**CONFIDENTIAL**

Date Transcribed: 21st March 2021

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**AD: Hello, and welcome to the third and final webinar in a series that has been organised by the University’s Birmingham Plastics Network. My name is Andrew Dove, I am a member of the network and I’m a Professor of Sustainable Polymer Chemistry here at the university. We’ve brought together the network to be a unique interdisciplinary team of academics and beyond. To bring together chemists, engineers, environmental scientists, philosophers, linguists, economics, experts, artists, writers, and lawyers, and beyond that. There are over 40 of us in the university interested in the area of plastics, and what we want to do is come together to holistically address the global problem from an interdisciplinary point of view.**

 **I want to start with an apology today, Doctor Julie Gilson was due to join us and present, but unfortunately, isn’t able to join us today. We have still got a really exciting and interesting webinar ahead of us, as we have a got a panel of experts with a very diverse range of expertise, from across industry and academia. I am going to straight over to our first panellist today, who is David Maddison, who is a Professor of Economics at the University of Birmingham. He is going to give us some of his thoughts on the areas of barriers to change in the area of plastics. David, over to you.**

DM: Hello everybody, my name is David Maddison, I am a Professor of Economics at Birmingham Business School. I am also a natural resource economist and environmental economist. Environmental economics is largely to do with the study of externalities if you’ve had no exposure to environmental economics before. Externalities describe a situation in which the actions of one economic agent, let’s call this person the polluter, imposes costs on another; let’s call this person, the victim. But because these costs fall largely upon other people, the costs of pollution are apt to be ignored by the person generating them. And this, of course, results in a situation where there is scope for potential welfare gains through government intervention. Now, the disposal and production of plastics, and how it is achieved, is something that generates externalities. The usual economic recommendation in this situation is to make the polluter pay. But this turns out to be very difficult in the case of plastics, as I will go on to explain.

 Another question that entertains the mind of the environmental economist is how much of a reduction in the undesirable pollutant or activity do we want to cause? In other words, what constitutes prudent use of plastics; do we want to immediately rid ourselves of all of the plastics? Well, clearly, we don’t because plastics are incredibly useful, so, presumably, what we want is to continue to permit the important uses of plastics and to prevent the frivolous use of plastics and also possibly become slightly more restrictive over time as the quantity of plastic in the environment increases. Now the difficulty here, of course, is determining what is important and what is frivolous.

I suppose it could be determined in a number of ways. You could through government diktat decide that certain uses of plastics are unimportant and should be prohibited. But I think that the way the environmental economist would want to approach this is by seeking evidence of willingness to pay for the privilege of using plastics that is more than sufficient to outweigh the damage that the plastics would actually do to the environment. And in that way, to discriminate between the frivolous and the important uses of plastics.

The question then turns to what actually is the environmental damage of plastics in monetary terms associated with the use and disposal of this material? Well, here, we get into the business of environmental damage. And of course, the environmental damage from plastics is visible, but it doesn’t have a market price attached to it, although there are ways in which environmental economists do attach monetary values to things like the despoilation of scenic views, impacts on ecosystems. But I think the deeper question is what actually is the damage done by plastics; do we enough about it? Is it perhaps mainly aesthetic damage, is it a damage that falls mainly on the ecosystem, and critically, I think, this would be a game-changing finding, what evidence is there of potential human health impacts?

Monetary evaluation of damage allows us to determine what is a frivolous and an unimportant use of plastic, but critically, requires clarity, requires underpinning scientific evidence which arguably is at present, currently inadequate. So, we need research into the environmental impacts of plastic use, it is very important to ensure that the policies that we have on plastic, match the severity of the situation. We want to know if current policy is doing too little or doing too much unnecessarily. This is one situation in which the value of scientific information, could be very high indeed.

I want to say a bit more about the difficulties involved in making the user of plastics pay for the full environmental cost of their actions. And here, I think the way that we would want to do it, is in view of the many different ways that we could adopt of reducing the use of plastics, we want to do it in the least cost way. And that, I think, means handing the potential polluter, the user of plastic, some flexibility in how and when they cut back their use of plastics. And critically, doing so in such a way that creates ongoing incentives, to look for new and ingenious ways of reducing the harms associated with plastics or to develop substitutes.

Now, the ideal, from the point of view of economics, would be to tax the act of disposal, bearing in mind there are different ways of disposing of plastics and they all have different environmental costs attached to them. Taxing the act of disposal is ideal, but the problem here is that it is generally difficult, if not impossible, to observe the act of disposal itself, although we could have presumptive taxes where the presumption is that—you will, if you are using plastics, dispose of them in a harmful manner and only if you present them for authorised and safe disposal, do you get the presumptive tax back. If you can’t do that, then you are pushed back onto either taxing the consumption of plastics, for example, the 5 pence charge on the use of plastic bags, or the production of plastics. These, of course, are good measures, but they are not ideal because they don’t say anything about the manner in which the plastic is to be disposed of.

Those are economic approaches, but you can also have a command-and-control type of approach, where there is government diktat, standards, or targets about what you can do concerning plastics. These are feasible, the idea that you ban, outlaw some particular uses, or mandate certain targets for recyclability, but potentially, they can have high costs. And critically, failed to provide an ongoing dynamic incentive to look for cheaper ways of doing things.

Those are the measures that economics would perhaps propose, but there are other measures too. And here they are listed; the foremost among these, I think are measures intended to change societal norms. Because economics doesn’t say much about how societal norms and preferences are formed. So, what is it that we can do in order to encourage people, of their own volition, to take more care about the use of plastics and the manner in which they dispose of it?

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Not just people too, but also invoke corporate social responsibility, getting firms to go beyond the minimum that they are required to do by regulation. We are also going to need to address existing regulatory failures, especially when it comes to considering the relative balance between some of the most important disposal options for plastic, for example, the balance between landfill, incineration, and recycling. We know that landfill is discouraged through the landfill tax. But would it be better if we were landfilling slightly more of the plastics rather than, for example, attempting to incinerate them? This is something that we need to look at. We also need to pay more attention to the monitoring and enforcement of existing regulations concerning the uses of plastics.

My senses at the moment, that enforcement of regulation is perhaps uneven, and inadequate, in view of the potential harms from plastic. There is also the possibility of subsidising those who are engaged in research and development, in the hunt for alternatives to the more damaging sorts of plastics. We also need to pay attention to the possibility for ex-post clean-up of plastics in the environment once they have been released. It could be easy on land, but in the marine context, we could find that the pollution caused by plastics is nearly irretrievable; but we should try. And such a clean-up has to be, of course, publicly funded because it is a public good.

At the bottom of the list here, I refer to exporting the problem because one way of dealing with our problem of plastics, is to export the used plastic to other countries. Now, I say this with some hesitation because we had to be very sure about what happens to the plastic once it has been exported. It is becoming hard to export our plastic waste to other countries, they are reluctant to take it now. We need to be careful because we do care about what goes on, we care about the extra-territorial impacts of the plastic, once it has been exported. We also have to concede that environmental problems caused by plastics are transboundary in nature. The plastic used in one country can find its way into the sea, via the river, so, it is global problem. As a global problem, it requires international coordination, in the same way, that climate change requires international coordination. But alas, that is very difficult to do because of the—what economics calls the free-rider problem. That means it is better for everyone if we all take action, but it is better still if you can free-ride on the actions of others.

We also, and this is my penultimate slide--we also need to question the way in which we are tracking progress towards sustainable development at present. Now, sustainable development means different things to different people but to an economist, sustainable development is all about natural capital. Natural capital is what environmental economists call stocks of things, like stocks of fish, stocks of timber, stocks of ore, stocks of minerals; things that were not man-made. Now, a proper recording of what is happening to stocks of natural capital is central to the idea of sustainable development as understood by an economist. The idea is it is okay if the value of some of these stocks is declining, provided that it is more than compensated by increases in the stocks of other things, and perhaps, compensated by increases in stocks in man-made capital too.

Now, in order to get a proper picture, you need to take a careful, proper account of all the various stocks that constitute the wealth of the economy. The problem is that stocks of waste are not natural and as such, appear to be overlooked at the moment in national accounting exercises. Stocks of waste are ignored, and this is a serious error, particularly so far as stocks of plastic waste are concerned, because they are rapidly accumulating, and they are not going to degrade in the foreseeable future. So, we need to take account of these things in order to judge whether the economy is proceeding down a path of sustainable development.

Now, this is my final slide where I summarise the different things that I think ought to happen in order for us to get a better grip on the problem of plastics. The first is that nationally, we are not properly accounting for stocks of waste and we to start doing that. Secondly, we need to have some international cooperation, we can’t solve the problem of plastics waste on no individual country cap. We also need to ask hard questions about where norms of behaviour come from and what we can do to encourage people to do the right thing, without deploying economic instruments in order to force behaviour.

We also need to do more about providing ongoing incentives for people to substitute and create new forms of plastics that are less harmful to the environment and easier to recycle. But I think the key thing, and I’m sure this is something that will resonate with my academic colleagues, is that there is inadequate scientific evidence about the potential impacts of plastics, and more research is required. And with that, I revert back to Andrew, thank you.

**AD: Brilliant, thank you, David. You have obviously provoked quite a lot of thought in our audience, the Q&A is starting to fill up, but please—to our audience, please keep those questions coming in, we will have, I think, a very interesting discussion session at the end. Thank you, David, again. We’re going to move onto our next speaker now, who is Paul Davidson, who is UKRI Challenge Director at the Smart and Sustainable Plastic Packaging. Paul, over to you.**

PD: Thank you, and good afternoon everybody. I’m Paul Davidson, I am the Challenge Director for the Smart Sustainable Plastics Packaging Fund. So, firstly, for those of you from an academic background, you are probably very familiar with UKRI, who we are. For those of you who aren’t, we are the main body by which government funds research and innovation in the UK. So, we have a budget of around 7 billion a year and we get to do some of the cool stuff, like the British Antarctic Surveys, which is funded by us. So, we’ve just taken delivery of the Sir David Attenborough, which we are really pleased about, and also Boaty McBoatface. The Oxford vaccine, for example, was also co-funded by us as well. So, that is kind of the stuff we do.

 I run the Smart Sustainable Plastics Packaging Challenge Fund, which runs between 2019 and 25. It is 60 million pounds of public funds, and one of our targets is to leverage 149 million of public funding. We want to bring about a wholescale change in the UK’s ability to reduce, reuse, and recycle. If you are in sustainability, that is a pretty familiar message, but it is really important to us and we work across that whole waste hierarchy. Recovery is not part of what we want to do, what we do absolutely wish to do is support bold, ambitious, large-scale innovations; that is at the heart of where we are.

But onto today’s topic, this is about barriers, and I don’t like talking about barriers particularly because it sounds pretty negative, so, let’s talk about challenges and issues if you will. But I think we do need to address that it is not straightforward or plain sailing with plastic recycling. So, I’ve tried to divide these up into those three things. So, firstly, the barriers to reduction; and I think this is really fundamentally about striking the balance. The picture, by the way, is a friend of mine, I’ve caught up with in Tesco’s, this is pre-Covid, and this was her shopping trolley. She made a very conscious decision I’m not going to put the plastic bags—a really good effort. There are implications to that though. So, there are more product losses, we also know the shelf-life is diminished and there is also product damage as well. So, we need to make sure that if we start reducing packaging then we don’t end up with a worse case of actually increasing, say, food waste and associated carbon emissions with that.

The other issue I think we have on reduction is that traditionally, industries approached this by light-weighting. And it was really put to me in quite stark terms, they said, “Look, does it really matter if a whale or a dolphin eats a carrier bag, if that carrier bag is like, 23 microns or 17-micron gauge?” So, I think the agenda and the argument has moved beyond a lot of light-weighting strategies.

So, let’s have a look at refill and it is one of those things that keep coming around as an idea—keeps coming around as an idea. I think the barrier here is we have yet to identify what I would call a compelling proposition.

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What I mean by this is that a lot of refill initiatives, they say, well, of course, people will want to do it because it’s the right thing to do. It is, but however if you then start trying to work out what the implications are of that, for the brand owners and retailers, and consumers, you quickly run into the point that it is very, very onerous for retailers, it puts a lot of burden onto the stores themselves. It tends to slow sales down, particularly at the moment, it is critically important that stores can get people in and out as fast as possible; Covid has reduced the retailer capacity at the minute. The brand owners as well. If you are taking back refillable packaging, you’ve lost that brand connection, that brand identity with your consumer. So, how do you reinstate that, how do you maintain that sort of brand value, the brand equity? It’s a real tough one. And also, many consumers aren’t particularly motivated to do all this. So, how do you introduce a refill scheme that is at an appropriate price point? And also, can be accessed by consumers of differing abilities and with different times and motivations to do it. I think we really need to think about this because refill is one of the areas where we need to have more growth, we can’t just recycle our way out of this problem. But at the minute, I just don’t see that the propositions are fully developed there.

Now, in terms of recycling, for me, the main barrier here is one of end markets, and the barrier from that, from the end market, is because packaging dominates plastics use. That is the chart on the right and it is a really important chart. We want to recycle plastic back to plastic, the environmental winds of recycling plastic to wood or other applications, by and large, aren’t as good. However, if you look at the chart on the right, what this tells us is that just under 40% of all plastics are used in packaging. Also, the next largest application is only half the size. Now, we are already at a recycling rate of about 57% something in that area, so, already, we are recycling enough or more plastic packaging than the next application uses.

So, the other problem we’ve got here, and again, the chart shows this really clearly, that packaging is dominated by polythene, polypropylene, and PET. So, if go to the building construction industry and say, I’ve recycled loads of plastic packaging, do you want all this plastic, it’s polythene and polypropylene and PET, look at what they use, it’s dominated there by PVC. So, it is too much of the wrong polymer to go into other applications. So, we have to be able to recycle plastic packaging back into packaging and packaging is actually a really, really demanding application, both technically, from a regulatory perspective, and from a safety perspective. So, that is one of the real challenges that we face here.

The next one, I’m going to put this—as an uncertainty. I think this is also building on the comments that David made earlier. We have a lot of regulatory and fiscal change going on at the moment. So, we have an extended producer responsibility, being radically reformed, especially for the UK. It now means that 80% of the net costs will be met by the producer, in the past, it was way, way lower. We have the introduction of the Deposit Return Scheme for on-the-go consumption. We have a virgin tax coming up in the UK, starting in 2022, probably around £200 a tonne. We also have proposals which will be consulted on next year about should plastic film be included in the consistent collection proposals for kerbside and recycling schemes. And, the EU is introducing a plastics tax of about 800 Euros a tonne, starting January the 1st. Any one of those on their own would constitute the largest change we will have seen in the landscape in the last 20 years.

The prospect of having all 5 together, being introduced together in the next 2 to 5 years is quite challenging, to say the least. My big question is how are these going to interact because for sure, they will. For example, we know that the introduction of the Deposit Return Scheme will reduce the value of what is collected kerbside in terms of plastics. It also means there will be more space in the kerbside collection lorries that they can fill with other things such as plastic films. So, there are opportunities and there are some concerns here as well. But there is certainly a lot of uncertainty from this change in regulatory positions going on in the short-term.

It would be remiss of me not to mention the funding opportunities that we have, so, we currently have a competition open at the moment for relatively small grants between £50,000 and £150,000. We have 2 much larger grant schemes coming up in the new year. If you are looking for information about those, or generally about what we’re doing, please sign up to the UK Circular Plastics Network, and there is a whole bunch of news and other items on there. As part of that, there are also our funding opportunities. Thank you very much, I think we’ll be doing questions later, Andrew, is that correct?

**AD: That’s correct, Paul, thank you very much for your interesting introduction to your thoughts in the area that you are focused on. I think there are some interesting comments that hopefully, we can explore in the discussion later. Just a quick reminder to the audience that the Q&A is open, so, keep firing those questions into us, we will do our best to get to as many of them as we can.**

 **Just to introduce very quickly, our next speaker, we are going to move onto the final presentation that we have, which will be Doctor Walters Nsoh, who is a Lecturer in Law at the University of Birmingham, Walters, over to you.**

WN: Thanks Andrew, good afternoon, everyone. I think my talk is basically just picking up from what Paul and David have just spoken about. I will be speaking specifically on the role that law and policy can play in governing plastic use and disposal. Specifically, I want to focus on 2 important instruments, the 2018 Plastics Resources and Waste Strategy in England, which contains a number of policies aimed at reducing plastic waste and also, some of the proposals that are contained in the Environment Bill that is currently under consideration. But before I talk about the law and policies, just a brief background I think, on the nature of the problem of plastics in the UK, which I think Paul and David have touched on already.

 The UK government estimates that 5 million tonnes of plastic are used every year, nearly half of which is packaging. And as of 2016, an estimated 1.53 million tonnes of plastics were reported, and this was up 24% since 2010 and 13% since 2014. The bulk of this, 53% of it is from the service sector and households contributed just over 8%. While these estimates on their own, look really high. The UK government or the UK data on plastic waste is nevertheless being questioned by some organisations. For example, the WWF estimates—or has calculated that the total plastic waste generated in the UK in 2014 was around 4.9 million tonnes. This could increase to around 6.3 million tonnes by 2030.

 So, what are some of the problems that we encounter, what are some of the problems but also some of the benefits that plastics present to us? The environmental implications of plastics, as we all probably know, are wide-ranging. So, plastics often do not decompose, and they can last for centuries in landfills. They can also end up as [unclear 00:28:56] in the natural environment and habitats are then degraded when chemicals leak from the plastics and animals can suffer when getting caught up or having eaten plastics. And we see a lot of this, not just in the fiscal environment but also in the marine environment as well. There are also impact on health and wellbeing as well.

Single-use plastics do also have a number of benefits as well and this includes contributing to food safety and hygiene, as well as reducing packaging waste in transit, and thereby reducing the energy and emissions that would be generated from using alternative materials. So, given these problems and benefits that we encounter with plastics, what is the role that law and policy and can play in tackling the plastics problem?

**[00:30:00]**

Now, a lot of the UK's current waste legislation originates with the EU. You might be mistaken in thinking that with Brexit, that might mean a reduced influence of EU legislation, but that is not quite right. Existing environmental law, derived from the EU continues to apply and have the same effect, following Brexit on the 31st of January this year and will continue to apply even after the implementation periods ends on the 31st of December 2020. That is essentially down to the EU Withdrawal Act 2018 as amended because all of that EU legislation is given effect or has been transposed in that withdrawal Act. In relation to plastics, the main EU legislation includes the EU waste framework directive, which essentially provides us with the framework under which waste policy has to be implemented throughout the EU. And the overarching requirement of that directive is that member states like the UK, have to apply the waste management hierarchy, which I have on the next slide for you. This basically sets out the order in which—or the order of priority to apply to products and waste and shows that prevention and reuse options should be considered before recycling and this would then be in line with moving us towards the overall aims of having a more circular economy.

Another important piece of legislation is the EU Packaging Directive. This directive again requires the UK—under this directive, the UK also has a statutory producer responsibility regime for packaging, covering the whole of the supply chain from raw materials to finished packaging. This system essentially is a way of incentivising packaging producers to take financial responsibility for the end of recycling their products. Under the directive, it sets packaging waste targets—it does so for material-specific recycling targets, for example, for plastics. It set a target of 22.5% for plastics, that have to be recycled. Since 2008, member states must continue to meet these minimum targets, but they also have the freedom to continue to set maximum—or much more higher domestic targets if they choose to do so.

Another important one is the Amending Packaging Waste Directive. This directive, what it does, is it amends the packaging waste directive—the 1994 directive by increasing the recycling target to around 70% by weight for packaging waste by 2030, with an interim target of 65% by 2025. It also introduces a new plastic packaging recycling target of 55% to be reached by 2030. All of these—the UK government, of course, requires the implementation of the requirements of this directive by placing a legal obligation on businesses over a certain size to make and use packaging to ensure that the proportion of the packaging that they place on the market is recovered and recycled. This obligation is known as the Extended Producer Responsibility Scheme for Packaging, which Paul mentioned earlier. The primary legislation that gives effect to these EU directives, is the Environment Act 1995, for England, Wales, Northern Ireland, and Scotland with corresponding regulations in Northern Ireland as well. The secondary regulation that also gives effect to these directives and the obligations under those directives are also set out on the slide there for you.

According to a 2018 National Audit Office report, in 2017, just about 7,000 companies registered as having packaging obligations across the UK. The relevant businesses basically discharged their responsibilities by collecting evidence of waste packaging, recycling, and recovering the equivalent to the weight of their obligations from accredited processors and exporters. Then, we have packaging recovery notes and packaging export recovery notes, are then issued by accredited businesses and they provide evidence that they are actually complying with their obligations under this scheme.

This system has been criticised quite a lot, for example, the National Audit Office has examined these packaging recycling obligations in its report published in 2018, it expressed concern that there we no checks to ensure that exported material actually was being recycled and that there were risks of fraud and error within the system. It also noted that where it was clear that the rates have increased over the lifetime of packaging, the packaging obligations system, that the system itself was likely to have contributed to this change, the system appears to have evolved into a very comfortable way for the government to meet its targets without actually facing up to the underlying recycling issues in relation to plastics. It also highlighted that there is no evidence that the system is encouraging companies to minimise waste or to recycle more of it, or they were relying on exporting waste.

Companies were relying on exporting waste to other parts of the world without adequate checks to ensure that the material was actually being recycled and without concentration on whether other countries would actually accept this waste. Another criticism of that was that of this system was that rather than producers, taxpayers were covering around 90% of the cost of packaging waste disposal, indicating that the system, the Producer Responsibility System wasn’t working as it should be working. The current system has also been criticised as not sufficiently incentivising the design for greater use or recyclability of plastics as well. The system is not stimulating sufficient invention or sufficient recycling targets and that it encourages producers to export more of their waste rather than try to do something about it here.

So, in response to these criticisms, the UK government in its 25-Year Environment Plan set out an aim to reform the Extended Producer Responsibility Scheme for Packaging. This was followed in December 2018 by the Resources and Waste Strategy for England, in which the government set out a series of reforms. And this strategy basically sets out the government’s ambition towards a more circular economy for waste and to become a world leader basically, in using resources efficiently and reducing the amount of waste that we create as a society. It also set its strategic ambition for the government to work towards plastic packing placed on the market being recyclable, reusable, and being compostable by 2025. This was followed, as I said, and it is intended to support commitments that were already made in the 25-Year-Environment Plan to leave the environment in a better condition for the next generation. In particular, working towards an ambition of zero avoidable waste by 2050 and working towards a target of eliminating avoidable plastics by the end of 2042.

The policies included in this document, in the Resources and Waste Strategy, included a commitment to reform the extended producer responsibility system for packaging which will be introduced in 2023. It also included policies to ensure consistency across local authority collections in England, as well as proposals to introduce the Deposit Return Scheme, which Paul mentioned in his presentation earlier, as well as the introduction of a tax on plastic packaging that has less than 30% recycled content.

**[00:40:00]**

The Environment Bill contains all these proposals, it contains proposals to amend the producer responsibility—Extended Producer Responsibility Rules. Specifically, it contains provisions for those involved in the manufacture, process, and distribution, and supply of products and materials, to be required by regulations to pay for or contribute to the cost of disposing of those materials. It also contains provisions that are made for the enforcement of the scheme, for example, the powers for enforcement will, in their relevant authorities, for example, the relevant Secretary of State of the Environment Agency, to make provisions for the enforcement authority. Which could be the Environment Agency, requiring producers to maintain records and provide information to an enforcement authority. So, those are just some of the provisions that are contained as far as the Producer Responsibility Scheme is concerned.

In relation to ensuring consistency across local authority collections in England, in February 2019, the UK government published a consultation on consistency and household and business recycling collection in England. And among the wider range of measures aimed at increasing recycling rates, it proposed that local authorities should have to collect the same set of core materials for recycling, including a number of plastic items. The Environment Bill again contains provisions to amend household waste requirements designed to ensure a consistent approach to recycling. There is also again, proposals to introduce the Deposit Return Scheme as well, and that was set out in the Resource and Waste Strategy in England as well. The proposals again, include—the scheme would be managed by a central body, which is known as the Deposit Management Organisation which will be funded by the fees paid by producers and revenue that is obtained from the scheme itself, from the deposit return Materials that are sent for recycling.

Among the other proposals is, of course, also the introduction of the plastics packaging tax, which will be introduced in April 2022. But just to round up on that what does this tell us about the role that law can play? Where does all of this leave us? It shows that individuals and businesses are responding to a lot of these concerns, and there are a number of initiatives that are taking place. In response to all this, the government is also releasing steps to actually make these changes happen. And it is doing this through a number of traditional common and control regulations but also, using market-based instruments like taxation, to try to nudge behaviour. There are a number of other things that are happening and businesses I think through schemes, a number of schemes, supermarkets, and other businesses are making a lot of effort in this regard to try to encourage and nudge and deal with the issue of plastics broadly.

One last thing, I just wanted to finish—I was also highlighting what impact maybe the Covid pandemic has also had on the wider uptake and how quickly these regulations and also the changes that are being proposed have been implemented. And, of course, it has had an impact in slowing down the process, and there would need to be consistency across the board with all these policies that are being introduced to ensure that businesses are able to take it up. Thank you very much.

**AD: Thank you, Walters, that was a really interesting discussion of a lot of different areas there. I would like to bring the whole panel back now to answer at least some of the questions that we’ve got. I’m conscious of the time so, perhaps we can try and keep our answers relatively brief. We’ve got quite a lot of questions that have already come in so, I’m going to start, David, with a question that has come in directed towards you. Could you please explain what you mean by stocks of waste being overlooked? The waste industry does not tend to stock up waste, it is sent for treatment. I think the use of the term “stocks” is a bit confusing, perhaps you can explain a little bit more about that for us?**

DM: I’m delighted to do that. By stocks of waste, I meant 2 things that are of particular importance. That is the stock of waste contained in the landfill, which is then producing over time, disimmunity impacts, and also, and perhaps more importantly, stocks of waste in the environment. What has been deposited into the environment, the nanoparticles, the microplastics that are in water bodies, those are the stocks that I was concerned about.

**AD: Thank you, David. I’m going to put the next question because it is very personal—Paul, perhaps this is one that you can immediately comment on or Walters, you may want to take this on. To what extent does the panel believe that our imminent withdrawal from the EU will affect the UK’s handling of plastic use and disposal; do you have a view on that, Paul?**

PD: I suspect it won’t be the most heavily impacted area by our withdrawal from Europe. I think the one thing that we do know, is that quite a bit of our recyclables are exported for recycling elsewhere, or transhipped quite often through, especially, the Netherlands and Rotterdam. So, that route might be a problem, but I think in the scheme of things, that wouldn’t be at the top of my worry list, to be quite honest.

**AD: It brings us onto another part of a different question about how much care has the UK taken to find out what happens to exported plastic waste, or is it just glad to shift the problem elsewhere? Paul, I don’t know if you’ve got an answer, or Walters, maybe this is more one for you.**

PD: Well, this comes under the care of the Environment Agency, who are responsible for ensuring what was—the phrase is “broadly equivalent” so the recycling has to be done under conditions broadly equivalent to those that would be done in the UK, for—to be able to claim the-- so, the practicing export recovery note. And obviously, a phrase like broadly equivalent is not super-specific from a legal perspective. And I would also say, I think the Environment Agency has struggled in terms of resourcing to enforce that. So, there have been a number of exposés on the TV where you can see UK waste being treated—let’s say, sub-optimally, in emerging economies and you have to ask yourself, well, was that a really good solution? So, I think that is probably what we can say on that.

**AD: Thanks, Paul. Walters, do you have anything to add on this?**

WN: Yes, I think just to add—it is the same view I have with Paul. I think it has to be done on a comparative basis, as it would be done, in the UK. In addition to that, and something which we didn’t get a chance to really mention is that, of course, all of that is also subject to international law as well, the trans-shipment of waste is also subject to international laws and obligations. And the UK is a signatory to those obligations, to some of those conventions like the convention under the transboundary movement and shipment of waste as well and hazardous waste. It is subject to the obligations under that as well, in addition to those on the EU Directives as well.

PD: I think the Norway Amendment will tighten that up significantly as well. So, I think there is optimism—I think the TFS or the Basel Convention, is being amended by Norway—it looks like a really interesting—I think that’s gone through actually—I’m not sure, Walters, you can help me on that. If it goes through and the enforcement is adequate, then, I think we should be in a better place.

WN: Yes. I don’t have that up-to-date information here.

**AD: Thank you. It is interesting that we look at the UK typically, but this is a question that is obviously much more international. It brings me to one of the other questions, and I don’t know, David, if this is something you’ve got an opinion on, but the UK has a relatively efficient recycling system, I think relatively being the keyword there. To what extent should we help fund other countries to reach our level of recycling; is that something you can comment on, David?**

DM: Yes, I think that there is an argument that we should assist other countries to develop their waste-handling facilities. The economic argument would be that if those countries are dealing with waste in a sub-optimal manner, some of it will leak out of the system, find its way into the rivers, into the seas and come back and harm also the UK. So, there is an economic argument for assistance to be provided. I’m in favour of that.

**[00:50:00]**

PD: I would say also, Andrew, it’s not necessarily just economics, they always use these words knowledge transfer. I think there is a lot of don’t make the same mistakes we made. So, if you’re starting with a blank sheet of paper, for example, and I’ve been asked this question lots—how would you implement plastics waste collection? You don’t start with that—we iterated, so, we kind of started with, let’s do a bit of paper, then a bit of glass, then—let’s see what we can do. If you start with a blank sheet of paper, the first thing you do is take the putrescibles out of the domestic waste stream. Because as soon as you take the food waste, which is your very, very high carbon impact anyway, and deal with that, everything else becomes so much simpler in terms of your collections. So, if you’re starting from the ground up, then there are a lot of opportunities and I would say, if anything—so, it’s not about what countries should do—that’s up to them, but saying, please don’t make some of the mistakes that we made because they’re quite easily avoided.

**AD: I think it’s really interesting, we had a fascinating discussion last week, when we were talking about different aspects of plastics around the world and how we often think UK-centric or West-centric of our recycling systems and how to prove them. There are some incredible challenges in our recycling systems, but the way that plastics are handled across the world is incredibly different. As you go to the global south, in particular, plastics just aren’t recycled in the same way that they are here. It kind of relates back and then, there is another question in the chat about our responsibilities of shipping our waste away from the UK and taking that on.**

**Maybe we will address that question now, as we’re talking about it; does our government keep track of what happens to the plastic shipped to other countries for recycling whether those are recycled or not? I’ve read some countries accepting more plastics for recycling from the EU than they actually have the capacity and facilities to recycle. I don’t know if anyone has got any insight on that and wants to come in on that as an answer?**

WN: I think it should be keeping a record of it. But the question and I think one of the criticisms of the system is whether the record is being actually kept and to what extent the system is actually being monitored and enforced. But technically, the system requires the government to keep track of what percentage or what waste is being shipped overseas. Whether or not it is actually being enforced is a whole different question on its own.

PD: We looked at this a few years ago. It was really looking at the trade between the UK, Hong Kong, and China. If you looked at the export and import data, it looked like the material was transforming from polythene to polypropylene, and also, the amount of material that was going into Hong Kong was way more than Hong Kong could accept. But what was clearly happening is that Hong Kong was being used as an unofficial trans-shipment port for China. At the time, China should not have been accepting direct recyclables, but if you looked at the trade ratios, it was quite clear what was happening. So, you do see that and since China has clamped down on what it will accept, you are now starting to see other South East Asian countries becoming pre-treatment centres as well. That confuses the picture because you will have Vietnam doing a lot of taking recyclables, washing and flaking, pre-preparing it to make it eligible for import into China and then it going to China. So, when you look at capacity, you have to say, the capacity to do what? I don’t think the situation is quite as clear and as easy to understand. However, you see countries like Malaysia, I think Indonesia, also shutting their ports because they’ve run out of capacity to deal with plastics, so, they’re saying no more plastics, thank you.

**AD: Thank you. It’s a fascinating area for discussion, isn’t it, and we could continue. The questions are flying in, thank you so much to the audience for keeping them going. We’ve maybe to time for one more and I’ll throw this your way, David, as a starting point. Are the panel concerned about the socio-economic impact and the changing landscape of plastics and alternatives? Sustainably packaged items tend to be more expensive, thus excluding many households from making changes, with taxes, tariffs on plastics all passed onto the consumer and that is also problematic.**

DM: It is problematic—and that is a valid observation. When somebody points out that environmental policy has adverse distributional impacts, I find myself agreeing that is often the case. However, be aware that if, what you are concerned about are the distributional issues in society there are other better instruments than environmental policy of addressing those concerns. In other words, eschewing necessary changes in environmental policy is not a good explanation for making these necessary measures on distributional grounds.

PD: I think the issue we have is that the current system has been optimised over the last 45, 50 years to be the lowest cost way of providing foods and goods to people. So, almost anything different you do is going to cost more. So, then the question is if that is inevitable and I think the argument, right from the beginning was the inability to internalise those external costs mean that the alternative is probably going to cost us more. So, how do we make that at a competitive price? And that, as you say, is a completely different policy issue and I think that is exactly what David—and I agree completely with the comments made by David.

DM: Remember, it is only half the picture because you also need to ask who are the recipients of the tax revenues so raised through environmental taxation?

**AD: I think that is probably, unfortunately, due to time, all we’re going to have time for in this webinar and in fact, this webinar series. The series will be available for people to view after this, through Facebook, I believe. So, you can revisit the whole discussion that we’ve had in the 3 different areas. We’ve barely even touched on the technology of plastics through this webinar and there are huge questions there about what can be done technologically. I think what it has probably highlighted is this really isn’t a simple problem. And actually, only by looking at all of these different angles and looking at how they play off each other, are we going to come up with sensible solutions? And this certainly what we are trying to do with the Birmingham Plastics Network.**

 **If you want to find out more about the Birmingham Plastics Network, then you can do so by visiting www.birmingham.ac.uk/plasticsnetwork. I thank the panel again for their great presentations and their insightful discussion and I thank you all for attending.**

**[Audio ends: 00:57:33]**