**FM1 - Interview Fund Manager, Windhoek - 14-2-2023**

So for the record, ##[0:03] at [name], so go ahead, fire away.

**Could you please start with the introduction.**

[name] is a fundraising and project development company that we founded together with ##[0:20], whose building this is. In 2020 I was managing the biomass research association, NBIG, before I decided to get into private sector myself. So before that I was at NBIG managing day to day essential progress. We started the company because it was a commercial opportunity to modernize the charcoal industry and we have now got a modernized large-scale charcoal production operation, running for the last year or so, producing 500 tons of charcoal a month from a centralized retort system. So it's a lot more sophisticated than what you may have seen through the NCA. And it produces a higher quality product, more consistently with better conversion, efficiency. So that was the project that sort of broke me away from the association and we capital raised for that. We got our bankability for it, we got our environmental impact assessments done for it. It's fully FSC certified. We export through a single buyer to Germany and from there it gets distributed through mainland Europe. And that's sort of one step to help modernize the industry because I'm sure you heard issues around fire, social issues and all sorts of other stuff in between with a traditional charcoal and there's a big demand, but charcoal is really climatically, it's a horrible product, very high carbon footprint. And so from there it's a stepping stone. And we'd like to look into other value addition, for example, using it rather as a biochar product. Again, the retort system carbonizes much more efficiently at a much higher temperature, so you can actually get this stuff certified as biochar. So that's one avenue we are looking at. And of course there's interesting carbon credit stuff happening in the world, as you know. But then we also are involved with the Horizon 2020 European Commission funded project called Steam Bio.You may have heard of it from NBig. We actually started developing the proposal for that while I was still at NBig and then it only got approved after I had left to start Carbon. So both Carbon and NBig are involved and that is demonstrating a novel biomass processing technology, looking at upgrading the biofuel, solid biofuel properties of our biomass more as a coal substitute, a drop in coal replacement. And I think the biggest interest there commercially is actually the South African market. They're so reliant on coal in Namibia, we're not very reliant on coal, we're reliant on the power that they generate and send us here. But the demand is in South Africa. But that project is sort of regional spanning Namibia, Botswana and South Africa. And it's interesting because all three countries have different dynamics on the biomass supply chain. Botswana has a lot of communal land and that has its own complexities Namibia. We largely focus on the commercial lands and in South Africa they also have invasive aliens in their waterways and so on. So there's different focal points there and there's also opportunities for useful byproducts that we're exploring.But that's a grant funded project, so we get to spend other people's money. And you've heard it all from NBIG, I think, commercially. The other projects that we're looking at now are a white pellet project to export wood pellets to Reunion. There's a French power company which supplies half of the power in Reunion at the moment. And they import wood pellets from as far away as the US. And they import coal from South Africa and they also co-fire some bagasse residue from the island itself. But they're trying to develop and secure feedstock essentially for the coming decades because they have power purchase agreements that span 40 years. And the wood pellet market is very volatile at the moment. So we're co-developing a project there. First phase would be 100,000 tons per annum of wood pellets and then we'd ramp that up to 200,000 tons of pellets. Because it's a European company in a European territory, we need to be completely red compliant. So now we're currently doing our due diligence on red two compliance as well as red three, whatever that will look like. So we're busy doing the carbon mapping and carbon balances around that. So these are more focused on solid biofuels. I think the big constraint about using the biomass as is as a biofuel is you can't move it very far unless you somehow densify. So Steam Bio is interesting and the woodpellet project is interesting because both are trying to densify the energy content in different ways. One chemically, one just physically, but you have to densify it in order to move at big distances and of course, far away from everything. So you need to do that unless you want to add the value locally, which of course is a nice opportunity. If you can add all value locally, like biochar, for example, make it and use it locally, then it never leaves the country and it makes sense. But you need to have a commercial demand. And currently Namibia is such a small market, you can't only look at it as a single market. You need to look at other offtake. So regional is also good, but at the moment the region is lagging behind in terms of its sort of green ambitions, if I can put it that way. So, yeah, that's in a nutshell. And as I mentioned briefly, carbon credit projects, we also got two that are very earlystage, looking at one soil organic carbon project. In managing your graze lands properly, you can actually increase your soil organic carbon. And currently our rangelands are not managed properly, so the baseline is quite low, which allows these projects to sort of make sense. And then of course, the biochar avenue. So that's in a nutshell what we are busy with. At [name], we're the majority shareholders of the charcoal project. We are one of the commercial partners in Steam Bio Africa.The aim there is actually to commercialize the core technology. So what we've done is we've now installed a demonstration plant which can do 250 kilo throughput an hour, which is not very much, but the commercial plants are looking at two tons and above per hour throughput. So this will be the last sort of step until commercial scale and the designers are on board. So they're going to be now looking at the next 18 months of operations to try and optimize the system. Of course, in that project, from the social perspective, being an EU-funded project, these components are also included. And I think it's interesting because we also have research into the soil, the effects on the soil before and after harvesting and so on. So there's also some nice research coming out of this and how the communities can be involved and whether this fuel can be used domestically as well. But I've been interested in liquid fuels for a while and I believe that's what you're are looking into more. And one of my questions is, is there a mature technology to go from lignocellulosic material into a liquid fuel? I've had some interaction with a group and it's a German technology owner, but they operate a demonstration plant out of ##[09:52], for whatever reason, and we've sent them samples and they've produced biodiesel from it. But that's just a demonstration-scale plant. I've also now recently had company come approach me for gasification to hydrogen and of course from there you can also go liquid fuel. So I'm curious, from your research, are there mature technologies out there? Because one thing that I will say, and this goes for any project you want to do here, is that Namibia is not a great place to guinea pig something. We don't have the infrastructure, we don't have the expertise, we're far away from everything. Our biomass is not your standard affair, it's not growing in plantation forests or anything like that. And all of these things combined make it more challenging to get a project up and running. The one saving grace is that the biomass almost has to be removed. So there's a huge positive story with selectively harvesting biomass because it helps restore the ecosystem if done correctly. But yeah, I'm also a bit skeptical about our green hydrogen projects here in Namibia because of that very reason. I mean, we want to do a three giga watt green hydrogen project, but you can't show me a single other project on Earth at that scale. And why Namibia? Just because we have some sun and a desert doesn't compute to me. And also the fact that the energy balance doesn't make sense to have to desalinate salt water and then only electrolysis and then transport to 10,000 kilometers to market. So all of those things make me a bit skeptical. But what's interesting is gasification because that's straight solid hydrogen and I don't know what you are looking at or where you're anyway, that's a small overview of what we do. I'm by training a biotechnologist with an MBA, so trying to bridge the gap between the technical and the scientific and into the commercial. And my partners are financial guys, so there we have a good mix to try and commercialize products. And that's also why we focused with the charcoal industry because it's proven the market demand is there. And of course charcoal is nasty, but we produce a better charcoal than most in Namibia, and Namibia as a whole produces better charcoal than other countries like Nigeria where they're stripping natural forests and so on. So we look at what's commercially interesting and we take it forward with our own capital and where it's more research-based or experimental, then we look for grant funding. Another maybe thing worth noting is that now, after getting this first Horizon 2020 project, I'm looking at a second shot at it, but focusing around gasification to electricity, which is something that is typically failed in Africa, and I think it's more a management issue than a technology issue. But anyway, I want to sort of compile a good consortium of partners and put in another proposal. I think there's a new window coming up in May,so that's something that I'm also looking at again, to use grant funding to prove something that should be commercial and figure out how we can roll it out commercially after that sort of demonstration phase. So, yeah, I've been talking a while now, so it's your turn. Ask away.

**Where is this centralized resource system located?**

It is close to a small mining town called Combat, which is between Otavi and Krutwontain. so it's about 440 it's not about it's 444 km from here and I've driven it many times, but we chose that site because the farm that we've positioned the site on was derelict. It had a lot of biomass, so we got it for a good price. And in that general area, there's not that much happening in terms of charcoal. Like, in comparison, the Otjiwarongo which you visited is the charcoal central charcoal capital, rather. So there's already a lot going on there.

**Okay, and then do you work with farmers in the region that supply to your?**

so we started thinking we'll do all of our own supply ourselves, and we quickly realized that we had to develop some of the technology ourselves to do that. And it's still in development, so we've been operational a year. We spent a lot of time and effort and money on trying to adapt a chopping system that can billet our bush into logs because we don't need to chip it down. And of course, for chipping there are off the shelf solutions, but there's nothing that can do an entire acacia bush, chop it up into little 20 centimeter logs. There are some European systems, but they were designed for European wood, which we bought, lots of them, and through trial and error, we figured out how to upscale and so on. So anyway, that made us rethink and start sourcing other wood from the surrounding farmers. What was interesting is many of the farmers who supply us now, they switched over from doing their own charcoal. So they saw the benefit of supplying us with raw biomass instead of charcoal because they don't have the fire risk on their land. They can supply us through the wet season, which charcoal producers typically can't, because the charcoal is wet. The cash turnaround is a lot better for the farmers and the workers. So I think for those main reasons, they switched over and now we get 90 plus percent of the wood from the farmers, and we're still in the development process to get our own system to where we want it. And how do they harvest it? They harvest it manually, so it's axe and good old fashioned bunga. And the farmers, typically, it's the same model as charcoal, except minus the kilns, and we pick it up from the farm, so they just pile it into big piles, and then we take our tractors and telehandler and do it that way.

**Okay, well, maybe we can show you our concept, called biohub that we are working on. It's quite similar, I think, to concepts that have been developed here as well. So, the idea is that in a green area, there are different farmers and communities that supply the biomass to a central biorefinery. And in a biorefinery, we're investigating technology. But I think see if I can explain it a bit more later on, where we produce different products. The main output is a biocrude. Second is a biochar that can be used again in the areas where it's produced, and then a wastewater stream and a gas stream that can be utilized again in the facility. And what we would like to find out is how this concept would work in the context of Namibia and what challenges and what opportunities there are.**

I can definitely tell you why the other biohub project didn't work, because it was missing that anchor, that commercial anchor product. It was nice because, I mean, Clustering has all these benefits and we know it works in the rest of the world, in other industries, and there are synergies and all of that, but you need to start somewhere and if you're going to go to an investor you need to have a clear concise idea, right? If you want to raise 500 million Namibian dollars, you need to have an idea that you pitch in 2 minutes. But what happened with the other biohub or what do they call it in the industrial park is that it got too complicated, there were too many things going on and it meant that it got sort of lost in the scale and all of that. They wanted to include housing, they wanted to include PV, they wanted to include many, many different value chains and it wasn't going to be attractive as a single investment. But what I suggested at the time, and I was involved with that project, is that you need an anchor client or an anchor product, like a pellet plant for example, or like a cement plant which is already buying in biomass. And these are two of the options we explored because if you can get the commercial draw to already bring the biomass to the centralized spot in whatever form or multiple forms, then you can start with synergizing and using waste streams. Like for the pellet plant we are estimating 10% waste after screening, which is probably a bit optimistic, it might be more, but 10% on 100,000 tons per annum is 10,000 tons of biomass that we'll be screening out and we'll have no way to add value to that or we haven't thought of it yet. So there naturally, if there's some other technology that can use that material, turn it into a biochar, whatever, then there's a sort of synergistic opportunity to bring that and latch it on. But for me there has to be a commercially viable core to the hub and I understand all the different benefits. One thing I can say now that I couldn't say previously is that you can definitely rely on the farming community around the project to supply wood. We've proven that now in the last year we're buying in 1500 tons of wood from farmers every month and they're consistent. So I think that's definitely something that we validated in terms of getting their buy in and they're willing to do it on a sustainable basis that everyone's FSC certified. As long as you can match sort of the economic attractiveness that charcoal brings but come with some other benefits, then you'll easily convert people to supply wood instead. And yeah, it goes without saying, but I think that's a bit of a win because the way we're doing charcoal now is so inefficient, it's scary burn like five, six to one ratio. And what the Charcoal Association doesn't tell you is that you leave 40% of the biomass you harvest in field because it's too thin to put through those kilns. So, yeah, if we can move people away from that to other value chains that are a bit more efficient. And then another thing that's always interesting to me is, or that I use it to give some gravity, is that the charcoal industry in Namibia is currently producing 200 and 2230 thousand tons of charcoal like that for export. That's equivalent to over a million tons of biomass being harvested every year currently. And most of it going to a central export port and going out of the country. So it's sort of proof that it can be done. But there's a lot of optimization, and it's not like we get a huge price for charcoal. At port, you're getting five and a half thousand million Namibian dollars a ton in Germany or in the Netherlands, you're paying the equivalent of 20 or 30,000 Namibian dollars per ton at the retailer. So we're not getting the bulk of the value here, but it's enough to sort of get an entire 10,000 axe workers-strong industry supplying biomass. So that's also why I'm confident that you can go for large-scale projects. Okay. And maybe from a commercial point, you may have heard it from NBIG, but there's a cement plant that buys in wood, but currently they're very constrained because of the construction industry where it is at the moment, it's in a big downturn, so the demand is very limited. And then the breweries here in Windhoek also use it, but they harvest themselves. But at small scale, I mean, at most, we're probably using 25, 30,000 tons of woodchips for thermal energy here, which is nothing. And there's a power plant project by our utility, Nam Power, but it's still not gotten the financial green light to go ahead, so there's no guarantee that it materializes. but I mean, the bio-crude, so that's one facility that's bio-crude, I guess you can use it already in the shipping industry as is, or does it need to go through further refinement?

**It still needs a minimal upgrading. It has to go through some refinery.**

Okay.And that would happen where? In the value chain?

**Here. So we are actually aiming to have this value chain fully established in Namibia. Because the thing is, what I agree with you, like, even in terms of infrastructure and everything, it's lacking. But the thing is, if such a development is coming here, this value chain would be of good help, because from this bio-crude, you can produce not only marine biofuels, but can also upgrade to any transportation fuel. You can produce diesel or jet kerosene, things like that. So that could also reduce the dependency of Namibia over the imports, because currently all the transport fuels are imported, but a refinery needs a certain critical capacity to make financial sense.**

So what is that? What are you looking at in terms of throughput?

**Yeah, indeed we are looking at at least, because one of the things is that shipping sector can take huge volumes, right? Even one plant in a full scale, it would be like 350 kilotons then per annum of biofuel which is being produced. Then that would be you are unde rmore than a million tons of wood. But that's just one plant. It can be multiple plant. And the shipping sector just consumes a lot.**

We've already had requests from our diamond mining company. Renewable fuels, but a million tons. So they're one of your biggest. And okay, it's also a power hungry process. Most likely anything big like this is the two challenges we had with the Pellet Plant Project. In terms of citing the project, is logistics and power. And actually, power was the more inconvenient out of everything because the rail line, you can always add a siding along the rail, but the power, there's only so many substations that you can get a certain amount of power from. And so that was the biggest limitation. And building a new substation for a project will double the cost. And it doesn't really make sense. So, I mean, the Pellet Plant Project, we needed three and a half megawatt of installed capacity, which, judging by the scale that you're looking at, is not that much. You'll still probably need to go bigger. But just to give you an idea, I mean, Otjiworongo as atown doesn't even use 3 MW entirely, even at its peak. So it's a lot of power for Namibia. So you have to think about that. And then logistics as well for these sort of volumes. Not necessarily supplying the biomass, but also but more where you're going to be sending your final product. So, of course you want to do it on the rail. The road is just too expensive for our distances. So these are things you need to consider. And then also the financial ability to raise capital for a project like this. At a certain point, you will be beyond this scale that any local bank would have an appetite for. For example, the Development Bank of Namibia, they have a 400 million Namibian dollar ticket size. That's as high as they can go. And that's the Development Bank of the country. So they went in with that ticket size to the cement plant that they've provided equity for. But $400 million is a drop in a bucket if you're talking billions. So there you also need to consider how you finance something like this. It probably won't be locally driven. Has to be like the Pellet plant project, for example, is a 600. Or let me talk in euros, it's about 30 million euro project. But because the French company is coming in as a majority shareholder, they're going to be bringing in most of that.And they are the shareholder of the Pellet project. They're also the main offtaker. So in terms of guarantees and security of supply, it's a very robust project because your main shareholder is also your main offtaker. And banks like that, but it's still not easy to raise that capital, even for them.They're going to PROPACO and they're going to the local banks. And I mean, someone like the Development Bank would be interested, but they can't finance the entire project because of their limits. So that's also something maybe from a more commercial standpoint that you must factor in. And I think with the VIP or Biomass IndustrialPark, it got too big to be taken seriously. It's like the new city in Saudi Arabia, which they're developing is like so crazy that only some mad oil prints can actually pull it off. And that's where you lose the attention from people who want to do real business. And I wouldn't say it's the same with green hydrogen, but it's not far off in terms of the scale of the investments needed. They want to de-proclaim a national park to put PV in for green hydrogen. I mean, that's really, in my mind, a big move. So whether they get it right or not, we'll have to see. What are your experiences, what are your headaches in the project? Where do you see the risk?

**I think the first not risk, one of the challenges in our concept is the technology itself. It's not a fully commercialized technology yet, but it is one of the most, or how to say it, has the fast growth. So the technology which you are investigating is called hydrothermal liquefaction. It's like pyrolysis, but wet pyrolysis. For Pyrolysis you need a dry biomass, but for hydrothermal liquefaction, it can be wet. The concept is simple. You put biomass, you put water, high pressure, high temperature, 15 minutes, you get four products. One is the bio crude, which can be upgraded into anything. Minimum is shipping oil, but it can also be upgraded to.**

sounds similar to the technology that we send samples for. They also used a similar liquefaction process. So where do you generate the thermal energy that you need? How is that done?

**Yes, so that usually should be done from an electric. Yeah, we should have a dedicated plant or a steam plant or things like that to generate the thermal heat.**

So one critical weakness from the steam bio-side is that the UK based engineering company designed electrical elements to heat up the biomass to generate the steam, and again in Namibia, power and transmission connection to the grid. So we've cited the project at CCF, which are not on the grid. So now we need to run the whole thing with renewable energy, which, with battery storage for continuous operation, is just economic suicide at the moment. But we're doing it because it's grant funding and we need it to be green under the theme. But ideally, you want to generate that thermal energy in a much more practical way. So we're thinking using biomass residue to drive a steam boiler or something like that, or use a closed cycle oil heating system or something.

**So that's something to consider thinking the same either as a biomass thermal powerplant or something like that. Or it could be from a different renewable source already existing in the grid. If, let's say, green hydrogen or something comes to realization, that's a lot of renewable energy power, like wind and solar, so they need offtake. And those are really tough to maintain as well. You can't store them. So that would be one of the things. But that's the but this, on the other hand, this technology, because it can absorb wet biomass yeah, usually the drying step is the most energy intensive step.**

In Namibia, we just negate it because we dry it out in the field. So, I mean, that's also a big opportunity for pelletizing, is that in most pellet plants around the world, 30% of your Opex is spent on drying the feedstock beforehand. Here, we just leave it out in the bush for a few weeks and it dries down to what we need it. So you don't spend as much money and you're not transporting water. So it's a huge advantage. And that offsets the fact that our biomass has higher silica content and is more abrasive. So you go through maintenance or your maintenance costs increase. So the fact that we don't have to dry it actively sort of helps balance that back out. But something else to consider, if you came to pitch me an investment, that would be my biggest concern, is the technology isn't proven at the scale you want to do it just, for example, our retort project, we were looking at two. We had looked abroad for all sorts of retort technologies but we eventually went for something that we saw working here in Namibia at a different scale. But the technology had been running for five years, and we could go and see and touch it. It was full of flaws. It had many problems. And some of those problems we fixed in our iteration, and some of them we still have to fix in the next iteration. But the fact that we could see it operate was the reason why we went for that. Even though there were more sophisticated systems out there. But running in France, or it was a concept from guys in South Africa. It was like, well, if we're going to put down 60 million of investment and your house is part of collateral, you want to bank on a technology that you can trust. So that's for me, where it could be interesting to take the model that Steam Buyer is using or that I would like to do with gasification, put together a proposal for some grant funding, get a demonstration technology that you think is robust enough to work here and has the opportunity to scale up and get some grant funding for it. I don't know what your appetite is. I don't know. Are you students or are you researchers at the university? What do you want out of this? Is this a thesis or is this a project you want to be a part of going forward?

**Yeah, exactly.So we are just researchers at the university. So we are just here to investigate what we call it's a pre-feasibility study. So we want to do it, then if it's possible, then we will let the locals know, okay, guys, this is possible. This is how a value chain can set up for this kind of things. And then they can take it further. And if for the next, like a pilot plant or something like that, then we might be involved in doing certain. And things like that. And also in this consortium we have some private partners as well who are the end users from the industry. So they might also be interested in those kind of projects.Those are things. But right now we are just a very early stage, very early stage of pre feasibility analysis, if I could call it like that. Then if that comes true then we go into a much detailed phase. Yeah, we are definitely not going to build the plant. And this technology there is actually demonstration plant right now, but in Scandinavia, not really here. in Norway.**

Norway coldest part of Scandinavia, right? Yeah, with steam bio, there was also demonstration plant in Spain before the one in Namibia. But I mean, that also was an Iterative process and now system here is more robust and larger scale. So I still think there would be from my side an interest to look at raising grant funding for pilot project based around this technology. Because if you can prove it even at a smaller scale, you give everyone else comfort and you identify problems that you will not know now. Because in operating I can tell you Murphy is a crafty, crafty fuck up because everything that can go wrong does go wrong. And then when you think you fixed something, you've created a problem somewhere else. So I mean the real learning is in doing so and again doing but not on a commercial basis where you've put your own capital or other people's capital at risk. Nam Power's project has all but raised what was it? 20 million? 20 million, yeah, no more 20 million euro of grant funding from the Nama facility. So that was a nice process where the Nama facility came down, they had no clue what to expect. We sensitized them on the biomass and the supply chains and they became comfortable that this was a good project but it wouldn't work on commercial basis alone. And so they've committed to Nampower that they'll help subsidize the first biomass powerplant up to 20 million euro. And for 20 million euro if you can't do a decent pilot project then it won't work. So I think that could be something that would be interesting. And I mean you as a research group, us as sort of commercial partners and then of course you say you have other commercial partners and there's probably other partners that you need for this sort of thing. You could put in a strong proposal. If there's technology that's already sort of in the pipeline and being proven. Are you aware or linked to the JZ study that's now going out or the tender for the what is it? Aviation fuel stuff? We have heard, but we never know. Deadlift was apparently the one pushing that. So maybe speak to him. I've just been approached by GFA Consultants to become part of the consulting. So I don't know if we'll get it, but then I'll also have to spend more time on that sort of thing

**Interesting area. And also one of the things which you always hearis projects happen, like for three or four years till the project has funding and then it stops and no. Yeah, it doesn't continue. There have been a lot of pilots which have been done like that and then stopped.**

Yeah, because the commercial argument was not correct from the beginning. So, in the beginning, you can put a nice idea together, it sounds good, it makes everyone happy and it gets maybe some donor funding, some jazzed support for some pre-feasibility studies and due diligence and then you get some grant funding. But ultimately, if the core commercial concept was not correct, it will fail at that point where you've done all your studies, you've spent all the grant money and now you want real private sector capital. And that's when the hard questions come and that's where they start asking you, why are you doing this? This doesn't seem like the core business. And that's what kills projects. That's why I say if you can't sell this concept in two minutes to a bank, then you're on that road for the same thing. If you told me to sell this project, I would simply go, we want to turn Bush into crude oil. Finished. here's an off-taker debt marine or Namdeep or whoever, they've already committed or they've already given their sort of demand profile. They'll take this sort of volume at this sort of specification. We're going to supply it. simple. like you need the feedstock supply chain sorted out, you need the technology processing site sorted out, and then you have your offtake in place. And as simple as you can make it, the better. And then you can have a sort of plan to add other efficiencies along the way. But if it doesn't work on that merit, on that simple merit, then nothing else that you've thought of will happen because the main project doesn't make sense. So it needs to make sense without all the frills. And it's also why the other project did exactly what you said, got two, three years of support, lots of stakeholder engagement, nice long document drafted business plan, and you take that to the bank and it will not go anywhere.

**Yeah, because also one part of this bio-hub is also the social part and to make it inclusive and I think that's one of the challenges that we've seen here is how to include also the farms in communal areas or settles farmers. So is that something that you also engage with in your projects?**

We don't do it actively, but it is possible. But sad reality, when I did a study looking at exporting biomass from here to Hamburg, the sad reality is that because of colonialism, communal farms are at the US end of the country where there's no other infrastructure. So already they're on the back foot not just because of legislation or because of skills or anything. They're just far away from logistics, they're far away from services. And the reality is the same with our charcoal project. within, you'd have to go 150 km or more to get into the communal areas from where we are. So naturally we service the commercial farms in the area. There are some resettlement farms in that same zone, but to a point it becomes commercially non-viable. So unless you've got some other grant funding or something like that to subsidize the cost of trying to include them, like Nam Power with Nama facility, nama said you have to also have the social inclusion aspect. So they identified communities near within the sort of 100 kilometer radius of their project that they could use to support. But of course, these communities also need special handholding and support. So the economics, they're not doing it because of the economics, they're doing it because of the strings attached to the donor funding. And and it may sound cynical, but you can commercialize a project in the communal areas. I mean, the model is there. You have to have a community Forest Gazette, they can manage their resources how they see fit and you can build something there, so they could be a supplier. But you have to think about the logistics and the power, and they have neither of those. And that is the biggest stumbling block. Again, with a pellet plant where we cited it, we cited it right next to the gold mine. We knew there's power and we knew there's rail. And bush is really a secondary factor because the bush is everywhere, so it's difficult to do that. But what you also need to realize is that 70% of Namibians are directly, indirectly linked to agriculture. And if you can have an impact there, you will naturally have an impact on communities. And I don't want to use the word trickle anything, trickle-down economics, because it's nonsense. But the people who are on the ground doing the work, their lives are a bit better now with our charcoal project than they were. It used to be that they had to wait three months for payment, so they would be in the bush chopping and charcoaling and what what. And two, three months later, maybe they get some money. And that's only assuming that the money they get is more than the debt they've racked up with the farms themselves for food and stuff. So now they can get paid weekly for the work. Every time they deliver, we pay the farmer, the farmer pays the worker. And they're much more happy because they see that cash conversion a lot better. So, in a way, even that's a better, more inclusive, more better option. So, again, at the processing point, you should plan to accept biomass in all shapes and forms, logs, chips, anything in between, and you should allow anyone to deliver it as long as they meet certain, probably sustainability standards. But, yeah, it's a challenge. I mean, again, that's why I said in Steam Bio, we've got the mandate to look at that and to try and really put effort into ensuring that inclusivity. But on a commercial project, you need to have there are other factors that are simply just more important, if I can put it that way. And that's the sad reality. But if you can't power the plant, there is no project. So, yeah, not to undermine the topic, definitely not. Namibia is one of the most unequal countries in the world and we're very well aware of that. Sad reality is that most of our charcoal workers are not even Namibian. They come in from Angola, so it must be worse there. Again, mechanization can happen, but you need the scale to justify investment into mechanization. And again, we're on the back foot because all the technology suppliers sit in Europe and the US. And we have to buy it and import the systems. And if you can't import systems at scale, those suppliers forget about you the minute the check clears. So they're not going to worry about one chipper sitting in the arse end of Africa, they're going to worry about their clients in Europe who have 50 of them. And that is a practical challenge. We've had one of our wood chip suppliers that supplies the cement plant. I used to work for them.They would need something as simple as a ball bearing for an American machine that is in Imperial units. So you can't get it anywhere here. And it took them two weeks to import this ball bearing. And in that time their operation was basically stopped because of a ball bearing that cost you a couple hundred bucks because of that inefficiency. So again, mechanization is definitely my preference wherever possible because it creates skilled jobs as well. But it's also got its challenges here. We are very reliant on service providers from Europe or from elsewhere. We for the Charcoal project bought a German packing system and yeah, we had to spend 200,000 Namibiandollars just to get the guys from Germany to come and commission the plant because it's very sophisticated. And then anything else we need them to do will be another 200,000 knock. Yeah. Are there any other questions that you wanted to ask or any other comments?

**Yes.So we also made this power interest grid to understand different stakeholders involved that could play a role in this biohub and their relationship, and also their position in terms of power that they have, or the influence or power to make decisions and the interest to play a role in a biohub like this. So, yeah, ask you, how do you see the position of these stakeholders which should change something or interest?**

I'm just trying to understand it before I give you my opinion. So these guys here you say are the most important stakeholders to drive it forward. So there's the most interest, most.

**power,as in their ability to make things happen or make a decision happens and make ideas into reality.**

I've got some strong opinions on that. These guys, these two, this one especially must be like there, this one must be here because they don't make things happen. Private sector makes things happen. What these guys do is stop things from happening by being the regulators. So what I would do here is I'd separate government from the regulators because the regulators are typically independent bodies. With oil it might still be mines and energy, but with power, it's a separate body with many of the other things that's separate. So the regulators are really important in my view, because without that, you can't do business without the necessary certification. So if you want to decrease the levelized cost of power by putting in PV and goes beyond 500 installed capacity, you need a generation license from the Electricity Control Board. And that's important. But government stay far, far away. That's also something that the VIP tried and it's because it's Jazzed funded. Jazzed is a government project. They have to be involved with government. They have to show that they're trying, but government doesn't make things work. You can quote me on that. I'm not shy about it. Every government project in Namibia is a disaster because they don't have that commercial story sorted out. They want to do a project to create jobs. That's not how it works. You do a project to service a market demand, and in the process, you obviously create jobs. But you can't start something without it being a black hole for money.If your main intention is just to create jobs, it doesn't work that way. So, in my opinion, from, again, a private perspective, which I see a few of them here, but I would separate government from the regulators. Regulators, I still think are very importan tbecause they can kill a project. Government, I would say, is fairly low down industry. This is your market, the maritime industry, right? So these guys with before we wrote our business plan for the Charcoal project, we secured an offtake agreement from the buyer. Before we approached any bank with anything, before we even approached other equity providers, we had that signed offtake agreement. So, for me, these guys, your market, they are number one. Technology providers as well, are really important, but not the most important, because there's different choices there, and then the rest will fall into place. Municipalities and regional government are the same, I'd say, and we try and stay far away from these guys, like we actively will. Now, start the second charcoal site. And one of our decision or our sighting criteria is not to be within a municipal area, because it comes with rates and taxes that you don't get any benefit from, actually, and they just cause you more problems. And in any case, in this sort of biomass industry, the benefit is being in the sort of more rural areas, commercial farmers. So, yeah, these are your biomass suppliers. They must also be very high on the list. One thing I don't see here is your international standards and certifications. So I don't know which ones you'd be looking at, but if the fuel, for example, has to be used in Europe, then red two, and that comes with either SBP or Shua or whatever it is. So those are also important, then, the financiers, are they here?

**No.**

Yeah, they also they can kill a project. Yeah, like I've said, they kill projects all the time. But yeah, low.You don't have many. Transport, I think is logistics in general in Namibia is a challenge. So I elevate that. so low for me, if I'm brutally honest, will be civil society, academia, communication, municipalities, local communities. If you mean communal farmers, small scale farmers as well. If you mean communal farmers just because of their proximity, and I mean technology providers, it depends on their role. Are they a shareholder in the projector are they just supplying your system? If they're just supplying your system, then they're not that important. It's a one off transaction and then it's done. But if they want to actually invest into the project, then it's a different thing. Another factor that killed the PIP was we tried to cite it within the Otjiworongo municipality. Not a good not a good plan. They came with all sorts of weird and wonderful demands and always a challenge. There's no alignment. They want one thing and you want something else.

**Because we heard that they were still very interested.**

Of course they're interested, because it'll be great if it happens for them, but once it happens, they'll want to also keep maximizing their benefit from the project, which might again be they're pulling in this direction. You want to pull in that direction, and it'll cause friction. It's guaranteed. If you don't hire everyone from Otjiworongo, then there's going to be a problem. They will want to increase your rates and taxes because they see a successful project and they want more income for themselves. They will expect you to do community outreach projects, fix the roads, do all of the things that they're supposed to be doing. They'll want you to do because you've got some big shiny company there. So I'm very cynical about that, but that's my observation.

**So then what would you suggest? A good proximity or location or site for this value chain or such a refinery to place if it's not?Also, Otjiwarongo have power coming up. Also I think near Sumer, the new power NAM power station is coming, right?**

I think yeah, there's a big chance it doesn't go forward. But yeah, that went through a big site selection process that looked at various sites and again, power grid tie in was the most important factor. So I think their site is a good one for that purpose. Our site for the Pellet plant is also a good one for that purpose because it looked at substations being nearby. And rail, you need rail, and it needs to be a rail line that's actually functioning. So basically the only rail line that functions is from Tsumeb to Walvis Bay. It's that straight line that functions. Everything else is just on a map and it's non-functional. The African Development Bank have now just funded Transnama, like 4 billion Namibian dollars to keep that line in good shape. So there at least you have security that that rail line will continue in operation. And in terms of that, you can also then go and map. What we did for the Pellet plant is on Google Earth, I brought in all the power lines, all the rail lines, all the substations, and then started plotting just overlapping radii. You don't want to tie into the grid and have to build a new power line for more than about 15 kilometers. It becomes exorbitant. So think about that. Your rail line also there's a certain limit on how long you want to make a rail line sort of tie in, preferably right on it. And the problem with town land is that usually it's already developed. And with projects like these, where you're talking big amounts of biomass, you need stockpile area, it's a lot of space, you have dust and noise that you need to consider. And I mean, you've been to Otjiworongo, it's a big town in Namibian standards, but it's a dead place. The horse that used to live there died long ago. In terms of an industrial area, doesn't have that much to offer. So you need to also consider that. So just look at practically what happens with big projects. The cement plant in Otjiworongo is a few k's out of town. The Ohorongo cement plant, they bought their own farm, put it up on virgin land. They just put it up where the resource was, which is why they did it. But again, it works for them. They're not in town yet. They have towns nearby to service. So that's also important. Don't be too far away from a town because you need those services, you need basic services. So I would try and keep within 50 kilometers over town,but not be in a town and try and meet those other criteria of finding a rail power. The bush is everywhere. You've seen it driving up. It's as far as the eye can see. We're not going to, you don't need to choose a site based on bush unless you want to do it in the desert. So, yeah, I think that's my advice to you. How far in the process are you? What's your project time frame? What are the next steps going forward?

**So we are right now in the halfway, actually. So Namibia is just one of case studies which you are doing in the project. We have other two case studies in other two countries, like Spain and Colombia. So now, going back, we will look at.**

**One other thing is we need water for the project.**

How much water? Decision criteria. If you need a lot of water, yeah, then you have to look at Tsumeb ##[0:22]. There's strong groundwater where people can get extraction permits for industrial or agricultural stuff. But in Otjiworongo it's a water-controlled area, so you won't even get a permit to extract 20 cubes a day or something. So first you need to know how much water, roughly the sort of scale, and then figure out if we can do it. But again, as far further north you go, then you start hitting the communal areas and it brings other complexity. And then beyond Tsumeb, like I said, that's when the rail line ends. And then if you're going to be refining somewhere, then you also need to look at your customer. Let's say your customer is dead Marine and Luderates. Also need to consider that you're going to be transporting the stuff like 900 km or go to Walfus or something like that, where they already have fuel depots and stuff like that. Yeah, water is not something I considered, but that is important because we typically have limitations there. In our area, for example, where the Charcoal project is cited, there's very good water groundwater, and we want to look at doing agricultural projects there because of it. But there's something in Namibia called the MaizeTriangle, which is basically between Otavi, Rotundae and Zimmer, and it's called that because that's where your good groundwater is, so people can extract it on big volumes. For example, a Pivot, a 15 hectare pivot for maize needs like 150 cubes an hour to irrigate. So that sort of scale. And then some farms have multiples of those. I don't know how much water you're going to need. If you say you can process wet biomass, then of course you can factor in that some of the water will come from the biomass. Tsumeb is really a nice town in terms of it's an industrial mining town. So it has a lot of good things going for it. So I'd say to Map is a good spot and if Nampower doesn't go forward with that project, then site is sort of available. Yeah, the EIA is done and that's good substations there. The only challenges are in the municipal area. But yeah, it's a decision making criteria. Need to do a matrix like that for each site and see what makes sense. When are you heading back?

Saturday.

Okay.You have a workshop on Thursday, unfortunately.