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#MeetTopEnvEcon – Ed Barbier

Date: February 8, 2022 Author: Ingmar Schumacher ⁂ 0 Comments —

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homepage

I am very happy to present a new episode of *Meet Top Environmental Economists* (#MeetTopEnvEcon), this time with none other than Edward B. Barbier. Ed is a University Distinguished Professor in the Department of Economics, Colorado State University and a Senior Scholar in the School of Global Environmental Sustainability. His main expertise is environmental and resource economics as well as international environmental policy. He has consulted for a variety of national, international and non-governmental agencies, including many UN organizations, the World Bank and the OECD. He has authored over 300 peer-reviewed journal articles and book chapters, written or edited 25 books, and published in popular journals.

Apart from being one of the most productive environmental economists, his contributions to environmental and resource economics, with a more specific focus on biodiversity and

nature conservation, are exceptional. His overview and review articles yield insights and discussions of a depth that few others do, and if you are interested in some more in-depth discussion and policy-oriented work, then take a closer look at his books. Ed has a fresh and open, kind-spirited character, is up for laughs and seems to be able to not only write about environmental and resource economics, but also has a life outside of academia. If you read on, then, among other insights, you will also find out which famous other environmental economist he is married to. Enjoy.

Here is the **video of the Express Views interview**:

Express Views interview with Edward B. Barbier

Here is the **podcast version of the Express Views interview**:

0:00 / 25:13

And now I am very happy to present you the **Meet Top Environmental Economists interview**:

(Date of interview: December 2021)

(download interview as pdf)

Meet Top Environmental Economists interview – Edward Barbier

What made you get into environmental economics?

It's interesting because I never really thought I would end up being an environmental and resource economist. In fact, it took me a long time to settle on economics, even as an area of interest. When I went to college, one of the advantage in the United States is that you don't have to go to college for a particular subject. And that was the case in my situation, I didn't really know what I wanted to study at college when I went and I basically thought I would

be a writer. I was interested in writing and I also was interested in engineering and I was pretty good at math. I wasn't brilliant at math, but I was good enough I thought I could be an engineer. So I was taking courses like that.

And then, because I grew up in low and middle income countries, I also had an interest in the world in general, so I took a political science course. Not only did I enjoy that course, but I also found that it was really easy. And I said, well, I'm beating my head on the wall doing physics and stuff and not really enjoying it. And I'm enjoying literature and English, but it just seems way too vague.

What interested me was the comparative politics and economic side. So I thought I'll try out economics courses and I discovered I really liked them. Then I decided that I wanted to go on to do graduate work. So I went to do a master's degree at the London School of Economics. There, I discovered that I was attracted to development economics given the fact I grew up in low and middle income countries, but I was a little unsatisfied because a lot of the problems I saw, both growing up and when I went back to visit for undergraduate research field work, that there was no real talk of how poor people lived and how they interacted with their environment for just basic survival.

I was then encouraged to take a course on development by Partha Dasgupta, who was a very young professor at LSE at the time. It wasn't meant to be about resources, but he had just finished writing the book with Geoffrey Heal on the economics of exhaustible resources. So towards the end of the course, he was actually giving us the type script that he had photocopied for us to read, just to delve into some things different. And I just got fascinated with that. So, that's what really got me into thinking about environment and resource economics, but in a development context.

And when I went on to do my PhD, I was still fascinated with problems of natural resource use in developing countries more than I was in standard problems, such as optimal resource extraction of a finite resource or fishery resources. So I started to delve into things like tropical deforestation, soil erosion and its impact on farmers and their livelihoods, ecological functions and how poor people depended on nature. And so that's the work I started to do and think about during my PhD and afterwards, and that got me into this issue.

So I kind of constructed my own path in environment and resource economics by an interest in development and rural resource problems in developing countries and big problems. I mean, I was fascinated by things like the global public good problem with climate change that people like Bill Nordhaus were just talking about in the late seventies. And then on top of that, I was given a golden opportunity after my PhD to work as an economist at the International Institute for Environment and Development. And at the same time, just right next door to us was the Department of Economics of the University College London. And there were two economists there, David Pearce and Anil Markandya, who were working at the World Bank, OECD, every institute, basically talking about global environmental problems and economics.

So the three of us got together and formed the London Environmental Economic Centre, exploring everything from green economy issues to climate change, to poverty and natural resource use, to economics in the ivory trade. And we were writing all this stuff and I was like a kid in a candy shop and that's where my background and my interest just took off.

You're writing around, let's say, 10 academic articles a year, and many of them get published in top journals. You also wrote 25 books. Some edited, okay, but some really written only by yourself. How do you find the time? How do you spend your usual day in order to bring about such a vast output?

Contrary to popular myth, I do not work all the time. People think, oh, you must work 20 hours a day and that's not true. I actually don't. When my eldest daughter was 15. she came to me one day and she said, "Dad, you're an economist. You're interested in efficiency, aren't you?" I said, "Yeah." She said, "Well, I just came across this great definition of efficiency." And I'm thinking, okay, she's going to talk about something like minimizing cost or allocation of resources. And she said, "It's intelligent laziness." And I thought, wow, that just captures me. I mean, I'm really efficient with my time, but because I operate under the principle of intelligent laziness, I'm inherently lazy, which means I don't like to waste time and I enjoy my time and I enjoy my leisure time.

There's so many things out there, particularly in our modern age that are very distracting, such as email and Twitter, Facebook, social media, and so on. When you're a professor, of course, you've got students, you have responsibilities in teaching and more administrators asking for more meetings and more stuff that you have to do as an academic. So I try and keep that to a minimum. I like to carve out time for myself to do the reading, the thinking, writing, and often most of it is thinking, but just ideas and concentration. And I don't like to waste that time.

If I commit to doing something, whether it's a consultancy report or a book or an article with co-authors, or even for myself, I try and say, okay, this is the deadline. This is what I need to work towards. What do I need in order to get to that point? I know now from experience how I work and how I do things, I know there's so much time I need for the various tasks you need for research, including the writing side.

If you were to give a list of articles that a young researcher in your line of research should read, what would it be (and why if you want)?

In terms of a list of articles, here are my suggestions for articles published in approximately the last 10 years or so. I have focused on major review articles, rather than specific technical articles, as I think the former are the best way for any young economist to be introduced to a broad area of economics literature. I would include:

Arrow, K.J., P. Dasgupta, L.H. Goulder, K.J. Mumford, and K. Oleson. 2012. "Sustainability and the Measurement of Wealth." *Environment and Development Economics* (3): 317–53.

Barbier, E.B. 2021. "The Evolution of Economic Views on Natural Resource Scarcity." *Review of Environmental Economics and Policy* 15(1):24-44.

https://www.journals.uchicago.edu/doi/10.1086/712926

Barbier, E.B. 2019. "The concept of natural capital." *Oxford Review of Economic Policy* 35(1):14-36. https://academic.oup.com/oxrep/article/35/1/14/5267896

Damania, R. 2020. "The economics of water scarcity and variability." *Oxford Review of Economic Policy* 36(1):24-44.

Kraay, Aart. and David McKenzie. 2014. “Do poverty traps exist? Assessing the evidence.” *Journal of Economic Perspectives* 28:127-148.

Van der Ploeg, F., 2011. Natural resources: Curse or blessing?. *Journal of Economic Literature*, *49*(2), pp.366-420.

Venables, A.J. 2016. “Using Natural Resources for Development: Why Has It Proven So Difficult?” *Journal of Economic Perspectives* 30:161-84.

What articles or books in your topic of research would you suggest to someone who is working in policy (politician, policy advisor)?

I would recommend:

Dasgupta, Partha. 2021. *The Economics of Biodiversity: The Dasgupta Review.* HM Treasury, London. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

Barbier, Edward B. 2022. *Economics for a Fragile Planet. Rethinking Markets, Institutions and Governance.* Cambridge University Press, New York and Cambridge. https://www.cambridge.org/core/books/economics-for-a-fragile-planet/E1A205824EF1BBB89B83240475915F4D#:~:text=In%20this%20book%2C%20renowned%20environmental,while%20sustaining%20per%20capita%20welfare.

What advice you would give to young students who want to work in your field or in economics in general?

First of all, one of the things I often say to undergraduate students, who are going on to graduate school is, don’t do it right away. Don’t go from being an undergrad immediately to a grad school, which is kind of hypocritical, because that’s what I did. But I actually took a break between doing a master’s and a PhD, because I needed to just kind of figure out what it is I was interested in.

It’s hard to be a graduate student in economics. It’s a real commitment. We’re one of the toughest disciplines, certainly among social sciences, because we demand so much of our students. Don’t rush into it because you don’t want to burn out in graduate school, which is what I see way too often with people.

Now, once they’re in graduate school, unlike when I was, as I described earlier, nowadays, there’s so much choice. And the great thing is there’s environmental and resource economics everywhere. My first piece of advice would be go to the best place for what you’re interested in. Who’s doing the research there that really appeals to you?

And the third piece of advice would be, be both a researcher and a teacher. So obviously you’re interested in researching, but also, make sure that you’re in a program that gets you to do a little bit of teaching as well, but maybe not too much so you can’t do your research, so that you can get a feel for what it’s like to teach from what you’re learning. I learned a lot of economics from teaching. And also, if you’re fortunate enough to get a course to teach when you’re a graduate student, that’s in your area of interest, such as environmental

economics, it just really makes a huge difference to you to be able to do that, to work with people along the way.

The other thing I've been increasingly telling graduate students is don't think that because you become a PhD you have to become a professor or get an academic position. It's not easy. It takes a certain type of person. There's so many other opportunities you can do with a PhD in economics, including environmental economics. We're very lucky now that so many areas, like the private sector, NGOs, government agencies, academics, research institutes, all want environmental economists. Get some experience there, too.

I also tell graduate students, think about a postdoc. There's some very interesting postdocs being offered by some really excellent professors and researchers and some in economics and some even outside of economics, that really are great opportunities and give you a chance to find out whether this is for you or not to become a full-fledged researcher.

And the last thing I'll say is that I basically think for young environment and resource economists, we are really, really lucky in this field. Well, there's a good side and a bad side. The good side is we're very lucky that we're at this point where everyone's trying to figure out where does economy and nature fit together. And there is a huge range of opportunities for our subfield in terms of research. That's the good news.

The bad news is that, unfortunately, there has always been this kind of prejudice within our discipline, which is that because we study the environment, we are not top mainstream economists. We're not the cutting-edge economists. That's the macro economists. Those are the econometricians and financial economists. It's changing and it's changed an awful lot with climate change issues becoming so prominent and others, but nonetheless, that's slightly the downside. If you can live with that and be happy that you have a huge playground of research opportunities, then environment and resource economics is really for you.

Another thing I say to young researchers is: don't be afraid to collaborate with natural scientists and ecologists and even hydrologists and climate scientists. Write some really fascinating interdisciplinary articles. And you can get those in the top journals in the world, Science, Nature, Proceedings of the National Academy of Science, Royal Society Philosophical Transactions. These journals have citation rates 10 times higher than the top economics journal citations. Now, maybe if you're an academic economist in certain departments those are not counted very high because economics departments often say you have to publish in economics or top field journals, but increasingly in terms of an impact on policy and moving the world's thinking, environmental economists do that more regularly than other economists do.

When it comes to skill building, I'm old school on that. I also believe in interdisciplinary research and I believe in interdisciplinary collaboration. I like to see a combination of theory and empirical methods, and essentially I'm an applied economist.

Now, if you want to tackle a particular problem, whether it's, let's say, coastal habitat supporting fisheries, you can work with an ecologist to help you. You can work with a fishery biologist to help you. You can work with a mangrove expert and you can obviously use your skills as an economist. And you can put that together and you can come up with something novel there and that can help bring in new methodologies as well as some

interesting, really economic and scientific and policy insights. But that doesn't mean that you give up being an economist. You're using your discipline's skills to work together, to solve a complex problem. That's how I think progress on environmental problems should be done on the whole.

What future direction would you envision for environmental economics?

I think we're at a huge crossroads right now, both in our discipline and also in the world as well. I started off my career thinking big because nobody was doing that work at that time. It was kind of a golden age in some ways, environment and resource economics, where we suddenly realized in the early eighties and nineties, that there were so many problems out there where environmental economics had a way to think and their big problems and little problems, big global problems like climate change and biodiversity. And then also small problems like poverty and how do poor people use resources to survive. And in between we had resource extraction and pollution.

We're at a point now that the world is facing major global environmental risks and environment resource economics is, within economics, the one field that is best capable and has been talking about many of these risks. And so we, as environmental resource economists, are now in a good position to help the world think about how do we deal with these problems?

My mother, who just celebrated her hundredth birthday, always had a few sayings for us growing up and one of them is: you can lead a horse to water, but you can't make it drink. Environment and resource economists have been saying for decades these are serious global problems. We have ways of analyzing them that show this is what we need in terms of collective action. This is what we need individual countries to do. This is what we need to do, change markets and policies at the local and national level. And we've been saying that, but so little progress has been done.

So we've led the horse of society to the water, but they have yet to drink. And I think this is a critical 10-year period we're in right now. We're running out of time for many of these global problems, obviously climate change, fresh water scarcity, nature and biodiversity loss, and deterioration of coastal and marine environments.

I just finished writing a book for Cambridge University Press called *Economics for a Fragile Planet*. And in this book, I'm aiming it at the interested public. I'm aiming it at policy makers. I'm also aiming it at fellow economists to say, look, let's keep going. Let's keep our nose to the grindstone, keep pushing. And this is what we've learned from economics. And also, we need to go a step further and have to think more about problems, not just in terms of relative scarcity, but we have to think about constraints and how do we self-limit, how do we think about our economies within nature, embedded within nature? What does that mean for our market incentives, our policies and so forth? How do we transition to green economies? What's the role of business and finance and how does business risk, financial risk, environmental risks fit together?

You have written on poverty and climate change, on environmental issues, nature, the interlinkages between these. Doesn't overcoming poverty quickly imply further degradation of the biosphere and the worsening of climate change?

It does if we continue to do it the way we've been doing it, which is basically to say, all economies should follow the model of development that has been hereto put forward. So I've written about this in some of my books, and maybe one or two articles. These are big issues, but I've been very interested periodically about looking at different historical eras of how economies have used natural resources. In fact, I got so interested in it, I wrote a book about it called *Scarcity and Frontiers: How Economies Developed Through Natural Resource Exploitation*. And one of the things I got out of that exercise, besides a really nice book, is the fact that each era where we've had a pattern of natural resources and development, one economy or a series of economies have emerged as the model. This book goes back to the beginning of the agricultural transition of 10,000 years ago.

Fast forwarding to the modern era, essentially I see ourselves still stuck in what I call the fossil fuel age. And the fossil fuel age is, of course, connected to the industrial revolution, but the fossil fuel age was divided into two parts in my view. One part was the coal-based era led by Britain, where Britain was the model economy. How it developed and how it used its colonies from 1750 to the end of the 19th century was the model. And they were the leading economy and everybody else, all the other economies in Western Europe, United States, Japan, and all the other Neo-Europes adopted similar technologies.

But then something happened, which was towards the end of the 19th century. There was a discovery in the United States in the use of oil and natural gas. Now that didn't change the fossil fuel age, it just put it on a different trajectory and it put the United States, with its abundant natural resources that it had within its borders, into the forefront of the model of global development. And essentially we've been following that model of global development since that period. It stopped being so productive around 1970, but it so happens that we still follow that model. All the economies in the world are t this model, our populations are benefiting and poverty has been reduced, but we're following a model which is heavy on natural resource use, heavy on fossil fuel use, and heavy on destruction of nature.

And you can see trends. And I point this out in my recent book, from 1970 on, this acceleration of the destruction of nature around the world, that is the byproduct of that model. So in a sense to answer your question, we are stuck in this age where it has diminishing returns and it's now being actually destructive and harmful to the environment, which is why we're facing global environmental risks. And the problem is that this is the model we're using to pull people out of poverty. And I actually think that the work I've been doing and others on sustainability for 35 or more years, we've been arguing about intergenerational equity, about the fact that we can't go on using natural resources and environment to satisfy needs today without impacting the opportunities and welfare of future generations.

We've been seeing sustainability as an intergenerational equity problem. We're now at the point where it's also an intragenerational equity problem. Inequality's gotten worse, wealth inequality, income inequality. And so essentially the gap between rich and poor has gotten worse. And with the recent global pandemic, the progress we've made in the last 10 or 15 years in reducing global poverty has been reversed, and in some cases, anywhere from up to 150 million more people may have been thrown into extreme poverty.

And so we cannot revive the old model of pulling people out of poverty without doing serious harm to the environment. And also, I don't think it's going to work to pull people

out of poverty anymore, because there's diminishing returns to it. And that was the focus of a book I wrote inspired by Thomas Piketty, among others, called *Nature and Wealth* where I tie inequality and natural resource exploitation, ecological scarcity together. And it's something that I now believe people are starting to recognize. That's where I see the green economy is not a luxury. It's a necessity. The transition to a greener economy, a more sustainable economy has to be a way of also being more inclusive and certainly we need a new model.

The good news is that those economies that figure that out first, they will lead the new era. They'll be the new model economies. I don't know who will be, but if one or more economies in the world start to prove that a green economy transition is beneficially economically, as well as socially, then it's going to be the new model. It'll be after my lifetime. I'm actually quite worried that we could have a few catastrophes before we get there, but I hope not. But I think that's the future.

So another option to reach sustainability is, of course, what has been recently advocated by the degrowth movement? What is your position on this initiative?

Well, that's interesting as well, because I remember back in my days as a graduate student or between periods where I was a master's and a PhD student, I used to go and listen to these debates about growth is bad for the environment. And you had to be on one side or the other. But working with David Pearce and Anil Markandya early on, all three of us agreed that it's not about growth. It's about development. It's how you develop. Structural change is not growth. Structural change in the economy, whether it's transformation of a developing country from predominantly rural to a diversified economy, where you have industries and services, that's development.

Similarly, a transition from an economy that is fundamentally dependent on pollution, natural resources and fossil fuels, to one that's fundamentally green, that's more sustainable, that's a developmental and a structural transformation. That's what we need. It's not about how much does the existing economy grow in the short run or even the long run. It's how do we transform economies? How do our economies transform along a path toward sustainability?

And also, I was profoundly influenced by Schumpeter's work over the years, not necessarily just the creative destruction side of his work, but he wrote one of the first books on development way back at the beginning of the 20th century. Schumpeter made it very clear that there is an ongoing process of change in the economy. Economies don't stop developing just because they're richer and others are poor. They're constantly transforming and new sectors are coming up and others are changing.

And so we have this weird obsession in economics with the Gross Domestic Product, how much goods and services we produce and how much that production grows or increases over time. So I think these degrowth models are missing the point. You don't want to take the existing economy and stop it from growing. You want to transform that economy into a more sustainable, greener, less fossil fuel dependent economy.

You're saying that one of the really big problems is the intragenerational inequity, the extreme poverty. This needs to be overcome, but it needs to be overcome with a sustainable approach, which would be helping these countries to grow in a green way. At the same time, the developed countries

need to transform the economies also and need to transition to a more sustainable path out of the fossil era.

Well, can I make two minor modifications to what you just said? The first one is that I don't see intragenerational equity to be just about poverty. I also see it to be about the amassing concentration of wealth at the 0.1%, meaning we now have created this uber rich class in the world who have tremendous wealth power, and they can use that power and are influencing political processes that govern our economy. That to me is just as much a part of intragenerational inequity as is the continuing poverty problem.

The second thing I want to say is that I think all economies should become greener and more sustainable, not just the rich ones. The rich ones certainly do, but I also think that emerging market economies and even developing economies for their specific development stages that they're at, they need also to transition to greener economies. That may be different than how more advanced economies do it, but I think this is necessary for the entire world economy, not just the rich ones.

I would presuppose that the rich countries have enough finances and means to make the transition themselves, if the political will then persists or develops, but do you believe that the poor regions, the developing ones, have also the financial means or do that? Or do they need help and how would they get that help?

I think it's a combination of the two. It's not that the rich countries have to provide the assistance to help developing countries, develop in a way that it's more sustainable, nor is it just the fact that developing countries have to do it on their own. There are certain things that rich countries need to compensate poor countries for and to provide assistance for, particularly technical financial assistance for goods and services that they don't have and technologies they don't have, as well as assistance for global public goods, conserving nature that has global public value are things that need compensation from rich to poor.

The other thing that often is left out of that conversation is what's the role of the private versus the public sector? Right now, almost all assistance for things connected to nature in developing countries is predominantly provided by other governments and through international public financing. But the private sector has huge supply chains. Businesses have supply chains that are based in developing countries or a part of developing countries. They have a stake in managing nature, too, and managing nature that benefits them directly. And there are more mechanisms by which the private sector can be involved in helping more capital flows, investment flows assistance to developing countries.

Another area of assistance is, of course, adaptation because there are certain developing countries that are going to bear the brunt of climate change, sea level rise and other natural disasters and calamities that are upon us now. And I do think that there needs to be a system of assistance.

But I also think there's a lot of things that developing countries and governments and entities within those countries, which are under the control of those countries, could do that would be more beneficial. One is the issue of subsidies. To give you one example, water and sanitation subsidies around the world, they're around $400 billion a year. This is for big supply networks, both for cities and for irrigation. Almost all those subsidies are in developing countries. That's not a sustainable way of meeting the clean water and

sanitation needs of millions of people, who currently lack it in developing countries. But there are other ways that you could reallocate those subsidies to meet some of those issues.

Equally, in developing countries, there's a huge amount of fossil fuel subsidies, not in all of them, but in many of them. Those could be reallocated to expand better use of access to rural energy by poor households, solar safety net programs, and so forth. India and Bangladesh already have programs like that. Many developing countries depend on primary products as the majority of their exports. Those natural resources are often poorly managed and depreciation is too fast and the way in which the management takes place is harmful to long-term use and sustained use of those natural sources, which those economies need to use in a sustainable way and in an efficient way in order to make that eventual transition to diversify their economies.

And similarly, there need to be policies in place that allow the rents from natural resources to be invested back into physical and human capital within countries. And these are things that countries themselves can control and do, yet many of them do it in completely the wrong way for short-term gain profit and at the detriment to much of their populations.

In this regard, it has been quite often argued that developing countries also lack the expertise to take the right decisions. Would you agree with that? And if you agree, what can be done?

In some cases, it's lack of expertise, certainly regarding new more advanced greener technologies. Developing countries aren't the innovators, they're the adapters of technologies. And you do need a certain degree of human capital skills and so forth. But we've been there before and the private sector is quite capable, with the right incentives, to make that transfer. However, in terms of management of natural capital, whether you're talking about fossil fuels, timber products, land, so forth, there are mega companies and entities within developing countries that already have the expertise. It's not a problem of expertise. It's a problem of political will and acting in private versus social interests and understanding the critical role that natural resources play in terms of long-term development, rather than short-term profit gain and exports.

But those big companies, they don't necessarily have the incentives to take the best policies for the country.

Sometimes they don't. And also, often they're in collaboration with the political leaders to focus on short-term gain, rent seeking, and so forth at the detriment of greater social welfare. But to say it's a problem of lack of expertise, no, it's not. It's a problem of political economy and also poor incentives, poor institutions, governance, and so forth. And I think that, time and time again, we see that it's how natural resources that are managed, that determine how the development takes place, rather than just simply the fact whether we have abundant natural resources or scarcity confines us to less development or more development. No, it's how we manage natural resources that is important. And we have that expertise in place in many developing countries. It's just poorly done.

Let's pick up this management of natural resources. In much of your writing, you advocate for aprice on nature. Yet some researchers argue that if we introduce markets for nature, then this will only worsen the extortion of nature. What would you say to these researchers?

Well, first of all, they don't understand that nature already has a price in markets. It's near

zero, because in the commercial decisions that are made to exploit nature, essentially those commercial decisions are marketed decision. They involve conversion of forests to oil palm. They involve conversion of mangroves to agriculture. Those issues are taking place and they're market decisions, but the externalities, the environmental impacts, the value of those natural systems that are being destroyed are not taken into account in those commercial decisions. So we're already giving them a price. It's zero. But it's worse in that we often subsidize those activities, so that in effect, by subsidizing, they go out and exploit more. We're putting a negative price on nature.

And that doesn't reflect the real scarcity of the goods and services that are destroyed and embodied in that natural capital when it's lost. We need to start understanding what those values are. And we have to make sure that policy and business decisions that lead to destruction of nature take into account in market-based decisions and commercial decisions that loss of scarcity value. And that's the problem. And that's what I call the underpricing of nature problem.

We know from the International Energy Agency that around $400 billion a year globally is spent on fossil fuel subsidies. The OECD has estimated for 50 countries that $100 billion or more of agricultural subsidies are directly environmentally harmful. I mentioned water and sanitation subsidies that lead to overuse of water. That's around $400 billion a year. Fishing subsidies, tens of billions a year, which are destructive subsidies. So we know about a lot of subsidies that are directly environmentally harmful. Yet we perpetuate them and that causes this environmental damage.

Then on top of that, we also have to say, okay, if we're going to look at commercial decisions and policy decisions that impact nature, what are we losing there in terms of value and capital? We have to make sure that those policy and market decisions include those lost values. That is what I mean by ending the underpricing of nature, but that's part of the problem. That's one part of it. And I talk about that in my latest book on *Economics for a Fragile Planet*, but I say there's another problem, which is we grossly underfund nature. And it's tied to underpricing, because if you give nature a zero or near zero value, or even a negative value, who's going to invest in it, right? You're going to build more factories rather than protect nature, because you're saying that doesn't have any value. There's no return on my capital.

More and more businesses are finding out that the supply chain depends on nature. We're finding that some of the services of nature are important for the poor, but they're also important in terms of protecting downstream activities. So protection of forest and watersheds actually protects agriculture and infrastructure downstream. And so suddenly people are realizing, there is a return to nature. We need to find ways of funding it. Now here's the problem. The problem is that most of the world's most valuable nature and its biodiverse nature is in tropical countries, which are predominantly poor countries of the world. Low and middle income countries are predominantly the tropical countries. That's where most of the world's most important nature is, but the whole world benefits from it.

So we need to find ways of public funding that can assist helping developing countries, tropical countries in particular, to conserve nature. We need them to spend more and we need we need public funding to do that. We also need more and more companies and corporations to see that their supply chains are dependent on nature protection in tropical regions around the world and, to treat nature in their business decisions as being a valuable

form of capital.

You were talking about the funding. Given that we already have so many problems to get the 100 billion together for climate finance, do you see any reasonable grounds for saying that we could create a similar fund for nature?

That hundred billion is purely public funding. That's money promised by rich governments to poor governments going back to the Paris Agreement. They promised, starting in 2020, they would provide $100 billion per year in assistance to developing countries. And I think that's important for us to achieve, but I think that there's more scope from the private sector than what's there. And there are ways of raising money privately or through some sort of quasi-public way.

For example, take green bonds. Green bonds are bonds that are essentially a way of financing large-scale projects. There are green bonds being released now by multilateral banks, by rich and poor governments, and by private companies that are geared towards green projects. That bond market is growing and more and more long-term projects are involved. Right now, most of the green bonds are financing climate and energy projects, renewable energy, clean energy, and transportation projects in particular. Very little is used for land use biodiversity nature projects, because those projects are much smaller and they're usually scattered around countries. And many of them are in developing countries rather than in rich countries, which is where we need the funding.

But one could put together a portfolio of these programs and projects and then release a green bond through multilateral banks and through the government of the developing country and get it financed that way. And then private investors could invest. You could also see a case where you have major companies that have a vested interest in a certain industry, such as the seafood industry, get together and say, we have a problem with global marine stocks of fish and those biological resources that support our commercial fish stocks, the feed stocks and the other parts of the marine food web. We have a problem here and we're losing our capital.

And that's essentially what's happened: that there's been an initiative put together by the major seafood companies to say, we have a problem with the sustainability of our stocks. We've got to figure out a way of working with local governments and jurisdictions and use our might as the major seafood companies to deal with it. And they've put together something called the SeaBOS Initiative, supported by scientists and policy thinkers to try and tackle this problem. And we need much more creative thinking than that, it's not just about rich countries' governments reaching into their pocket, pulling out money and doing it.

Some colleagues and I have argued, and these colleagues include two ministries of environment from developing countries and one of the vice-presidents of Conservation International. We wrote an article for nature calling for a tropical carbon tax. And this is a tax for developing countries tax their fossil fuels and put some of their proceeds towards investing in nature-based conservation restoration, land management projects. This is not just a theoretical exercise. This has actually been done since 1997 by Costa Rica and Columbia has adopted since 2016. In this nature article, which we published in 2020, we basically said, well, if 16 mega diverse tropical countries did the same thing, they would raise billions of dollars of years for this type of solution.

One last example, which is from United States, is that one of the biggest things that is of concern to environment and resource economists in the United States like myself, is the fact that we don't have a national carbon price, whether it's a tradeable permit market or a tax. But what we do see is more and more states and local initiatives, subnational jurisdictions adopt carbon pricing, and that's starting to have an impact on the US meeting its 2015 Paris Agreement national contributions. And so there are different mechanisms that can happen. To think it's all government to government and the government has to do everything and the rich countries have to just give poor countries money to solve the problem, I think we make a mistake putting it in those terms. There's so many mechanisms, policy instruments, and so forth. What we lack is the vision to say, this is what we could use these things for, and the political will to see those go through.

Time is running out. I have a couple of quick questions. Do you know the concept of holidays or do you take your papers to the beach?

Oh, definitely, when I have a holiday, I am not taking papers to the beach. I used to do that occasionally, but no, I take proper holidays.

Your wife, Jo Burgess, is also an environmental economist. How do you spend your evenings? Doyou discuss about environmental economics or do you prohibit that talk?

We used to have a rule that we would stop talking about environmental economics. So we'd go out to dinner or something, and then we'd stop. But now we just talk about environmental economics whenever we want. Our kids have gotten used to this, and sometimes they ask questions as well. None of them so far have shown an interest in economics directly in terms of studying it, although our youngest daughter is keen to learn some. But they all know enough economics from hanging around us that they are interested. So they bring up questions and we often have family discussions. My wife and I we publish a lot together. We've written books together, papers, and we insist on just that always from the beginning, she uses her maiden name so we don't sound like a law firm when we write papers.

But taking a break from economics and taking a break from global environmental problems or whatever we're working on is really important. That's why holidays are important. Another really important part of my life is playing music. That's a break for me. I've played in different, small rock bands over the years, just for fun and playing some gigs.

What is your favorite economic joke or anecdote from a conference?

One of my favorite jokes is three economists go duck hunting, and they're waiting and waiting and finally a duck flies by. The first one takes a shot and he misses 10 meters to the left. And then the other one takes a shot, he misses 10 meters to the right. So the third economist throws up his shotgun and he says, "Hooray, on average we hit it."

Nice. Finally an economist who knows a joke, haha. Please feel free to suggest someone else who you would like to see in this series.

There's so many good top environmental economists, and you have already talked to quite a few, including Partha Dasgupta and Anil Markandya I believe! You should also ask Nick Hanley from Britain. First of all, he's I think really very interesting in what he's done over

the years. And Sjak Smulders you should have, because I think Sjak has really great insights. Frank Convery, of course. I think Frank is great because he has such a wonderful policy experience and unusual because of the combination of academics policy and insight, plus he's so darn entertaining to listen to, and he'll be very good for this. I'm sure there's others and I apologize, there's many others I could probably mention that should be also included.

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