree of contamination of people's drinking water from their latrines, which leads to things like cholera outbreaks. Because obviously cholera – you know, once some people get sick and they're defecating and their faeces is there and their faeces is leaking into the water, and then that's when you get outbreaks. Because suddenly you've got billions of these vibrio cholerae, the bacteria that cause that disease, present in the water system. And then as people get sick, they need to drink more water but they're drinking the contaminated water. And it's just – you know, it's pretty devastating. So now we're actually at the point where we're like,"Okay, we need to think about what's happening to this stuff at the end." We can't just keep putting it into the ground or forgetting about it or flushing it out to sea like we do here in Sydney. You know, we need to thinks more about it. What's

actually happening? And so now what they've got is a new category which is safely managed. Is the sanitation safely managed? And when we say sanitation, it's the toilet, but it's also where is that treatment system? Who here has a septic tank or been on a farm with a septic tank? Yeah, or a pit latrine and one of those composting latrines in a national park? Yeah. So you guys have an idea when I talk about on-site sanitation. Those systems are called on-site. The waste is contained on-site and there's some type of treatment that happens on-site. In Sydney, most of us get to flush away because we're on sewer system. We're on a centralised system and we can flush away and not think about where it goes to. So who here has visited a wastewater treatment plant in their life? Oh my God, so many people. It doesn't actually – that's like more than normal but it probably makes sense that you're at this talk.

[Laughter]

But you go and visit a sewage treatment plant in Sydney, oh my God, the stuff that they get in there. Whew, there is so much. Just recently the – what is it? There's been a case in the federal court where the water utilities backed by the Australian Commission for Consumer Protection have taken on people like Clark-Kimberly that produce Kleenex. Because they were producing these flushable wipes. Huh. So these things, flushable wipes, are not flushable. But the policies and the guidelines have not kind of caught up with where this industry's at. And so they actually lost the federal court case because they kind of ruled that, you know, there isn't actually – by what's currently written in standards, Kimberly-Clark and these flushable wipes were made to those standards. But the standards are not adequate. So currently in Sydney alone, Sydney Water estimates they spend $8 million a year pulling flushable wipes out of sewer systems. Flushable wipes are responsible for three quarters of all blockages. Has anyone ever been in a suburb that's had a blockage before? Yeah? You smell it and something gets closed down. It's not great. But that's the industry we live in. Because to go back to my little yellow sign in Fiji, I'll never tell. Nobody cares what happens when you flush the button. Ah? It's funny, I used to take students to Malabar Sewage Treatment Plant, and they were mortified at the screening stage, so just the initial stage of treatment, screening. Cotton buds and condoms do not go down the toilet, people. Just don't do it. But how many people have done that? Come on, come on. Let's be honest, who's flushed something down the toilet that maybe they kind of knew wasn't there? You're lying. You're all lying. I know you're lying.

[Laughter]

It's not true, ladies. Tampons always kind of go plop sometimes. You're like, "Oh, should I fish it out?" You're like, "No, just let it go."

[Laughter]

Come on. I thought I'd break some barriers here. You're meant to do this with me. Now I just sound like the crazy lady at the front. But that's the culture we live in, yeah? That's like – I get it. Okay. It's early. Anyway, so wastewater

treatment systems in centralised systems spend a huge amount of money and time trying to screen all this stuff out. So it's a lot of waste, effort and energy, and most of it will just go to landfill anyway. So don't bother sending it through the sewage system to get to the garbage dump, because it's just going to get there anyway with a lot more time and effort involved. And plus the garbage dumps are a disaster anyway, but that's a whole other issue. We won't get into solid waste. There's not enough time tonight. So anyway, so what does that look like in a developing country? So in a developing country where quite frequently there isn't normal waste collection services, it's very normal for the pit latrine to also become the rubbish dump. Because in developing countries, waste collection is ad-hoc. Ad-hoc's the wrong word. People really have to pay for their service. So for example, in Dar es Salaam where we do some work, people pay for their service – it's by volume. So you have to actually pay. And when you're living on less than a dollar a day, you know, that can be the difference between whether you're going to eat today or not if you're paying for your bucket of waste to be collected. And so yeah, the obvious option is it goes in the river or it goes in the toilet and that can be a big problem. And the interesting thing is part of my work, is actually kind of digging out pit latrines. I have to admit, a lot of fun. But I'll be honest, I'm probably not brave enough to do it myself. And so we pay people who are more qualified than I am to dig them out. But they're like little. Like a little bit of history frozen in time. So we were in a rural village called Singale which is about 400 kilometres east of Dar es Salaam in Tanzania. Actually hands up, who's been to Tanzania? Anyone? Oh, there's a few, yeah. So most people go to Tanzania and they go to the national parks and see some great animals. They stopped killing all the elephants. But yeah, so rural villages. And these villages, really they grow corn and rice and they're pretty simple. Interestingly enough, they have a very vegetarian diets which means that the sludge is quite green. Because they actually eat a vegetable there called cassava that's very green. All right, so part of our work is to extract these latrines because we need to know how to treat it. How big is it? What's the chemical composition of this sludge? There's lots of things going on, and so we paid a household to dig out their latrine. They thought we were crazy. They were like, "What? You're going to pay us to dig that out?" We're like, "Yes." And we're going to dig it out half a metre at a time and we're going to take samples all the way through. The village turned up to watch. They're like, "What are these crazy white people doing digging out our toilet? Are you joking?" But interestingly enough, as we dig down, because we really need to understand – we need to understand, you know, is this waste stabilising at the bottom? Because there's been some estimates and we're now starting to talk about this safely managed sanitation. We need to start thinking about what's happening to the stuff at the bottom? Is there actual – are the pathogens still present? You know, the ones that can make us sick. Is it breaking down? What's the chemical composition? You know, what's the solids? How thick is it? Can we pump it out? Can we dig it out? It actually gets quite technical. But what we realised – it was quite fun actually. As we're digging down we hit this layer of like it's different. There's

like diapers in there, like plastic diapers which is unusual for a village. There's condoms. There's lots of stuff. So we dig down – because the whole depth is about 3.5 metres. It's about 1.5 metres in. And the village, because they're all watching, they turn up and they're like, "Oh, that was so-and-so's wedding."

[Laughter]

That was the wedding. And we're like, "Yeah, it's probably about one and a half, two years ago." They're like, "Yeah, that's definitely the wedding." And they're all having like – didn't everyone have a great wedding? There's condoms and diapers and other bits, plastic plates and all sorts of stuff in there you wouldn't find. So it just sort of shows, you know, how it's quite a, you know, deposit of human activity.

[Laughter]

That's true. So now we're at the point – so 2007 statistics for safely managed sanitation. So now this isn't just, does your toilet floor kind of – is it washable? But is the stuff, is the pit or septic or soak away or sewer – where is all this stuff going? Is it safe? Is it not contaminating the environment? Is it actually being treated properly? Because many treatment plants around the world, especially in developing countries, don't work properly. You know, stuff just gets bypassed, gets flushed through. Many latrines, they're not lined. It just leaks out into ground water and into rivers, you know, contaminates the environment. And so what they've found now – our current stats is that only 45% of the global sanitation is considered safely managed. That's a bit scary. So now we've got over half the population worldwide that is defecating or excreting their faeces into what they think is safe or perhaps it is not. It's not safe at all. And Australia, we're not much better. So Australia current statistics are only 74% of people are actually – that their sanitation is safely managed. Many of those areas are perhaps small towns where the plants are not working as well as they should. That perhaps septic tanks that are not working as well as they should are being desludged. Those are the main areas. So I guess what I want to emphasise is this is not just a developing country problem. Obviously in developing countries it's a massive issue. So unsafely managed sanitation results in a large burden of disease. It results in, you know, environmental contamination. And the disease is a real burden because the disease often has, you know, flow-on effects to economic productivity. Because when someone's sick, normally it's the lady in the household who has to spend time looking after the children. And you know, it leads to huge outbreaks. 2014-2015 all across Tanzania they had a massive cholera outbreak because all this unsafe faeces was sitting around like a bomb basically. Like it's all there and it only takes that spike in the bacteria or whichever, maybe a virus or whatever else. But whatever the pathogen is, that spike, and then suddenly everybody's exposed. And they were a bit lucky because the mortality rate on that outbreak was low. They got a little bit less virulent version of the bacteria or type of that particular strain. But it can be devastating. And that's the problem. So interesting enough with that cholera outbreak it was partly linked to climate

change. So we have La Nina/El Nino, so the warming in the Pacific Ocean. And what they find is that there's certain conditions that encourage the growth of bacteria. They got a particularly strong El Nino effect that year which means it's just a little bit warmer or a little bit wetter, and suddenly you get those bacteria. Those that are going to make us sick grow a little bit more. And then boom, outbreaks. Actually, the World Health Organisation predicted. They said, "We're going to have a strong climate effect these next couple of years. You have very poor sanitation still. You're going to have an outbreak." And they did have an outbreak. And as that climate's changing, we're still trying to estimate how it's going to change. But all the models show that these will become warm a lot less. Bacteria like warm places and as other places get drier, there will be less water for people to do hand hygiene and washing and those type of things. So you know, scarily enough, only two-thirds of primary schools worldwide have basic water and sanitation, which is really scary. So like as a young girls going to school, especially as you start to menstruate, you're not going to go to school if you can't manage that, if there's no water, if there's no toilet. So you stay home. And once you start staying home, then you know, it's difficult to catch up. So I think I've told you a lot about sanitation, but there's some real challenges here. And I'm sort of mentioning, you know, the human examples. And I touched on India a little bit earlier with open defecation. I've sort of spoken in big numbers and big statistics. But the individual human experience of this can be really devastating. So in India, again we were working with our students there. We went to a farm. And I just needed to use the toilet. I'm like, "Oh, is there a toilet?" And they all laughed. "What is she talking about?" There's no toilet? And they're like, "No, no, no." And then I was quickly ushered away by someone we were working with and they go, "Don't ask about that here." I'm like, "Okay." So we're definitely in the "I'll never tell" space. That's fine. But then we started talking to one of the ladies who was translating with one of the ladies. Because often this is quite gender-sensitive, so you need ladies to talk to ladies about this stuff. And they were really kind of explaining to me how tough life was, how they managed this challenge of they could only go to the toilet at night under the cover of darkness in those trees over there. That's it. That was the only time they could go to the toilet. So what happens if you need to go to the toilet in the middle of the day? They said, "Oh, we don't." I said, "But what happens if you need to just do a wee?" And they said, "Oh, we don't drink water. So we restrict our fluid intake during the day so that we don't have to go to the toilet during the day." Now everyone here is probably like trying to drink two litres of water a day because we know it's good for us. Imagine working in the hot sun, normally covered up and you can't go to the toilet. So that has some real implications. So then people cut their water consumption during the day which leads to more urinary tract infections and other health complications and kidney diseases and around we go. And then they can only go to the toilet at night. They said, "Oh, but we need to go at a certain time together because if we go by ourselves, there's a risk that you know, someone might be there who wants – mainly men might take advantage of us." So yeah, so not having appropriate sanitation can really

expose women and girls to sexual violence and those type of things which is a massive issue. In Fiji, the project we're working on – so typhoid – who's been to Fiji? Yes? Who's been to Suva in Fiji? Oh, great. Yeah, that other side. So that's the more – it's the eastern side. It's kind of the business capital, those type of places. It doesn't look anything like the nice resorts in Denarau, I'll tell you that. So there in the villages people, they don't – how they deal with their containment is they use like an old water drum and they put their waste – well, their excreta goes in there. The problem is they don't contain the excreta, they don't contain the faeces. And then kind of what the people – they sort of know, but not realise, is that just down from there is a great place to grow taro which is a root crop. Who's eaten taro? Yeah, it's a bit – it kind of gives you that kind of tingly feeling. Not one of my favourites, but it's a great staple. And so there's a direct link between people growing their taro in what is the effluent for their toilets. But they don't really kind of realise it and it leads to cholera. Sorry, it leads to typhoid in Fiji's case. And they have quite endemic levels of typhoid. And especially when there's typhoons or cyclones come through, it can really cause problems. So I think – and I've already spoken about Australia and our, you know, flushables. We're not flushing. We're not flushing anything anymore, aren't we? Three P's, that's it: poo, pee and paper. That's the only thing that goes in the toilet. But we need to start thinking about this, because there's so much value in actual human waste. The agricultural sector at the moment is having a little bit of a – you know, there's going to be a crisis coming up where they don't have enough of the macronutrients needed to grow our food. Carbon, nitrogen, phosphates, calcium, potassium, real basic things. And guess what our faeces is full of? All those things, especially faeces from well-fed westerners who eat a lot of meat. So you know, there's a real need to start thinking about how do we take value from this? In Australia there is a biosolids industry. There are – we do use some of our biosolids and it goes back into sort of, you know, more crops which you don't directly eat and those type of things. So it is there. But it's a very – I would say we don't use all of them and the industry still has a lot of space to grow. There's also a component we can recycle water from our drinking water treatment plants. Does anyone know – in Sydney there's a couple of sites that do that. They take the wastewater treatment and they recycle it and it comes back in and you can use it in your gardens and your lawns and those type of things. Which was kind of initiatives that we really saw in the 2000's when we had this ten-year drought. But now we don't have the drought anymore and we have that de-sal plant that we're not using. We've got plenty of water. So now that's kind of come off the policy radar. It's not as encouraged. But there's so much value. So think of this, we can get nutrients from this human waste that we're happily disposing. There's so many pluses. We're going to stop contaminating the environment. We're going to stop these disease pathways. And we're also going to help create and feed back into the food industry. There's a few steps to go in this process, but there are many researchers around the world who are actively working on it. And part of the barriers to making these steps is around the stuff about the yuck factor of all my food was grown on human poo. Hmm? There's obviously, you

know, there's research and stuff that supports that it's been properly treated and those things. But I think we as all consumers and especially in developed countries that have the resources, we really need to start looking into this future and actually making the effort to start thinking about, "Yes, I would say yes to that if my product was grown on a biological fertiliser. I would say yes to that." I'm not going to be that person that writes into the newspapers and claims that I've got some weird skin infection because, you know, I might have showered with recycled water once. There's a purpose that we need to think and we need to as consumers grow a little bit. Because where I'd really like to get to is I don't want to see this sign above our toilet anymore saying, you know, "Keep me clean, treat me well, what I see I'll never tell." I don't want to see that anymore. What I'd love to see is, "Keep me clean, treat me well, what I see has value and needs to be used well." So anyway, thank you.

[Applause]

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