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Q.1 What is your take on the Indian Budget with respect to the environment?

It is a good thing that they have cut the GST rates but it is not a strong enough policy. They need to do much stronger things than what they have done. There is the EV policy that was announced later- I think it came after the budget.

The problem here is that the auto industry is anyway going to say that 'one should go slow' with such policy changes. The reason why they are going to say that can be understood through an example. Suppose, you have made a capital investment in a factory and the expected life of the factory is 15 years. Then, the government comes up with a policy which says that since these vehicles are polluting, you have to stop making them in 5 years. Consequently, you are going to make less money out of that existing plant and it is expensive to redo it to produce a different kind of vehicle.

Therefore, you are either going to lose money or make less money. But if you take the argument at its face value, then you never make any environmental progress. Because it is always going to be cheaper to invest in a more polluting vehicle than investing to make a less polluting vehicle. So, the problem with all this media report about the difficulties with the EV policy is actually motivated by that.

It is the fundamental fact- you talk to any polluter about anything, they will always say that this is not a realistic approach. That people are going to lose jobs, etc. So the point is that for any kind of policy that the government puts into place, the important thing is to have a long term plan, announce it, and ramp it up. No stakeholder in the process wants to have big policy shocks. For example, everyone is merrily polluting and then one day, you want a big change. Now what has happened is that in the last 10 years, more companies have made investments with the assumptions that they will go on polluting and no one will say anything about it. So what you have done by not giving signals ahead of time, is that you have encouraged the industry to invest in polluting technologies. And, such capital investments are long-lasting.

Thus, any policy you want to do today, think about it for the next 10-15 years because that is the time horizon which the companies make when they are planning big capital investments. For instance, a company sets up a factory to produce automobiles which it has to pay over many years. So you need to send a signal today and a credible signal, not just cheap talk that policies are going to get tighter and tighter. However, it should start low and then ramp up. Because what that will do is that the industry will be warned ahead of time. Investing in polluting technologies will be risky since one may not be able to sell those things. That is the kind of signal you want to send.

But then again, there is always going to be the case of the industry lobbying against regulations. There is no way out of this dilemma- you have to take a stance somewhere. Because you can't say today that 10 years from now you will sell only electric vehicles despite knowing nothing of what will happen between now and the next 9 years. If you don't put some requirements into place this year, no one will take your announcement seriously. People will only take your announcement seriously if you show them that you mean business, and to show that you mean business you have to put in regulations that actually have some point. This is essentially the weakness of the Indian regulatory policy. We don't have a policy that looks at the long term sufficiently. The Indian policy is incomplete because the duty cut for EVs is not

enough. At the moment, the EVs are still much more expensive and to make them less expensive, you have to have production.

There is something known as a learning curve or an experience curve, and what that is- is that every time you double production, not just production but the cumulative production of any industry- be it coal firepower, solar power, washing machines, cars, trucks, railway engines, whatever it is- if you take cumulative output, then for every doubling of cumulative output, there is a percentage fall in the cost of production per unit. This percentage decrease can be estimated from the data, and it applies to every industry. The actual coefficient, i.e. by how much or what percent the cost falls for every doubling of cumulative production, varies from industry to industry. But it is a very predictable relationship in every industry. What this implies, basically, is that if you want to bring the cost of the technology down- in the case of non polluting technologies you want cost to come down as quickly as possible- you have to gain encouragement to increase output so that this learning by doing happens.

This was the reasoning behind India's National Solar Mission which started in 2010. What they did was that they said that they were going to procure solar PV energy even though it was 10 times as expensive as power from coal-fired plants. However, it is cheaper now. Why? Not only in India but worldwide, solar power was encouraged. There were government procurements that signaled that even though it was expensive, they would procure it and that moved the industry down the learning curve. In the case of solar PV, the learning Coefficient is quite high. There is around a 22% fall in cost for every doubling of the total volume of production. This is quite rapid, so the cost has fallen by about 80% in the last 5 years.

So now you have a situation in which non-polluting technologies are cheaper than the polluting technologies. Therefore, it is only a matter of time now before the old technology goes out. Why is it a matter of time now? Because as I said before, you have all these plants and equipment sitting there and they have lifetimes. You want to achieve the same for, for example, electric cars.

Q.2 Will the trade war affect this?

We have to understand that almost everything now is made in China. China is the big manufacturing giant of the entire global economy. You go to any shop in any country in the world and just look at how many things are made in China. This industry is no exception.

Q.3 How common Is it for the Indian government to have experts such as environmental economists for suggesting some policy changes or recommendations?

I don't think they have any clue about the environment. I am sorry to say this but they are not getting good advice on environmental economics.

Q.4 Do you think we have enough literature available on the Indian environment?

Yes, it is available, but there could be more. There is enough to make better policies than the ones we have now. But, of course, it is good to have more research because as the years pass you want to be able to use that research to make better policies.

Q.5 Then why do you think the government is going wrong? Why aren't they incentivized enough to approach experts?

I think the fundamental problem is that environmental pollution has only recently become a bigger issue. It has been only in the last 2-3 years that the media has picked up on it, especially focusing on Delhi.

What this reflects is that the general public is still not thinking about this much. They are not really concerned and if the level of concern and awareness in the general public is low, then this is not a very big issue in the minds of policymakers. Because at the end of the day, they pay attention only to public opinion. Until we have much greater awareness, we are not going to have a sufficient degree of concern in the government to invest. It is true that they will be better off doing it because the problem is that environmental issues are a build-up, it is not that today everything is clean and tomorrow it is dirty. It builds up all the time and you really want to have the capacity to monitor it, to detect it and to put in place regulations that gradually ramps up so that the problems never buildup, to begin with.

Suppose the government announces some light regulations but says that they are going to be tightened and tightened. Then you don't get all that dirt to begin with. That's the economically efficient and cheap way of dealing with the problem. But we don't do that. In fact, we do almost the opposite. We do nothing. Then after that, suddenly, you will hear a politician saying that you people have very bad habits, you should clean up. Then after that, people go to court. Then the courts come up with some extremely draconian rules which can't be implemented anyway.

Q.6 Suppose there is a genetically modified crop whose productivity is many times more relative to the existing varieties. On one hand, the environmentalists who have a normative viewpoint argue that in the long run, this new GM variety can result in the extinction of all other varieties and this is a dangerous situation because there is a chance that we may lose the crop altogether. On the other hand economists like Mukesh Eswaran and Ashok Kotwal argue that, a considerable increase in farm productivity results in the structural transformation of the economy which pulls people out of poverty. As an environmental economist, what is your policy approach to this?

GM crops are no different from other crops, so the environmental concern about GM crops is entirely bogus. It is complete fiction created by Greenpeace and some European branches of Greenpeace which they use for fundraising. They have scared everybody into thinking that it is dangerous.

So why do I say that there is no concern about GM crops? The reason is very simple. That when you do plant breeding which people have been doing for thousands of years. You do exactly the same with GM, the only difference is that with GM, you can do it much faster. For GM, you can take a gene from a bacterium, and insert it in

wheat or cotton. Now the point is that, if it was the case that the crop had some adverse effect, then you would've found it but you haven't.

There is a new thing called gene editing. With this, you don't have to get a gene from some other species and stick it in here. You can just speed up this process which people do on farms, they grow something, select two parent species and cross them so on and so forth. You can do the same thing with gene editing, except you can do it very quickly because you don't have to wait for any generation to breed it; you can just edit the genes.

Q.7 Can you tell us about your current research work?

I am working on a number of issues, such as- on the impact of high temperatures on labor productivity, the impact of high temperatures on wheat productivity, and on the effect of electric induction stoves on household air pollution.

Q.8 We also have heard that you are using Game Theory to model the effect of climate change. Is it true?

Well, I do use Game theory in my work. I have, in the past, worked on climate models of Game Theory but I am not doing anything on that right now.

Q.9 How important do you think is it to have researchers from multiple backgrounds in order to produce a good research study?

There is a lot of research in which, as an economist, I will not be able to say something sensible without consulting or working with someone from the concerned field. So what I told you about the GM- it has got nothing to do with my work. So yes, it is absolutely crucial.

Q.10 There are some scientists who believe that climate change is not driven by human beings. What is your take on that?

There aren't any scientists who believe that climate change is not caused by humans. There might have been some legitimate doubts of this 20 years ago but that was a long time back. Since then, that has not been the case. If someone is telling you that climate change is not caused by humans, then he or she is not a scientist. The uncertainty about this was resolved a long time ago.

Q.11 We have heard that many people working in the field of Climate Change have experienced mental trauma and depression. As someone who has been working in this field for more than three decades, have you had similar experiences if yes then how did you deal with it?

You have to not let yourself get depressed, that is all I can say because it is depressing. It is very scary but you have to be positive and try to make a difference. One of the things that I have learnt to do is to stop paying attention to all the misinformation and to just let it pass by. To make a difference, you don't have to give

up your car and adopt a bicycle or make any changes to your lifestyle. Making changes individually is insignificant and what matters is raising awareness. So if you make a change in your lifestyle, it should be in order to persuade others that it matters and that they should do something about it themselves not just in their own lives but by persuading the media and the government to regulate and the best form of regulation is pollution fee.

There are many ways of doing regulations but the first important thing is to want to do it in person and to persuade the government that they have to do it. The only way that they are going to be persuaded is when the public, in general, gets awareness. So it is very important to raise public awareness, raise media awareness, and campaign for the government to do something. But if some companies spend tons of money to show that climate change is not an issue and you have many other problems in life, then you will not go out on the streets campaigning against it. Often the scientific information does not get communicated to the public because there is vast propaganda out there.

Q.12 Do you have any advice for undergraduate students who are interested in the field of environmental economics because when we usually talk to students they are always confused about what they can do to make a tangible difference within 5 or 10 years from now?

You actually have a very strong incentive to do something about the environment because it is going to be bad unless things are done now. It is important for you to be politically engaged. Things are already pretty bad- you have seen the droughts, Chennai without water, and this is only going to get worse at an accelerating rate because the rate at which carbon dioxide concentrations are building up is increasing.

Forget about carbon dioxide concentration growth rate falling to zero, the growth rate is not even declining- it is increasing. Unfortunately, I am going to be around to see all of that but you are going to see a lot more. Unfortunately, people have no idea how bad it is going to get and how quickly. There is a book called 'The Uninhabitable Earth' by David Wallace-Wells. In the first part of the book he discusses the various impacts of climate change, you should read that and tell everybody you know about it.

