SUSTAINABILITY THROUGH INNOVATION

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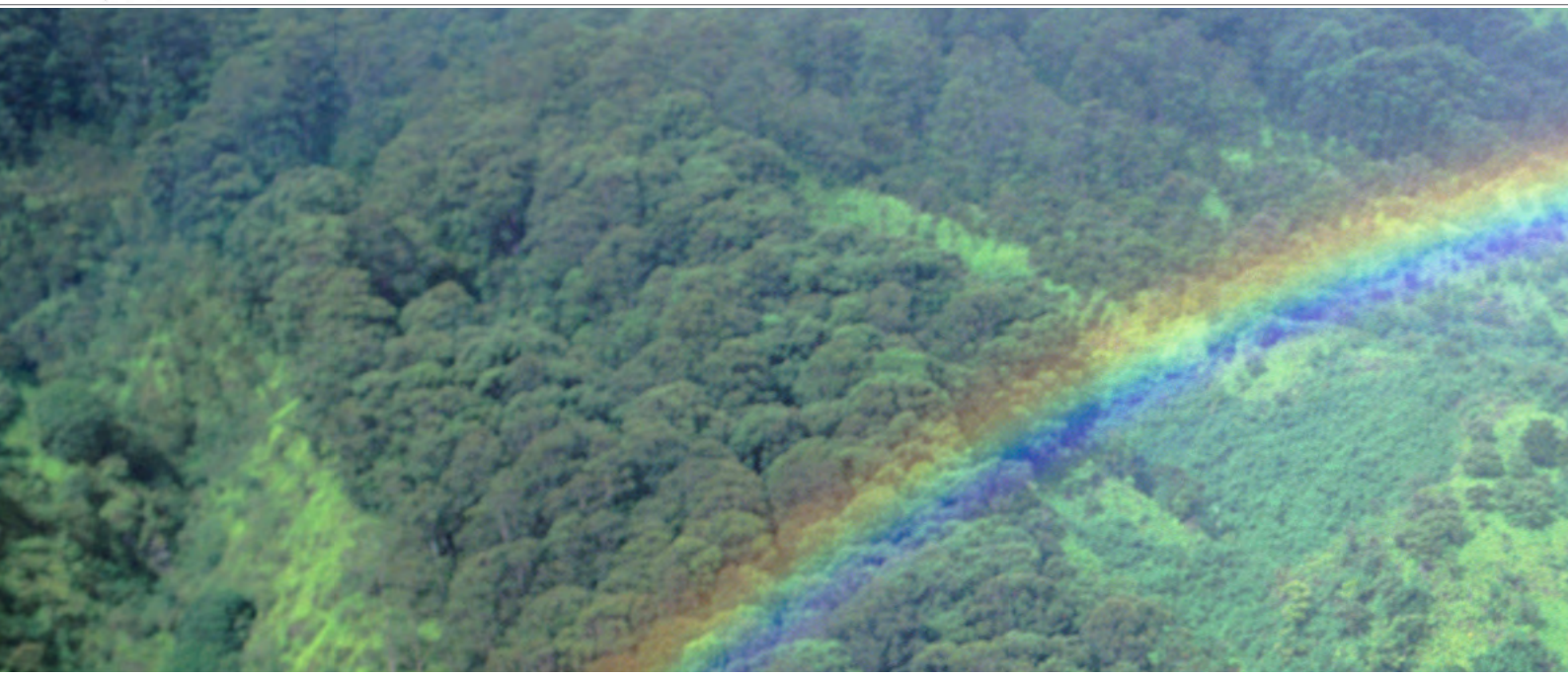
This paper sets out our belief that investment in innovation is the most effective way to achieve a sustainable and prosperous future. It demonstrates this belief with reference to the impact of companies in which we have invested.



We are optimists

We do not think humanity is managing the resources of the world in a sustainable way. Around us we see many challenges. We hear the rising concerns. We do not think it is possible in practice to sacrifice short term prosperity for longer term sustainability. So why are we optimistic?

Our answer is: innovation.

The challenges of sustainability are often presented as a zero-sum game, in which the planet is seen as a closed system, with finite resources, capable of supporting a maximum number of souls with, in effect, a capped standard of living. We think this is defeatist. Humanity has a consistent track record of dreaming up ingenious ways to do more with less – what these days is called 'innovation'.

Although such improvement to the human condition has been a clear historical trend, innovation is highly unpredictable. To deny its existence and its power seems to us to be folly. To plan for it, though, is daunting.

So, at ETF Partners we want to show that venture capital techniques can be used to address our biggest problems.

We are driven by the desire to demonstrate that technological innovation offers compelling answers to one of the most pressing problems of the world – achieving sustainable prosperity. We invest in innovative companies that we think can change the world. We bring the smart money – because investing in innovation requires patience, focus and expertise. By viewing the challenge of sustainability through the prism of innovation, we spot opportunities that others miss. We look particularly at opportunities to enable Smart Industry, Smart Cities and Smart Energy.

It's what we call Sustainability through Innovation.

Big challenges require big ideas

Most investors, institutions and governments want to invest in things that exist today – of course! The lion's share of investment funds and government money directed towards 'green' agendas, whether direct or indirect, targets today's technologies, and also tend to focus on energy generation – primarily solar and wind. It is therefore largely concerned with the deployment of infrastructure. Occasionally some portion of funding will go into novel infrastructure – such as tidal or wave – but typically it will seek technology that is as mature as possible.

The problem with this is twofold.

Existing renewables technologies are not sufficient to meet the full challenge of sustainability. They are made cost effective via government subsidies. Their resulting large-scale roll out is – while welcome – expensive. Governments simply cannot afford to endure the cost of permanent subsidy, so they are indirectly betting on innovative cost reduction to bail out taxpayers. This bet does seem to be working in solar, but it is not so obvious elsewhere. Whichever way you look at it, more resource should be deployed into innovation.

In addition, subsidised markets ultimately deter private sector investors, because they are not durable – a fact that many investors in renewables have learned to their cost.

"On a recent trip to Beijing, we could stare at the sun in the afternoon. The pollution was so thick that the sun was dull red."

The second problem is that sustainability is a far broader agenda than can be addressed simply by new forms of energy generation. On a recent trip to Beijing, I could stare at the sun in the afternoon. The pollution was so thick that the sun was dull red. Clearly, 20th century manufacturing cannot continue to expand as it has been doing.

A lack of commitment to innovation feeds into pessimism about what is possible. The COP21 Paris Agreement is a case in point. The commitment, to reduce the increase in average global temperature to 2 degrees, continues to produce political fireworks – but sustainability whimpers. Predictions suggest that in trying to meet this goal by multi-billion dollar deployments of existing technologies will lead to a 5 degree temperature rise.

Isn't it time to start thinking differently? To be clear, we are not arguing that solar and wind energies should not be deployed. We are arguing that, in addition, there should be far more focus on Sustainability through Innovation.

"The COP21 Agreement continues to produce political fireworks, and sustainability whimpers."

Focus on results

Innovation cannot be mandated by governments. It is not even clear that governments can control or direct it effectively. However, governments can help foster and enable it. They can create an environment in which innovation can flourish, using 'the markets' to reward the best solutions.

There are strong precedents for this, if you look back far enough… Three hundred years ago the British government launched, via an act of Parliament, the Longitude Rewards to determine "a simple and practical method for the precise determination of a ship's longitude at sea". The rewards system was not concerned with the method or technology used – just the result.

In a sense the availability of capital from investors such as the ETF Partners is a modern day version of this type of prize – but whereas the Longitude Board determined, by a set of criteria, who wins, these days the market will decide.

Regulation helps too. No, really.

Another way governments can constructively support innovation is – surprisingly – through regulation.

Legislation is typically thought of as a cost, and as being unfriendly to business. This doesn't have to be the case. The careful application of legislation to intelligent innovation can enhance the competitive advantage of a country. This happens when it is used to accelerate, or even force, market change. When this is done well, it creates new demand for innovative products and services as well as creating new and high-growth industries, generating high quality jobs in the 'early adopter' countries. This is a huge 'win-win'. It is also, from a government perspective 'free', in stark contrast with subsidy-driven policies.

To be clear, there must be a practical innovation in the first place, and it needs to be mature enough to be legislated for. But once a new innovation has proven itself as a viable alternative to incumbent approaches, the regulatory screw can be turned to ensure rapid adoption.

One well-known example is the EU's phasing out of incandescent light bulbs after more energy efficient alternatives became available. (It's not a perfect example because the bulbs were at first slightly dimmer, so some consumers perceived a trade-off.)

Perhaps a better example from our own portfolio is Kebony, a Norwegian company that has developed a revolutionary technique to effectively turn soft wood into hardwood. In one fell swoop (!) governments could now choose to ban all importation of hardwood that has come from rainforests, with no trade-off for consumers.

But before we get carried away, we should acknowledge (to borrow a phrase) an inconvenient truth.

"In a sense the availability of capital from investors such as ETF Partners is a modern day version of the eighteenth century's Longitude prize."

Innovation isn't easy

No; innovation is not easy. And, as we said, it can't be mandated by top-down targets.

Individuals innovate, not Governments. Scientists, engineers, and entrepreneurs do not just see the world as it is, but also as it could be. Such innovation can be chaotic, revolutionary, unpredictable – and world-changing.

This is where investors such as ETF Partners come in. Successfully investing in innovation is a skill in itself – one that requires experience, knowledge and extensive networks. As you might imagine, great opportunities aren't always easy to find, so we are an independent team that is completely dedicated to the task. Above all, we have that rare situational experience gained with high-growth technology companies across Europe, Israel, Asia and Silicon Valley.

Through experience, we have become good at spotting promising innovation, assessing the right time to invest, and supporting those innovators with the guidance, capital and contacts to help them succeed.

While all this could apply to every type of innovation, we are focused solely on innovation that creates sustainability.

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Our future lies in cities

Humanity is becoming city-bound – a big change from our agricultural past. These days more than half of us live in cities, and the proportion that does is only going to increase. So changing how we think of cities, and, indeed what they really are, is key. We are just beginning to re-frame our view, from cities being defined by buildings – bricks and concrete – to being a smart connected framework that supports people – an intelligent network that anticipates, optimises and enables. These smart cities hold immense sustainability benefits.

We were the first investors in Telensa, which has rapidly become the world-leader in smart controls for new LED street lighting and from this vantage point is now becoming a leader in smart cities technologies.

Telensa's systems already control millions of street lights. In fact, it is the world's most widely deployed smart streetlight solution, with over fifty city and regional networks deployed in 8 countries.

It does all this economically because of its special 'ultra-narrowband' internet of things technology. For cities, not only does the system pay for itself in a few years through energy reduction, it also provides a city-wide platform for other new 'smart city applications' as they become viable, such as pollution monitoring, smart parking systems, and even identifying which roads to grit when it snows. Deployments range from Manchester, to Moscow to Atlanta and Shanghai.

Telensa offers the first real and commercial application to enable the smart city.

Telensa

Telensa | Wireless smart city solutions

BY NUMBERS:

Current CO_2 mitigation since 2011: **60,000 tonnes**

Global CO_2 mitigation potential: **15.5million tonnes**

Energy efficiency increase on "dumb" LED street lights: **20%**

Sustainability is the lens we use to view the world

And we see some surprising things.

Rather than restrict us, it gives us an advantage. Sustainability is the greatest challenge of our age – it follows that it is the greatest investment opportunity.

Today we see a number of large industries beginning to change as a result of pressures that, essentially, are forcing them to become more sustainable. The change often goes through three stages;

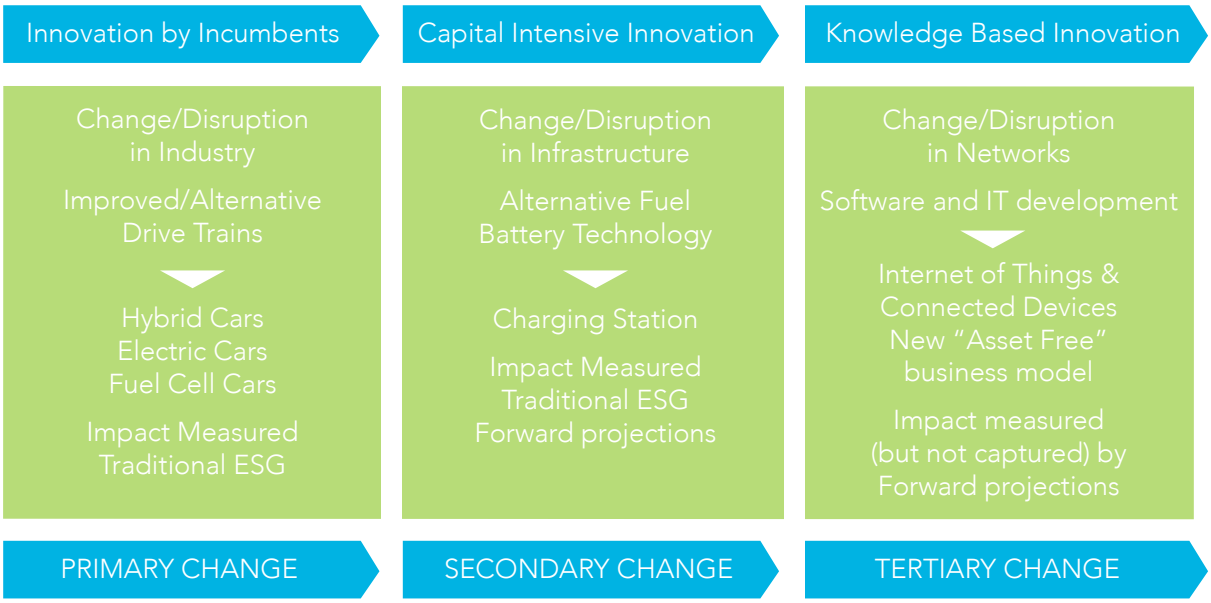
1. Making a more efficient or sustainable version of the same thing
2. Creating new infrastructure to support new approaches
3. Creating new systems and controls to address resulting problems and manage the new approaches better

Take the automotive industry. The chart below shows that in the first phase, companies made the same cars as they had before, but powered by electricity. With the exception of Tesla, few made money here. The second phase was investing in the required infrastructure – again, rarely a profitable stage to invest. The third phase though, is where it gets interesting. This is where knowledge-based companies emerge to address the problems and opportunities created by the new vehicles and 'real' infrastructure. These companies can have a big impact and often require relatively little capital.

"Word has got around that the sector is not right for venture capital' – just at the time when it actually is."

Vulog is an exemplary 'third phase' business in the automotive sector. It is a France-based provider of in-car technology and software that enables "free-floating" car-sharing – allowing you to pick up and drop off a car, anywhere. This radically increases each vehicle's productivity, reducing the numbers of cars, while delivering huge environmental and social impact in the process.

You would think everyone would want to invest here. However, many investors feel 'burnt' by their prior experience of the first two phases of change and often word has got around that 'the sector is not right for venture capital' – just at the time when it actually is.



Parallels with the information technology revolution are clear. Arguably, it wasn't the monolithic Bell Labs, Xeroxs and IBMs of the late twentieth century that reaped the benefits, but the generation of more application-focused businesses that followed – the Googles, Apples, eBays and Amazons.

So with sustainability.

Those nimble, capital-light businesses that can stand upon the shoulders of giant sunk investment, and deliver the promise of sustainability to the world, will reap rewards out of all relation to their own costs.

Upcycling – too good to be true?

We hear a lot about recycling. Clearly this is extremely useful, even though often it is pretty 'low-tech' and hard work to generate real economic returns. What, though, if we could innovate to 'up-cycle' and actually create better and higher value products?

Take E-Leather, a British company that makes a fantastic product from otherwise unusable tannery waste. It makes a modern composite leather that is functionally superior to 'traditional' leather and yet looks, feels and even smells identical. Among other things, it can be made significantly lighter and at the same time more durable and fire retardant. As a result, it has grown rapidly to become the largest airline seating materials supplier in the US.

In achieving this it has also significantly benefitted the environment. Each seat made with E-Leather weighs one kilogram less than if traditional leather were used, saving a large amount of weight in a plane and so saving a large amount of fuel. If E-Leather was adopted globally by the commercial airline industry it would result in an annual saving of approximately 50 million tonnes of CO_2 – over 6% of the annual emissions of the entire industry.

When you consider, moreover, that animals on factory farms produce 130 times as much excrement as the entire human population, coupled with the ever decreasing availability of land for raising cattle and the grains that feed them, there is a massive potential environmental impact, not just in carbon abatement, but also in water and land usage for a company that disrupts the leather production industry.

Another upcycling innovator from our portfolio is Kebony.

Kebony uses ground-breaking wood modification technology to transform conventional softwood into what is effectively hardwood. (It can also further harden readily available, sustainably grown, temperate hardwood). Kebony wood in fact has comparable or superior technical attributes to tropical hardwood in terms of durability, hardness, maintenance requirements and dimensional stability.

Kebony therefore provides a way for us to protect against the depletion of tropical rainforest and provides a substitute for the damaging traditional impregnation technologies used on softwood today (which rely on biocides and toxic chemicals). It also represents

a growing disincentive for illegal logging particularly of the so-called, and much sought after, old-growth Burmese teak – now under extreme threat – for which Kebony is the only substitute.

Kebony has key applications in multibillion markets such as outdoor decking, flooring, windows, cladding and furniture. Their product is increasingly being adopted by forward thinking architects, developers and their now environmentally aware clients.

If Kebony's technology was implemented globally it would reduce the equivalent annual carbon output of 28 million Europeans.

E-Leather | Creating high-tech leather from tannery waste

BY THE NUMBERS:

Current annual CO_2e mitigation in airline fuel saving: **190,000 tonnes**

CO_2e mitigation potential in annual airline fuel saving: **50 million tonnes**

Toxic chemicals used per m2 of standard leather: **2.5kg**

Toxic chemicals used per m2 of E-Leather: **0.04kg**

Toxic chemical reduction potential: **4.9 million tonnes**

Kebony | Don't use hard wood, grow soft wood and make it hard

BY THE NUMBERS:

CO_2e mitigation since 2011: **540,000 tonnes**

CO_2e mitigation potential: **244 million tonnes**

Toxic chemicals saved since 2011: **633m³**

Toxic chemical reduction potential: **861,311m³**

But is it green?

In 2014 we invested in a cyber security company called MWR InfoSecurity. People said, 'Nice deal. But how is it green?'

We don't get asked that anymore.

It is increasingly obvious to many that it is not only banking networks and internet websites that can be undermined. Hackers, criminals and nation states are attacking all types of networks and devices. "Green infrastructure" is particularly vulnerable, as evidenced by recent attacks on the electric grid in the Ukraine, the Tesla car, the San Francisco tram/BART, and the German smart meter network.

All these networked computing devices, from the smallest Internet of Things sensors to the largest mainframes controlling the grid, are being targeted, and the damage caused can have serious physical and monetary consequences. Just ask the merchants up and down the East Coast of the US, who suffered huge outages brought on by a distributed denial of service attack (DDoS) against the internet infrastructure they relied upon. Many of the devices that drive the smart city today (CCTV cameras and home monitors) were utilised as part of this attack due to their poor security. Millions of dollars lost. Customers and merchants in an uproar.

"If we want to have a sustainable world, then someone has to innovate to secure it..."

If innovators such as MWR do not solve issues around cyber security around the smart city, smart industry and smart energy, then companies and consumers will not deploy these new technologies. If you want to have a smart grid, and benefit from distributed energy, then someone has to secure it. If you want to have driverless cars, trucks and planes, then someone has to secure them.

If we want to have a sustainable world, then someone has to innovate to secure it.

The point is that by thinking about innovation broadly, and through the lens of sustainability, we unmask innovations that can have a truly transformative sustainability impact.

How do we know they can achieve that? If you are still asking that question, you haven't been listening. We don't know for sure. Not in advance. We will only invest if we see the potential, of course, and if we even have to worry about adequate potential then we just don't do it. It's that simple.

From an 'impact' perspective, this is where it gets interesting.

"By thinking about innovation broadly, and through the lens of sustainability, we unmask innovations that can have a truly transformative sustainability impact."

What can't be measured matters most

Reporting on 'sustainability', 'impact', 'ESG', 'CSR', is an industry in itself. Measuring, tracking, form filling – the credo being that what gets measured gets managed.

For large and established companies with a significant footprint, there is a good place for such an approach. Sometimes though, measurement masks meaning – creating workload and merely managing what can be measured, somewhat for its own sake. For fast-growing, innovative companies in particular, their current environmental footprint is an insignificance compared with their potential sustainability impact – and sometimes even a distraction. The challenge is to be clear about potential future impact, and how to achieve it.

So we want to be blunt. While we are as analytical as possible in measuring the potential impact of our companies, the data we have (such as it is) requires heroic assumptions – and the further forward we look the more inaccurate we will be. What we do know, whether we measure in CO_2e or water consumption, or tonnes of hazardous waste, is that the numbers – and the impact – will be big.

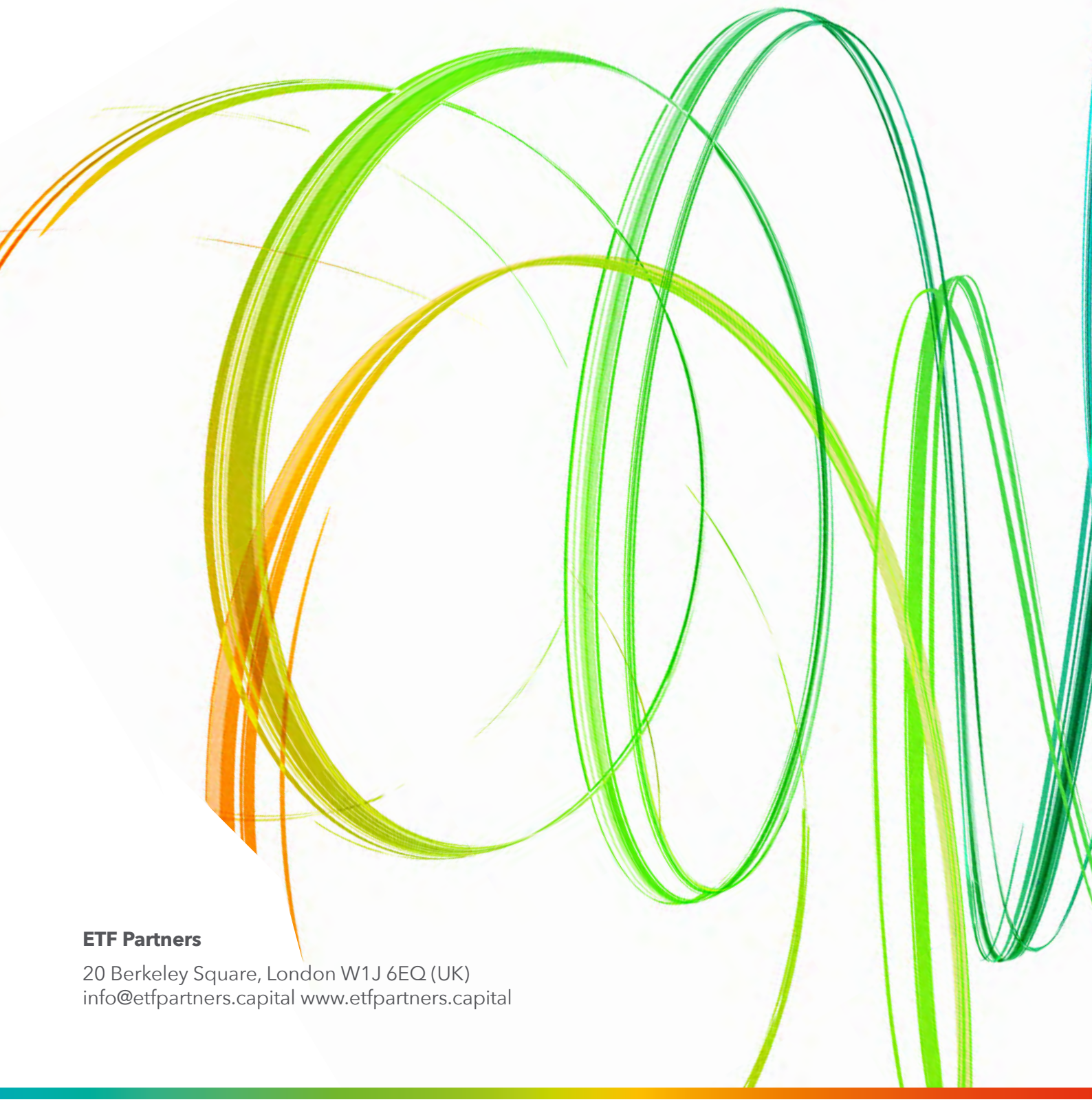
Potential impact is more important to us than ease of measurement. In fact, we are actually moving further away from being able to measure things as we seek greater impact. We are looking for potential that is off the charts. We have therefore moved more towards having simple belief statements of the impact potential for each of the companies we invest in, backed up over time by a fairly subjective assessment of how they have done so far. So, from our perspective, the state of the art remains, for now, very much an art.

All this raises the question of where we are making a difference. Let us take you to a place where ingenuity and innovation has been identified, supported and is being tried and tested in the threshing floor of commercial application; it's a place where the chaos of inspiration becomes organised into a focused revolution, determined to change the world.

This is how you get there: www.etfpartners.capital/portfolio

Welcome.

Sustainability through Innovation



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