

sustainable

HEROES

green leaders in focus



CATIA BASTIOLI

The Circular Bio-Economy

JIM FISH

Sorting Out the Future

DAME POLLY COURTICE

Follow the Impact Leader

ION YADIGAROGLU

Decarbonizing
Venture Capital

DAN SHUGAR

Tracking the Bright Side

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Tracking the Bright Side
DAN SHUGAR



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Disrupting Supply Chains For Good

Today's world is connected more than ever before. For the past two years, more than a million people are coming online for the first time every single day. Events now occur on the far side of the world and within seconds, our immediate network comes alive in reaction. As a consequence of the digital age, we see how connected the world truly is. At Greentech Capital Advisors, we see the same effects in the integrity of our global supply chains, where one decision or one mistake, can ripple around the world with results both tangible and intangible, which affect all of us.

Take plastic, for example. As our oceans and rivers fill with discarded single use plastics, the urgency to reinvent the plastic lifecycle rapidly intensifies. We know for certain that there are dire consequences for our climate if we do not decarbonize the supply chain. Nearly all plastic is made from fossil fuels; from extraction to refinement to waste processing, emissions from the plastics lifecycle is a massive contributor to climate change. Fortunately, there are facets of the problem that technology and leadership can immediately address.

In Sustainable Heroes, we highlight heroes who are meeting the challenge and have dedicated their careers to combating the impacts of climate change and unsustainable, wasteful business models.

We interview **Jim Fish**, CEO of Waste Management, the largest environmental services provider in North America. Jim walks us through their 360 degree solutions approach to inefficiencies in the recycling process. Upstream customer education, new and improved sorting robotics and landfill methane-to-fuel technology are among the innovations that Waste Management is pursuing to meet ambitious sustainability goals.

We speak with **Dame Polly Courtice**, Director of the Institute for Sustainability Leadership at the University of Cambridge. Dame Polly leads business and policy leadership groups, as well as executive and graduate programs for private and public sector leaders to advance solutions to the greatest challenges facing global sustainable development. In 2016, she was made a Dame Commander of the Order of the British Empire for her services in sustainability leadership, and she now shares some her of most important lessons with us.

Next we speak with **Ion Yadigaroglu**, Managing Partner at Capricorn Investment Group. Ion is one of the original "Impact Investors," beginning his sustainable

technology investment career in 2004. Following early investments in Tesla, SpaceX and QuantumScape, among others, Ion details Capricorn's mission of focusing capital on technologies and solutions that can solve the world's leading challenges. Capricorn's latest push targets the electrification of the aviation industry.

We sit down with **Catia Bastioli**, CEO of Novamont, an innovative developer of the bioplastics value chain dedicated to protecting soil and water resources. Catia is a chemist and researcher by training who has studied and promoted territorial regeneration through the conversion of industrial sites that are no longer competitive into biorefineries. She has also pioneered Mater-Bi, a product line of biodegradable and compostable plastics that could shape the future of the plastics value chain.

Lastly, we speak with **Dan Shugar**, CEO of NEX-Tracker, a designer and manufacturer of advanced solar tracking systems. Dan has over 30 years of experience in the solar industry and his designs have led to some of the most significant breakthroughs in solar energy efficiency throughout the industry. Dan speaks with Greentech on his entrepreneurial lessons through his rise to CEO, as well as on his optimism for why the solar sector is poised to shine even brighter.

The global climate challenge is not isolated to inventors or waste managers. It will take every one of us to do our part to apply our specific knowledge and willpower to address this crisis. In this edition of Sustainable Heroes, we focus on 5 women and men and what their unique careers can teach us about the pursuit of sustainability and accountability across the global commercial system.

It can be done!



Jeff McDermott

Managing Partner

On behalf of the entire Greentech family

P.S. We welcome nominations for people you'd like to see featured in future editions. Please send your nominations and other comments to EGriswold@greentechcapital.com

The Depth of the Challenge

It is estimated that between 4% and 8% of global oil consumption is for the production of plastic. By 2050, greenhouse gas emissions from the plastic lifecycle could reach 56 gigatons of CO₂e, almost 13% of the entire remaining “Carbon Budget,” which is the limit on how much carbon we can emit and still keep the planet’s temperature rise below 1.5 degrees Celsius.¹ If we continue producing plastic as currently planned, by 2030 the annual emissions from plastics will equal that of almost 300 new 500MW coal-fired power plants running year round.

Plastic and climate change are interlinked throughout the plastics lifecycle. Greentech believes that by addressing the tangible inefficiencies and emissions of plastics (and indeed of all commercial waste), we can help mitigate climate change.

The first step is to address extraction. Fossil fuels underground need to be scouted, tested, drilled and transported to refineries. Indirect emissions and a reduction in carbon sequestering capacity occur from land clearing and deforestation to make room for oil and gas infrastructure. Direct emissions, from practices like gas flaring, are released at the wellsite and during transport via pipeline and rail to refineries. Refineries not only run on fossil fuel-powered electricity to manufacture the plastic, but chemical refining processes also represent one of the most emissions-intensive processes in the entire supply chain. Globally in 2015, facilities refining ethylene emitted as much CO₂e as 45 million passenger vehicles emit in a year. 300 new and expanded petrochemical plants are being built in the U.S. alone.

Eventually, out from these emissions-intensive processes comes plastic, a lifesaving and culture-changing technology, which is then used for a short time and thrown away. Only 9% of plastics globally was recycled between 1950 and 2015. The rest of the collected waste ends up in incinerators or landfills.

Of course, there is also the vast sum of plastic that misses the collection system altogether, inundating our waterways and oceans, choking marine life and accelerating the collapse of natural ecosystems that are necessary for carbon sequestration and biodiversity, two critical bastions in the fight against climate change.

Greentech focuses on helping incumbents and innovators that are proposing solutions for each of these problems along the supply chain and waste management processes. We see sustainable heroes stepping up every day and it is our goal to elevate their ideas and technologies to aid in the fight for the future of the planet.

1: Plastic & Climate: The Hidden Costs of a Plastic Planet (Center for International Environmental Law, 2019)



ONLY 9% OF PLASTICS GLOBALLY WAS RECYCLED BETWEEN 1950 AND 2015.



BY 2030 THE ANNUAL EMISSIONS FROM PLASTICS WILL EQUAL THAT OF ALMOST 300 NEW 500MW COAL-FIRED POWER PLANTS RUNNING YEAR ROUND.



BY 2050, GREENHOUSE GAS EMISSIONS FROM THE PLASTICS LIFECYCLE COULD REACH 56 GIGATONS OF CO₂E, ALMOST 13% OF THE ENTIRE REMAINING "CARBON BUDGET."



300 NEW AND EXPANDED PETROCHEMICAL PLANTS ARE BEING BUILT IN THE U.S. ALONE.

The Circular Bio-Economy



Catia is CEO of Novamont, an innovative developer of the bioplastics value chain dedicated to protecting soil and water resources. A chemist and researcher by trade, she has studied and promoted territorial regeneration through the conversion of industrial sites that are no longer competitive into biorefineries, as well as the creation of Mater-Bi, a product line of biodegradable and compostable plastics.

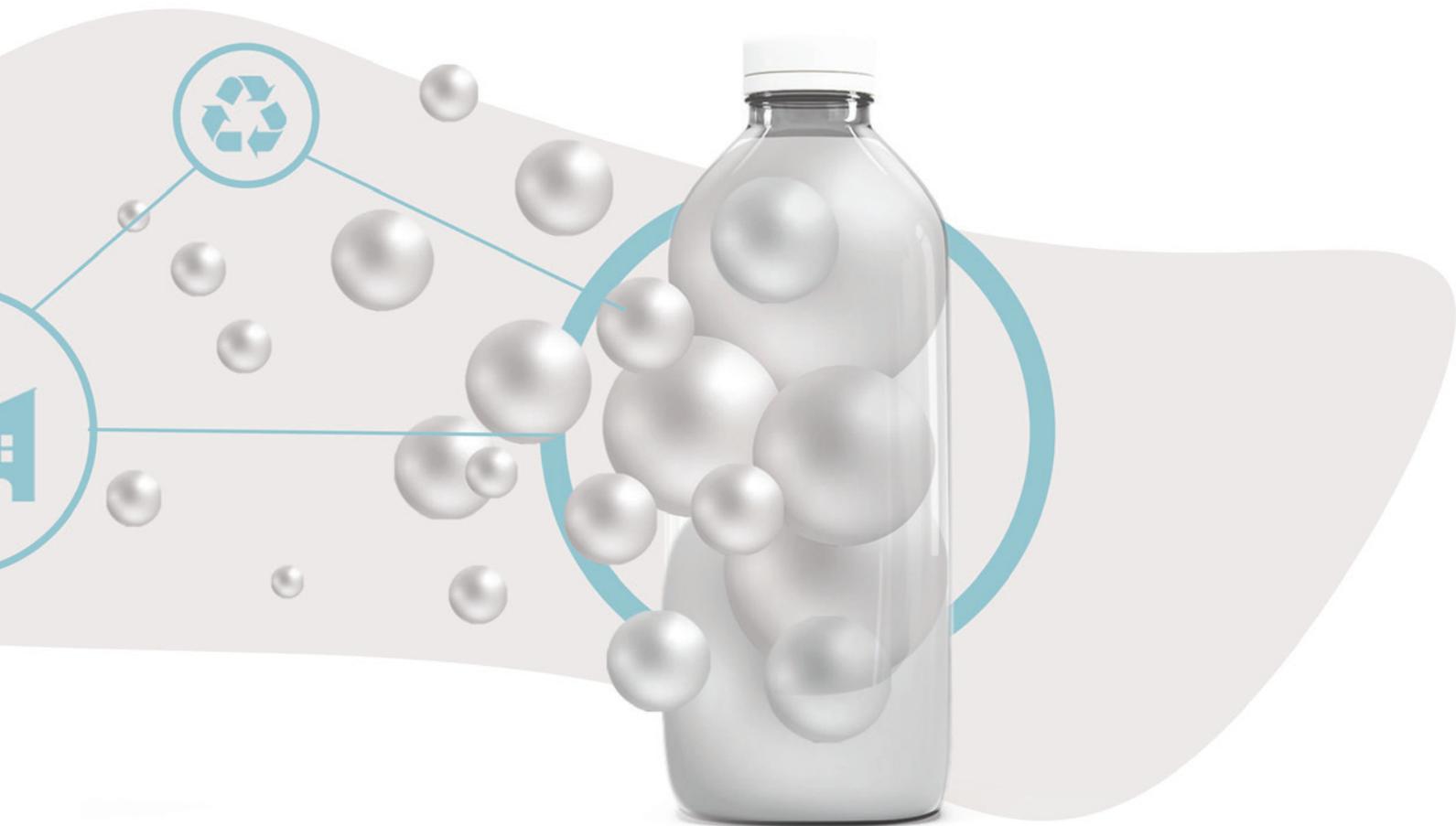


CATIA BASTIOLI

● Where does your interest in sustainability come from?

Even though since I was a child I was highly interested in chemistry and the natural world, my experience in this sector began as a researcher within the Montedison Group (the largest chemical group in Italy) where I could apply my knowledge of chemistry on agricultural raw materials and waste in order to develop bioplastics. At that time, I helped found the research centre, that would later become Novamont, being responsible for the strategy and specific activities in the biomaterials sector. I strongly believed that science and technology could improve the world and people's lives. However, since the beginning, I have been persuaded that any innovation and technology, even the best kinds, can have negative effects unless they are developed with the required wisdom, especially when renewable raw materials are concerned. I then decided, starting from bioplastics, to devote all my efforts to experimenting a systemic approach, which could create added value and reduce environmental impact, to reconvert no longer competitive and polluted industrialized sites and to recreate opportunities for territories and skilled employment.

The Italian territories were, for my team and me, open-air laboratories through which to grow a new inclusive and shared culture and in which to verify the quality standards directly on field. Today Novamont Group has 6 interconnected sites and 5 proprietary technologies, developed over years with a view to upstream integration as far as the agricultural sector. In recent years it has made a relevant effort to industrialize its cutting-edge technologies, in terms of both financing and research: €500 million invested in plants, €220 million invested in research



and development, multidisciplinary projects implemented in collaboration with other leading companies and R&D centres in Italy and abroad. Mater-Biotech and Mater-Biopolymer plants, both originated from the reconversion of no longer competitive industrial sites, represent two recent tangible outputs of this effort, as well as a virtuous example of regeneration of local areas and valorisation of preexisting infrastructures and skills. With more than 600 people, Novamont Group posted sales of €238 million in 2018 and made continuous investments in research and development activities: 5% of its turnover, more than 20% of people (2018 consolidated financial statements). It has a portfolio of around 1,800 patents and patent applications.

You were selected as the 2017 Person of the Year by Bioplastics News and Novamont was the winner of the 2019 Innovation in Bioplastics award, what do these types of awards mean to you personally and for your mission?

The Award “Inventor of the Year 2007” assigned by the European Patent Office and the EU Commission EPO for the range of patents on bioplastics and the ability to transform patents in technologies, plants, products and jobs was totally unexpected and for

this reason of great impact. This Award as well as the other two represent a recognition of our efforts in terms of research and investment and demonstrative cases for sustainable development and cultural growth. Through its development model, Novamont has in fact contributed to redesign entire application sectors, affecting the way raw materials are produced and modifying the use and disposal of products, extending the experimental activity of research labs to local areas. Our hope for the future is to see that the efforts of so many years can truly be the basis of a national project. The idea is that of a development with roots in the territory and the head in the world, which respects the diversity of the regions and uses it as a competitive advantage to create not just an industrial, but a cultural model involving the communities. Our objective has always been to help resolve real problems faced by society and we will continue to do so building on the results achieved.

Mater-Bi sounds like a true breakthrough product, what are some interesting applications for it?

Products made of Mater-Bi bioplastic are not conceived to simply substitute traditional plastics, but they are designed for specific applications in order to reduce environmental impacts and preserve

natural resources in a circular economy perspective. Following an eco-design approach, Mater-Bi aims to provide solutions to certain environmental, economic and social problems, such as in the managing of the organic waste collection or in sectors where there is a high risk of dispersion in the environment, as in the case of applications for agriculture. In this sector there is the problem of soil degradation and growing production of greenhouse gas emissions. Bringing back clean organic matter to soil is necessary to maintain fertility and decarbonize the atmosphere, but if organic matter is polluted by plastics and other pollutants it cannot return to soil.

We must rethink the eco-design of the systems and then make sure that the products we are going to put on the market have the capacity to be closed in a virtuous cycle.

This is the reason why in EU about 66% of organic waste goes to landfill (about 64mm tons/year). Just as a simple example, compostable shopping bags can substitute the traditional ones, so that they can be used for the collection of organic waste, avoiding biowaste to be mixed with plastic and creating a positive impact on the quality and quantity of waste collected. This dual use allows, at the same time, the reduction of the number of plastic bags that are thrown away or end up in landfill. With the use of bioplastic bags, organic matter can be converted from waste to compost, a valid soil improver, closing the carbon cycle. Another interesting application of bioplastics are biodegradable mulching films, which can be processed directly in the soil avoiding the accumulation of plastic material. They do not have to be disposed, reducing the production of plastic waste and the environmental impacts related to the improper removal of traditional plastic films. They maintain the same agronomical performance as the conventional black plastic film and they can also be used on crops not normally mulched with plastic, like tomato, rice and vine. Other applications are, for example coffee capsules or multilayer films, difficult to be recycled if polluted by food scraps.

Novamont is a pioneer in the circular economy. How do you see this market evolving in the future? What would you recommend for businesses that are looking to contribute to the circular economy?

The current economic system is not resilient and

is definitely not circular. The global environmental crisis has been joined over the past two decades by financial, industrial and social crises. We have reached this point because of a model of linear, dissipative development of the economy that has become globalized, minimizing the rights of the majority and producing waste. In this scenario, the circular bio-economy is a powerful tool and an unmissable opportunity to transcend the linear model of development and decarbonize the economy, addressing the problems of the degradation of the ecosystem where it is still possible to do so, all while involving the communities. Companies can play a decisive role in tackling the climate change global challenge by making the decarbonization of the economy a priority, starting from the centrality of ecosystems, such as soil, water and air, ensuring the need to redesign an integrated value chain, consumption habits and approaches to recycling. This requires a strong interconnection of the sectors, an integrated approach and the construction of networks of collaborations towards common regenerative projects.

Plastics pollution is a very visible threat, yet climate change is not always so apparent; do you see these issues as intrinsically linked? How does innovation in the plastics industry contribute to the fight against climate change?

The growth in product volumes takes place at an impressive rate: plastics production has reached over 300 million tons and is predicted to hit one billion tons per year in 2050. However, we should not make the mistake of looking for consequences without thinking about the causes. We cannot forget that plastics have improved our everyday life. Plastic is not good or bad, it is a technology and like all technologies, its benefits depend on how it's used. Today 72% of plastic packaging is not recovered at all and just 2% of plastic packaging is recycled and transformed into the same or similar-quality application. We cannot start from the waste that should not be there, to create an "economy on waste," instead, we must rethink the eco-design of the systems and then make sure that the products we are going to put on the market have the capacity to be closed in a virtuous cycle; this is true when we think of all the innovations. We need to rethink the use and disposal of products in a circular perspective, consuming as few resources as possible, using plastics wisely and when really necessary. In short, we have to stop thinking of unlimited growth and this represents first a cultural change. In this scenario, the use of biodegradable plastics designed to protect eco-

systems and to promote a sustainable use of soil, could contribute to climate change mitigation. Just as an example, compostable bioplastics in specific applications could help to recycle 64 million tons of food and yard waste put on landfill with a CO₂ potential saving of the order of 50 million tons.

Where does Novamont innovate to from here? What other initiatives or ventures are you most excited about?

The need for biodegradable products in various applications creates incredible opportunities. Indeed starting from the bioplastics value chain, Novamont is developing a series of synergistic



*Catia Bastioli at the European Patent Forum
Photo Credit: Novamont*

products, like biolubricants and greases that, if spilled in the environment, do not reduce soil fertility, do not accumulate toxicity in the groundwater and biodegrade in a few days. Moreover, Novamont is developing biodegradable bioherbicides for the management of weed control based on pelargonic acid of vegetable origin and a line of biodegradable cosmetics, which allows for the avoidance of contamination of sewage sludge and the dispersion of microplastics into the waters. The next Novamont steps towards decarbonisation will be the continuous improvement of the energy efficiency of our plants: developing agricultural value chains, by dry-crop farming that can be realized on marginal or arid land, in order to regenerate soil and, at the same time, produce raw materials to feed the biorefineries, animal feed and other applications, ensuring the continuous increase in the renewability of our products.

● **Who is your sustainable hero and why?**

I don't have a particular hero. However, I highly appreciate Aurelio Peccei, entrepreneur and founder of The Club of Rome, the first think tank that figured out the Limits of Growth in 1972 forecasting twelve different possible scenarios that are still valid nowadays. Peccei understood that to address the concerns related to the natural resources consumption and the destruction of natural capital, he needed to work together with the most brilliant minds of that time, putting together different skills, in order to create a widespread awareness in the world population beyond the interests of the few. He understood that changing the paradigm to combat climate change and resource degradation was only possible if each of us had taken our share of responsibility: heroes are not enough! Another interesting entrepreneur and financier was Raul Gardini. He acquired Montedison when I was a researcher in that company. "Moro di Venezia" was the Italian boat for the 1992 edition of the America's Cup, a project strongly supported by Gardini. For me it was something more than just a boat; it was the demonstration of what can be achieved for a sailor who knows where to go. I appreciate Raul Gardini for his ability to see beyond and foreshadow new developments by taking into consideration issues that thirty years ago were ignored by most. In the world of the Italian chemical industry, he had the courage to speak well in advance of global problems, such as environmental pollution, world hunger, the depletion of energy resources and the need to safeguard planet Earth by proposing innovative solutions.

Sorting Out the Future

Jim is CEO of Waste Management, the largest environmental services provider in North America. Jim walks us through their 360 degree approach to solutions to inefficiencies in the recycling process. Upstream customer education, new sorting robotics and landfill methane-to-fuel technology are among the innovations that Waste Management is pursuing to meet ambitious sustainability goals.



JIM FISH

● Where does your interest in sustainability come from?

My mom grew up in Wyoming and it's a beautiful state. My dad grew up in Colorado. We didn't really call it sustainability when I was growing up, but we've always been lovers of the outdoors and the environment. For a long time, I have done what may seem like silly things; when I'm brushing my teeth, I turn the water off; when I was growing up we had a garden in the backyard which was pretty sustainable. Again, we didn't call it sustainability, but our family has always lived that way. I think that's something that's been ingrained in me since I was a kid.

● Was sustainability in the back of your mind when you started your career?

I started with KPMG and there wasn't a whole lot to think about with respect to sustainability. Certainly, as I got into this business at Waste Management, it started to make sense to look at what we're really doing here. Part of being the biggest recycler in North America is that we are leaders in an industry that is managing over 250 million tons of trash a year and trying to do something with it. I ask myself: what is the best thing we can do with it based on today's technology? Is there anything we can do with it as that technology evolved? I'd always heard coming into this industry that landfills are bad, and I started thinking about that a lot as I was hired at Waste Management in 2001. There's been a big shift in how we actually manage landfills from an environmental standpoint just in the last 18 years because so many of our landfills are in fast-growing Metro areas. As I got to Waste Management, I started thinking about how do we recycle more? How do we recycle better? And then what is it that we can do with landfills?

Right now, engineered landfills are probably the best solution for large quantities of waste for the U.S. In some countries, landfills aren't as numerous because you don't have the amount of land availability. Now,



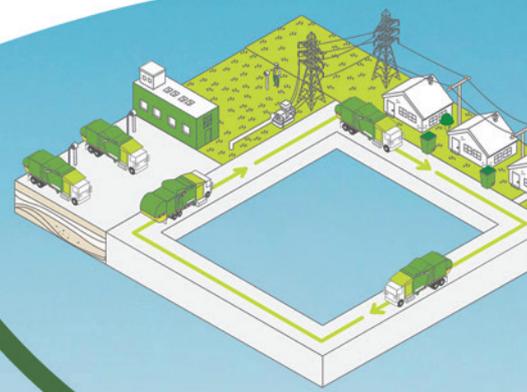
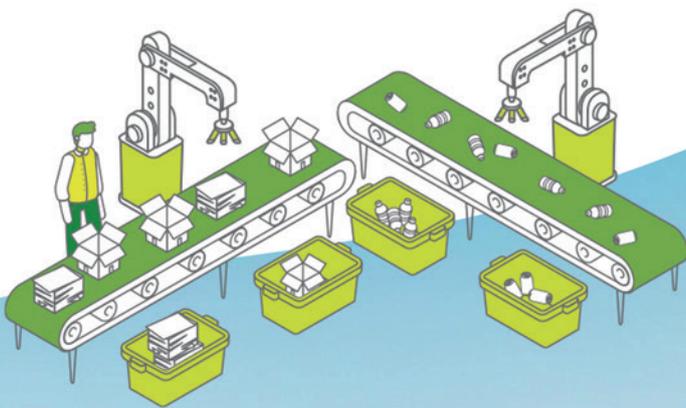


Photo Credit: Waste Management

is there another solution once these landfills come to the end of their lives? I read an article several months back that said “when you think about landfills in the U.S., at least once that material goes in there, it is sequestered, not like in developing countries.”

You have spoken about creating the “recycling plant of the future.” What does this look like? How will it impact your business and the way we recycle?

Two things are worth touching on here: one is regarding our recycling plant of the future and the other is regarding a couple of other plants where we’re investing in robotics technology. The recycling plant of the future is not robotics, it’s optical sorters and we’re putting, for example, 14 optical sorters in this plant in the Chicago area. The number of optical sorters has been hugely increased in this recycling plant and enables us to do a much better job of sorting.

We’ve also changed the process and flipped it on its head a from a negative sort to a positive sort and that just means instead of pulling those things that we don’t want from the conveyor belt off the floor, we are pulling the stuff that we do want. In theory, everything else that goes by goes through further sorting and comes out of the plant as a clean commodity. Unfortunately, the sorting equipment that is in many U.S. recycling facilities today just is not

capable of producing the type of clean commodity that is expected by our customers.

China has asked for 0.5% contamination, meaning only a half a percent of everything we process can be material that they’re not looking for — something other than cardboard, for example. Our current equipment at our single stream plant is not capable of producing that because there’s so much junk in there. I was looking yesterday at the stream of recyclables and it really is absurd what’s coming into these plants. It is ridiculous what you see in the recyclable “bin” that’s very obviously not recyclable. I mean garden hoses and stuff that actually is bad for our equipment and can actually cause it to shut down. The recycling plant of the future uses greatly enhanced optical sorting capabilities and it would make sense intuitively that the bin is much cleaner because what you’re doing is targeting that material and telling the optical or human sorter to pull it out and put, say, number one PET plastic bottles (soda and water bottles) and number two HDPE plastic (milk and juice jugs) in this bin.

It’s then plausible that the amount of contamination could be less because really the only contamination possible now is if a sorter picks out the wrong material. That’s a 180 degree change in the process. It is also augmented by all the equipment we’re putting in. We bought eight robots that we’ve deployed at three different plants and we will bring all of

that together under one roof and employ robots together with enhanced optical sorting technology and the new process I described.

Thinking more broadly about the recycling value chain, where are the current bottlenecks and where do you see opportunities for Waste Management?

Sorting is certainly a major bottleneck and education is obviously a huge piece of the puzzle so we do invest quite a bit in education. The one that I think has the greatest potential to really make a difference is alternative products or alternative uses of material at the back end. We can try and educate people all day long. I don't mean to sound like a cynic when it comes to education, but people are just going to put stuff in their bin and some of it is incentivized by contract. The problem here in this example is that customers pay by the bag for their trash and they don't pay for their recycling so there is an incentive for customers in this community to put everything they can in the recycle bin just from a financial standpoint. Therefore, it doesn't matter how much we educate them on it.

What other waste to value innovations are you excited about?

While I can't say a whole lot about this because we haven't rolled it out, something I'm very excited about is a company that we've made a 35% investment in which is making materials out of a low-value plastic. It's also not hugely expensive to build the type of plant which produces those materials.

We previously made an investment in a company called Agilyx that turns various types of plastic back into a base oil, so when you do that, you're going to end up building a plant that cost \$300 or \$400 million and it just ends up either not being competitive with oil itself or it forces us into a process that ends up being super expensive on the back end. I've always maintained that one of the solutions is going to be a low capital-cost process that creates something of value. Yes, Agilyx creates something of value, which is ultimately base oil, but it does it at a cost that's far greater than the cost to oil companies to pump it out of the ground. But if I'm able to create something where I can compete with another product, I have something that's sustainable at a competitive cost, then I can come to you and say, "look, we can sell materials to you that are fully sustainable and we can do it for the same price to you" then that's a pretty enticing investment opportunity.

Right now, materials without end markets go out the back door as trash because we can't use all this stuff, for example giant sheets of bubble wrap. Yes, it's made of plastic, but we can't do anything with it. We are looking at solutions that could take all of this material and allow us to make use of it. Today, I feel like I'm saying "put less of your plastics in the recycling cart because I don't want that bubble wrap. I don't want the garden hose. I don't want all the junk plastic that you put in your recycle bin because I can't sort through it." I can't and there's no market for it. But if I have a market then to me, that's a pretty exciting alternative to the status quo (which is taking a bunch of that plastic with no end markets into the landfill).

I don't see landfills as being bad. Trash goes into a landfill and it's not as if it gets into the ocean.

Are Landfills becoming obsolete? How do you view that as a solution to the future of managing waste?

I don't see landfills as being bad. In the U.S. trash goes into a landfill and this prevents it going into the ocean. Is there a better use for the trash or way of handling it? The question in my mind is really the definition of recycling: do you save the Earth's natural resources? If all I'm doing is just diverting it from a landfill, which is how these municipalities look at recycling, it doesn't ultimately do any good in terms of saving natural resources and I wonder what the point is. However, if it saves natural resources, then I am all for diverting waste away from landfills.

Following up on your thought regarding what recycling really should mean, is this a question that education can resolve? How else could we connect the dots between recycling and saving resources?

It almost always comes back to money. Many municipalities have set aggressive "diversion goals." I probably sound cynical about this and I am because I've seen it, but it really doesn't matter to them if they divert 50% of the material at the curb to something other than a landfill. If half of that material ends up going to a landfill in a 2nd or 3rd step, they don't worry about that or count it against themselves. Therein lies the irony. If they were really worried about preserving natural resources, then they would care that this material that they're

“diverting” away really hasn’t done any good. In fact, it’s actually worse because it’s consumed a lot more natural resources in terms of electricity that it takes to process all of this through our single stream plants and then it eventually goes out the back door and to a landfill anyway. If we’re really concerned about the total footprint of natural resource consumption than I would just assume take it at step one to a landfill to save on electricity. They don’t care about that, they only care that in step one it goes away from a landfill.

As Waste Management is focused on North America, are there waste systems in other parts of the world that you could learn from and implement here?

We sold our international operations, but I have been to India a lot because we have 650 back office employees in India. I’ve looked at this out of interest, but I will tell you that a landfill in India is a much different animal than a landfill in the U.S. It’s not engineered well and you have a lot of material that escapes from those landfills and ultimately gets into sewers and finds its way into the oceans so I’m not sure they have anything that I’ve learned that we would implement here. I have learned some things over there that we certainly do not want to do.

What I have seen as we think about becoming an international company again, as we’ve talked about, is that we’re not going to take our landfill model to Europe, for example. Europe is largely waste-to-energy focused and is much more of a self-sort

model. They tend to have a cleaner commodity but their equipment is not really any different from ours. Coming up with this solution at the back end such as utilizing some of the low value plastics and paper would be something we could bring to other areas, particularly developing countries.

As we think about ocean plastics, we ask ourselves, is there something we can do to help those countries that are contributing so significantly to this problem? In particular, India, China and South-east Asian countries contribute probably 95% of all the plastics that flow into the ocean every year according to National Geographic. Simply the use of a landfill itself could be a very sustainable and well-engineered solution that would be a massive improvement, so I think we could start there.

Is climate change on your mind when you look at your business model? Do you believe businesses have a role to play?

We think about climate change a lot. There are two places where we generate greenhouse gases, one is through our fleet and the other is through our landfills. In fact, we had a big meeting with our equipment suppliers recently and one of the topics was about electric vehicles and making the shift to reduce GHG’s in our fleet. We’ve made a very material investment to move to natural gas trucks, which is one step in a multi-step process to get to electric vehicles. Natural gas vehicles are better than diesel and in a very short period of time we’ve moved 60% of our fleet to natural gas which is way more than any other company out there. There are

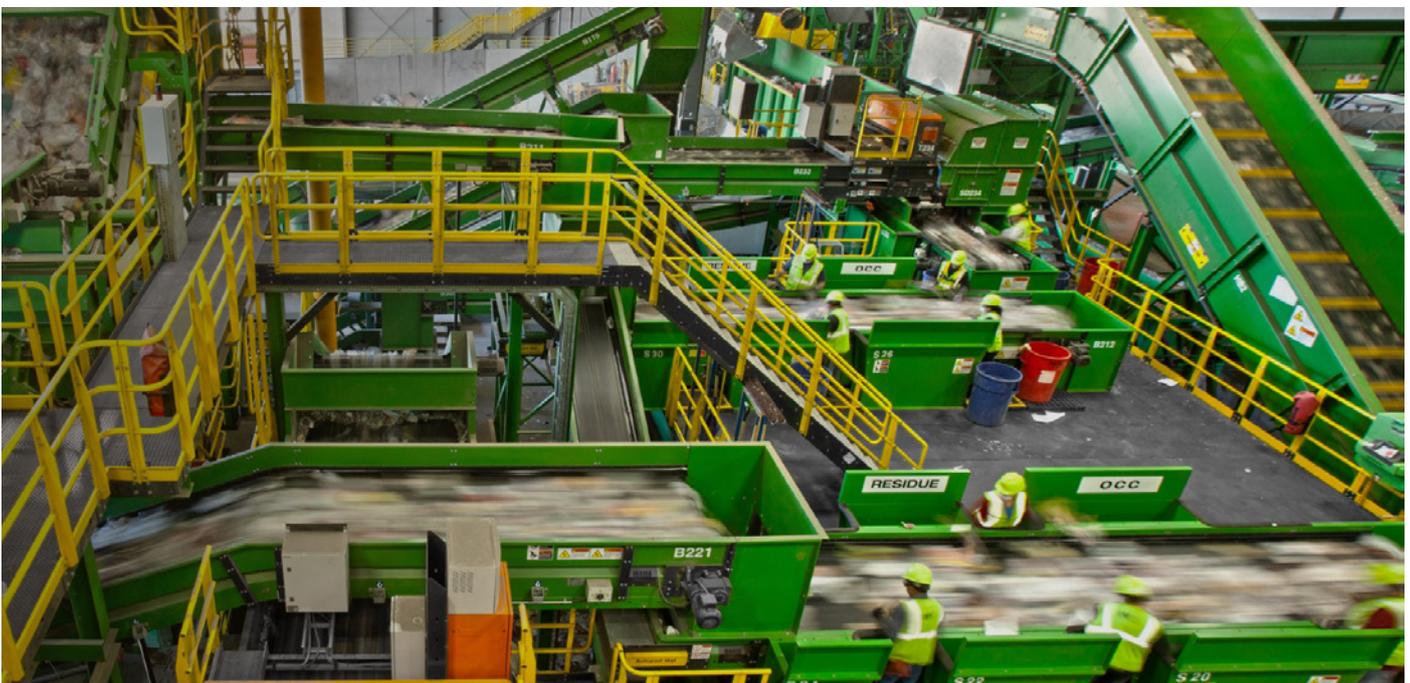


Photo Credit: Waste Management

electric trucks out there, but they only have a 25 to 40-mile range, which is not where it needs to be because our average range for our truck drivers is anywhere between 100 and 150 miles a day. We would need to quadruple the number of trucks that we have or figure out how to work through the night and hire more drivers.

Currently, our investment in natural gas is strong. We have a fleet of 1,200 trucks and continually expand our natural gas fleet and fueling stations. The second piece that I mentioned is regarding our landfills. What we've always been doing is to capture leachate gas and that is a requirement. We have over a hundred gas-to-energy plants that take that gas and run it through our Caterpillar or GE engines and turn it into pipeline quality natural gas. And because we've got a natural gas fleet that is consuming it, it's a fully closed loop. The gas that we use in our CNG trucks is renewable when it comes from our landfills. We are becoming greener in both these areas of our company.

● Who is your sustainable hero and why?

It would probably be my parents, but in terms of somebody in the corporate world that has done a great job, I don't feel like there is anybody that's truly synonymous with sustainability. I know there are some companies that do a nice job with it; for example, we visited Google recently and they said they've been carbon neutral for 10 years or so. Now, they're in somewhat of an easier business to be carbon neutral but I don't want to take anything away from them.

I probably won't give you a company, but there are some countries that have done some pretty impressive things. This summer I visited Denmark and I was pretty impressed with that country. They do a lot of conservation, which in my mind is the greatest avenue to true sustainability. I've been to Turkey, where they heat their water with solar. With almost 365 days a year of sunshine they do a lot with solar power. The Netherlands as well, they ride a lot of bikes and granted Houston, Texas is not really set up for that, if I wanted to ride my bike to work, I live 20 miles from my office, so I'd be a sweaty mess in July; but I do think there's some things that those smaller European countries are doing from a conservation standpoint that I think is impressive.

● Is there anything else you would like to add to sum up your leadership on sustainability?

Just to reiterate, I do think the natural place for Waste Management to flex our muscles on sustainability is in recycling. How do we educate and how do we change the process to create a cleaner stream? Producing a product out of the back end to me is both financially and environmentally motivating and attractive to me. I've said many times that sustainability has to be both economically and environmentally sustainable in order for it to reach that bigger, broader definition of sustainability. It has to be a win-win. People may just look at it as if we just have to recycle, saying, "I don't care what you do with it; Waste Management, you figure it out," but that's a win-lose. But I feel like we can get there, absolutely.



Photo Credit: Waste Management

Accelerating the Growth of Sustainable Infrastructure



Follow the Impact Leader

Dame Polly is the Director of the Institute for Sustainability Leadership at the University of Cambridge. Dame Polly leads business and policy leadership groups, as well as executive and graduate programs for private and public sector leaders to advance solutions to the greatest challenges facing global sustainable development.



DAME POLLY COURTICE

● How did you come to be interested in sustainability?

I grew up on a small farm in South Africa on the slopes of Table Mountain, one of the world's great natural wonders. My childhood there instilled in me a deep love of the environment and an acute awareness of issues of social justice.

It was only later, in the early 1990's that I encountered the powerful notion of sustainable development, which helped me to make some sense of the tensions that I had grown up with in South Africa: between economic growth, human development and environmental protection.

By then I was working at Cambridge University helping businesses to understand and respond to a rapidly changing world, to the forces of globalisation and the rising tide of dissatisfaction with the worst excesses of shareholder capitalism at the expense of society and the environment. The Rio Earth Summit of 1992 was a real catalyst for action on sustainable development, although the involvement of business in setting the agenda had only been marginal. Shortly thereafter I was approached by The Prince of Wales, who had long been deeply concerned about social and environmental justice and wanted to help business leaders understand this new agenda and respond accordingly.

This led to the establishment of what is now our flagship programme for senior executives - The Prince of Wales's Business and Sustainability Programme - which seeks a convergence between profitability and sustainability. Amongst other things, it tackled head-on issues such as climate change, biodiversity, human rights, poverty and development and the state of the planet and its people. These might seem commonplace in business discussions today but they were new and edgy topics



Photo Credit: University Of Cambridge

for business to factor into their strategic thinking in those days and the debates were lively and fascinating.

In your mission of connecting senior leaders from business and government to explore the link between sustainability and profitability, what are the most significant findings that have come out of that search so far?

Our role in those days was the same as it is now: to challenge and support leaders to respond to the evidence before us; to make decisions based on the latest and best science; and to build business models that create value not just for shareholders but long-term value for society and the environment.

Today we run many more executive and graduate programmes and host business and policy leadership groups that develop solutions to some of the most intractable challenges we face. We now have an influential network of over 9,000 alumni and other leaders across the private and public sectors who understand the need for change and are inspired to find solutions. Over the past three decades we have seen enormous progress as the corporate sector has responded to the demands from society to clean up its act. Strategies and policies now exist in many companies to set targets, measure impact and report on progress. The

ever-widening agenda, clarified in 2015 by the UN Sustainable Development Goals, is pressing companies not just to report on their carbon footprint, but also on their impact on water, soil and biodiversity and equality to account for their contribution to human wellbeing and social justice. There is a very long way to go and progress is patchy, but there is a growing understanding that business as usual is just not an option and that there are huge opportunities for companies that seize the opportunity – estimated to be worth \$12 trillion by the Business and Sustainable Development Commission.

But at the same time, it is clear that there is a limit to what individuals or organisations can achieve on their own, operating within a system that is so often driven by short termism and paralysed by inertia rather than designed to prioritise long-term sustainability. The need to bring about change at a more systemic level has led to a different dimension of our work where we support leaders in working more collaboratively with peers and competitors, clients and suppliers and with policy makers and communities to develop solutions by ‘changing the rules of the game.’ If we are to transform our economy at a fundamental level to address climate change, ecosystem destruction and inequality, then it will take systems-level change and a combination of collective will and collective action from leaders in business, finance and government pulling in the same direction.

What made you want to work with Cambridge University? What can other universities learn from them with regards to sustainability research?

I did my undergraduate degree at Cambridge and was able to see first-hand the extraordinary range of insight and expertise that existed there that was relevant to sustainable development. As the Institute developed, we were fortunate in being able to draw on that breadth and depth, both in terms of teaching for our executives and in providing the evidence base to support senior decision makers. Last year we set up The Prince of Wales Global Sustainability Fellowship Programme to attract academics from around the world to collaborate with peers, companies and policymakers to identify breakthrough solutions to meet the UN Sustainable Development Goals (SDGs). The aim is to help mobilise global evidence on real-world challenges such as inequality, nutrition and environmental protection, with a view to enabling companies and policymakers to play a catalytic role in building a sustainable economy.

You have mentioned a need for “transformational leadership” in addressing challenges in sustainability, could you elaborate on what sort of qualities that type of leadership should strive to imbue?

It is clear to me that the same type of thinking and the same type of leadership that got us where we are today, will not get us where we need to be.

Many existing leadership models and approaches focus on the individual and their immediate organisational context, but they often fail to take into account the wider context of the urgent global challenges faced by society. This wider context and how to engage with it as a leader, has been the focus of our work.

Acts of leadership can happen at all levels and it's not just about leadership from the top

In 2017, we published our model for ‘high impact’ leadership, to draw together all we had learned over three decades developing leadership for sustainability. In the model, we outline a number of capabilities required to lead systems change, across the domains of knowledge, values and practice. All three are required, as action without knowledge is likely to be insufficient or misplaced. For example, action to tackle plastic waste caused by plastic straws is well intentioned, but fails to address more fundamental questions and material impacts of our dependence on plastics in modern life. The values that inform leadership decisions are also critically important, as businesses are increasingly operating in contexts of growing inequality, in which concepts of ‘fairness’ and the boundaries of corporate responsibility are contested.

But one thing that we are clear on is that this isn't a job for the heroic few. Instead, we should develop collective leadership capacity, both within and across organisations. Acts of leadership can happen at all levels and it's not just about leadership from the top – although the CEO does have an outsized role to play.

The critical thing we emphasise in our leadership development work – with both companies and individuals – is that it is no longer simply enough to anticipate the future. Leaders need to take an active role in shaping a desirable future. Just as impor-



Photo Credit: University Of Cambridge



Photo Credit: University Of Cambridge

tantly, they need to be accountable for their impact and for the progress they have or have not made in real terms. This requires an understanding of what is truly necessary, not simply what is currently possible or convenient. This is the leadership we need.

Are you optimistic about the future of corporate leadership with regards to sustainability?

All the science indicates that we have set in motion a potentially existential threat to our societies and economies in the form of climate change and our impact on the natural world more widely. But it's almost too easy to offer a doom and gloom story with no positive end in sight. It is entirely down to us and it is within our capability to do what needs to be done. Amazing things have been achieved and can be achieved in the face of such threats, by acts of leadership and courage and determination.

In the change that we need, companies have a critical role to play, but they cannot do it alone. Ultimately, we will need to see a greater shared sense of responsibility for this change, with each party playing their own distinctive role. Governments need to set the rules of the game to create the conditions in which capital will flow in the right direction; companies need to create value across more than just the financial domain; and citizens can shape the political space in which progress can be made.

You have worked closely with His Royal Highness the Prince of Wales for 30 years. I understand he was driving a force behind the formation of CISL. How is it to work with a future King?

The Prince of Wales was far ahead of his time in his understanding of the problems we face because of the way we live on this planet and he has devoted his life to trying to address this. In my own way, I share that ambition. His leadership has been inspirational to me and his patronage of my institute has been fundamental to our success.

You have been appointed Dame Commander of the Order of the British Empire, can you explain why you were honoured and what it means to you?

I was recognised by the UK government for the work that my institute has done to address the challenges of sustainability. I have had the good fortune to lead the work of an amazing team of people who share the passion to achieve a more sustainable economy. I must admit that never in my wildest dreams, all those years ago on the slopes of Table Mountain, did I imagine I would be working for one of the world's greatest Universities, under the patronage of the future King of England, on the most important questions that we face as society – or that I would be made a Dame in the process.

Decarbonizing Venture Capital

Ion is the Managing Partner at Capricorn Investment Group. Ion is one of the original "Impact Investors," beginning his sustainable technology investment career in 2004. Following early investments in Tesla, SpaceX and QuantumScape among others, Ion details Capricorn's mission of focusing capital on technologies and solutions that can solve the world's leading challenges.

● Where does your interest in sustainability come from?

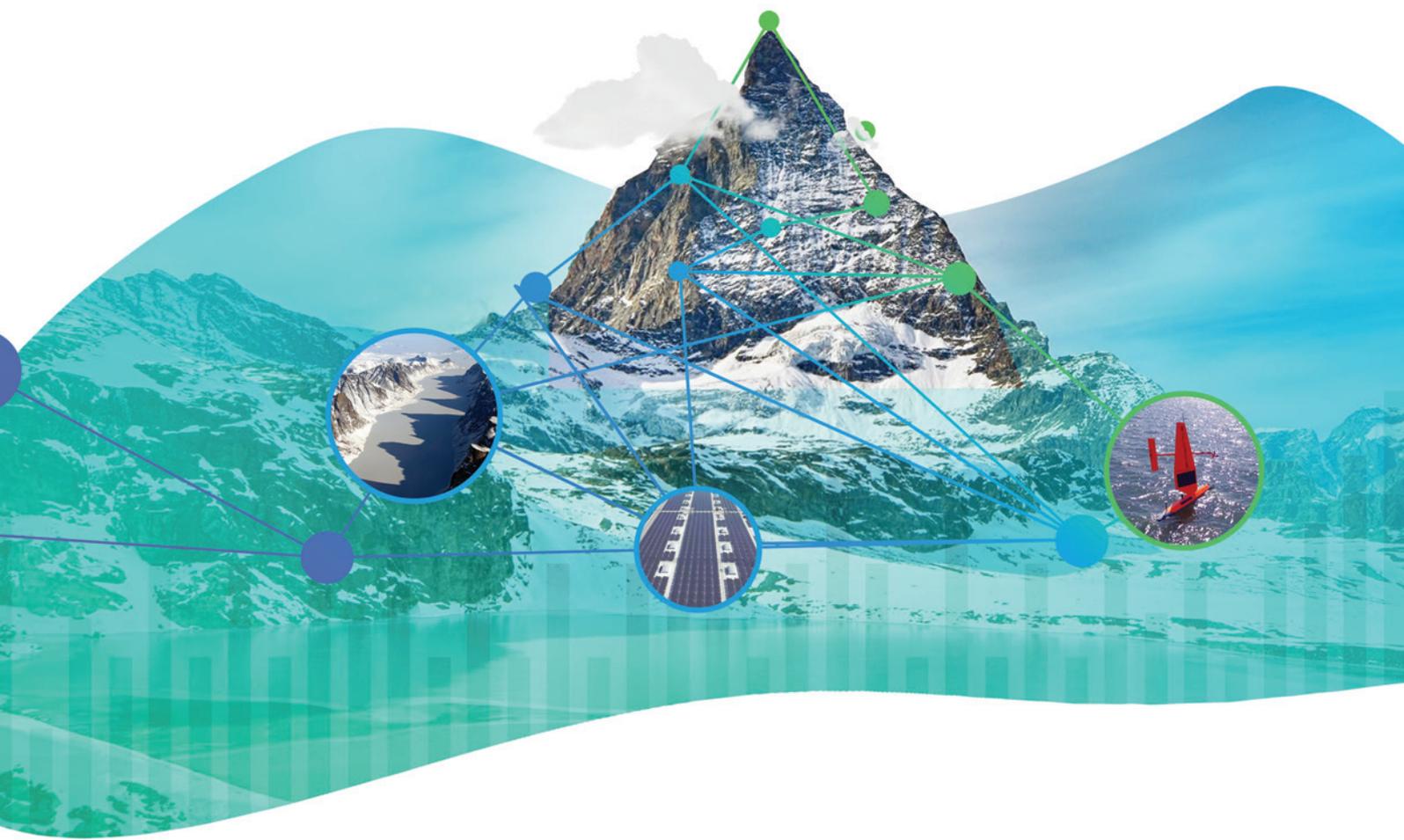
I'm one of those people who couldn't sleep when I was 10 years old because I would think of how we are wrecking the planet. I think there are certain human beings that have those feelings and there are others that don't. Education makes some difference, but I do think some of this is how you're wired, whether you care or not. It's always bothered me to see the loss of a beautiful forest or the pollution coming into some pristine ocean, so for me those feelings are really, really strong.

Now as it comes to investing, the 2005 documentary *An Inconvenient Truth* had a big impact. We had created Capricorn Investment Group with Jeff Skoll, who produced the film. He had formed a company, Participant Media, to pursue his life passion of using media to tell great stories with the thesis that society functions thanks to great stories told in film and books. He wrote a \$1.3 million check to produce the Gore presentations in to a film and I had the privilege to witness its production; and in between filming, Al Gore came to me and put his face close to mine and told me we had 10 years to solve the climate crisis.

We had been given \$5 billion and a blank sheet of paper to make money but, to do it in a way that was meaningful, so these ideas and experiences came together and eventually developed into an investment thesis at Capricorn. It's one of those things where the same day it happened it had no effect, a week later, maybe it had some effect, but only two or three years later you think back, why did I do all these things? And I am absolutely certain that [the film] had a very big effect.



ION YADIGAROGLU



That's why, when the sequel came out two years ago, I said we need to get the thousand or so people who control the \$200 trillion of investable securities in the world to sit in front of this sequel and even if they're bored or they have no reaction, a year later they'll do something they wouldn't have done because they sat through the movie for two hours. And so we took it on and did screenings in major capitals around the world inviting only senior executives that control large amounts of capital and I think we had some representation of about a third of all investable capital - literally trillions of dollars.

My ambition in doing Capricorn was always, wow, we could do something special and the huge opportunity of decarbonizing energy, transportation, agriculture became such a big focus because of the intensity of this experience.

What are you working on now that you're excited about at Capricorn?

Too many things! Fast forward to now in 2019, nearly fifteen years after *An Inconvenient Truth* and as you know emissions have continued to climb in the world, so there has been no successful application of energy policy or transportation

policy that has made a big enough dent to even slow emissions down. It's really quite depressing and I can't say that we've moved on to new themes; we're still attempting to scale like crazy the things that can make a difference. I'm a product of the Bay Area, of science and technology and innovation. It's the one place in the world where all wealth is made through innovation, something like a trillion [of wealth] is created every 10 years and there's no other place like the West Coast of America in the world. So that's what I grew up around and so we look for technology that is potentially so scalable and so large that it can make a real difference.

Obviously one of our biggest successes was being a key investor in Tesla, before it even had designed its first car. I was a Teaching Assistant in an honors physics program and one of the many brilliant students there was a fellow named J.B. Straubel and he was not only smart but a pragmatic thinker and realized the problem and the opportunity of Moore's Law would have in power electronics and batteries and how these would enable a big revolution in transportation. So we wrote a check and the investment snowballed into a whole bunch of work that continues today and we're just getting started.

First of all, to electrify transportation, there's way

more work left to electrify trucks and cars. Although this is becoming quite obvious, in California, Tesla still only represents around 2% of all cars on the road, and this is off the charts related to everywhere else. Therefore, this space continues to offer opportunity. We have also had to wait more than a decade but electrifying aviation is something that we're heavily into now and out of the 100 or so start-ups we found in aviation, we funded a company called Joby Aviation.

You know in the Tesla days we couldn't admit to funding the company because people would laugh and say that's ridiculous; but because of the success of Elon Musk, in a good way people are not laughing about electrifying aviation. The downside to this for a venture guy like me is that there are a hundred startups, as opposed to a few only in the early Tesla days. So it's good for the world, but a little tougher for venture capitalists.

How far away are we from commercial electric aviation?

There are things you can do very soon with still somewhat experimental planes, operating under waivers and things like that. We could have properly tested and certified vertical takeoff and landing (VTOL) aircrafts in as soon as two years from now. For broader application, it's probably five years when, as long as you live in the right place and you're a bit curious and want the experience, it will be possible and available. In 10 years, I think it will have grown to be very, very big.

How do you go about qualifying some of these investments as fitting your original thesis to make the world a better place?

We do a lot of things that have various impacts that are good, but for us, climate is the major focus, and it's one where the metrics are most obvious. You know, we might be eating sandwiches for lunch and we could debate for months whether the sandwich we ate was healthy or not. There's no single metric for food and lots of perspectives, right? Not with climate. It's not that complicated unless you're a crazy politician or CEO of an oil company. We know what the problem is and the metrics are quite obvious. For transportation and power generation, it's all about electrification and there's really no other way to fix the climate problem without decarbonizing these two pieces. Of course, there are other problems to tackle like steel and cement, the heating of buildings, etc, and then you have to address the big problem of agriculture.

There's enormous amounts of noise and disinformation in this area, like the idea that if we stop eating hamburgers, the problem is solved right? That is ridiculous, because if you stand in front of a coal mine you understand that there's no way to get there without fixing power and transportation where the majority of the problem starts. I am all for solving the other problems but they are secondary in terms of impact versus dealing with the core issue of fossil fuels. So batteries have been a focus for 15 years and perhaps our most exciting company is called QuantumScape which develops solid state batteries. The speed of the trend towards cheaper and more efficient batteries is exploding so that's super fun and exciting because they can really make a difference.

At the same time we have 7 billion people that are expanding their consumption of transportation, energy, food and everything else and that growth is still outpacing the solutions. You can, for example, go from being non-existent to being a best-selling carmaker in a few years and feel good about yourself, yet when you look at globally what is happening, transportation is emitting more this year than it ever has and next year we will emit more than we ever have, so it challenges your optimistic perspective.

Our work is super exciting, scaling at a pace that you've never seen. I think we'll manage to scale the impact of Joby Aviation several times faster than even Tesla, as crazy as that sounds because of the skill sets that are improving along with the urgency of the climate crisis and large amounts of capital that is available from people who want to make a difference. But we are still not winning versus the problem, right?

How are Venture Capitalists working with companies to meet new standards in ESG or supply chain sustainability? What role do you see others like yourself playing in face of climate change?

It's a really odd thing, but for the past 15 years, nearly every dollar in venture capital has gone into a non-technology problem enabled by technology platforms, platforms like Transmission Control Protocol/Internet Protocol, Ethernet, Android and iOS, etc. Now, for the first time ever, a trillion-plus in wealth has been created by venture capital in the use of technology, not the technology itself. The prior trillion dollar wealth creations were much heavier in engineering including the software cycles that led to the Oracles and the Microsofts and even Google, teams of hundreds of software



*Ion Yadigaroglu visiting the Planet offices
Photo Credit: Capricorn Investment Group*

engineers doing heavily technical work. So this is a striking shift that has happened. Venture capitalists have basically lost interest in engineering and science and ended up promoting people that were super bold and knew how to scale stuff and go crazy. Now the companies that move the fastest and get the best syndicate to fund them and spend the most money win and it doesn't have a lot to do with understanding the technology better than someone else. The most valued skill sets have been non-technical, they've been unique to scaling digital models. We are at this point where most venture firms don't even have any science or engineering talent left.

However that is now mostly played out and we are beginning to see a lot of venture firms rebuild science and engineering skills, plus it's not lost on them that we have a giant problem with climate, with other problems like plastics and many others that seem intractable. We are seeing a growing part of the population that wants to do work in a job that is meaningful and venture capitalists are absolutely not immune to that trend. On the other hand, most venture capitalists themselves still want to be known as the greatest venture capitalists, not as someone known for solving some big global problem, it's about how their multiple looks on their last Series A and that won't change overnight.

Question: Talk to us about the origins of Impact Investing and what the next phase looks like.

I was there at the start, when the word was invented. In 2007, we had a long weekend at the Bellagio Estate on Lake Como to talk about the intersection of making money, investing and doing some good. And after an intense weekend there was obviously no one answer, no silver bullet that emerged. A fellow named Anthony Bugg-Levine said we could instead start a movement and for that we need a sexy new word and he suggested "Impact Investing." And a few of us wrote small checks to put money behind that idea and a few months later Anthony got \$40 million in grants from the Rockefeller Foundation to launch it properly. That's how impact investing started. Of course like many of these movements, it has become so big and now co-opted by all kinds of stakeholders and has I think lost some of its essence.

The movement remains very exciting and successful but there are aspects that are so far a failure. What people want to do is they want to talk about these problems academically and define "what's a good company? What's a bad company? What's

a normal investment and what's an impact investment? What's the metric you use to decide all of that?" That is mostly nonsense in my view. The real issue is people in investment roles and why they make certain decisions. People make certain decisions because of selfish reasons: career reasons, ego reasons, comfort and so on, so for me, the impact movement was about understanding and changing the people part, not the academic part.

When you're looking at a certain person making investments for an established firm, what do they think about? When they show up for work every day, how do they make those decisions? What are their incentives? And how can we think about changing those things? So this whole thing on impact metrics for instance is useful but a bit of a red herring. When you're eating a chicken sandwich to say: "this sandwich rates 6.6 or 9.2" is a ridiculous thing because you haven't defined the problem anywhere close to precisely enough to be able to use a metric. If you're talking about climate you can use good metrics, because the problem is stated clearly, such as whether you're using fossil fuels or not or if you're emitting methane in agriculture, for instance.

We need \$20 trillion of solar wind and storage, yet we're doing \$300 billion a year

So this idea that impact investing is entirely about creating an amazing nomenclature is wrong and it loses the main push of the concept. In fact metrics are being used to deflect from the real issue, which is that the finance industry is a big part of the problem. We have 200 trillion of investable capital globally, most of which is earning nothing, between 0 and 2% in investment grade bonds, the rest of which is compounding at best at 7-8% which is the track record of the American stock market, the only stock market that has survived a 100 year run and there are giant misallocations of capital and real needs are starved of capital. This is why impact investing is so important. Wall Street can't make a product that doesn't claim to return 15% and therefore warrant high fees and revenues to them.

We need to do several trillion of reindustrialization of the transportation system, we also need to do several trillion of agricultural work. We need \$20 trillion of solar wind and storage, yet we're doing

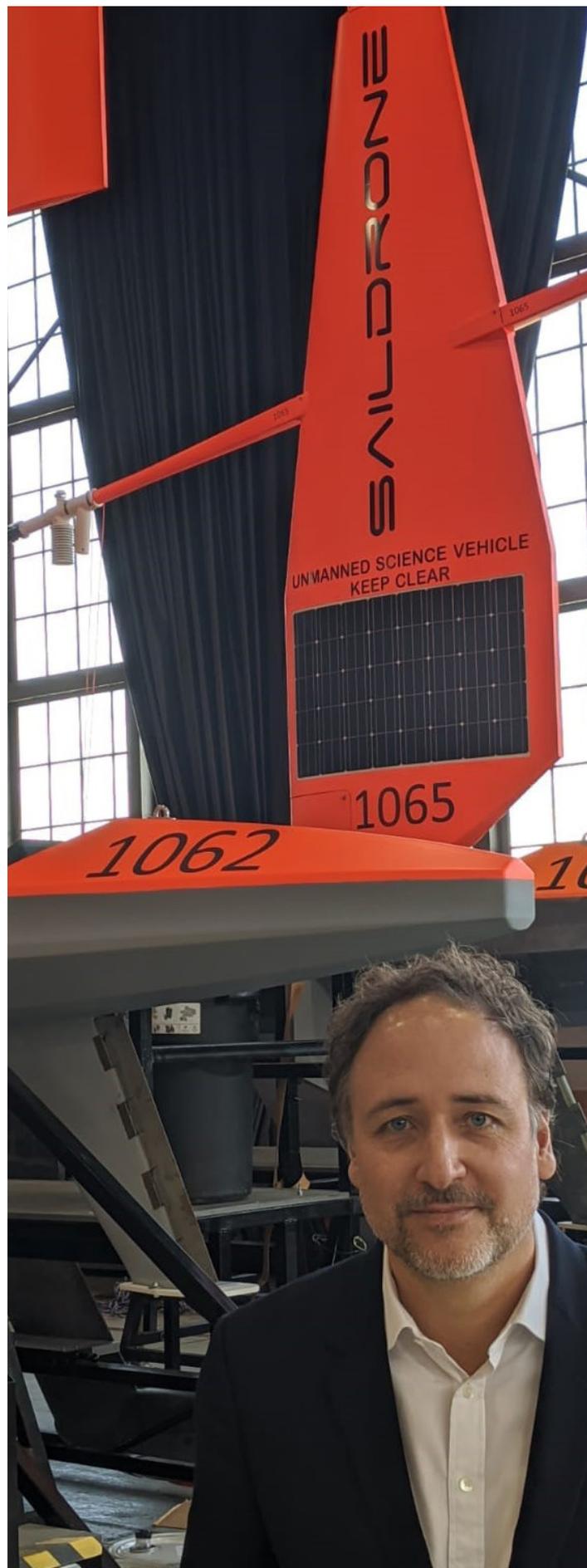
\$300 billion a year most of which is being done by utilities, not by guys sitting on Wall Street or in London offices. So if you think there is \$200 trillion in the world that means that 10% of everyone's assets, most of which are in retirement systems and pension funds and insurance floats, needs to go into solar, wind and storage. There is almost no institution in the world that has a plan to do that. I don't know one CIO of a pension fund that knows how he is going to end up with 10% of their portfolio in solar, wind and storage or who can admit that returns will be short of promises.

To understand our venture capital work, you should consider that big investment risks used to be taken by companies. CEO are now mostly managers that don't take big risks. So that has left a big gaping hole for venture capital to play the role of innovator - and it is high expertise, especially in areas like we pursue which is super heavy in engineering. It is not for everyone and relatively small amounts of money and you can make a lot of return and it's different than the bulk of the \$200 trillion in assets in the world that we need to allocate to fix global problems. Changing the system is what impact investing is about in my opinion and we need to get on with it quickly.

Who is your sustainable hero? It sounds as though it may not be an investor.

I am waiting for that hero. In fact what is shocking to me is that nobody in a very high-profile position... there's no example of a CEO of an energy supermajor or equivalent in the world who has yet to raise his or her hand and say I'm going to quit because I actually don't have a solution and I'm realizing that what I have been saying versus what I am doing is completely incongruent and I want to stop this because it's painful. It has yet to happen. You can't name a single high-profile person that has defied expectations and admitted that they are on the wrong side of this problem and are not in fact offering a solution. Everyone thinks they are doing great. That's why I think the divestment movement has been so much more interesting than people think, so I would say a person like Bill McKibben is a bit of a hero to me like Al Gore is a hero.

So I do have many heroes but yes, not from investing or even big company management and I think that's sad. People in those positions have such a uniformity of character that not a single one has stepped out of the box to say this is messed up and because I don't have something better to offer... I should quit.



*Ion Yadigaroglu visiting Saildrone Construction
Photo Credit: Capricorn Investment Group*

Tracking the Bright Side

Dan is CEO of NEXTracker, a designer and manufacturer of advanced solar tracking systems. Dan's designs have led to some of the most significant breakthroughs in solar energy efficiency throughout the industry. Dan speaks about his entrepreneurial lessons through his rise to CEO, as well as on his optimism for why the sector is poised to shine even brighter.

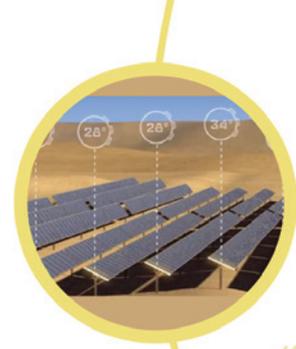
Tell us about your entrance to the solar industry, what drove you to the sector? Do you feel the same way about the sector today?

I got involved through fortuitous circumstances. I was working at PG&E (Pacific Gas & Electric) doing traditional electric transmission planning and operations in the mid-eighties. I saw the opportunity to work in the research and development department and that sounded exciting. I'd been working on providing electric reliability through transmission planning, thinking about the opportunity to strategically locate modular generation at key places in the electric grid to improve the reliability. As soon as I started reading about photovoltaics, I thought that would be a great option.

So literally the first day I went in to meet with them, I proposed that we select a plant that was tuned to the transmission distribution system and that ended up happening a few years later as part of the PVSA project, which to my knowledge actually ended up being the largest plant built in the decade of the nineties in the Americas. It was part of a national research project with the U.S. Department of Energy. Once the plant was built, we empirically measured the benefits to the grid. They were tangible, concrete and quantifiable. We published dozens of peer reviewed technical papers on the subject.

Much of that work served as the analytical underpinnings for net metering and other policy activities to further promote the solar industry. As a young engineer, the research and development department was a rich environment. We were exposed to a lot of great ideas.

I've had two aha moments. The first was that solar could uniquely benefit the grid... The second was when I was up in the Altamont Pass in Northern California — which at the time that was the largest wind power area in the world. And looking out as far as you could see were about



DAN SHUGAR

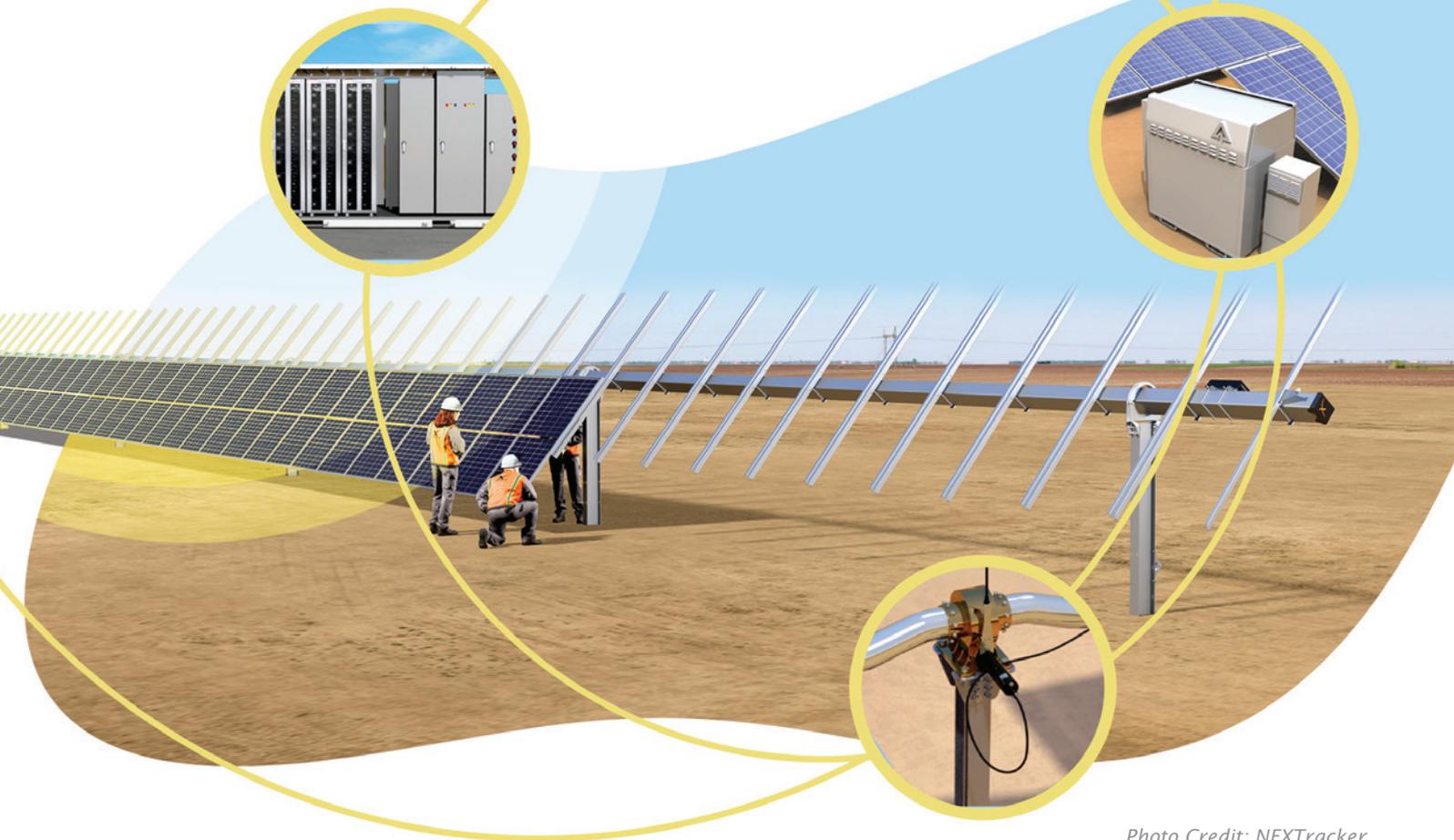


Photo Credit: NEXTracker

500 megawatts of wind turbines. It inspired me to do something like this at this scale and do it with solar. That project ultimately came to fruition. For perspective, it took about 16 years to actually build 500 megawatts.

Fast forward to today, at NEXTracker our weekly capacity is 500 megawatts. It took us – the industry - 16 years to build out that kind of volume. And now at NEXTracker we're docking that out every week. It's incredible how far solar has come.

Do you feel that this growth will continue its acceleration or will it begin to slow anytime soon?

I think the growth is going to continue pushing innovation. The economic fundamentals are strong. We're going to keep seeing progress. At first we were subsidized and we were competing in places where solar had unique benefits: where it was super sunny or there was a local state subsidy. For utility-scale solar, those requirements have gone away. Now that we're installing in geographies that don't have the best sun or where challenging terrain exists and we don't need state subsidies. Solar is coming in at half to a third to a quarter of the cost of polluting assets and the risks are considerably lower. We got to this amazing place three years ago when solar became the most cost-effective new resource. Well, now we're at a place where it's lower cost than the existing marginal costs of production of coal.

We're seeing these coal plants dropping like flies over hot fire. Recently one of the largest U.S. coal fire plants, the Navajo generating facility out near the four corners, has dropped. And that was a couple of gigawatts. Even though it was fully paid for and depreciated, it could not continue to operate economically because the marginal costs were above the current levelized costs to produce renewables and other resources.

Given that we're in this great economic place, we feel good about it. We were quite concerned, a year and a half or two years ago when the then U.S. Department of Energy Secretary, Rick Perry, tried to get these bogus subsidies to support coal and nuclear under the inappropriate banner of grid reliability and resilience. Fortunately, that failed. We now celebrate Perry's departure from the U.S. Department of Energy.

Evil forces haven't been able to slow this thing down. We're excited about prospects for accelerated growth. There's a tremendous technology story related to all things solar. From the solar cells moving toward Mono PERC to better ways to put modules together with shingled cells, bi-facial panels and then to advances in components like glass in the modules. There's also an amazing story on trackers. NEXTracker has revolutionized this technology by incorporating a smart yield enhancing control system called TrueCapture — which produces up to 6% more energy per site.

We continue to build on these advances that improve the economics of solar relative to other forms of power generation. Financial institutions have accepted this technology as the lowest risk way to make electricity. The number of locations is growing, we're getting support to create value-added manufacturing in panels, in optimizing our global supply chain, construction, professional skills development, improvements in long term operation and performance, maintenance and financing— all these things are coalescing.

It's a beautiful story and we're on the winning side. We've completely changed the largest industry in the world, the power sector. We've put it upside down in a few decades. It's extremely gratifying to be in this place.

Are there any initiatives at NEXTracker that you are most excited about?

Well, first we revolutionized trackers. Years ago we introduced a balanced tracker at the center of mass that required less energy than previous systems, which allowed each tracker row to be independently operated by small solar panels on the row itself which avoids needing to run power out to the field. This self-grounded, independent-row architecture radically lowered operations and maintenance costs for cleaning and vegetation management. It had a tremendous amount of connectivity and instrumentation and data capture that allowed us to continuously learn about the health of the plant. That was in the beginning. Two years ago we introduced the True Capture smart control system which produces more energy by dynamically operating the angle of the tracker to be optimized relative to the adjacent structures as well as to changing atmospheric conditions. This is pushing the industry again to think about performance optimization.

Today we have over five gigawatts of projects operating with TrueCapture amounting to dozens of projects on three continents. This is the big first thing to alter tracker algorithms since my days at PG&E where a team of us introduced backtracking in 1991. Now we're developing software, further connectivity, deploying predictive analytics to increase the output out of these systems.

This past fall we launched a separate, second tracker platform, adding to our tracker portfolio. The first one is one panel-in-portrait called NX Horizon. The second, known as NX Gemini is a two-in-module-portrait architecture, allowing for

a shorter row system yielding the highest power density of any tracker on the market today. It's also designed to have an extremely efficient foundation profile for sites with challenging soils and terrain. We can now address virtually the entire serviceable market. Both tracker systems have been designed with an evolved control system for plant optimization, including a weather system, weather stations, inverters and energy storage. It's playing out quite well for us.

What are some of the most important lessons that you could share with entrepreneurs that are trying to build zero carbon energy systems?

The most important thing is getting your team right and that relates to any business.

It's important to build good relationships with the leaders in the company and to create an environment that engenders the best ideas to come forward, not necessarily the loudest voice. This provides upward mobility in career advancement. It's also important to generously distribute equity throughout the company. Those are part of our core values.

If you look the leaders in our company, some came in at entry level positions. They've been rewarded through their hard work and ingenuity and team ability to ascend. By far the most important drivers are getting the team right, investing in people and rewarding them accordingly.

We also believe in a high degree of transparency. We consistently share information with staff about our strategic direction, what's working, what's not, what our challenges are and our plans on addressing customer pain points. It's important to build culture and establish communication across teams. It's easy for people to stay with you in good times but when things get difficult, what's going to keep them with you is how you treated them in the hard times. We really believe in this.

With respect to building teams in the renewable energy sector, we look for folks that are mission driven. Building a great company is fun and thrilling but changing the world in a positive way is a different level of satisfaction. Engaging and attracting a diverse talent pool. We want both. We want people who are interested in building a great company with a high degree of professionalism. These types of people tend to stay with you for the long term; and of course, when you invest in people, you don't want them to leave.

Other lessons we've taken to heart is that we like to really try to put ourselves in the shoes of our customers, understand their pain points and how our products and services can add value for them. We want to make it easier for them to do their job of implementing solar power. We think about that a lot and try to take care of our customers by offering exceptional service. By listening and responding to ingenuity, soliciting their inputs into the product and the business process and into our model, they then come to have a vested stake in NEXTracker, they have ownership of our success and that's served us well over time. We founded our company six years ago and our goal was to be number one in our space in three years. We did it in two. We've been able to maintain strong global market share with a 30% leadership position for four consecutive years.

We'll see what the numbers say for this year, but we feel good about it. We do more than the next three or four competitors combined in any given year. It comes down to the team and stability of the mission and vision to make solar the number one source of energy in the world and then to operate with a lot of integrity and essentially do what we say with customers. These are the big principles I want to share with entrepreneurs. To aspiring younger entrepreneurs that want to found companies: If you have this part right, the other things usually work out.

What are the biggest obstacles to a 100% renewable energy economy in the US?

It comes down to communication and policy. There was a narrative out there about government regulation and war on coal that was erroneous and not based on political fact.

We are focused on key messages. One, solar works technically. Two, it lowers costs and three, it creates economic opportunity. We have five times more jobs per megawatt with solar than the polluting power generation like coal. Solar could provide energy independence from foreign sources. It leverages technology and innovation and allows for clean air and clean water. These are key messages we're promoting and they are being received well across the political spectrum— independent of geography or political affiliation. The public want their energy from the sun.

The problem ten years ago was that the cost to produce solar was high. Now it is among the lowest cost options. This message is not yet understood. We get it in our industry and it's understood in certain geographies. We need that message broadcasted everywhere. The technical barriers for wider adoption are solvable. Storage is part of that answer. Communication and control are also part of the answer where customer loads can be operated more dynamically.

For example, if you're charging your car, does it really matter to you if you're charging at 25%, 50% or 100% of full capability if you know that your car is going to be charged at the end of your workday? Probably not. Knowing how certain homes or appli-



Photo Credit: NEXTracker

ances are operated provides dynamic flexibility to integrate renewables into the electric grid. It's quite solvable and low cost. I don't see any major issues with getting to very high levels of grid penetration.

The grid in California is already about 34% and it's going to have 50% within 10 years. However, the national grid only has 2.5% percent solar. That's great for us. There's a tremendous growth opportunity before us. We're going to grow, commercialize this technology, kill the dirty technology and bring on more solar. These coal plants keep dying and the nuclear plants are dropping, we can go head to head with gas and generally wind. We're setting our sights for an even bigger pie, which is to not only be number one in the energy sector, but to convert several appliances in the home from gas to electric.

“Keep your eyes open,” that’s my message to the 21-year-old aspiring entrepreneur.

In California, several cities have passed new ordinances for new home construction. There's no gas. It's to be all electric and we really believe in this effort. I've personally converted several of my houses to electric to both save money and prevent emissions. We need to stop heating water by burning gas and use electric heat pump technology to provide a cleaner overall environment, especially in the home and we plan to power all of it with solar.

We are setting very high goals to not only succeeding in the power industry, but succeeding in the building and transportation sectors, moving away from oil to electric powered mobility. Beyond cars, we've seen the scooters take off, the high-speed rail is under construction in California and electric buses are integrating rapidly. Tesla also recently introduced an electric pickup truck and there were 2 million pickups sold in the country this year.

Bottom line, there is a huge opportunity for solar to contribute to the power sector, but also the building sector and the electric mobility sector as we transition to a renewable-powered economy.

What advice would you give to your 21-year-old self?

My advice is to go with your instincts and don't be afraid to take risk. To focus on the idea that what you're doing in some ways is less important than who you're doing it with. You need to find the right people and then set out to do something big that adds value to customers.

You must also fully commit. I tell young people in these entrepreneurial sessions that there has been a lot of glorified people that succeed. The idea that they started an internet company and in a year or two later they sell it for a fortune, that's not the world I come from. With NEXTracker, it did happen quickly, but that success was built on decades of experience and hard work. The world I come from is one where you must work hard for a long time, take a lot of risk. Generally, it's not going to work.

Now, occasionally it does. At NEXTracker, we don't have a sense of entitlement, but rather a sense of appreciation that we can really reinvent the way people use energy and really have that renewably powered. It requires a lot of dedication and sacrifice. It's not a lifestyle industry. It's the energy industry and it is hard no matter how smart you are. Even if you do everything right it may not work. At that point you're going to have to try again.

● Who is your sustainable hero and why?

It would be my father. My dad was very conservative, but he told me something when I was about six years old. We lived in Albany, New York, near the Hudson River, which is great story by the way. It was one of the most polluted waterways in America and now it's one of the most productive waterways for fish and marine life. There was a tremendous amount of contamination that went in to the river and through the hard work of Bobby Kennedy and The River Keepers Association it was cleaned up. My dad told me that he was so angry about these polluters that he wanted to go down and blow up their pipes that were bringing pollution into the river. That had a really big impact on me.

Later, I wasn't happy in my traditional public high school. I asked my parents if I could go away to a mountain school in the outdoors and they supported it. I got my outdoor values by being in this school, that's why it's important for young people to get out into the environment and to hike and learn to care for the environment as I have.

The Future Heroes

This magazine intends to bring our sustainable heroes and heroines to the forefront and celebrate their achievements and insights into how they are shaping our future.

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LOUISIANA

A special note from **Jeff McDermott,** Greentech's Managing Partner

Dear Reader,

On December 11, 2019, Greentech announced that it intends to merge with Nomura to bring more value to clients. This is an ideal strategic combination for both companies. Operating as Nomura Greentech, we will remain the same team, with the same culture and the same intense commitment to our clients' success. The proposed transaction will allow us to bring more value to our clients, by delivering Nomura's integrated structured finance and capital markets solutions and through Nomura's leading access to Asian based companies and investors. This combination will be a force multiplier.

More infrastructure will be built in Asia over the coming decades than anywhere else in the world. Nomura is Asia's leading Investment Bank. Together we will accelerate the growth of sustainable technology and infrastructure.

In Europe, Nomura has power and infrastructure relationships which complement our own and on both sides of the Atlantic, Nomura has strong private equity coverage teams.

Globally, Nomura is highly skilled in Sales and Trading and Capital Markets. They have strong capabilities in project finance, structured financial solutions, leveraged finance and equity and convertible debt capital markets. All things our clients need.

Going forward, our mission and vision will remain constant and Nomura is very much aligned with us. Nomura's leadership is committed to the UN's Sustainable Development Goals and believes that ESG factors will change how investors allocate capital and how corporate Boards and executive teams run their companies.

After 10 years of growth and experience, the Greentech team remains committed to the mission. 1. Serve our clients. 2. Have deeper expertise. 3. Add value to our clients in ways that no other Financial Advisor can. This will not change. We will now provide deeper global reach, more financing products and a strong balance sheet to help our clients accelerate the Sustainable Transition and change the world.

If you are also committed to this essential mission, we look forward to working with you in the future.

Sincerely, Jeff

Please go to www.greentech.com to read or watch the Merger Announcement

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