

The Great Simplification

Nate Hagens (00:00:30):

Bienvenue à la Grande Simplification. I'd like to welcome to the show, Jean-Marc Jancovici. Jean-Marc is a French engineering consultant, professor, author, and independent columnist. He's very well known in France. He's been working at the intersection of climate, energy, and economics for over 20 years. He's the co-founder and associate at the Carbone 4 consultancy firm, as well as the founding president of the think tank, The Shift Project. This was a weird conversation because I have never watched until a few hours before this any of his work and he's never watched any of my work, and we're saying almost the same things. Which to me is a robust finding and I hope to collaborate with Jean-Marc in the future. Please welcome Jean-Marc Jancovici.

(00:01:33):

Jean-Marc, good to see you. Welcome to the program.

Jean-Marc Jancovici (00:01:34):

Good morning or good afternoon. I don't know.

Nate Hagens (00:01:52):

It is almost afternoon here. You're seven hours ahead of me. So you and I have been sharing similar stories and viewpoints. From what I understand the past two decades, a lot of people have told me about your work. It was only this morning that I watched one of your English videos, so could you start us off by, in your own words, give us a long elevator pitch of how you see the human situation with respect to energy, climate systems, oil depletion. What's the big picture?

Jean-Marc Jancovici (00:02:28):

Well, actually the big picture goes back to two centuries in rough figures. The reason why we're today able to talk together even though we are thousands of miles apart and we all have a computer and we all have plenty of food to eat and we all have a big house and we all have means to move around for actually not a lot of money, it's called fossil fuels. What happened to humanity for the last two centuries is that thanks to fossil fuels and thanks to machines that were put in motion by these fossil fuels, we have progressively replaced hard human labor by easy so to say, human labor, which consists in giving orders to machines that plant and harvest the crops for us. Plant and harvest cotton and knit clothes for us.

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(00:03:25):

We have machines that move us around, manufacture the billions of goods that we can now purchase in stores. We have all these machines that fly, sail, move around. We have the machines that heat our homes, build our homes, et cetera. Basically we live in the world of machines and the conclusion to which I've come, I would say during the last 20 years, is that what framed the 19th and 20th centuries actually bears a very simple name, coal, oil and gas and the internal combustion engine and the steam machine. Basically that's what happened to humanity for the last two centuries.

Thanks to, or no thanks, I don't know, to fossil fuels, the number of people on earth grew from 1 billion to 8 billion. Life expectancy at birth went from let's say a little bit under 30 in 1800, to the world average is probably around 65 today. Even in India, life expectancy at birth is over 70.

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So we have, again, all the material goods that we have today is due to fossil fuels. This has also framed the geography and I would say the settlements our people as it is no longer necessary to have people in the fields growing food, we have progressively shifted to industrial then office jobs or tertiary jobs, so to say, that we have in cities. So we progressively went to a type of settlements where most people live in cities and actually you can observe that everywhere in the world. The more energy per capita you have and the more people live in cities. And so the modern urban world with people working in offices or in commercial buildings, living in a home and owning a car is basically the type of the way of living that you have everywhere when abundant energy comes in, it's basically what happened everywhere.

(00:05:48):

And of course this comes with the price. Actually the first price that it comes with is that all these fossil fuels have changed the composition of the atmosphere through their burning and it has increased a natural effect called the greenhouse effect that was discovered by a French two centuries ago, Joseph Fourier in 1824. And this greenhouse effect is being increased or enhanced by all the extra CO₂ that we pour into the atmosphere, knowing that the CO₂ is a very stable molecule because it's an oxide and oxides are very stable chemical compounds.

(00:06:27):

And it leads to a change of the climate system, a climate drift so to say, which is going to be an increasing burden. And the other price that we have to pay is that all

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these, I would say industrial civilization, rests on non-renewable resources that we have to use and destroy when we use them more and more fossil fuels, namely we destroy them when we use them, but also metals. Today our modern civilization needs all the metals that we have found on earth. The computer that I'm using right now and that you're using right now needs 40 to 60 different metals to be manufactured.

(00:07:14):

So the civilization that we have built is increasingly complex and dependent on non-natural resources that can be depleted. So the two main challenges, I would say the two main global limits that we face today is a global limit regarding the environment that cannot accept all the waste that we pour into it. CO2 being one of it, I would say one of the best documented and addressed today, but there are many more. And an upstream bottleneck on non-renewable resources that we would like to have more and more and it's not sure that we'll have more. And actually regarding oil, it's almost sure that we'll not have more and more and in a couple years we'll have less and less, globally speaking in the world.

(00:08:09):

So that's the challenge we address. And one of the difficulties that comes with it is that very few people understand the challenge because it is not something that you can get through the most common indicator that we use every day, which is money. The challenge that I've just evoked is not embedded into current prices because basically natural assets have no price. And so we cannot realize that there is a challenge through prices, but it happens that the only quantitative indicator that we use every day is money.

(00:08:49):

You don't take your blood pressure every day. You don't measure the amount of CO2 that you put into the air every day. You don't measure the mass of copper that you use every day. The only thing that you count every day is money basically. And so the difficulty is that as the challenge is not embedded into prices, it is very difficult for people that have not devoted their life to studying the challenge as I have done, to understand it easily.

Nate Hagens (00:09:18):

Magnifique. That was a better summary than I've ever done I think, even though we're telling the same story. When was your red pill moment, Jean-Marc, when you first

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realized how central that energy was to the entire civilization and our expectations and everything?

Jean-Marc Jancovici (00:09:37):

Actually I had a collection of red pills, of small red pills. My first red pill was when I realized the magnitude of the challenge regarding climate change. Actually historically, I came to climate change before coming to energy. The way I got my revelation so to say, is that at the end of the 90s I was working in the telecommunication sector, and it was the time where the operators were very excited by the idea of developing remote activities. It was the beginning of telework remote learning and all these things. And I was as a basic consultant doing business plans for the main French operator in telecommunications, Orange, today. At the time it was for telecom.

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And looking at the fact that home offices could spare people moving or could spare car commuting, I came across the word greenhouse gases and I asked myself, "What is that?" So I began looking, so that was my first red pill moment. I understood that we were changing the composition of the atmosphere and that it could, I would say, trigger a change of climate era in one century, whereas in the past it was done in 10,000 years with people able to move around, which is not the case today because we have settled.

(00:11:20):

My second red pill moment was when I tried to understand what was causing this and the link between the way we live and energy. And my second red pill moment was when I realized that actually energy or the increase of energy supply had been the main driver over a century say that framed all the countries in the world. Basically you give machines to a country and the evolution is always the same. People leave the fields, go to factories, then to sit in two offices, live in cities, their purchasing power increases, they get retirement, they get long studies, they get vacations, they get their weekends, they work less in the week, they vote. Everything came in with energy.

(00:12:15):

And that was my second red pill moment because then I asked myself, "Where will the world go the day we have less and less energy?" Will we keep democracies or will we have rights everywhere and social unrest? Which is unfortunately happening here and

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there more and more. Will we keep peace or something that won't happen? How are we going to in a way become sober without the whole society collapsing? I still haven't the complete answer, but that was my second red pill moment. Then I had another red pill moment when I realized the way democracies operate, and I realized that a fast reaction to that issue would not happen. That was I would say a third red pill moment. So I had at least three and maybe through our discussion I will discover that I have more.

Nate Hagens (00:13:17):

Yeah, the room is full of red pills. We actually have so much in common on how we see this. So if I was an economist or a world leader listening to your summary, I might say, "Yes, but it's technology that caused all the increase in population and the increase in wealth and services and the increase in city and retirement and vacation. It's human innovation that caused it." Do you encounter that pushback and how do you respond to it?

Jean-Marc Jancovici (00:13:52):

Well, it's an easy answer because actually to spread technology, you basically have to spread the objects that embed the technology. So you have to manufacture plenty of object and manufacturing plenty of object, persons aid, which is energy because you need plenty of energy into the industrial system too. I can put it the other way around. Let's suppose that tomorrow morning you do not have much energy and you can't manufacture cars anymore. Even if you have brilliant engineers, how do you spread technical progress in cars if you can't manufacture cars? Obviously you can't.

(00:14:28):

And if you can manufacture cars that people can't use because there is no energy to use the cars, how do you spread technical progress in cars? You can't. So it's very easy to explain that actually spreading technical, finding something which is new, doesn't require much energy. Actually it requires a little energy because it requires free time. In the Middle Ages, people were busy feeding themselves because it's the first need of humanity, and once the day was over and they had worked all day to feed themselves, they had no spare time to find whatever the proton or the neutron or the electron or the way to conceive an electric engine.

(00:15:15):

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One of the reasons why we have plenty of researchers today, able and Mr. Musk can hire plenty of engineers, is that precisely machines are growing the food first. If we're busy harvesting potatoes, we wouldn't do any research, wouldn't have the time to do so. When you look at countries that are still very sober regarding their energy consumption in Africa for example, they do not have many engineers and then do not have many researchers. So it's also the result of abundant energy that we can have research and technology, but to spread again technology, we need plenty of energy because we need to manufacture plenty of objects.

Nate Hagens (00:15:55):

So there are a lot of very ambitious technological plans of the future, such as net-zero and there are promises of decoupling or dematerializing GDP from energy and materials. What are your thoughts on that?

Jean-Marc Jancovici (00:16:16):

So far? It never happened. Actually, 15 years ago, I began doing something very simple, which is plotting the world GDP against the world energy consumption. I've got data going up to 1965 and I was astonished to discover that I got almost a straight line. So when you plot the world GDP in constant dollars against the world energy consumption, which is actually the size of the active fleet of machines in the world, that's what the energy consumption is. You get almost a straight line. You have a little improvement of the energy efficiency every year. So actually it's not exactly a straight line, something which is slightly convex, but you get almost a straight line.

(00:17:04):

And the reason why is very simple actually to have, as long as the GDP counts the same thing, that is square feet of construction, goods moving around, goods being manufactured, number of ships operating in the world, you have physical things and in the physical world you have rules that you cannot, sorry for the repetition, overrule. For example, to put a mass in motion, you require a minimum energy, which is the mass times the square of the speed times one half. And you cannot say it's one quarter because it would be, I would say energy if it were one quarter. So I'm going to vote at the Congress that it's one quarter. You cannot do that. It's always one half.

(00:17:53):

So you have limits. You can near the limit, but you cannot overcome it. I'm going to take another example. To go from iron ore to iron, you have to remove the oxygen in

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the iron ore. Actually iron ore is an iron oxide. The most common molecule in iron ore is two atoms of iron for three atoms of oxygen. To remove the oxygen, you use carbon, coal actually, meteorological coal. You need 1.5 atom of carbon to remove the three atoms of oxygen and it'll never be one and it'll never be 0.8, it'll always be 1.5. So in the physical world you have physical limits and it's the reason why when you look at the energy consumption per physical unit, per kilogram of steel, per kilogram of copper, the improvement actually is very low. It is very slow, it doesn't go fast and you have an absolute limit that you cannot overcome.

(00:18:59):

And in the future, we might even degrade the energy efficiency of the industry because the concentration of copper in the copper ore for example, decreases with time, which means that you need more and more energy to get one kilogram of copper. And so at the certain point with time, you will not have an improvement of the energy efficiency of mining copper, but you will have a degradation of the energy efficiency of mining copper. Again, when you look at the past, there is no decoupling at the world level. You have a slight decoupling in some given countries, but that's thanks to trade because you have the added value in the country and the industrial process or the physical flow that provides this added value which is outside the country. So it's an illusion. When you look at the world as a whole, you have no decoupling in the past and there is no major reason that you can get to decoupling in the future.

Nate Hagens (00:20:00):

Jean-Marc, have you ever watched one of my lectures or any of my videos?

Jean-Marc Jancovici (00:20:06):

I confess that I have not done so recently.

Nate Hagens (00:20:08):

Well then I am very happy because you are telling my story and we've never met and never watched each other's videos, which means this story is robust. I feel I found a brother from another mother. I say these same things over independent research for the last 20 years, and I just question why it is that so few people have connected these dots. And I suspect that one reason is that as you said earlier, the total amount of energy available to society has increased every year, and that is hiding all of the

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future assumptions and plans just implicitly assume that will continue, so they miss the centrality of energy abundant and cheap, are contributing to our society.

(00:21:05):

Why do you think you and I and many others have been talking about this for 20 years and it is still not, well, maybe in France it has, but elsewhere in the world, this is still a narrative of technology and money and energy materials are out in the distance, in the explanatory stories?

Jean-Marc Jancovici (00:21:27):

You are geographically closer to the answer than I am. I believe that it's a consequence of the University of Chicago.

Nate Hagens (00:21:35):

That's where I went to graduate school. Yeah. Okay.

Jean-Marc Jancovici (00:21:41):

Basically it goes back to what I've said earlier. Many people in the economic world believe that physical constraints are embedded into prices, and one of the things that they believe is that there is an elasticity between prices and volumes so that if you near a limit, you will see it into prices. And if you don't see anything into prices, instead you are far from the limits. I will explain in a couple seconds why it is false for commodities that are essential to our modern economy. For oil or steel for example, it is false. I can explain that very easily. There is no elasticity. And so that's one of the reasons why. Of course, and it goes back to framing, actually it's not the fault of the University of Chicago because before that it was the fault of French and English early thinkers of the classical economy.

(00:22:38):

Two centuries ago, basically the classical economist said, "In the world, we are going to count what is the limiting factor of production, which is the economic science."

Basically it is addressing the limiting factors of production. And at the time, two centuries ago, basically the economy was still a lot centered on agriculture. There was a little industry, but basically, and what they said is that there is plenty of land, plenty of resources, we don't lack iron ore, we don't lack coal. The only thing that we can lack is human labor and human capital. So the only thing that we are going to count is human labor, which is a kind of energy, but it's a slight part of the energy that we can

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get. And human capital, which is also a limiting factor, but there are plenty other limiting factors among natural capital.

(00:23:38):

If you are a fisherman, you need a natural capital, which is fish. You don't only need human capital, which is a boat, and you don't need only sailors. You also need architectural if you're a modern fisherman, a little oil or a little diesel oil to put into the engine. So basically, and what they have done is that they have invented that technological progress, which is for example, the solo residue in solo's vision, which is the total productivity of factor. If you look at copper, glass, so they invented that term, which cannot be predicted, which can only explain past, what happened, which is fantastic, which was called technological progress. And which actually when you look carefully at things, is energy machines and natural resources. That's what it actually is. But as it is not explicit, people stick to prices and they believe that with prices you can explain all what happens to the productive system.

(00:24:46):

Now, why is it false that we have no elasticity between prices and volumes regarding oil or steel for example? It's because these commodities are essential to modern economy. If you produce less oil in the world, if you have less oil, you will have less cars, less trucks, less planes and less boats that can operate. Therefore, your economy will shrink a little and if the economy shrinks a little, people earn less because basically the revenues are equal to the production. That's basic macroeconomic formula. So if people earn less and have less money and you have less oil to offer them, you don't know whether the new equilibrium price of oil will be higher or lower than the former price. And actually, when you look at past prices, there is no clear relationship. With less oil, you can have prices that are lower, prices that are higher, you can get everything.

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Same thing for steel. The modern world fully relies on steel. If you have less steel, it's an essential commodity for the economy. So if you produce less steel, you will destroy a little part of the economy, therefore producing less, people earn less. And then again, the new equivalent price of steel has no reason to be higher or lower than the previous one. So there is no elasticity between prices and volumes for commodities that are essential to the functioning of the economy. If you take a commodity which is non-essential, like handbags for example, if you produce less handbags, of course it

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will not destroy the economy. The people have the same purchasing power, only you have less handbags, and so the price of the handbag goes up. So that's okay.

(00:26:28):

But this relationship, it doesn't apply to commodities that are essential to framing the modern economy. Which is why for example, you won't see oil depletion coming through oil prices going forever up. You will see them with GDP going forever down. That's the way you will see it. But nominal prices, and today as economists have never looked at the relationship between energy and GDP, when the GDP goes down, it's the fault of bankers, people that don't want to work, those lazy, whatever, but they never see energy in the picture. Energy, volume, I mean.

Nate Hagens (00:27:16):

There's a biophysical economist who used to be on our advisory board called Reiner Kummel who explained the solo-

Jean-Marc Jancovici (00:27:25):

Yeah, I know him.

Nate Hagens (00:27:26):

He explained the solo residual is almost all energy. And I think if we did it on a global basis, it would be over 90% of it. I think his numbers were 60 some percent, but yeah. Excellent. So what are your thoughts? You mentioned money and GDP. What are your opinions on finance and quantitative easing as adding false or temporary wealth to the economy in the last couple of decades, and how does that affect some people's claims that we're decoupling energy from GDP?

Jean-Marc Jancovici (00:28:04):

I am not an expert on quantitative easing, but one of the conclusions that I've come to is that it led to an inflation of assets. Actually, there is an old theory that says that when you create money in excess compared to the physical possibilities of the economy to produce something, it leads to inflation. Actually what happened during the last 20 years is that creating money didn't lead to inflation in common goods, but it led to inflation in assets. Real estate, stocks, et cetera so that's what happened basically. And that inflation of assets is not fully corrected in deflating all that you count in the GDP. For example, if you have a square foot in a building which costs

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twice the price, you'll need a mortgage which is twice the amount and you will count the production in banks as twice the previous production. You will not deflate that production on the basis that it's always a square foot. It is physically still the same goods, only cost twice the price. And so you have no reason to count twice the bank added value.

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And you have that same thing for the stock market. If stocks go up, you will not deflate that saying, "Okay, it's always a stock, it's always the same company. There is no reason to count it for twice or 10 times the price." And I have never had the opportunity to make precise calculations to see how the GDP would have evolved if we had discounted, so to say, the inflation of assets from the GDP. But my belief is that it would have removed something, a little something.

(00:30:04):

And the other thing that we should have removed from the GDP basically is the debt because if you increase the GDP that you count today through increasing the debt that you have to reimburse tomorrow, normally you should have an accounting closer to an asset and liability accounting than to a P&L accounting, which is what we do. So you should count something for the creation of debt that you should deduct from today's GDP. And that correction also has never been made, and the level of debt has never been as high. Well, actually for the last century, it's never been as high as today except for the second World War.

Nate Hagens (00:30:52):

It's even higher than that now as a percentage. But all that debt, Jean-Marc, when it's called in, when it's created to be paid down is a claim on energy. So all the debts that exist in the world when they're eventually paid down, and we don't have that amount of energy, so I think this one piece alone is being completely missed by the financial markets in my opinion.

Jean-Marc Jancovici (00:31:17):

Well, my belief is that it'll end through inflation or default. Or a mixture of the two. I of course have a preference for inflation because it's softer, but obviously we are building a Ponzi pyramid and we all know how it ends. But I agree. If you need extra GDP in the future to reimburse the debt, it means that you need extra energy and you don't see how it fits. If we have less and less energy in the future.

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Nate Hagens (00:31:52):

So temporarily we can print more money, which is a facsimile for more energy, but it just extracts the existing energy we have faster?

Jean-Marc Jancovici (00:32:02):

I am not sure that it had a major effect on extraction of energy. It did have in the US a significant effect on the shale oil industry because between 2010 and 2018 during the shale boom, as you probably know, shale operators didn't earn a single buck. Actually, they were all losing money and they were also building a Ponzi pyramid. They were burning cash and refinancing themselves with new stock and new debts. Until one year before COVID, the financial sector said, "Now end of the game, we want our money back."

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And actually the only way to get the money back is to stop drilling all the time because with drilling all the time, you have huge CapEx and you just burn cash. You cannot earn money. And the paradox of shale oil is that you can earn money only if you do not increase production too fast or if you do not increase it at all. But quantitative did favor that movement, the extraction of shale oil. It did have an effect.

Nate Hagens (00:33:29):

But after shale oil, there's nothing left except for oil shale, which is basically uncooked rock with oil in it. So that's not going to work.

Jean-Marc Jancovici (00:33:41):

Sorry, at The Shift Project, which is an NGO that I chair in France, we have done a thorough analysis with the data coming from Rystad Energy. We had access to the full database of all the oil fields in the world for a very minimum price. And we published, I think there is an English version, our research on the projections that we make only under geological constraints. We do not mention, above ground constraints, political pressure, climate, whatever. On the perspective of the 16 top suppliers of Europe, that includes US, which happened to be the 16 top producers in the world except Canada, which is a significant one, and Brazil. And the result of our work is that the combined production of these 16 countries should be divided by two between now and 2015, including shale oil and including tar sand.

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Nate Hagens (00:34:49):

So 27 years from now, cut in half?

Jean-Marc Jancovici (00:34:54):

By 2050, the combined production of the 16 top supplies of Europe, which includes all the Middle East, Russia, all the US, Mexico or whatever, all the 16 top producers in the world, but Canada and Brazil, the production should be divided by two including shale oil.

Nate Hagens (00:35:20):

That's almost best case unless there's some new technology because it doesn't account for geopolitics or climate inability to get water to process the mining or any other complexity problems or things like that.

Jean-Marc Jancovici (00:35:37):

I would say it's a no crisis scenario.

Nate Hagens (00:35:40):

Yeah, I think that's plausible. I would expect my numbers might be a little bit higher, but in that ballpark. So on that note, Jean-Marc, my personal stance, and I expect you would agree that on a grand scale, climate change is the most existential issue that humanity faces this century. However, you and I both believe that fossils are going to become economically unavailable sooner than our cultures are planning for. That eliminates a lot of the more extreme climate scenarios that some reports predict. What are your thoughts on that?

Jean-Marc Jancovici (00:36:18):

What it excludes in my view is the most extreme temperature increase coming from greenhouse gases, but it doesn't exclude consequences much more unpleasant than what we today believe coming from the scenarios that remain plausible with the amount of fossil fuels that we can access if I develop a little bit. I do believe that the higher end of the bracket regarding scenarios which is emissions, growing and growing during the 21st century is plausible, because my belief is that we'll experience some kind of slow collapse before the end of the century preventing the economy from growing and so preventing emissions from growing. So the scenario which is a healthy "economy" and healthier and healthier "economy" becoming bigger and bigger until

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2100. And powered by fossil fuels is something that I don't believe possible. I don't deem it is physically possible.

(00:37:32):

What is possible is that we get a peak fossil sometime around 2050, 2060 or so, but that would be enough to trigger three degrees plus scenario. And what I want to elaborate is that the consequences of a three degrees plus scenario might be much, much more ample than what we believe today, because there are plenty of processes with threshold effects in the world, and basically we discovered them when it's too late. I will give a couple example. 10 years ago, I had never heard of the possible collapse of the Western Antarctic ice sheet, which is today considered possible starting from 1.5 degrees of global warming.

(00:38:30):

10 years ago, I had not heard of the placebo complete melting of the Greenland ice sheet in a couple of centuries, of course, which is something which is today considered possible, not certain, but possible. 10 years ago, I had not heard of the possibility of the whole Amazon Forest turning into a dry forest or even a savannah, which is something which is today considered possible.

(00:39:03):

And I remember that 20 years ago I did some kind of TV show in France and we elaborated a false weather forecast for 2090, and the temperature that we mentioned was 40 degrees celsius, which is something that we get today each summer in France. So basically my belief is that we should not be reassured by that. The higher end of the warming is not possible, but the higher end of the consequences that we get for a given warming today will be overcome.

(00:39:48):

And the reason why is that the models that go from a global temperature increase to the consequences in a given sector, being the possible dismantling of an ice cap, or the evolution of yields regarding maize or rice are models that are built with the past variability and they do not embed the possible future of variability. And some recent research has been published in nature saying that if we increased a lot, the variability in the future of climate parameters, we get damage which is much, much higher than if we do not do that.

Nate Hagens (00:40:30):

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I totally agree with you. Yeah, we don't have enough to meet the high threshold, but we have plenty to have a disaster in the climate. So I have so many questions for you. Let me just keep firing because you are giving succinct and very articulate answers, not in your native language by the way. So thank you for that. So a main news story in France ongoing has been protests and unrest over the raising of the retirement age and the threshold for pension fund access. Do you think that this connects back to energy scarcity and do you think we'll have more of this type of response, or do the French just have a certain proclivity for civil unrest?

Jean-Marc Jancovici (00:41:17):

Well, we have the two. We like to complain, which is a national sport here to complain, but the fact is that we today have retirement thanks to abundant energy. Two centuries ago, there was no retirement. Actually, it's not true. Retirement was invented by Colbert four centuries ago, and he did that for the Royal Navy. And at the time there were 20,000 sailors and you could get retirement when you turned 60 and believe me, in 1600 something, turning 60, which means surviving scurvy, an adverse fire. He didn't make a major risk with the budget, our friend, Colbert, but thanks to energy now, we have so much production given by machines that we can feed and provide clothes and housing and cars and everything to people that "work", which is giving orders to machines today, working.

(00:42:31):

And people that do not work, but some of them physically do exactly the same thing. You see, for example, today I'm supposed to work. I'm a consultant, I'm sitting behind an office and I work. What is working for me? Talking to you. Is that work? It is not work. If in a couple of hours I will talk to somebody else doing exactly the same thing, sitting on a chair, will not be through a computer and it will not be work, it will be leisure. What is the difference in physical terms? No difference.

(00:43:00):

So what we call work today for plenty of people is something that a middle-aged peasant would've called leisure. Sitting on a chair and talking. Or sitting on a chair and typing on the typepad of a computer. Well, okay, big deal. This is not work. So retirement is actually a gift of abundant energy. You have no retirement in countries that are very sober regarding their energy consumption. And so of course, unfortunately I have to say, the long-term trend is that in the future it'll be harder and harder to retire.

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Nate Hagens (00:43:40):

So building on that, let me ask you a difficult question. I frequently cite that a barrel of oil is worth around five years of human labor. You've made similar statements including that we've essentially replaced slave labor with fossil fuels. So if energy supply is going to contract-

Jean-Marc Jancovici (00:44:04):

It's my order of magnitude. I've got exactly the same order of magnitude. Yes.

Nate Hagens (00:44:08):

Well, it's-

Jean-Marc Jancovici (00:44:09):

Five years of work, of human work, of very hard work.

Nate Hagens (00:44:13):

Yeah, very hard work.

Jean-Marc Jancovici (00:44:14):

Yes.

Nate Hagens (00:44:14):

Well, the actual math is around 12 years, but humans are more efficient with directing muscle labor to actual work. So you have to handicap it, but it's around four and a half, five years. So you just suggested that of the 16 exporting countries that Europe imports oil from, they'll be cut in half, their production by 2050 plus or minus. So if we contract energy supply, we are also, GDP and jobs are also going to shrink. So do you think it's likely or possible that we see a resurgence in things like slavery as fossil energy availability declines? And do you have hopes that we can avoid such a scenario?

Jean-Marc Jancovici (00:44:59):

It's my fear. My fear is that relationships between humans will become, I would say, harder than they were, that we'll have more... I don't know the expression in English, *arbre des forces*. We'll have tensions between humans and brutal force will be more important than it was at first. I'm not sure that we'll have less work. We might have

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less jobs or less revenues, but when we had no machines, we worked harder. So I do not know exactly how it's going to recompose, but the main ideas are it will have more hard work and will earn less basically because what energy did is triggering the exact opposite, working less and earning more.

Nate Hagens (00:46:14):

That's what I refer to as the great simplification. The name of this podcast based on taint premise of classification required energy.

Jean-Marc Jancovici (00:46:25):

If it's possible, because you see two centuries ago, the world economy relied on only nine metals. It relied on iron, copper, zinc, tin, lead, and a couple of them more. Today, you do not have a single element of the table of Mendeleev that doesn't have an industrial application. Not one. And you and I, we depend on all these 92 elements because for example, you depend as I depend on the digital system, which by itself requires 60 to 70 different elements. Today there is no single company that can operate without an information system. No one. If you go back to paper sheets and pencils, you cannot operate any company today. So basically simplifying the present world is going to be extremely hard. Extremely hard.

Nate Hagens (00:47:37):

Yeah. So you're getting at complexity, which I refer to as one of the big four risks that we face. I consider them to be the financial system, geopolitics, complexity, and the social contract. Not energy per se, but it's the change from abundant energy to flat or declining that will trigger those other things. So you've got in Europe a realtime trial of this, of sorts going on right now because of the Russian situation in Ukraine. In your experience in France, what have people's responses been, especially last winter to increasing prices in Europe? Has it created stronger community cohesion and a return to relying on social capital or has it caused more division over scarcity or what's been your trial run?

Jean-Marc Jancovici (00:48:37):

Basically in France, it has triggered very high prices of natural gas and electricity. And it has triggered significant savings by people. So they heated less, they use less electricity. A number of companies and mostly energy intensive industries produced less. That's basically what happened. I have not felt a major change in social

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structures or the way people behave. Actually, it has nothing to do with what happened during the COVID for example. Last year, nothing much happened. The political response has been significant, and now the word *sobriété* is everywhere in political speeches. That is something significant.

Nate Hagens (00:49:36):

What does the word *sobriété* mean?

Jean-Marc Jancovici (00:49:39):

It means, actually my own classification of energy savings includes three, well counts three terms. The first one is efficiency. Efficiency is getting the same service while using less energy, either to manufacture an object or to use it. The second term that I use is *sobriété*, which is deliberately waiving a service or good in order to save resources or energy. For example, I was using a car, I use a bike or I commute by train. This is *sobriété*. And poverty is exactly the same physical item than *sobriété*, only you didn't ask for it.

(00:50:25):

So *sobriété* is having no longer the economic means to own a car or to use it. And so you have to use a bike or to go by train, but you didn't want it. My belief is that today what happens in France is actually poverty. People didn't ask for it and they have to organize themselves differently. But the government, no government can use the word poverty. So they use the word *sobriété*, which is giving the impression that we do it in an organized and deliberate way.

Nate Hagens (00:51:06):

It gives people agency to have *sobriété* instead of poverty. I think the distinction between those two is really important and clever. Do you think that individuals listening to this program or cultures, nations can choose *sobriété* before it is forced upon us as poverty?

Jean-Marc Jancovici (00:51:31):

I believe no. One of my friends with whom I worked in France says, "You have the strategy of your sense." So it basically goes the other way around. So my belief is that the best that you can hope is that the day you have a shock or a crash, then you can pull out of the drawer, a *sobriété* plan that was framed or conceived before you had

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the shock of the crash. But I don't believe that democracies will spontaneously implement a decrease of their production and that consumption, but I do believe that they can decide to go that direction the day they realize that anyway, they do not have the choice, again, because that's the strategy of your assets.

(00:52:31):

And if I can be a little bit rude, I understand that I'm talking mostly to US auditors. I believe that it's going to be even more complicated in the US, which is the land of plenty, which was built on tremendous resources, tremendous land, and basically through getting rid of all the previous inhabitants and animals that were there. So it's the country with no limits, by excellence is the US. And so it's going to be even harder in the US than it is in Europe.

Nate Hagens (00:53:09):

Well, let me ask you about that because Europe will arguably have to face sobriété and poverty before the US does because we still produce 90 some percent of our own energy.

Jean-Marc Jancovici (00:53:24):

Yes.

Nate Hagens (00:53:24):

Will that be a blessing or a curse? Will Europe have to suffer the pain first, but they will reorganize in different ways that will ultimately be more helpful? What do you think?

Jean-Marc Jancovici (00:53:35):

I think it can be both. And history will tell. I don't know. It's a blessing in the way that what I hope is that we use the residual fossil fuels that we have at hand to build a world that can operate the best it can without fossil fuels. It is not something that people understand clearly today. It is an idea which is making its way, but slowly. And of course I believe that in the US you are farther from that idea because you still have plenty of resources.

(00:54:15):

And also I won't, you will not learn with me that actually your country is two countries. You have the US of the coast and the US of the middle, and actually it's two different

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countries. And the reaction to what I'm explaining right now is totally different, whether you are talking to Massachusetts or California, or Wisconsin or Ohio.

Nate Hagens (00:54:50):

So I'm actually again totally aligned with you on this. I don't think we're going to change until we're forced to. So the best thing that people listening to this and you and I are working on is building those plans for when that moment comes. So you, among other projects, you run The Shift Project, which has plans for transforming the French economy. Can you give a brief overview of what you're doing and what your hopes are there?

Jean-Marc Jancovici (00:55:21):

Yes. That work started during the COVID. Actually, when the COVID stroke, it was clear for me that a number of companies would ask for help. They would say, "Okay, we cannot operate anymore. Give us some money, or we'll have to fire. We go bankrupt and we fire everyone." Which in France is much more drama than in the US. And so I thought that the time, one of the things that we should try to design is the counterparts that the state should ask to these companies before lending them a helping hand. So okay, we are going to sign a check, but we ask you to do this and that, regarding being able to operate in a world with less fossil fuels. And then we realized pretty quickly that our work would never be ready before the first checks would be signed.

(00:56:25):

And so we said, "Okay, we are going to do something slightly different. We are going to design a plan, which is how we should reorganize the economy if we want to align ourselves with a decrease of 5% premier of the greenhouse gases emissions in the world." And this is called, the Plan de transformation de l'économie Française: Plan to Transform the French Economy. And actually it's an attempt to do economy without talking euros or dollars at first, but we talk physical flows. So basically what we do is that we look at the physical flows that frame the economy, the construction sector, the automotive industry, the way we grow food and transform it. And we say, "If we want to decrease the greenhouse gases emissions by 5% per year, what does it mean regarding the number of cars that we manufacture given the energy efficiency of manufacturing one car, the number of houses that we've built, the number of people

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that can move around in cars, in trucks, and the number of peoples that are employed in the different sectors?"

(00:57:47):

So it's a plan to transform the system without saying, "We should invest money here, finance such a sector with so many billion dollars here." We do not talk money at all. And it's a method in a way to address the economy as a physical system. And we had a huge success in France because we published a book which was called le Plan de transformation de l'économie français, and we sold over 100,000 copies, which in France is a huge success for a book, for an essay.

(00:58:28):

In order to give you a comparison, it happens that a graphic novel that I wrote with Christophe Blain, which is called the World Without End, Le Monde sans fin in French, was in 2022, the number one book in France, the most sold book in France. And we sold a little bit over 500,000 copies. So 100,000 copies for an essay on decarbonizing the French economy, it is a huge success. In our wildest dreams, we wouldn't have come up with such a figure. And plenty of top executives have read it, plenty of politicians have read it. And I believe that we have oriented a little, the debate in France, on the way to decarbonize the economy with this work and with this book. So it's a method again, and we could apply it to the US exactly the same method. It's how do we orient the physical flows of economy if we want to decrease the greenhouse gases emissions by X percent per year?

Nate Hagens (00:59:39):

So in the Global North, I suspect that the country that you live in France, may be closer as a culture to understanding climate energy constraints partially due to your book, you said 500,000 copies, partially there's this collapsologie subculture there, French president, Macron, periodically voices comments that the best times are behind us economically. Are these books and discussions allowing France to be ahead of the curve discussing limits to growth, sobriété, and is that good or bad? What is your thought?

Jean-Marc Jancovici (01:00:23):

Again, we have the strategy of our assets. What is our assets? It's our history. We're a known country. We have experienced hunger, wars, physical limits of all kind. And so just as Great Britain, just as Scandinavian countries, just as Switzerland. So the only

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countries that had an easy life in the ancient world were Italy and Spain, which are countries today that are, I would say they are not as comfortable as countries that are farther up north with large scale organizations designed to face a constraint.

(01:01:07):

And so it's only the result of our history. When you look at other countries in the world that resemble us, you have Japan, country with no resources, very strong technical culture, and which is also very conscious of the physical limits today. And you have in a way, China, same thing. China is an old country that has experienced also hunger, wars, physical limits, and which is also a country of engineers. Historically in ancient China, the top class people where the engineers able to operate all the hydraulic system feeding the rice paddies, supplying the rice paddies,. So all these countries have things in common, which countries that have been recently occupied and which are very, I would say very big. Vast countries with plenty of resources are not like the US, like Brazil, like Canada. In a way, like Russia, what we could call anti countries. Well, these countries are not so comfortable with global physical limits.

Nate Hagens (01:02:24):

So in preparing for this interview, Jean-Marc, I was reading about you yesterday and you are increasingly being called a guru and a most influential public intellectual in French media. I'm just curious, how are you navigating describing our extremely challenging biophysical reality in a political system that in France and globally rewards simplicity and feel-good messaging where your message is counter to that? How are you finding that?

Jean-Marc Jancovici (01:03:06):

What has changed the relationship between an individual and the population today is social networks. My fate would probably have been very different in a world with only media because I would have in that world, without pleasing the journalist, nobody would have heard of me. In the modern world with the social media, you can put online videos, you can put online long videos or conferences, you can put online explanations. I used to maintain now it's a bit old-fashioned, a website to vulgarize energy and climate change issues. And the reason why the graphic novel that I mentioned before was a success is that before that, the online videos of the course that I teach at Mines Paris was already a success. And the reason why is that, well,

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success by French figures, I think I went up to 1 million views or something like that. And it was a success because people appreciate consistency.

(01:04:21):

Actually, I believe that the reason why I have had small success is that I offered to a number of people that were vaguely conscious of something but couldn't put a name on it, all the pieces of the jigsaw puzzle that they can assemble and get a clear picture of, that's what I provide. So I provide them with some kind of comfort of not being so stupid because they felt that something was not corresponding to the explanations they got elsewhere, basically. And the fact that I have a base in a way that I can address directly through social media. For example, today I write a daily post on LinkedIn, I publish videos online once in a while, makes it so that my reputation cannot be made only by the media.

(01:05:26):

Whereas in the past, you were fully dependent on what the media said of you for your reputation. Now it's a little bit different. So the relationship that I have with the press is I would say in between a distant relationship. Whenever I get an invitation, I don't say yes all the time, actually I say yes one time out of 10 maybe. And I don't feel I desperately need them. And actually my day-to-day job doesn't involve them. My day-to-day job is to run a company and to chair an NGO, that has nothing to do with the media. And so when I'm labeled a guru of whatever, the best thing that I can do is not responding. And if some people mention it to me, then I answer saying what I think of it.

Nate Hagens (01:06:40):

Well, I think people not only value consistency, but they value truth and authenticity. And I suspect, I don't know, but I suspect as events get closer, as we have more expensive and less available energy, that the conventional media will not be able to tell the full biophysical truth that you and I are telling. It is just too threatening to the general public. So the role that you and others are playing is very interesting in informing and hopefully inspiring society towards change. Do you agree?

Jean-Marc Jancovici (01:07:23):

Partially only because I think that what the press can do is describe simultaneously a problem and the way to react to the problem. Just saying over and over and over that there is a problem, is something indeed that they don't appreciate much. And actually

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when you look at the way they've vulgarized climate change, they have selected information which is distant in space and in time. Basically the information that they like the most is what will happen in 2100 and the global temperature increase. So this is distant in time, 2100, and it is in space because it's a global temperature and you don't feel a global temperature. And I don't feel a global temperature. I feel the temperature, which is right now in the room where I am, and you feel the temperature, which is right now in the room where you are. And neither of us feels the average temperature. Doesn't exist for our senses.

(01:08:32):

But what the media don't speak of much, and there was an article published also in the scientific literature pointing that a couple of months ago, the very much relay information that pertains to things that are not so distant in the future and pretty local. For example, what will be the flow of the Colorado River in 10 years and the consequences that it can have on props? That is something that they do not give much audience to this kind of scientific work, even though you have plenty of scientific publications that pertain to this kind of issue. So what they like, again, the media is talking of an issue when you have the beginning of a solution or the beginning of a way to react or to act facing the issue. And this is why I've set up The Shift Project. The Shift Project is actually fully devoted to proposing ways to confront the issue and to react to the issue and to organize ourselves with the issue.

(01:09:48):

So it also tries to provide hope in a way, and then you can get more audience on both the issue and the way to react to the issue. The leading economic paper in France, which is called Les Echos, gives much more audience to environmental issues now than it did just two years ago. But the reason why is that they right now also have many stories to tell regarding companies or action, which is being taken to face the issue. So that's the reason why. And do I believe that France is at the forefront? I would say in a bunch which is globally very late, the answer is yes. So what I believe is that in a collection of countries that are globally extremely late, France is a little bit less late than the others. We have done a number of things that were done for the first time.

Nate Hagens (01:10:54):

Well, you and I have been telling variations of this story publicly for 20 years, and I feel that the world events have caught up to the story that we're telling. What's your

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experience? Obviously because of your popularity, people are now more receptive to this.

Jean-Marc Jancovici (01:11:14):

I believe it goes the other way around. I believe I am popular because people realized, I'll put it the other way around.

Nate Hagens (01:11:24):

People realized it.

Jean-Marc Jancovici (01:11:25):

I'm surfing on the wave.

Nate Hagens (01:11:26):

Yeah.

Jean-Marc Jancovici (01:11:28):

Yes because we have heat waves, because we have prices of gasoline going up and down and up very often because we have, yes, because people realize. For example, let me take another example, which is the opinion that French have on nuclear energy. It gained recently 20 percentage points in support. So about 50% of the French population supported nuclear energy two years ago, one third were against, and 15% said they had no opinion. It jumped from 50 to 70% in two years. So you could say, "Okay, that's Jancovici's fault." But actually it evolved exactly the same way in all other European countries.

Nate Hagens (01:12:21):

Well, that could be because of Russia and Ukraine, yes?

Jean-Marc Jancovici (01:12:27):

Whatever. Even in Germany, it gained 15 percentage points of support. And I am sure of one thing, that in Germany people have never heard of me and in Finland people have never heard of me. And in Spain people have never heard of me. So I think we should put it the other way around. First people realize and then well, the people that said, "I can explain you why, become popular."

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Nate Hagens (01:12:59):

So I have some closing questions that I ask all my guests. I have so much more I want to talk to you about, but before I get to those questions, let me just ask you one final content question. What the hell are we going to do? What should we do facing this as nations? You're on the spot, Jean-Marc. Go for it.

Jean-Marc Jancovici (01:13:26):

As nations we'll do what our populations ask for as long as we are democracies, which is why at The Shift Project we never considered that we should address first and foremost politicians, but we believe that we should address first and foremost the civil society. So the people that we're interested to deal with are people who are deciding in the economic sector, are deciding as civil servants, are deciding as academics. So people that frame our collective knowledge and people that are decisive in the NGO sector. So this is our primary audience. The people that we want to talk to is the civil society.

(01:14:13):

And we believe that the day we are able to convince a sufficient fraction of that civil society, then it goes up because democracies are systems that go up and the elected people have to take that into account in a way or another. And I never believe that we should talk to politicians first. And actually I'm not specially eager to talk to them. Once in a while I've got an invitation from a minister or whatever, so I'm polite, I go to it, but I don't hope much for it. What the audience that I'm really interested in is the civil society.

Nate Hagens (01:14:53):

So we need to shift society before the politicians?

Jean-Marc Jancovici (01:14:58):

Yes, exactly. Exactly. You have a president elected because you have people voting for him basically. And a significant fraction of the civil society in France still, I don't know if the word is appropriate, but escapes our influence. All the people that vote for the populist parties, basically we are not able to talk to them today, which is an issue, which is a big issue. We have to talk to these people and I still haven't found a way to do so because these people actually are the first losers of the energy contraction. They don't realize it, but they are the first.

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(01:15:51):

So we have to talk to them and we have to embark them on the plan that we believe is, I would say, responds correctly to the situation. And I don't see that at my age. There is much more that I can do than going on, doing what I've already done, which is working with companies at Carbone 4, working with the civil society at The Shift Project and writing books. And as you may know, the Le Mond sans fin is going to be released in the US. We are currently working right now with my co-author on the US version because we have to move from meters to feet, square meters to square feet.

Nate Hagens (01:16:46):

Oh my gosh.

Jean-Marc Jancovici (01:16:50):

No. And we have to change all the examples that pertain to France into examples that pertain to the US.

Nate Hagens (01:16:57):

And when will that be out?

Jean-Marc Jancovici (01:17:01):

It should be released at the end of the year, if we're lucky. So end of the year or beginning of next year if we take too long in finishing the adaptation.

Nate Hagens (01:17:12):

So the ultimate plan then is to combine efficiency and sobriété at multiple scales in society to avert collapse and averts just abject poverty, some combination at institutional government and individual levels. Yes?

Jean-Marc Jancovici (01:17:32):

Yes. Basically you've summarized it correctly.

Nate Hagens (01:17:34):

Yeah. Excellent. I'm looking forward to getting your book. Let me ask you a few closing questions, Jean-Marc that I ask all my guests. We've talked about nations. What personal advice do you have to people watching this video, listening to this show at this time of global meta crisis?

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Jean-Marc Jancovici (01:18:00):

I would say I have two. The first one is devote time to understand what's going on, because basically the solid conclusions that you get to is always the conclusions that you have come to by yourself. We are, human nature is such that we don't like that much conclusions that were framed by others. We're like, "Uh-oh." So take time, dig into the issue, read, listen to people, watch conferences, whatever. Read scientific literature if you can do it or otherwise, watch videos of people that are good at verbalizing the issue.

(01:18:48):

And the second thing is do not stay alone because it's an issue which is it's easy to become anxious when you realize the magnitude of the issue. And we don't like, one of the things that we don't like is to pull ourselves out of a group because we have understood something that the rest of the group hasn't understood. And so we will never do that to take action.

(01:19:19):

So the only action that we're able to take, at least in Europe, maybe in the US it's a little bit different, is collective action, which is why it's easier to do something in the frame of a job, in the professional world, it's easier to do something because it can be collective action. And we need to still have social relationships. We still need to have a couple friends, kids, relatives, whatever. And so moving forward is something which is much easier to do when you belong to a group.

Nate Hagens (01:19:56):

Is there a way that the 500,000 people that bought your book or the 100,000 people that bought your transformation essay or that follow your LinkedIn can connect and actually meet and talk to each other in France like Discord?

Jean-Marc Jancovici (01:20:13):

There is a sister association of The Shift Project, which is called The Shifters, which is the association of all the people that want to give a helping hand to the work of The Shift Project. And actually this association today has around 20,000 members. A small number of them being in foreign countries. Of course, by and large, the two first foreign countries are Belgium and Switzerland because it's French-speaking countries.

(01:20:53):

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But we have a group in the UK and we probably have a small group in the US, small group though. And so this association is very well-structured. It's structured as a company because most people that belong to that association come from the professional world. And so they have organized the association as basically as a company. So it's very well-structured. And so yes, we have that.

Nate Hagens (01:21:25):

How would you change your answer about those two bits of advice if you were talking to young humans in France or in the United States or anywhere in the world, 16, 18, 20 years old who are learning about climate change and that energy availability might be in oil half of what it is 30 years from now, what sort of recommendations would you give to young people?

Jean-Marc Jancovici (01:21:53):

Actually, the youngest people that I often talk to are students. So I do not talk to people. I do not very often talk to people that are still in high school or primary school. But I would say that probably that my first advice is to be reasonably good in science, which is the way to connect to the physical world, and the way to understand how things work, how the world works, where to listen at weak signals, to look at weak signals before they become a first magnitude. So probably that the best advice that I would give to, I would say young people, would be to try to be good insights at large, which is again, connecting with the physical world.

Nate Hagens (01:23:03):

If you could wave a magic wand and there was no personal recourse to your decision, what is one thing you would do to improve human and planetary futures?

Jean-Marc Jancovici (01:23:18):

Suppress greed.

Nate Hagens (01:23:22):

That would require a magic wand, I think.

Jean-Marc Jancovici (01:23:30):

Including for me, including for you, including for everyone. It's one of the things that kills us is that desire to have always more.

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Nate Hagens (01:23:44):

Well, energy surplus has certainly turbocharged that in humans. I think without as much energy surplus, there was no possibility of having more all the time. So that is one of the thing that scares me the most is the concept of loss aversion because we are the richest generation ever to live of humans on this planet, and we would be happy with half what we have, but getting from here to there is going to be a doozy because of our psychological expectations are not that as a culture.

Jean-Marc Jancovici (01:24:22):

Yes, I agree with that.

Nate Hagens (01:24:25):

Yeah. So this has been a great first overview of your work. I know you are a world expert on nuclear energy, and we didn't really have time to dive into that. If you were to come back on the program six months from now, what is one particular issue that you are passionate about that's relevant to our future that we could take a deep dive on? Do you have any speculation?

Jean-Marc Jancovici (01:24:52):

I don't think that all the technological debates, be it on nuclear energy or wind energy or hydrogen or, is a fundamental debate. Basically, the fundamental debate is on cultural issues, just the one that we stated. Will we succeed one day in putting ethics above our greed, for example, will we succeed? It seems to me that this debate is much more fundamental, even though I've been trained as an engineer and for a very, very long time, I was convinced that the future was in technical fixes. Well, now I believe that actually it's in the way we accept to change our cultural references, which is much harder actually. It's much easier to build a nuclear reactor than changing our minds.

Nate Hagens (01:26:05):

The next tech is maybe inner tech, the tech in our minds on how we experience the world and how we can get most of the things we really want without using a lot of energy and materials. At least that's my hope. This has been great. It was so nice to meet you, and like I said, it feels we're on parallel paths in different parts of the world, and if I can help you in your work, let me know, and I will definitely get your book

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when it comes to the United States, and we'll put all the show notes on this episode of your references and such. Thank you very much.

(01:26:45):

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