Nate Hagens (00:00:02):

You're listening to The Great Simplification with Nate Hagens. That's me. On this show, we try to explore and simplify what's happening with energy, the economy, the environment, and our society. Together with scientists, experts, and leaders, this show is about understanding the bird's eye view of how everything fits together, where we go from here, and what we can do about it as a society and as individuals.

Nate Hagens (00:00:33):

This week I am pleased to welcome Dr. Martin Sheringer. Martin is a senior scientist at ETH Zurich and a professor of environmental chemistry at Masaryk University in the Czech Republic. He specializes in research on environmental and human exposure assessment and is also involved in the science policy debate. Today, we discuss Martin's most recent paper on PFAS or the so-called forever chemicals, which are being found to be much higher than safe levels for humans, in waterways and rivers around the world. We discuss their various health effects, including endocrine disruption. And more broadly, Martin and I talk about the risks and scenarios of plastic pollution to planetary futures, and what we might do about it. Please welcome my friend and colleague, Dr. Martin Sheringer.

Nate Hagens (00:01:47):

Good morning, Martin.

Martin Scheringer (00:01:49):

Hello. Good afternoon, Nate.

Nate Hagens (00:01:51):

Good afternoon. Yes. So good to see you in person last week. Was it last week? Oh, time flies.

Martin Scheringer (00:01:58):

Yeah.

Nate Hagens (00:01:59):

10 days ago or whatever. How are you?

Martin Scheringer (00:02:03):

Good. Busy. We are in the middle of a bit of a tsunami of media attention.

Nate Hagens (00:02:09):

So let's get right into that. What are you and your colleagues working on that's getting this media attention?

Martin Scheringer (00:02:15):

Yeah. That was a scientific paper we published two weeks ago and that caused a big splash. Much more than we had thought. This paper is about what we call PFAS. PFAS, the name stands for what's called poly- and per-fluorinated alkyl substances, and that's a complicated chemical name. The key here is that these chemicals contain fluorine bonded to carbon, and that makes them very special and very different from many other chemicals, and that's what this paper is about.

Nate Hagens (00:02:47):

Okay. I want to get into the implications of that, but let's take a step back first, because I think a lot of the listeners here are familiar with biodiversity loss and climate change and ocean issues, and they're even familiar with the fact that plastic now outweighs all animals on earth and they're the Ocean Pacific gyre of plastic in the oceans. But you work on microplastics, things that are unseen and kind of quantifiable. So can you break it down from the top? What is chemical pollution from plastics, especially on the micro side, and how does this work, this microscopic stuff? Does it fall off of little household items and plastic bottles, or just give us a big overview?

Martin Scheringer (00:03:42):

I'll be happy to do that. And I may go back to that paper about these PFAS because that is a first starting point that shows what is what's going on. In that paper, we summarized findings of different measurements of these PFAS chemicals in rainwater from around the world, and that was shocking to many people that these chemicals are in the rain water everywhere in the world, and they are not just there, but they are there at levels that may even exceed what's now a health advisory. So they may actually be of concern. So what we find here is chemicals that are present everywhere, everyone is exposed to them, and that may be of health concern.

Nate Hagens (00:04:27):

So I graduated college with a 3.7 GPA, but I got Cs in every chemistry class I took, so please help me out here. It's not my strong suit. How would PFAS or any other chemicals get into the rain water? Do they evaporate with water from... Really? So they're that small and they go with the water?

Martin Scheringer (00:04:55):

Yeah, exactly. These chemicals and many other chemicals that we have to see the cover in this broad problem of chemical pollution. These chemicals stay outgas from the materials they are used in. So PFAS are water repellent and oil repellent. They're used as impregnation agents for textiles, for outdoor clothing, for protective garments, and for many, many uses of articles that people have in their hands

every day. But they don't just stick to that surface. But they, as I said, outgas, and then they start a long journey.

Martin Scheringer (00:05:34):

They travel with air, with wind, they are deposited with the rain. They get into the soil, they get into the water, they move with the ocean currents. So they really have a long journey ahead of them. And because these chemicals have a special aspect, or special property, they are super stable. So they have a lot of time to travel and that's why they get everywhere in the world. But the basic mechanism is really they outgas and they start their journey and they go around, they circulate in all media, we call them multimedia chemicals, air, water, soil, vegetation, food, drinking water, and they go back into our bodies.

Nate Hagens (00:06:11):

My understanding is that these plastic jugs last seven to eight hundred years before degrading, but then what they degrade into probably lasts even longer. How long do these PFAS last and what do they eventually degrade into?

Martin Scheringer (00:06:29):

That is exactly the problem, also what caused the big splash. These materials, these chemicals don't degrade into anything in the environment. They will never go away.

Nate Hagens (00:06:39):

Never?

Martin Scheringer (00:06:40):

Ever. Yes. That is shocking, isn't it?

Nate Hagens (00:06:45):

I didn't know that.

Martin Scheringer (00:06:47):

Yeah. The only way that the levels could go down is that the chemicals dissolve or dilute in the deeper oceans because that's a lot of water that can take out a lot of chemicals, but they still won't go away with that. They will just go from where we are here from our immediate environment into the deeper water.

Nate Hagens (00:07:10):

And what will happen in the deeper water over centuries and millennia. We don't know.

Martin Scheringer (00:07:16):

Not much. Yeah. It's cool and dark there. Nothing is going to happen really to them down there. So that's the shocking thing. And that comes from the fluorine carbon bonds, that these chemicals that contain fluorine bonded to carbon, and if a chain of carbon atoms where fluorine are attached, and that part, this fluid chain makes them so special because this fluid chain does not interact with anything. It's water repellent, it's oil repellent, and that makes them so strong impregnation agents, it also makes them lubricants because they're not sticky at all. They make things glide easier. So they are, for example, used in ski wax to make skis glide faster. But of course that is kind of crazy, really, because then of course they go out into the snow and again, start their journey circulating in the environment. So I think ski wax is a totally irresponsible application of these chemicals.

Nate Hagens (00:08:15):

So what percent of our products have these sorts of chemicals or related chemicals in them?

Martin Scheringer (00:08:22):

Yeah, that's why I want to start from them because they form a certain group, and this is this very special group, and they are about 5,000 chemicals of that type, more or less. Overall, there are more than 10s of thousand. I think it's 300,000 chemicals that are on the market commercially globally. So many, man more than these PFAS. Of course, they have different properties, they're not as extreme, but they have all kinds of properties. They may degrade easily, they may also be persistent like PCBs, poly chlorinated biphenyls. They may be very toxic, they may be less toxic, whatever. But overall, there is a soup of chemicals that are circulating around us and also within us, and I think that is now the answer to your question, what is chemical pollution about? It's really about that messy soup of so many chemicals that we can't really control.

Nate Hagens (00:09:24):

And can't see and can't feel, in the short run.

Martin Scheringer (00:09:28):

Right.

Nate Hagens (00:09:29):

Oh my gosh.

Martin Scheringer (00:09:33):

You have often said that we are energy blind, but of course we are also chemicals blind, which is natural because we--

Nate Hagens (00:09:43):

We're externality-blind, my friend.

Martin Scheringer (00:09:47):

Yeah. But also here it fits exactly. It's just a kind of blindness. Of course, it's not just physical blindness, but it's also mental externality blindness. I agree.

Nate Hagens (00:09:56):

Okay, so I have a ton of questions for you, Professor. So when these chemicals were invented 30, 40, 50, 60 years ago, the chemists that developed them at DuPont or the oil refineries or wherever, they had to know that they would degrade a little bit into the environment. So was it, let's just optimize profits and this is such a microscopic thing, it's not going to be a big deal. How did that thinking unfold, or did it? Or do you have any insight into that?

Martin Scheringer (00:10:34):

Not really. I have asked myself that same question many times. How did we end up in this mess? My grandfather was a chemist in the 1930s and '40s, but we never talked about these aspects and he made distaffs. But the people who invented these PFAS substances, I don't know. I think they could have known, but perhaps it was just, the solution to pollution is dillution.

Nate Hagens (00:11:03):

So if they remade the 1970s movie, The Graduate with Dustin Hoffman, now, at the end, and instead of him saying, "Plastics is the key to the future," it might have been, "The impact from plastics," would've been the takeaway line. So let me get back to your recent paper. Are there two phenomenon that are being measured? Number one, that the concentration of PFAS in the rainwater is increasing, and number two, scientists are recognizing that the safe level of PFAS is actually lower than we originally thought?

Martin Scheringer (00:11:40):

Yeah, mostly the second thing, the first thing is the levels have been more or less constant at these concentrations that have been measured many times in different parts of the world. They have not increased a lot over the last couple of years, but what has decreased exactly, as you said, is the level where we see a concern. Because more and more has been learned about the toxicity of these chemicals and they do different things, different type of harm to the body.

Nate Hagens (00:12:12):

So let's get into that. So what threat do these and related chemicals pose to our health and functioning, let's say in a 20 to 30 year timeframe? How might we be compromised in ways that could be difficult to recover from, from the microscopic chemical pollution?

Martin Scheringer (00:12:34):

There are many aspects, many ways in which chemicals can interfere with the body. So we were asked in response to that paper, what does that mean now? And the lowest level, these health advisories that have been published now by the US EPA, by the way, they reflect concerns about immune suppression in babies in infants. So these chemicals PFAS may lower the formation of antibodies and the immune response. So that is a very subtle effect that is new, at least to me that was new to learn that this is something that is really something we have to be mindful of. Then what they also do is they reduce the sperm count in men.

Martin Scheringer (00:13:16):

And so we do have really different effects in different groups of the population that set in at different concentration levels of the chemicals. So it's not just, we are safe and then we cross a line and we are under the impact of these chemicals and are massively poisoned. It is different. It's really that different groups of the population have different effects in their bodies already, and the higher we go in concentrations, the more happens. So at higher concentrations, these PFAS, they cause liver damage, kidney cancer, testicular cancer, loss of weight, metabolism of lipids is disturbed, many things that also happen in higher concentrations. But you see, there's this kind of cascade of range of things that are caused by the chemicals.

Nate Hagens (00:14:07):

How would one get exposed to higher levels of concentrations if it's just kind of dilute in the rainwater and such?

Martin Scheringer (00:14:15):

Yeah, have you watched the movie, Dark Waters?

Nate Hagens (00:14:20):

No.

Martin Scheringer (00:14:22):

That is the answer because that is about the DuPont case, I think it was in Parkersburg in West Virginia where dewpoint had a plan where they made Teflon. And to make Teflon, which by the way is also a PFAS, they use or they needed and had to use another PFAS called PFOA. And then in the process, they released these waste waters containing PFOA to the Ohio River and the groundwater, and it was

everywhere, in higher concentration, much higher than what we have found or people have found in the rain and somewhere else, higher levels.

Martin Scheringer (00:15:00):

And then that killed the animals of a farmer. The cows kind of dropped dead. I think that was the start of the battle. Then there was a lawyer, Rob Bilott, and he actually was working, I think, in favor of for DuPont, but then he saw that case of the dead cows on that farm, and then he was thinking about all that concern and kind of turned around. And then also people had cancer and all kinds of really serious diseases in these neighborhoods. So it's a dramatic story and a dramatic fight and battle, and it's worth watching, Dark Waters, and Rob Bilott is played by Mark Ruffalo.

Nate Hagens (00:15:45):

Okay. I will watch it. Though, to be honest, I tend to watch science fiction or comedy now because my whole life is a drama documentary sort of inbox, as I'm sure yours is too. So, is a PFAS considered an endocrine-disrupting chemical? There's a lot of news on EDCs. Is that like an umbrella term for all these or are there subcategories?

Martin Scheringer (00:16:20):

Probably, yes. That is not really my area or my field. Endocrine-disrupting chemicals, endocrinology, that's super complicated. And there are so many hormones that give so many signals to the body. But everywhere where these hormones act, other chemicals can interfere, and PFAS also do that in some point, in some way. But I don't know exactly how and where and why.

Nate Hagens (00:16:47):

The reason I ask is you and I have a lot of friends in common who are scientists. And some of our colleagues have told me that they can make a plausible case that chemical pollution, endocrine-disrupting chemicals can be a bigger risk to human and the natural world futures than climate change. What do you think of that assessment and can you speculate on that?

Martin Scheringer (00:17:20):

I wouldn't compare them on a scale because they are different dimension, they act in parallel. We are on under these stressors, under these impacts anyway, from both sides and from other sides as well there are other stresses. I wouldn't compare them on a scale of bigger... Because both of them are happening, we are under toxic impacts and we show the population, humans show the effects, we see them. There are so many non-communicable diseases that have increased a lot over the last 15, 20 years, and that is caused by, to some extent, certainly by chemicals, but for sure. At the same time you see all the climate effects. And this year, 2022, is a drastic turning point probably. And we have seen so much about all the heat waves and droughts and the impact. So I think we are under all of this now.

Nate Hagens (00:18:17):

No, I agree with that. The reason I pose the question is, we have tens of millions of people aware and working on climate change issues, rightfully so, both for adaptation and mitigation, but we may have tens of dozens of people working in your sector. It seems to be just widely unrecognized as a kind of existential risk in coming decades. So I'm just wondering, if this goes unchecked and if it's a slow ticking time bomb of the impacts both to humans and to other species, what could happen in the next 50 years with the accumulation of these PFAS, endocrine-disrupting chemicals, other things? What do you think about that? What would be things that would happen? And by the way, you mentioned humans and our livestock, are we seeing the impacts of PFAS or endocrine-disrupting chemicals and sperm count decline on non-human species?

Martin Scheringer (00:19:22):

Yeah, so first point was the number of people working on these problems, and I totally agree. The chemicals problem, the detoxification problem, I think is under-represented. It's not really addressed in the way and to the extent it should be. And there is whatever, a bias, the picture is too narrow. But of course, on the other hand, if they have many more people working on chemicals, we would come back perhaps to this later, we also would have to communicate all of this we have and then there may be also an inflammation overflow. We have to learn about how to handle all these different messages from the different parts of the problem.

Martin Scheringer (00:20:06):

But I agree. More people, more resources, more time and money is certainly needed for the chemicals problem. And I can tell you why in a couple of minutes, that is certainly the case. Now, what is coming out of this, and I think it's probably what we already see. As I said, there are all these diseases that have increased, are increasing, and that's probably just going on like this. So it is all these cardiovascular diseases, it's metabolic diseases, obesity, it's reproductive problems like the sperm count, the sperm decline. So that's continuing.

Nate Hagens (00:20:44):

So metabolic diseases, cardiovascular, obesity could have origins from the chemical pollutions that we're consuming invisibly?

Martin Scheringer (00:20:53):

Definitely.

Nate Hagens (00:20:54):

Definitely. How so?

Martin Scheringer (00:20:58):

There's even the term obesity genes for chemicals that cause obesity. So somehow, again, that's not really my area, but what I have learned, what I can say here is early in development of fetuses or even a newborn, or I guess it is fetus, whatever exactly it is, there are different types of cells. And for example, cells that will form bones, they are reprogrammed into fat cells. And then you get obese animals. There has been done in animal tests and there were mice and there was one mouse that was normal and there was the mouse that was treated and that was three times or the size and the weight of the normal mouse. So we can see that how these cells are reprogrammed and you turn into fat tissue.

Nate Hagens (00:21:51):

So this is happening in utero already before they start eating McDonald's or whatever?

Martin Scheringer (00:21:58):

Yeah. But then of course, exactly, later on we may add onto this first exposure and do more harm because there are so many changes that are triggered and controlled by hormones in puberty and later on in life where these chemicals can again interfere. So that is an ongoing process. And also testicular cancer in young men is something that happens more and more often and is in signal here. So you see, all of these elements of a bigger picture are already emerging. I think that is something we have to just project into the future as an answer to your question, what's coming out of this chemical pollution problem?

Nate Hagens (00:22:43):

So you and I have known each other for a long time and you've followed my work and I talk about the biological behavioral aspects of why we are in this mess. And one of them is that we are a biological species that cares about the present more than the future. So a lot of the risks that we see are emotionally invisible to us. There's nuclear risk, there's climate change risk. But climate, we're at least seeing heat waves and fires in Australia and British Columbia and things like that. So we get this emotional reminder or glimpse of what's coming, but not so on these microplastics. Unless there's a news or an interview like this one, they're just totally invisible. So it's just yet another aspect, another cost of our economic system that is fully back loaded that we don't include in our everyday prices and decisions.

Martin Scheringer (00:23:50):

Right, I totally agree. And there are obvious reasons for that because as you said, it's invisible. These chemicals are not visible in the water we drink and the food we eat, although processed and packaged food may contain lots of them. That's what Jane Muncke with the Food Packaging Forum does, and we still don't see them. And then secondly, really even if we know about or learn about it, what can we actually do? Because these chemicals are not part of our lives. They're not moving parts of what we

normally do. We have no agency here, really. They are in our environment, in our computers, in our food packaging, in our clothes and whatever. But again, we have no agency. We would have to change a lot to create agency for people to be able to decide what kind of chemical do we want to have and why and how and whatnot.

Nate Hagens (00:24:45):

So you probably know the stats to this. When I was reading up before this interview, I think it's, we create 300 million tons of plastic every year, and roughly half of that is single use plastic, drink or eat or use it once and it's in the garbage. So that's the stuff that ends up in the ocean gyres and in the landfills. And it will last a long time. But are those little plastic knives and forks and bottles, is there also the invisible out-gassing occurring on those items?

Martin Scheringer (00:25:25):

Yes, because the plastics contain, in addition to the backbone, the polymer, that is the hard material, they also contain lots of what's called additives, chemicals that make them more durable. For example, UV light absorbers so that the plastic doesn't get brittle and breaks. There are UV absorbers in the plastic or just dye stuffs or flame retardants and plastic softeners. And with heavy PVC is 50% by weight is phthalates, not PVC, because to make it soft. So 50% we are just outgas.

Nate Hagens (00:26:02):

Phthalates are very bad, right?

Martin Scheringer (00:26:04):

They are well known endocrine chemicals and are bad for that reason. Exactly. So imagine 50% of an item of soft PVC that will go out in the end, be the first part during its use phase in human environment and in indoor environment. But then when it's out there in the outer environment, then these chemicals just outgas and circulate in the environment.

Nate Hagens (00:26:33):

I'm just looking around my desk here, my podcast desk, and I have this, my bike helmet. I don't know why that's here. But vitamin bottle and my eyeglasses and the clickers and the thing for my phone. I mean, there's plastics everywhere.

Martin Scheringer (00:26:54):

Yes.

Nate Hagens (00:26:54):

You could argue we are living in the Plastoscene.

Martin Scheringer (00:27:00):

Absolutely.

Nate Hagens (00:27:01):

So on other podcasts, I think it was an early one with Art Berman, we discussed how gasoline is one of many of thousands of products that we get from petroleum. And if somehow miraculously we stopped using internal combustion engines and went totally to electric vehicles, we would still need to extract the same amount of oil because we have demand for all those other products. So plastics that come from petrochemicals, if I recall correctly, are expected to be 50% of the growth in petroleum demand in the coming 20 years. So is this an example of where we need an input and its demand creates a byproduct, like plastics, and then the demand for the byproduct, in this case, petrochemicals, outstrips the demand for the original product like high fructose corn sweetener as a byproduct of creating ethanol. What, if we stopped gasoline, could we stop demand for all these plastics? Can the growth in plastics demand be halted or does the industry world demand for this have its own metabolism separate from the transportation sector? That was a big bite, but what do you think about that?

Martin Scheringer (00:28:22):

Yeah, that's a big bite, and a complicated one. First of all, Art Berman says, oil is the economy.

Nate Hagens (00:28:32):

He got that from me, by the way, but go on.

Martin Scheringer (00:28:37):

That's fair. Or yeah, whatever. But yeah, can we really do what you said as a hypothesis or as a thought experiment if you stopped using gasoline? I think the oil part or the fuels part is much more important than the plastics part. So what you are saying is the plastics part may take over if we go down somehow some way with the oil, with the fuels part. But I think the fuels part will always be dominant. In terms of amounts, right now the chemical industry takes about 12% of the global oil production, and the rest is for fuels for transportation and heating or whatever we use it for.

Nate Hagens (00:29:17):

Do you know what the corresponding number is for natural gas, where we get our plastic bags from and other things, it's probably higher than 12%.

Martin Scheringer (00:29:24):

Not directly, but it's probably also a fraction like that. And now, of course, if there is this scenario that the fuels part goes down, then the chemical industry may want to scale up the plastics or the chemistry part. But I'm not sure about that. I don't think that's possible even because we need the fuel. We need

oil for the economy. In the function of a fuel, not in the function of a feed stock for the chemical industry. But if it were the way you said, of course, the industry is pushing for that, but there's no real need. Plastic is not the economy. We live in a plastics world. That is true, but that is not necessary. We could also live in our current modern life with many other materials that would be used to make it to items we use in our lives. So plastic is not the economy, whereas oil is.

Nate Hagens (00:30:21):

So what good progress is being made on that alternative products made with things that aren't come from petrochemicals? Is there a lot of progress on that, like using bamboo or other things?

Martin Scheringer (00:30:37):

That's a big concern, for me at least. And also a very controversial topic. Because some people say the chemical industry has to be decarbonized, and I don't really understand or see what that means because the products are made of carbon and you could say, okay, we need to get the carbon from somewhere else, so we grow bamboo or we grow whatever we can take from the fields. But given the scale of the chemical industry that we have, we would be in massive competition with food production, or we'd have to just flatten ecosystems and forests and convert them into agricultural areas to grow the feedstock for the chemical industry. That would be total nonsense. So I think that avenue is not there. So I think the only way is the chemical industry has to be scaled down, and then we may still use fossil fuels because it's a smaller amount that we use for them to make chemicals. Or we may also use some biofuels growing what is growing on the fields. But then overall the footprint would be much smaller. With the current size, it can not be greened.

Nate Hagens (00:31:55):

Couple thoughts. Help me out here. So if we decarbonize the transportation sector, we haven't really decarbonized because all that carbon is still in all our entire plastics and clothes and textiles and everything else. In order to truly decarbonize, which includes the things you're talking about, it has to be a smaller scale and we have to really change the economy dramatically. Just looking around my house and my refrigerator and my pantry, how long will that take to change the supply chains and inputs with all the packaging that's happened? How do we do that?

Martin Scheringer (00:32:50):

Yes, nobody really knows. But I think that could be done. That is a smaller challenge compared to getting rid of, let's call it fossil carbon right now, as a fuel. Because that is the function when you have spoken about that a lot, how many people we have are the slaves that work for us, the energy slaves that work for-.

Nate Hagens (00:33:09):

From 500 billion per year roughly, depending on the assumptions.

Martin Scheringer (00:33:14):

And that is still where we are standing on or from which we are working on. And then still given that input, we could still modify our supply chain for everything else. Again, we don't have to live in a plastic world, as long as we have all that energy input and have our modern lives.

Nate Hagens (00:33:32):

So could we go back 50, 80, a hundred years to use glass reusable milk jugs instead of plastic discardable? I mean, certainly the technology exists, it would be probably more costly. How much of using plastics and throwaway things are just because energy has been relative to its value, unbelievably cheap that we just did it because it was the most efficient and profitable thing.

Martin Scheringer (00:34:05):

Yes, exactly. Energy and fossil fuel carbon as a feed stock has been unbelievably cheap. And that's why it's so easy to make everything out of plastic. But of course, there are alternatives. And I'm not saying I have a solution. That would really imply we would have to rebuild lots of supply chains in the way we make food and we distribute food and all that. But still, what's possible is of course glass, and glass can be made lighter because it's possible to make glass much harder so that it doesn't break. And then you can make it thinner and lighter and that the energy needed for transport is less. So there is progress also here.

Martin Scheringer (00:34:42):

It's not that we always have to carry around heavy glass bottles that need a lot of gasoline or diesel to be transported. That can be changed. And of course it would have to be more local and regional. The transport distances would have to shrink a lot. But that's for many reasons that it's going to happen, I think. Now, political risks and other types of risks that now interrupted supply chains anyway. And we have to rethink many of our supply chains. So why not rethink them in a way that makes life more kind of regional and more centered around what people actually really need?

Nate Hagens (00:35:23):

Yeah, I agree with that. So Martin, as a long time collaborator, you understand the premise of what I refer to as The Great Simplification, that a number of the core systems we depend on are going to go through dramatic downsizing, change, transformation. Some of those big international agriculture are currently very chemical-dependent. So given this landscape, what do you see as the survivors and replacements within that industry, the international ag industry that uses pesticides and fertilizers and ammonia and products from fossil hydrocarbons?

Martin Scheringer (00:36:11):

Yeah, that's another big one.

Nate Hagens (00:36:13):

I'm only asking you big questions, Martin.

Martin Scheringer (00:36:16):

I see. Yeah, because again, of course there has been a lot of debate about what is the potential of, let's say, bio organic food growing and small scale of farms and all that. Is that really a possibility for the number of people we have in the world right now? And I would guess that probably we would need some amounts of fertilizers and other pesticides, less than now, less and fewer, also just fewer chemicals that are used as pesticides and a simplified way of pesticides. But to have a sufficient yield, I guess that is still needed or will be needed. But that may be a gradual process that we have to really think about what are the priorities, how much energy can we use for what purpose? And one of the purposes will certainly be agriculture and also probably, to some extent, fertilizer. Others would then be still transportation and other would then still be some kind of chemicals that may survive even under much more limited conditions.

Nate Hagens (00:37:26):

What would be the one, two, or three single most important chemical products that make our current world functionable?

Martin Scheringer (00:37:40):

What would you take with you on an island? I would say we need some pharmaceuticals, definitely. They are essential.

Nate Hagens (00:37:49):

Did pharmaceuticals come from petrochemicals?

Martin Scheringer (00:37:53):

Yeah. But historically, of course not. They come from plants. Plant-based herbal medicine was the root of modern medicine. But yeah, of course. The current products come from the chemical industry. But still, I think we need, or humans need, pharmaceuticals. Painkillers and many things that just make life much better and help us survive difficult situations. So that would be one brand, one area. Other things would be just chemicals for practical use, so adhesives and pains and glues and varnishes and chemicals that you need for building houses. So a lot of simple chemistry that is very productive and useful. And I think all of this is what people would figure out. They would see what they need. And there is, of course, the knowledge, now I assume the knowledge is still there, how this can be made. So there would be a list of

things that would certainly be given priority. And other things would just disappear because the priority is not there. And of course, as I said, fertilizer and pesticides would also be probably, depending on of course, where we are and what's grown, what's the crop, what are the conditions and all that.

Nate Hagens (00:39:13):

If I was on a desert island, the three things I would bring would be the Lord of The Rings trilogy, my golden retriever, and a good sturdy knife. But I get your point.

Martin Scheringer (00:39:25):

Yeah, no chemicals. Perhaps some chemicals.

Nate Hagens (00:39:27):

Perhaps some chemicals in the book, not in the golden retriever, other than probably the food I'm currently feeding the golden retriever probably has chemicals in it.

Martin Scheringer (00:39:37):

I meant as a fourth item, you may have a bag of chemicals.

Nate Hagens (00:39:41):

Right. That's right. So what about pesticides? This may not be your core focus. But I remember a few years ago there was this big controversy about Roundup and how Roundup was now being illegal in Europe. And I forgot who creates Roundup, ADM or I'm not sure who, but...

Martin Scheringer (00:40:06):

It was Monsanto.

Nate Hagens (00:40:07):

Monsanto. But then some executive said, it's totally safe. I would be willing to drink it directly. And I don't know if he actually did that or not. But how much of the impact of these intense chemicals would be immediate if you got exposed to high levels of it, and how much of it would happen over 20 or 30 years? Or, what I suspect you're going to tell me, is we don't know because there's no funding to do such experiments.

Martin Scheringer (00:40:37):

Okay, that's an interesting one. There are different answers here. There is a long tail. And that's something we know even without funding for long term tests, because that's from the persistent chemicals that will be there for decades. Going back to the beginning with PFAS that won't go away, these chemicals will be around, will cause damage in 20, 30, 40, 50 years. Similar PCBs were made

mostly in the '60s, '70s, polychlorinated biphenyls. They have now entered the oceans and they're still there and they cause massive damage to whales, in particular orca whales. Orca populations are collapsing because of PCBs, nowadays. There was a dead orca found on the coast of Scotland in 2017.

Martin Scheringer (00:41:28):

There was a report and that whale had enormous levels of PCBs in its blubber. And they said that it was infertile, it was a female and she never had offspring. And they said that the animal died because it was caught in a net. Normally they don't do this. They are so intelligent that they can navigate the nets and everything. And they said in the investigation that it is very likely that the cognitive capacity or ability of the animal was all reduced by the PCBs, which is what PCBs do. We know that.

Nate Hagens (00:42:01):

So in the same way that mercury concentrates in larger fish and they tell us not to eat it. It's PCBs concentrate in the larger top of the food chain.

Martin Scheringer (00:42:15):

Yeah, exactly. So that's a long lasting footprint that will not go away and that we know about even today. So that's one answer to your question. What is the long lasting--

Nate Hagens (00:42:26):

Yeah, Martin, we probably want to keep this to an hour and a half, but I think I could talk to you for five hours on this, partially because it's freaking me out. I've been exposed to this line of thinking, but I haven't actually had a deep conversation like I'm having with you on this. There's just so much else, but I feel this is far, far more important than our media and our cultural conversations are. So I just want to keep poking at you when things come to mind. So, getting back to golden retrievers, I did some research that, in the 1950s, the average golden retriever lived to be 15 years old. And I know that's not remotely the case now.

Nate Hagens (00:43:10):

Now, you could argue that it's due to inbreeding or things like that, but some of the comments were because of the chemicals and the food supply, et cetera. But just more broadly, the amount of cancer in our world, it seems like everyone knows someone that has or has died from cancer. Would we know that the preponderance of cancer could be linked to long-term exposure to endocrine-disrupting chemicals, PFAS, PCBs, things that are invisible to us? Has there been research on that? What can you say about that?

Martin Scheringer (00:43:56):

Yeah, that is the crux in a way of all this chemical and epidemiological research in connection with humans. Because what scientists can do directly in the experiment is animal testing. So they can apply the chemical on the skin or to the organ of the animals and find out what happens and what kind of cancer it may develop. But then of course there's always this question of what does that mean for humans? And then we only have these associations. So we can go out and investigate the population. Lots of people, that's what they did in the Parkersburg case with PFOA and DuPont, they had 80,000 people who were all exposed to high levels of PFOA, and then they look at all confounding factors and tried to take them out of the picture, these factors. And what they came out with at the end was a list of, I think it's eight or six diseases that were highly likely caused by PFOA, to such an extent, highly likely that they could really make a lawsuit and won. So DuPont had to pay, I think, $800 million.

Martin Scheringer (00:45:04):

So that was really very close to... Not even, yeah, you can call that a proof, it's a philosophical question here. It's not a causal result from a test in a human. It is just what we see here in people and what we see here at levels of PFOA in their drinking water and food. And if we remove everything, we see there are these eight things that stick out. Testicular cancer, kidney cancer, I have the list here. And thyroid disease, ulcerative colitis, high cholesterol and pregnancy-induced hypertension. That's what they found as the ones that were most likely caused by PFOA. But you see, we are kind of hitting a wall here in terms of final proof. And that's of course what the opponents can always say. They say, oh, there are so many other factors. There could be ElectroSmog. Somebody is smoking, there could be other chemicals. So there's PFOA and there's Roundup. Perhaps they always used Roundup in their gardens and that's where it comes from.

Nate Hagens (00:46:03):

There's not a smoking gun, there's just a lot of smoke.

Martin Scheringer (00:46:08):

Right, exactly. Lots of guns, lots of smoke, are not clear on how many bullets come out of what guns.

Nate Hagens (00:46:15):

Right. So which of the bad actor chemical families have really long, wide tails that will be doing damage a long time from now? Do we know that?

Martin Scheringer (00:46:28):

Yeah. I mean, again, the persistent ones, because they don't go away. So again, PCBs and PFAS. And then the other thing is really that we resupply lots of chemicals that are degraded that would go away relatively quickly. But we always make large new amounts of phthalates and flame retardant and things that we always resupply. So if you have always a new carpet, a new car, new electronic devices, you add

more sources of these chemicals to your life. But that would not have to be and to last. That could be stopped. What can not be stopped is the ones that just have these long lifetimes and don't go away.

Nate Hagens (00:47:08):

And those aren't so much a personal consumption decision. Those are just living as a part of modern society because they're in the water, they're in the rain, right?

Martin Scheringer (00:47:21):

Yeah. Exposure right now. Exactly. Is why food, why our water, because they have been released, we can not take them back. It's there.

Nate Hagens (00:47:32):

So this puts environmental justice at a whole nother level because those areas of the world that have not been using these chemicals in their industrial economies, just like they've not been burning fossil carbon to power their industries, but are going to be suspect to higher temperatures and droughts and floods, these areas of the world, well, you just wrote a paper that said that rainwater everywhere in the world has two high levels for safe consumption. Is the environmental justice community being involved in the global plastic endocrine disruption PFAS story?

Martin Scheringer (00:48:20):

I think so. I'm not in that community myself. But I think of course, that they are working on this and addressing it. But I have tried to make a connection here myself because what I have put in the focus of my work is two metrics of the hazard or of the problem of a chemical. And one is persistence, which means how long will it be there and what is the footprint in the future? And the other one is what I call spatial range, or you can call it all the travel distance, something that measures how far a chemical goes. Because both of these aspects directly address the question of intermittent justice because they show how far in space and time the burden is transferred, shifted away from the people who benefit from the chemical. So I think these metrics, as we call them, really make it possible to directly to open the door for an environmental justice discussion.

Nate Hagens (00:49:16):

So how does chemical pollution interact with other environmental issues like ocean acidification or climate change? Is there any additive effect or synergies or combinatories or anything like that?

Martin Scheringer (00:49:34):

When the direct impact of where it adds to the problem massively is, of course, biodiversity. Because we have not talked about the chemical stress on humans, but of course, animals have the same situation or are in the same situation under on the same pressure from chemical exposure. There is insect decline,

there is bird decline, there is amphibian decline, and chemicals play a role in this. They are not the only factor that is clear now, but they certainly play a role.

Nate Hagens (00:50:02):

So sperm decline in animals.

Martin Scheringer (00:50:05):

Also sperm decline in animals. Exactly. But also decline of populations and of entire parts of the biosphere that really, you may have seen that the reports about insects that have gone down by 50, 70% by mass.

Nate Hagens (00:50:20):

And we don't know exactly why that is, but pesticides are a large culprit.

Martin Scheringer (00:50:27):

Yeah, it is also habitat destruction and many factors, but also chemicals. So here we have a direct influence of chemicals on biodiversity loss. So biodiversity loss, species extinction is certainly impacted by, or made worse by, chemicals. That is one strong link. There's another one. Do you want to hear that now?

Nate Hagens (00:50:53):

Yes. But I'll just pause and say, you're one of my favorite people. I'm so glad I got to spend time with you a couple weeks ago. And I was really looking forward to this because I like you as a human and I'm also feeling sick right now from what you're telling me, even though I kind of knew it. So it's this bittersweet sort of conversation. But yes, please tell me the second one.

Martin Scheringer (00:51:19):

Yeah, no, I understand. And I'm sorry. But yeah, I think we have to face it. Yeah. The second one is a simpler thing, it's just when it gets warmer, chemicals outgas more easily.

Nate Hagens (00:51:31):

So there's a positive feedback that as we warm, there's more chemical pollution.

Martin Scheringer (00:51:38):

Right. Basically. These are the two links I would mention.

Nate Hagens (00:51:43):

Yeah. Okay. So chemicals aren't largely tested by industry for endocrine disruption effects before releasing them into products and processes, at least historically. So in your guesstimate, what percent of harmful chemicals or endocrine-disrupting chemicals, or any of these categories which I don't know their names, do you think we've discovered and there are people like you testing them, versus some out there that are doing harm that are not even on our radar due to lack of funding or research or just unknown, we don't know about them.

Martin Scheringer (00:52:25):

Yes. That's another big one. Because there's another abyss here to look into. It's not just the testing for EDC properties. I don't know the answer because there's a wide range. There are some chemicals that are more powerful EDCs and they are more well known and have been identified because they're similar to known hormones, estrogen, for example. And there are other chemicals that mimic hormones to lesser extent, but they still have some potency or they block a receptor where hormone wants to dock and it can't because the chemical is blocking the receptor. And this is all gradual. So there are probably hundreds of chemicals that may have some weak EDC properties. But as you said, totally true, there is no capacity really to test in a routine way for them for these effects because they're subtle. The testing takes time. It's not trivial. But the other I mentioned is really that the testing scheme that is mandatory before chemicals can put on the market is much too narrow.

Martin Scheringer (00:53:28):

So there are many aspects that have not been tested for most chemicals even. So most chemicals have been on the market for decades, and we know basically nothing about their toxicity, not just EDC properties, but also other properties. There are just no data. And that is a battle that is very difficult because this has been behind the scenes, kind of, it was a technical discussion between chemical industry regulators and scientists. And for quite a while there was, I think, the idea that this can be overcome with new testing and new methods and high throughput testing as they call it, all of that. But now we see that there several hundreds of thousands of chemicals on the market. It's just not possible. It's too many chemicals. And we have to stop that paradigm of risk assessment, I think, here, and have come up with a new scheme that helps us shrink the universe of chemicals on the market.

Nate Hagens (00:54:28):

And to shrink the universe of chemicals on the market, is this just a bunch of isolated academics like yourself that are studying this with, you mentioned Jane Muncke who works for a non-profit organization, but are there government agencies deeply working on this and are there dialogues with DuPont and the other major chemical manufacturers? They have to be aware of the things that you've been speaking of. Has that conversation accelerated in recent years or is it all swept under the rug?

Martin Scheringer (00:55:08):

It's at the beginning. I think it's dawning to more and more people, scientists like me at least, but also I think other regulators, they see that their regulatory system can not handle the problem, can not do the task. So it's dawning on people that we have to change course here. So it's not something that's not existent as a discussion, but it's very small yet and at the beginning, but it's gaining some attention and people are just changing, I think, their mindset, at least some people. So there are some discussion papers about how and why chemical risk assessment has failed. The paradigm that was in use for 30, 30, 40, 50 years even. So I would have some hope that this discussion could gain momentum and try to at least change the direction, but not yet more. It's difficult to say.

Nate Hagens (00:56:06):

So if personally I clean up my life as much as is reasonable, no Teflon, I replace glass for plastic everywhere I can, safe fabrics and furnishings, how much of my endocrine-disrupting chemical exposure am I removing, versus the percentage of my EDC exposure that I can't avoid without moving into a cave and eating grubs or something?

Martin Scheringer (00:56:35):

I think you can remove quite a bit, and that's one of the positive nodes here. I think that's a good message. You can remove quite a lot. By not having a new car every couple of years that is full of, you can smell it, there's the new car smell.

Nate Hagens (00:56:50):

Oh, the new car smell is you inhaling EDCs.

Martin Scheringer (00:56:53):

Yeah, right. Of phthalates and flame retardants, whatever it is that is in the plastics that is in the car. But you know that smell, that is the new car smell. There is computers with flame retardants. And if you don't have a new computer and iPhone or whatever that you always have with you close to your face, you can reduce that exposure. Also, carpets of certain types, I mean modern carpets that may be impregnated with PFAS, or processed and packaged food. If that's all reduced, then a lot I think is already at least no longer in your immediate environment. Of course, there's still something that may not be able to, can't remove from the water or so from your drinking water, from the tap water. But still, you can accomplish a lot by making a drastic change to your personal environment.

Nate Hagens (00:57:46):

My system's mind was racing while you were saying that, that if people became aware of the risks of all these PFAS and EDCs in our everyday materials, there's going to be a big movement to just having furnishings and flooring with wood. And then we're going to draw down that resource as an alternative.

Martin Scheringer (00:58:11):

I don't know the mass balance of wood and how much wood could be grown.

Nate Hagens (00:58:17):

2.8%. The volume of our forest every year they grow, depending on where they are, 2.6 to 2.8% is the volume that could be extracted and keep the forest body intact. And that is a tiny fraction in BTU terms of the amount of fossil BTUs we use every year. Tiny fraction.

Martin Scheringer (00:58:41):

Of course, as a fuel that's shockingly little. But as a material for building your home where it lasts much longer, there's a perspective here.

Nate Hagens (00:58:52):

Okay. So you teach both at ETH Zurich and also at a university in Czechoslovakia. I'm not sure how to pronounce that.

Martin Scheringer (00:59:06):

Yeah. Masaryk University in Brno.

Nate Hagens (00:59:07):

Yeah. So, how do your students respond to hearing about all this, and is there a difference between Switzerland and Czech Republic?

Martin Scheringer (00:59:19):

Not so much. I don't see a real difference. I think what I mostly see in students, but also in colleagues, in members of faculty and other scientists I talk to is, people focus on their immediate work. They focus on their studies as students, on their exams, on their projects. Scientists also focus on their projects, on their grants and the things they need to do to survive and to keep going with their normal lives. So I think there is, to some extent, a healthy response that people withdraw from these big questions, the big picture discussions, because they are difficult and not part of our normal life and our normal mindset.

Martin Scheringer (00:59:58):

So it's not easy to handle them. You and I have been struggling for this for long. We have spent years trying to accommodate these things as part of our lives and our work, but that is hard. So I see that reaction that people would try to keep going, which I understand. And as I said, I think it's even healthy. But on the other hand, of course this is a problem because we don't speak about the elephant in the

room, which is the crisis and the overshoot problem and all that. And the longer we don't speak about it, the worse it gets.

Nate Hagens (01:00:32):

The elephant in the room is that the room is full of elephants, and the meta crisis.

Martin Scheringer (01:00:38):

Right. Not just one.

Nate Hagens (01:00:40):

So what do you see as the communication information barrier to making progress on this issue? Do just more people need to know about it? Does there need to be infomercials or do you have an opinion on that?

Martin Scheringer (01:00:57):

Yeah, two aspects here. One is really just what you said, information. But that has to be produced, it has to be created, it has to be made available. And for example, colleagues and I have worked a lot in the last two, three, four years to argue for an IPCC for chemicals. So we have now reached a point that, at the UN level, there are negotiations stating that such a panel will be established for chemicals. Because there's one for climate and there's also one for biodiversity. And it's very logical and I think useful that there will be one for chemicals as well. That is something. And I can show you much more about that process.

Martin Scheringer (01:01:39):

Very interesting process. Very complicated, time consuming. But then of course, the other aspect is where does this information go? How can it be made effective in people's lives? And that's what I said earlier, where do people have agency regarding chemicals? And as long as chemicals are only the background of our lives, we can't do much. Even if we learn a lot about chemicals. And then even the information may be counterproductive. See, I think we need a different mindset more even than just information.

Nate Hagens (01:02:15):

Well, as we unpack all the different aspects of the back loaded costs of the prior 50 of our years economic system, there is a sense of, it's too much. I don't want to hear about it. And I think we're leading with the stick instead of the carrot. And ultimately, I think we have to design a different way of interacting with each other and with consumption and with the natural world. And I don't think we're going to do that out of fear. I think we're going to do it out of, this is how I choose to live a different way, and I'm going to avoid the consensus trance of following what everyone else is doing, stand by my

principles and live this way. But I don't think there are any... We all have a foot in both worlds, and it's very difficult to extricate ourselves from the many tentacles, chemical and hydrocarbon consuming and emitting superorganism that we're part of now. That was more of a statement than a question, but...

Martin Scheringer (01:03:19):

Yeah, I like the tentacles. Exactly. It is tentacles. That's really hard for us to... Yeah.

Nate Hagens (01:03:27):

So you've listened to many of my podcasts. You know at the end I'm going to ask you some personal questions more broadly about your outlook on life and what you think about. But before I get there, let me really put you on the spot, Martin. If you were to oversee this future IPCC of chemicals, swing for the fences, what are some of the things that we really need to do and could do to minimize this aspect of our future risks that of PFAS, PCBs, endocrine-disrupting chemicals, the lot. How would you frame that problem in response?

Martin Scheringer (01:04:19):

Look at the IPCC. The IPCC is important, has been important all the time, but of course it can't do wonders. So in the end, this is an information mechanism. It's a platform for information sharing, for building consensus, for identifying uncertainties. It's a lot about science and the process of science, what we understand. And of course, as a scientist, I would love to be in that role. I can clearly say. But I'm not sure that it really would help us actually solve the problem.

Martin Scheringer (01:04:51):

It could make a strong contribution by providing much more of all that information that we are lacking right now, that you would then ask for people to just generate that information, do the testing, create the data, put them all together, create the bigger picture, think in alternatives in scenarios of how many chemicals actually need to be used. Right now, there's a big discussion about something called the essential use concept. So what are the essential use of chemicals and what are the other ones that we can drop? These kinds of conversations I would try to trigger, to stimulate. But again, look at what the IPCC has accomplished and what it has not accomplished.

Nate Hagens (01:05:33):

Two things there. I think we could do the same thing for fossil hydrocarbons. I mean, there's a difference between cost and price and value. Price is what consumers pay. Cost is what the oil companies pay to extract and refine it out of the ground. But the value is what it's providing to society, which is orders a magnitude more than the price or cost. And so there are certain uses that are vital over a millennial timeline and we're just pissing it away because it's nearly free. I'm sure you can make the same case for many of the chemicals. Does such a hierarchy exist that if you take a hundred products that are made

from petrochemicals, that maybe these five are critical and these 10 are largely useful and these 85 could be done away with? Does that already exist?

Martin Scheringer (01:06:28):

No. It doesn't exist as a list like this. I think that's exactly the right thing to ask, totally.

Nate Hagens (01:06:35):

Okay.

Martin Scheringer (01:06:35):

It would be a very, very interesting discussion to have, and we would get very different lists probably, but then there could be even an intersectional overlap of these lists and there could be a core part where the list would even agree. It would be very interesting to learn.

Nate Hagens (01:06:49):

So taking a step beyond the potential IPCC of chemicals, what if you were a benevolent dictator and had some simple choices to make on reducing these risks to society? What would you do?

Martin Scheringer (01:07:10):

I'm afraid I can't step out of my shoes as an academic. So even as a dictator, I would go for information, but I would probably run a campaign. So with advertisements that tell people about all this in a way that is not just dry and scientific information, but really makes the connection to their lives and tells them the story about what could be done and how it could be improved. And that would be a huge thing to do. And if I had the means for that, I would go for that.

Nate Hagens (01:07:45):

Moving on to the personal questions part of the podcast, Martin, do you, as a teacher have specific recommendations for your students or young people globally listening to this podcast who have become aware that they are going to live their lives during a period of energy, environmental, biophysical constraints and risks encounter to what our cultural stories are telling us. What advice do you have for young people?

Martin Scheringer (01:08:19):

I would say, and I try to do that also where I teach in some conversations that may happen in between, I would say that people should try to accept these, or look at these many elephants in the room and make these problems and these topics part of their work at least, or their academic thinking and learning. So they should accept that this exists, all of this and that they should talk to each other about it and to their teachers. And they should form groups, networks, they should write about it.

Martin Scheringer (01:08:54):

They would try to insert it into the communication or the conversation, story, in the wider society, like Fridays for Future but perhaps more targeted as a learning process, not just as to be an activist and try to force something. Because I think it can't be forced. We have seen that. Because we are all in that boat and we can't force something against ourselves. We have to learn. And young people at the universities I think are the right ones to talk to about all this. And they should learn to talk about it among themselves, and then develop a critical mass of people who can think about all that, better than we can right now.

Nate Hagens (01:09:40):

Well, we and our colleagues are trying to breathe life into that conversation, so thank you.

Martin Scheringer (01:09:48):

Exactly. Yeah.

Nate Hagens (01:09:51):

So more broadly now, I'm not just talking about plastics pollution, but you, someone who's very fluent in the poly crisis and how all these things fit together, do you have any suggestions for people listening to this show on how they can prepare themselves and their communities for the coming Great Simplification? How we as individuals and communities might be able to meet the future halfway?

Martin Scheringer (01:10:22):

Yeah, similar to what I would do with the students. I would also, again, because we have that silence, there's this big void, there's this silence. Even people who privately would say, I am scared. Something is going very wrong here with many things. They don't say that openly. So again, I think the first step has to be that people talk about this more openly and somehow make it real. Because right now it's not real. It's an unreal conversation in most parts of the society, not here. You have facilitated this and I think it's a great piece of work that you're doing here with these conversations because that is what we need, I think, really that people can talk about it in a structured and an organized way without being just overwhelmed or be in their partisan camps and fight each other and all that. So again, I would ask people to learn and talk and then, of course, form their networks and try to be more resilient, but we don't know what's coming.

Nate Hagens (01:11:24):

I like that answer. Thank you. What do you care most about in the world, Martin?

Martin Scheringer (01:11:31):

The obvious answer is of course, my family, because that's what we all do. We have our immediate environment of people we love and we live with, and I try to help my two sons to navigate the mess in which we all are. But beyond that, I think it's much more because we are all connected to the bigger world. And when I see all that destruction, the clearing of forests, the Amazon destruction, the fires, the dying animals, but also dying people, people starving, I find that extremely hard to take and to handle. So I think we are all connected with the world as a bigger environment, and now this environment is being destroyed. And so I think we care about that, but how can we emotionally really handle that? I don't know. That's a big challenge for me.

Nate Hagens (01:12:34):

I've long worried that people that are empathic like yourself, in contrast to people who don't really care about those things, will burn out because it is a big cross to bear to not only see this in the news, but to professionally work on it like you do every day, looking at statistics on the environment and pollution, et cetera. So on behalf of our listeners, I thank you for your work. Again, outside of plastics per se, but one issue in the world are you most concerned about just in the next decade or so?

Martin Scheringer (01:13:19):

I think we can see it right now in a way, it's war, and it's the progressing, accelerating runaway climate disasters. Again, I think this year is a turning point, probably, and things are accelerating a lot. And that will cause a lot of migration, upheaval and whatever is coming. That is disturbing.

Nate Hagens (01:13:47):

And in contrast, in your communities in Switzerland and also in Czechoslovakia, what are some things that you're most hopeful about in the coming decade or so?

Martin Scheringer (01:14:02):

I think people can adapt if they have to, if they really have to. If they see what's coming and what instance in front of their eyes, or if it really changes their lives or threatens their lives, they can adapt to a lot of things. So I would hope for this adaptation on the smaller scale, I would hope for common sense, normal people having common sense and coming up with common sense reactions to all the mess. Because right now, we don't see common sense reactions. We see political action. That is not common sense. Perhaps it's impossible at that level.

Nate Hagens (01:14:32):

Yeah, I think we're going to need realists in society and we're going to need better governance somehow. And I don't know how to get there, but governance kind of underpins all of our issues that we discuss on this show. So I'm going to give you one more chance, not on chemical pollution, but if you

were just generally benevolent dictator on this planet and there was no personal recourse to your decisions, what one thing would you do to improve human and planetary futures?

Martin Scheringer (01:15:11):

I think there is not one thing I could do here, I could find, because that would be the magic bullet.

Nate Hagens (01:15:20):

So you would delegate your benevolence to someone?

Martin Scheringer (01:15:25):

I would consult with people. With you.

Nate Hagens (01:15:32):

Is it possible that we could have some sort of technocracy in the future, that there was a council of elders that had scientific exposure that was politically neutral or bipartisan, that could convene on these poly crisis risks? Is that something that our culture is capable of?

Martin Scheringer (01:15:56):

In principle, yes. I think, yes. We should hope for that.

Nate Hagens (01:16:05):

Thank you. We should do this more often. And I appreciate your time and your work. Do you have any other closing thoughts, or advice, or wisdom for our listeners?

Martin Scheringer (01:16:17):

No, I would just like to thank you that I could speak here and also for the entire Great Simplification work that you do that I think is wonderful and important. And please, keep going.

Nate Hagens (01:16:29):

I intend to. And we will have lots of resources and show notes for people that want to take a deeper dive into your work and the more broad risks and research on endocrine-disrupting chemicals, PFAS and other chemicals. Thank you so much, Martin. Enjoy your weekend, and let's talk soon.

Martin Scheringer (01:16:54):

Thank you. Bye.

Nate Hagens (01:16:56):

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