**INT: Brilliant, so it’ll just ask for your consent there. Did you want me to talk a bit more about the project now before we start.**

DEU26: Yes, go for it, yes, yes it might just help shape my answers as well.

**INT: Yes, of course yes, absolutely. So essentially there’s quite a lot of people involved in this project. There’s people from [environment research organisation], so myself and working with a small team, there’s University of York, Open University, CEH, so there’s a variety of partners. So, essentially it's split into different areas. So myself and the University of York are looking understanding current biodiversity and recorded needs. So, essentially trying to understand what's being used at the moment, why are they using it and looking at the future of data use. Then we’re going to feed that into what’s being developed as a tool and App. To hopefully improve model data and for a wide audience. That essentially is a summary of the project itself. Did you have any questions at all at the start?**

DEU26: No, that’s good. Just one quick question. Model data is that kind of models to predict biodiversity value, biodiversity in general.

**INT: At the movement they’re looking at probability, raw probability distribution. I’ve got a couple of examples to show you the end. There is starting points of what they are developing. I don't know you know the complete steps because it’s not in my remit. Yes, I’ll show you some examples of some current models.**

DEU26: What’s your specific remit then, what’s your role?

**INT: My role is essentially doing research, talking to people like yourself, so we've been talking to a variety of people including some government agencies, ecological consultants environmental consultants, conservation groups and universities as well. So, just trying to understand from abroad spectrum**.

DEU26: Cool, sounds good.

**INT: Excellent. So, so maybe just to start off with from your perspective if you could just tell me a bit more about the organisation you work for and then your role within that.**

DEU26: Yes, absolutely, so I’m [Name], I’m head of environment at [Government agency]. [Government agency] manage the nation's [land use type], so the public [land use type], about 250.000 hectares within England only. We are the largest land manager just I think. [unclear 00:03:13] We manage the nation's [land use type] for our triple bottom line, which match [unclear 00:03:21] developments. So, we manage them for [s/l people and nature00:03:25] [unclear 00:03:26]. What that means, so in terms of the economy that often centred on [unclear 00:03:35] business. So, we are 85% self-funded, the rest coming from government central funding and through DEFRA and the [Government agency]. Which is our [government agency] which [unclear 00:03:47] services, which is everything outside the public [Land use type]. It’s [unclear 00:03:51] but focusing on the nation's [land use type]. So, we talk about that triple bottom line and the economy part of it, is about sustainable business, so 85% self-funding comes from [product] income. In terms of the nation we [unclear 00:04:14] 80% if the [product][unclear 00:04:14], second only to China in World, in terms of volume of [product] imported. We review that as a crucial supply chain for the low carbon economies of the future. We’ll move away from oil based products.

**INT: Yes, absolutely.**

DEU26: Sustainable products like raw materials, [unclear 00:04:38]. We also deliver [land use type] for people, so we are very keen on engagement with nature, engaging people with nature, really a crucial service in terms of people’s well-being. So, it’s a core part of what we do, 85% of the population in England is within half an hour drive of [Land use type] or [land use type]. So, we’re pretty well placed to help deliver [unclear 00:05:07]. It’s all part of what we do. Then the third one, which is my remit. It’s become my remit, but obviously shared with lots of other people, is about nature biodiversity restoration [unclear 00:05:18]. We have to manage, as responsible landowners, we don't just manage the biodiversity, we want to actively [unclear 00:05:28]. A core theme which I’ll come back to is about securing and growing our natural capital. So, we view natural capital concept as a really nice way to integrate these different objectives of management. So, that our core aim is really to maximise our natural capital, that really incorporates on range of deliveries in terms of carbon capture, biodiversity outcomes. So, we’re very keen on natural capital, natural capital decision making, seeing how we can embedded into our [land use type] plans when we’re designing a [land use type] for the future and we’re making decisions about how to take the [land use type] forward. We do it based on the fundamental principles of what delivers and ever increasing. I’ll stop there, otherwise I’ll go down too many tangents.

**INT: That’s a brilliant, it’s a great introduction. Thank you. So, if we focus on what you use species record data for, so whether you use single species or groups of species for your work?**

DEU26: Sorry, I’ve immediately got a flood of thoughts, so I’m writing them all down, then I’ll relay them. So, by far the biggest thing in terms of top level strategy is, when we go back to [unclear 00:07:00] economy, economy we know how much money we make. We know how much [product] we sell, obviously, because that’s what we do. In terms of people, we’ve got a reasonably good idea about how many people visit the nation’s [land use types]s. We’ve got surveys, it’s what’s happened, it’s not perfect, but we’ve got a reasonable idea of people who visit and the [s/l number of times the visit 00:07:20]. The biodiversity our third core pillar, we have very little idea of the headline performance of biodiversity across [land use types]s. Historically that has been due to the difficulty in getting robust measures of biodiversity. We have tried a number of different approaches, for instance we’ve worked with BTO to utilise their breeding bird survey. There’s obviously a national dataset to extract the bits which are in the nations [land use types]s and see if that’s robust. It gives is a robust indicator of biodiversity. Ultimately it didn’t because it’s not designed for that. It was really unfortunate to dive into it a little bit, it might be of interest. Essentially the BTO could give us the trends for the most common species but it didn’t give us rare species trends, because they didn’t have a big enough dataset to predict the trend, because the species are rare. So, what it said was that the common species are doing fine, but that is not useful, when you’ve got a biasing dataset. So, we didn’t think that was fit for purpose, but a really interesting exercise. We also worked with the [wildlife charity] on their national datasets for moths and butterflies. That was quite good actually. That gave us a reasonable trend in terms of biodiversity, in terms of butterfly biodiversity in particular and it’s trend. [unclear 00:08:51]. I can’t remember which dataset we used, but Butterfly Conservation dataset. That was quite good. Our main concern was, we work quite closely with the [wildlife charity]on a number of different things. We are managing specific habitats purely for specific species of butterfly. Though as an indicator there’s a real worry about us using butterflies, [unclear 00:09:14]. The reason we monitored butterflies is because we like them, not because they’re a good indicator [unclear 00:09:18]. The same with birds. So, that scientific robustness and that’s fine as long as we can encapsulate butterflies plus a range of other species. But as we ran into it, it had problems with birds. As part of [s/l the suite it good 00:09:31] but as a single indicator it’s not good enough. Having said that we’re also working with Bat Conservation Trust, on [s/l direct 0:09:31] species monitoring using audio or bat detectors to see whether we can monitor the bats population. Our most exciting project to develop that headline indicator of biodiversity performance is working with [Government Agency] on the use of environmental DNA. Have you come across EDNA before?

**[00:10:01]**

**INT: I’ve heard being mentioned quite a bit, yes.**

DEU26: Cool. So, take a step back slightly and say that species data when looking at whole community changes, which are a thing we’re looking for to feedback to our boards to see whether we’re doing well, one of our core purposes. We ‘re quite sceptical about indicator species. So, birds and butterflies we record because we see them and we like them. But who’s monitoring nematodes, even inverts, which we’ve got a reasonable number of specialists in. Getting the whole community dataset, we’re sceptical that it can be achieved using traditional methods across [unclear 00:10:52]. The resource versus outcome, the resources and requirements being [unclear 00:10:56]. We’re very interested in environmental DNA. Essentially what it does and the approach we’re taking currently is, you get a sample and that could be a sample of, let’s say it’s a malaise trap which captures invertebrates over week long sample. Previously you would send that sample of inverts off and it might take a PhD to go through every single one, thousands of bugs and beasties, ID them all and get some results, which is great. Now we can do it for £250, so you can zap all those bugs up, you can sequence every bit of DNA and you can compare that DNA analysis with a reference database to match them up, which species.

**INT: Okay, yes.**

DEU26: Potentially you get a massive species list and you could do that not just with [unclear 00:11:44] traps like malaise traps, you can do it with- we’re currently doing with soil samples. So just taking a tiny little bit of fermentation layer, so that’s just below the [unclear litter layer, which it’s supposed to come from, which is arguably the best layer to take from. Then you do exactly the same, you amplify every little bit of DNA you find in that sample. Then you compare it to [unclear 00:12:04]. An immediate problem we find is the opposite of what we currently have. We’ve got too much data and it’s difficult to interpret. It’s the most high class problem you can imagine. But it’s exactly what you would expect from basically a brand new technique, going wow this is cool, what are we going to do with this. So, what’s really nice about it and fundamentally- I think I might be going into your future questions already.

**INT: You’re absolutely fine.**

DEU26: But what was really nice about it, is the fundamental issue with traditional monitoring techniques of biodiversity is that need for good robust monitoring of effort alongside species. Because otherwise you’ve just got a species list and you’ve got a species list of hotspots effort rather than species [unclear 00:12:48], I’m sure you’re aware of. But this gives us immediate quantification of effort, because we know precisely how many soil samples we’ve got. We know precisely where they’re from. Then we get a species list to match. So, we’re at the very early stages of exploring EDNA meta barcoding, but we’re extremely excited about it, because it’s very cool. That’s the big headline one, going back to your original question about big robust measures of biodiversity across the country.

The second way we use species records, is about protecting species. That’s really specific species. Every [management] operation we do, we do something called [s/l and Op one 00:13:30] basically a [management operation] survey, pre-interventional survey for protected species. As I’m sure you know we’ve got three different levels of protected species. European protected species being the most important. Then we’ve got domestic protected species in the Wildlife and Countryside Act, [unclear 00:13:50] and that kind of stuff. Then we’ve got S41 species. So, we do a survey prior to every [management] operation looking for those species. That includes record searches of any [unclear 00:14:07]. I get distracted. We built this shed, this is a real diversion. We built the shed over Christmas and the blue butterfly in the garden just now, I was like ahh hah, that’s the first one of the year. Anyway, I’ll take that off later. That’s a distraction, always the same. So, that species records and operations.

Then the third one we do is quite a lot of invasive species records. So, anywhere we have to- often plant focused, we don’t do much kind of vertebrate, non-native species control. We might do a little bit perhaps around dormice, I think that’s pretty minimal. Mostly kind of plant, non-native invasives, it’s UK FS requirements, so that’s UK [management] Standard to have a management plan for [unclear 00:14:57]. A big document how [land use type] should be managed. So, non-native invasives are important and species records are really useful in developing an action plan as you can imagine. The first step to managing non-natives is knowing where they are and how big a problem they are, so that’s a really fundamental area. Our records are okay for that but not for [unclear 00:15:20]. We rely on a whole range of different internal records. I think I’ll stop there, because I’m waffling on a bit.

**INT: That’s brilliant. I’m just going to touch upon a couple of things that you’ve just mentioned there. So, I did have this further down, but I think I’ll address it now. So, you talk about your data gaps, these are almost likely to occur everywhere in terms of biodiversity. How do you think it’s best to address these gaps and how to mitigate the effects they have in people’s work.**

DEU26: Yes, interesting. So, data gaps, I suppose protective species are a crucial one there because it’s the biggest influencer. Protected species, yes, fascinating isn’t it. It’s a real conundrum, because at the heart of it there is a philosophical issue, which is, if you monitor a specific spot long enough, it’s likely that for instance a dormice will wander through. So, your monitoring effort is directly proportional to the likelihood of engaging [unclear 00:16:38] species. But that doesn’t mean that that [management] operation should always look for a dormice environment, it could have just been one walking through. It has to be time relevant as well as species. So, for our [management]ry operations we have an ecologist who always does an assessment and that might be a desk based assessment, or a personal assessement, based on likelihood on that species [unclear 00:17:09] site.

Historical records are always useful, volunteer records are always useful, because they inform likelihood. So, if we’ve got lots of records of dormice in an area, we say okay, we’re probably going to have dormice, if we’ve got one, then we okay, let’s have a look and see how keen the local recorders have been in that area, if they’ve been super keen, then that’s likely [unclear 00:17:33]. So, it’s a risk based approach, it’s this interesting thing about our volunteers, because if we direct volunteers they become essentially our volunteers with our duty of care. That becomes in our people volunteer network, so it caused quite a lot of supervision and promise. I’m super keen on citizen science, but it has to be ad hoc because of that. Does that make sense?

**INT: Yes.**

DEU26: Because if we’re directing them, they become basically part of our workforce in many respects, which is important and we have to tailor that to post operations. But if we’ve got that background level of knowledge then that is extremely useful in helping directing them. It’s a bit of a waffly answer, but it does answer your question.

**INT: No, that’s great. So, essentially you do value citizen science and volunteer effort for your work?**

DEU26: Yes, very much and actually even with pioneering approaches, like environment DNA, we see that as- we’ll have a robust method that will utilise our own collection records. But actually, if we can get volunteers to collect samples, that’s half the cost of the analysis done. Volunteers seem to love a bit of science, proper science, DNA, as long as they get the results back. You can train them in quite technical protocols they seem to embrace, as long as they’re clear. Things like EDNA contamination is a real issue, you’ll [unclear 00:18:59] people one side to another, as you can imagine. But you know gloves, Hazmat suit and everything. People love actually engaging with science, so we certainly do that approach.

**INT: In terms of the EDNA you talk about how it’s such a large dataset and it’s giving you a different problem now compared to what you previously had. So, with the EDNA, so it needs filtering down essentially and is this to be applied on a national scale and a local scale as well. Is that the future of EDNA?**

**[00:19:51]**

DEU26: What a question. So, EDNA, research institutes have been using since [unclear 00:19:59] and it’s been slowly developing. But’s really about 2015/16 where the end of PhD and someone’s set up a consultancy on the back of it. They made it a business [s/l proposition, which is 00:20:12] crucial, because we’re a proper end user, we engage with the primary search absolutely. But what we need is to be able to contract someone to do something. Often research institutions what to produce papers, they’re not giving a service regularly. But there’s that real kind of- once it crosses over into a consultancy, like a service that you pay for, then end users like us get really interested. So, now that EDNA is in that- I don’t why I’m going down this tangent, but anyway, now EDNA- I suppose that history is useful. So, now it’s a product and we’re at the start of this brand new world. I’m pretty sure it’s revolutionary. We’re at the start of this brand new world, so the possibilities are huge. It’s everything from a national scale to local scale to interventional programmes to ranking different habitat systems based on their biodiversity delivery through to resilience of our communities to climate change, through to recording new colonises from continents, like Europe. It’s huge. We’ve identified one thing, which is national level biodiversity in England, because we need to show change in that to be able to react to that change. [unclear 00:21:32] you’re the client on our estate. So, That’s the one need we’ve identified as most priority, but there’s hundreds, I don’t know, below that are different other priorities, [s/l are the ones that 00:21:46] spring to mind and the SSSI conditional monitoring as well. A whole range of different things. Does that answer your question?

**INT: Yes, no that’s brilliant.**

DEU26: Is that all right.

**INT: I remembered the one I had before, we were talking about volunteers and how you valued them and that they love science. Do you give them any feedback to feed their motivation?**

DEU26: Interesting, we’ve got about 20,000 volunteers. They are involved in a whole range of different activities. In terms of biodiversity often, not recording but there’s a few specialists, we often engage with local specialists, especially around protective species. They often do habitat management. In terms of feedback to them when they’re looking at monitoring programmes. I suppose the closest thing is we did was, last year was our [celebration] year, so the [Government Agency] was 100.

**INT: Okay, yes.**

DEU26: We had a big project called, [wildlife event], where we used iNaturalist. Have you heard of iNaturalist? Have you come across iNaturalist?

**INT: iNaturalist, no sorry no I haven’t.**

DEU26: No problem. It’s quite a useful App, and it’s a citizen science App for recording biodiversity. So, one thing we did there was setup a project so the website itself was something that you could engage with. It gave really good feedback, you could upload your records, you could take a photo of a plant and upload that, it gives an ID for you, it will let experts comment on that ID. It will upload it to a biodiversity informational facility. The iNaturalist website then, you can download, you’ve got your own profile, like Facebook, which shows how many species you’ve recorded and were about in the country they are. Then you can look at the map of [wildlife event] sites, a nice feedback on the whole project. How the whole project was going and the number of species that were recorded, the rarity of the species. That was probably the main way we did feedback that was relevant. I think we view it as fundamental in any motivational programme to encourage [s/l future 00:24:01] species there.

**INT: That’s brilliant, that’s great. I think you’ve obviously alluded to it already, quite a bit, but just are there any other decisions in which this data informs you in terms of your work?**

DEU26: In terms of species records specifically?

**INT: Yes, focusing on species records, yes.**

DEU26: Yes, so protected species I’ve mentioned, definitely inform everything from [land use type] road building through to operations. Whether they influence other things. I mean the big strategic one, will influence the national level decision making about our investment in biodiversity. We need to get that [s/l print 00:24:58] line to know how we’re doing. Then there’ll be an intermediate, so we have a big kind of strategic high level objectives. We’ve got planned operations, we have all our planning processes, [land use type] plans. Currently biodiversity [unclear 00:25:14] in a slightly ad hoc manner. So, when you develop a [land use type] plan you would sit and look at the species records, just to check if there’s anything in there. It will help to drive that development of the [land use type] plan. Good examples include open habitat specialists [unclear 00:25:32] when you’re wanting to create a network throughout your [land use type] is part of that [land use type] plan. So, that certainly should inform it. But really we want to get to a stage where biodiversity records are informing, yes those three different levels, strategic, the planning and the operational.

**INT: Brilliant, no that’s great. Just in terms of, so we’ve obviously got the biodiversity net gain, the sort of environment bill. I don’t know whether this would affect how you use species record data in the future?**

DEU26: Biodiversity net gain specifically?

**INT: Yes.**

DEU26: Yes, so what I’ve seen of the DEFRA biodiversity metrics, it focuses entirely pretty much on habitats. So, it converts habitats into biodiversity units, then builds any net gain around those.

**INT: Okay, yes.**

DEU26: So, species records we wouldn’t see as informing, that might inform condition of a habitat certainly, but that is part of the kind of influencing multiplier basically on the net gain. It’s an interesting one. I think we view biodiversity net gain, we don’t want to do any in the existing nations. Because we’re planning all our [land use type]s, we think it’s double counting. We already have the aspiration. [unclear 00:27:03] yes, double counting the is the [s/l crucials 00:27:05]. We do view it as potential in terms of [land use type] creations. So, the England Tree Planting programme is pretty big, in terms of aspiration [unclear 00:27:14] year. In [Land agency] it’s a pretty minor part of that, in the big picture, but we’re still hoping to do, you know, I think it’s about 2,400 hectares in five years. There we’re really interested in the biodiversity value of the [land use type]. I’ll rephrase that, [land use type]s we create, we’re very much of the Rackham approach to [land use type]s. [land use type]s are not just [land use type] they are on the [unclear 00:27:43].

**INT: Okay.**

DEU26: So, on our [land use type] create, our [land use type] creation sites, oh I should [unclear 00:27:48] change the name shouldn’t I. Yes, [land use type] creation sites, we’re looking currently indicative kind of soft target and with about 80/20 split between broadleaf and conifers, mainly broadleaves. As well, that’s for the [land use type] area, but the whole area also 15% [unclear 00:28:05]. So, we want to make sure that these places are delivering for biodiversity. We’re quite keen again on EDNA to monitor that. It’s highly likely we’ll hopefully planting on degraded agricultural land and so we can see some serious biodiversity gain with that habitat creation [unclear 00:28:26]. Well, we’re super keen basically to use EDNA as robust methodology to evaluate [unclear 00:28:35] gain. Then there’s a real question about we engage with the whole programme developers. More broadly I’m slightly sceptical of it just because I’m not sure how many wildlife rich habitats that developers actually trash every year. I’ve got a funny feeling that they’re going to be trashing graded agricultural. But that doesn’t stop up from replacing- offsetting that with some really nice biodiversity rich habitat. I think there is a provision, although it’s like for like habitats creation, like for like net gain. So, if you destroy heathland your create heathland elsewhere. You can have an option to increase, as long as the habitat you create is more biodiversity rich than the one destroyed.

**INT: Sort of offsetting?**

DEU26: Yes, precisely, yes, yes. So, if they are destroying agricultural land it means we can create heathland. You don’t have to create agricultural.

**INT: Yes, that’s brilliant, no that’s great. So, you talked about how you obtain your data from volunteers and consultants. Do you obtain it from anywhere else and of the data that you do obtain is this as a raw product or has it been modelled or processed in any way?**

**[00:29:48]**

DEU26: So, in terms of species records, two aspects of that, so our operational levels are pure raw data. Taken from local records, highly dependent on local records centre, if we’ve got their records. Then [s/l NV atlas 00:30:13] as well. [unclear 00:30:17] That’s the raw records. Then at the national level with EDNA we’re working it out. But the raw records are just silly, you take a soil sample and you get 900 species from it. You go, what, that’s awesome what do I do with it. Is it good, is it bad. So, there’s a real question about how we utilise it. Yes, there’s a really interesting question there. Which we don’t know the answer to but we’ll certainly be not just using that raw data. We’ll likely use [research agency] as our analysis filter to say, whether, in terms of biodiversity trends because we don’t want biodiversity to be shown just to be increasing over the next years purely because of colonisation in Europe. [unclear 00:31:08] increase our national species. So, we certainly want an [s/l analysis 00:31:11] component, we can’t just use the alpha diversity, we’ve got to use gamma as well. There’s a real question about generalists versus specialists as well. Do we want our [land use type] to be just filled with generalists or do we want to provide them with specialists. Well, we obviously want the latter, but we could show quite biodiversity rich habitats purely by looking at generalists. There’s another question about colonisation versus extinction rates, in particular when we are- we manage pre-dynamic landscapes, all our [land use type]s are managed and that’s important for biodiversity, [unclear 00:31:53]. So, we’ve got pretty dynamic systems. So, actually that extinction and naturally [unclear 00:32:02] of colonisations [s/l is pretty essential it’s managed 00:32:02]. So, that requires analysis definitely, because you might see severe biodiversity decline in one plot. But that might be because we’ve had a big intervention the year preceding and we’re actually waiting for the colonisation over the next few years on that site. So, that species will slowly increase, so it’s really about modelling that data to make sure that we’re doing the right thing in [land use type] management. Anyway, [unclear 00:32:33]

**INT: Yes, that’s great. I was just thinking will raw data always be crucial to your work in terms of biodiversity? Will there be a point where you just rely on modelled data, or will you need raw data to influence your decisions?**

DEU26: Highly dependent on the decision we’re making. So, [Management] operations where there’s a protective species we need specific raw data. Modelled data will highly likely be influencing at top level and big strategic [unclear 00:33:09]. There’s no point in making national level decisions when it’s only [unclear 00:33:14].

**INT: Yes, no that’s brilliant.**

DEU26: [unclear 00:33:23] as with most things.

**INT: Yes. I think you’ve talked about it already, but do you do any processing or analysis of the data yourselves?**

DEU26: So, as I said at the start we’re [Land agency], we managed the nations [land use type]. As part of that [Government agency] umbrella, we’ve also got [research agency]. So, [research agency] are whom we really on for the EDNA analysis. We’ve not got the capacity to build in-house, so we rely on that external, not external, what do you call it, I don’t know partner organisation. But in terms of EDNA we might also outsource that to contract with an environmental consultancy. So, in terms of that analysis and processing, it’s all outsourced but in a variety of different ways by the organisation or [unclear 00:34:17].

**INT: Okay, yes, no that’s brilliant. How- I think this is a question that sort of runs through the whole discussion already. How could the data be improved to improve your decision making?**

DEU26: Let’s go through it, so I don’t think I need to talk about EDNA again.

**INT: No, no, yes.**

DEU26: That’s sorted and we don’t know how that data can be improved but we know we’ve got that. The cat is sitting outside my door and whining, he’ll shut up in a second probably. So, we’ve got EDNA, then we’ve got that operational [land use type] planning, so that [land use type] planning layer, which will be a bit of both. We’ve got local species records on that. The crucial thing is that operational layer, which is all about data gaps. You’re going to have much better data in the [Area], because most people are recording there than [Area], because no one goes there. So, it’s highly variable. I suppose it’s all about effort. So, actually now we’ve got high levels of recording effort, we’re pretty happy with our species [unclear 00:35:45]. But it’s about filling those gaps where we’ve got low recording, it’s what it ultimately boils down to.

**INT: Presumably the challenge will be how do you improve the recorded effort in those areas that are struggling?**

DEU26: Yes, yes, yes. No one wants to go to [s/l [area] 00:36:03] in the middle of winter.

**INT: No.**

DEU26: Or in the middle of the midge season. Trying to get citizen science involved there, you have to have a business way to [unclear 00:36:13]. That’s why we’ve got our ecologists to go there to do that survey before any operation. To make sure it’s not absolutely ram packed with red squirrels for instance.

**INT: Yes, because like you say, I think from a volunteer perspective they do it because they enjoy it. They want to go to the places and see those species that they want to see, because they’re doing it on a voluntary basis. So, if you want to address the gaps you’ve got to have a corporate business mindset.**

DEU26: Yes, absolutely.

**INT: Brilliant, no that’s great. That’s excellent. So, I’m just going to focus a bit more on modelled data, just the final bit. So, again you’ve sort of alluded to this already, but how would you feel about using modelled data?**

DEU26: Yes, absolutely fine. It’s totally essentially at the top end. Just one quick note on that, we view it as going straight into our natural capital accounts, so that’s the key national level document on biodiversity. Fully comfortable with it. If that answers your question.

**INT: Yes, that’s brilliant. That’s great. So, I’m just going to show you some examples of modelled data outputs that part of the team have created. So, essentially I’ll just ask if you can interpret them and then whether you find them useful.**

DEU26: Cool.

**INT: So, I’ll just share my screen now. Hopefully that should pop up there for you.**

DEU26: Cool, yes I can see it.

**INT: That’s brilliant.**

DEU26: I like a heat map.

**INT: So, the one on the left, I don’t know if you see my mouse there.**

DEU26: Yes.

**INT: Brilliant, so this is a raw probability distribution for a five-spot burnet moth. Are you able to interpret this model and would you find it useful?**

DEU26: Yes, pretty simple I’d argue. So, you’ve got a probability index between 0-1 with one being the highest likelihood of probability. The darkest green means you’ve got a very high likelihood of probability of that species at that site. Did you use [unclear 00:38:43] oh you’ve frozen have you? I’ve lost you, disastrous.

[no audio 00:38:54-00:39:03]

**INT: Sorry, I think we cut out there.**

DEU26: We cut out there, how much did you hear? Are you back?

[no audio 00:39:10-0039:19]

DEU26: You’re frozen I can’t hear you.

**INT: Yes, sorry, can you hear me now?**

DEU26: I can hear you now, yes, yes, can you hear me?

**INT: Sorry, yes, for some reason, I spoke to someone this morning and as soon as I shared my screen, it just- Yes, hopefully you can hear me and I can hear you, so.**

DEU26: Your video has stopped but that’s absolutely fine.

**INT: Yes.**

DEU26: If in doubt we can move to Teams, which is super easy for me to setup if you need me to.

**INT: Yes, okay. As long as I can hear you I think that’s the important thing.**

DEU26: Cool, how much did you get of that?

**INT: I literally just got the bit of where you were describing the model and how you interpreted it.**

**[00:39:54]**

DEU26: Cool, so yes dark green is clearly probability distribution of one, so very high likelihood, the highest you can get for this model of species presence. It looks easily interpretable and nice. My question at the end was how did you create it, was MaxEnt or was it [unclear 00:40:11]?

**INT: Of course, yes absolutely. I’ve got a little bit of background to the model here, which the modeller has provided me with.**

DEU26: Cool.

**INT: So, this raw probability model on the national scale, so it uses 21 land cover variables and 19 climatic variables along with an understanding of the conditions in which a particular species is found and the available literate to set the probability of finding the species in a particular location. So, most of the variables that the model use-**

DEU26: Ahh, it’s the cat. I let him in and this is foolish. Sorry go on.

**INT: Does that give you a bit more information.**

DEU26: Yes, that’s great thank you. I’m quite interested in that graph on the right.

**INT: Yes, of course, we’ll move onto that now, yes.**

DEU26: I don’t know how to- my immediate reflection is, I don’t know how to interpret that.

**INT: No, that’s fine. So, with this one they are essentially using them together to operate as one model. So, the variation model provides you with the level of confidence in the model on the left, the raw probability distribution. So, for example if we look at Wales, so on the raw probability distribution model, you’ve got a high likeliness of the species being present there. Whereas with the variation model this is the dark area, is highlighting a greater variation, so there’s less confidence that the species will be there. That’s essentially what that model is trying to show.**

DEU26: Cool, yes.

**INT: So, if we just use the southwest as an example as well, just to demonstrate it further. Obviously you’ve got a high likeliness of the species being there. Then at the same time you’ve got a greater confidence, because there’s less variation. So, if you were a recorder wanting to be certain that you’d find the species there, you’d want to go the southwest.**

DEU26: Yes.

**INT: Yes, brilliant.**

DEU26: That makes sense.

**INT: I think the variation model I think it’s trying to address those gaps, so where there is less confidence, you’d want to increase your recorder effort there.**

DEU26: Yes.

**INT: Brilliant.**

DEU26: Interesting.

**INT: For these national scale ones, is there anything that you’d add to these to make them more useful?**

DEU26: It’s not intuitive that variation headline, it’s almost, yes, what would you call it. I don’t know confidence. Anything other than that, so this is just single species.

**INT: Yes.**

DEU26: Fine. No, we’d want to [unclear 00:43:37] cut out the public [land use type] estate if we wanted to use the model and dive into that level of local knowledge. Apart from that, no look great.

**INT: That’s brilliant.**

[no audio 00:43:49-00:45:13]

**INT: Sorry DEU26.**

DEU26: Ah there you are, I had an email.

**INT: I’ll try and share my screen again quickly. For some reason I don’t know why it is, but as soon as I share the screen everything just goes kaput. So, I’ll just try this again quickly. Are you able to see that now.**

DEU26: Yes, it’s just coming up.

**INT: Brilliant. So, if I can just ask- I don’t know if you got my description of these about these being at a localise scale.**

DEU26: No, I didn’t see this map before.

**INT: Oh, no problem. So, these are again like the national scale models, but a localised scale around a five kilometre point in Wallingford in Oxfordshire. So, again you’re got a raw probability distribution on the left and then a variation on the right. Again these are to be used together. Would you find these useful at a localised level? Presumably more national scale.**

DEU26: No, absolutely, so remember that we’ll be using single species for operational decision making. So, what we’d really want is the shape file of the operational area to be able to be projected onto these, that would be the crucial thing to do. So, we could identify really quite robustly the likelihood of the species in that area.

**INT: Brilliant, no that’s great. In terms of adding anything to these models to make them more useful or again similar to the national scale when I asked you earlier?**

DEU26: I suppose what these number mean, so what’s the national average, maybe it needs an average of the scores across the region of England.

**INT: Yes, mmm hm.**

DEU26: So, for instance the axis on the left is between point one and point five, but then regionally there might be much better places that have got a one for instance.

**INT: Yes, okay.**

DEU26: Just a comparison perhaps with the regional or national average might be useful.

**INT: Yes, that’s a very good point. That’s brilliant, was there anything else at all?**

DEU26: No, that’s the main thing, yes just because they might all be terrible. It might look good that that spots high, but [unclear 00:47:39].

**INT: It’s true, yes, yes. No, that’s brilliant. Was there anything else that you wanted to discuss on these outputs at all?**

DEU26: No, that’s cool, it looks interesting though. I think we’d highly value them particularly for European protected species.

**INT: Yes, no that’s brilliant. I’ll just stop sharing my screen now. That’s brilliant. You’ve covered quite a lot of the questions that I intended to ask and it pretty [unclear 00:48:07]. Was there anything that you wanted to ask me or you thought that I should have asked you?**

DEU26: No, not at all, I suppose my only just broad question is what you see at the main outputs of the project and maybe perhaps a timeline for them?

**INT: Yes, of course. So, in terms of the main outputs, so like I said earlier there’s an App being created, which is in the process. Then I think they’ve got a number of smaller tools to support that. In terms of the timeline, so it’s a two year project, but it’s already six months in. The App is being created by parts of the team and they’re hoping to roll that out pretty soon. What they’re interested in is, so the next stage of the project will involve people like yourself to help co-design these products with your input and insight into what’s useful.**

DEU26: Cool.

**INT: Would this be something that you would be interested in at all, obviously it wouldn’t take up too much of your time, because I realise everyone is pretty busy. Is there something that you would be interested in at all?**

DEU26: Yes, definitely, yes, yes, pop me on the list and we’ll see how much time I can contribute to that. I’d certainly like to be involved. It could be really quite useful actually just for that operational decision making.

**INT: Yes, brilliant, no that’s great. That’s great to hear. So, if there wasn’t anything else that you wanted to ask me then, thank you very much for speaking to me [DEU26].**

DEU26: Brilliant, well very nice to meet you Joel and very best of luck with your project.

**INT: Thank you very much, yes, thanks again.**

DEU26: Yes, no bother.

**INT: Take care.**

DEU26: Cheers, bye bye.

**[Audio ends: 00:50:04]**