Global Opportunity Explorer 2019

Insights

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Global Opportunity Explorer 2019

Insights

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FOREWORD

From climate risks to climate opportunities

Global Opportunity Explorer 2019 Insights celebrates the ongoing activities on the Global Opportunity Explorer, which is now the world's leading open ecosystem for sustainable solutions. The platform is the first of its kind that identifies, verifies, and presents high-quality solutions that exist in the market.

Where others regularly examine the risks that threaten our businesses, societies, and everyday lives, the Global Opportunity Explorer is a testament to those who turn risks into opportunities. We are not blind to the need to manage risks. Far from it. But instead of merely curbing or avoiding risks, exploring their inherent opportunities can be truly transformational.

This year we focus on climate change, which is considered one of the most urgent risks to be tackled, and is already determining how markets are evolving. Factors like new consumer preferences, new regulations, changing investor focus, and market prices, will increasingly favour the climate, and create a new kind of pressure on companies. To understand this new reality of the business world, we investigate six sectors and analyse how selected companies have turned climate risks into climate opportunities.

You too can take part in this work. It is free for anybody to submit solutions to the Global Opportunity Explorer, in the form of products or services, and in turn have them vetted and verified by Sustainia's experts, if qualified. The platform is a tool for those looking for investments, new employees, special advice, or partners, in an era where sustainable solutions are urgently needed.

Having reached 1,000 available, scalable and financially viable sustainable solutions, we now wish to expand the Global Opportunity Explorer to include thousands of new solutions that address climate change.

This kind of growth is much needed for us to address climate change effectively and to turn a 'state of emergency' into a 'state of emerging innovation'. We hope this selection of insights - and the Global Opportunity Explorer - will inspire you to bring new solutions to the table, and help turn climate risks into climate opportunities.

Remi Eriksen
Group President & CEO
DNV GL

Lise Kingo
CEO & Executive Director
UN Global Compact

Rasmus Schjødt Pedersen
CEO & Senior Partner
Sustainia

The biggest market disruptor

Not only is our physical climate changing, but so is the business climate. Climate change is placing increased pressure on businesses from multiple stakeholders, making climate change the most significant market disruptor in the years to come. Climate change will challenge established businesses and sectors and create a wide range of new business opportunities, market possibilities, and business alliances. Companies not able to seize the opportunities or respond to the risks and pressures will lose. Others will prosper and confirm why climate change is one of the biggest opportunities in generations - potentially ever. But winning the climate game is not about your business sector or the size of your turnover, but more a question of mindsets - how business leaders understand and respond to the new market reality.

A new climate-driven market reality
In *Global Opportunity Explorer 2019 Insights*, we argue that this new reality will demand a dynamic shift in business mindsets. Businesses will have to move away from the ambition of being best in the world, to being best for the world, representing two sides of the same coin in the new climate-driven market. Given the time pressure imposed by climate change, a rapid shift is vital. The sooner companies realise this, the greater the chances are that they will be able to gain from all the business opportunities available in the new market reality.

Seven 'cross pressures' effectuated by climate change will determine future markets
Global Opportunity Explorer 2019 Insights has identified seven 'cross pressures' brought about by climate change that will change the rules of the game on how businesses operate. Businesses will have to adjust to these new pressures from all stakeholders: pressure from new regulations, new consumer preferences, pressure from resource shortages, pressure from new competitors offering 'climate-safe' alternatives, pressure to implement new technology, pressure from investors increasingly looking for sustainable investments, and finally, time pressure, given that most businesses need to transform within 1,000 days.

Six sectors documented
Global Opportunity Explorer 2019 Insights zooms in on six sectors that are among the most influential for the future of the climate. The companies contained within these six sectors are in a unique situation to change their businesses, as determined by their ability to turn climate risks into climate opportunities. We analysed these sectors to understand their potential to reinvent themselves and thrive under the conditions of the new market reality of climate change. They are: connectivity, energy, finance, built environment, mobility, and food.

Meet the climate leaders
Winning the climate game is basically about mindsets and leadership. Throughout this publication we feature thought leaders, climate change experts and leading business CEOs who are pioneering the transition to the new market reality. Together, they tell the story of the mindset, strategies, and leadership needed in the coming years. We open the series of interviews with an announcement from the CEO & Executive Director of the United Nations Global Compact Lise Kingo who invites global companies to build stronger partnerships and push for a low-carbon economy.

Global Opportunity Explorer 2019 Insights looks into the solutions, strategies and mindsets of the companies and leaders that have understood the rules of the game of the new market reality. They have turned climate risks into climate opportunities and can serve as best practice examples, demonstrating how to make the seemingly impossible possible.

INTRODUCTION

How to win the climate game

Climate change is placing seven 'cross pressures' on businesses, which makes it the biggest market disruptor in the years to come. This will create a new market reality with new winners and losers. Winning the game is about innovative solutions, daring strategies, and new mindsets.

By Erik Rasmussen

Founder of Sustainia & Co-Founder
of the Global Opportunity Explorer

Expect that the next 1,000 days will decide if you win or lose the climate game - the game that might be the biggest business disruptor for generations to come. 1,000 days to transform a company or change strategies is not a proven and scientific fact, it just illustrates the accelerating turbulence in global markets. A fast glance over the past few years with new digital breakthroughs, escalating political and financial turmoils, threatening climate changes, and our commitment to fulfilling 17 Sustainable Development Goals indicates what is ahead of us. We are facing a period with exponential changes - changes that will challenge our basic ideas on how to develop societies and run businesses. Some sectors and corporations may not have 1,000 days to adjust.

Global Opportunity Explorers 2019 Insights argues that climate change will be the biggest market disruptor in the coming years - for a couple of reasons: 1) Climate change calls for urgent and systemic cross-sector solutions. Neither the private or public sector can solve complex challenges like climate change alone. It takes new partnerships and market clusters. 2) Climate change is a risk multiplier, strongly interconnected with all other Sustainable Development Goals. Even if climate action is just number 13 among the global goals it interferes with the remaining 16. Successfully realising all of the goals fundamentally depends on the outcome of the climate war.

One thing is that the physical climate is facing dramatic changes. But so is the business climate. Climate change is already challenging and even 'endangering' the future of many businesses and sectors. But at the same time, climate change is creating a range of new business opportunities, market possibilities, and business alliances - it is a game with new winners and losers. It all depends on how fast each corporation "translates" the signals of climate change in due time.

The market revolution

The market for climate solutions is huge and difficult to measure by exact numbers. The need for developing and implementing fast solutions was strongly documented over the past year. Not only by new heat records, but through a series of scientific analyses and reports, all stating that we might have lost the battle for a 2°C temperature rise but are heading for 3-4°C. DNV GL's latest *Energy Transition Outlook* predicts that even with a fast transition to renewables, we will most likely end up with a 2.6°C increase above pre-industrial levels by the close of this century. Other credible scenarios predict a truly catastrophic 4°C, or even higher.

Challenges of this magnitude call for new approaches. We have to reinvent business models and public-private partnerships, scale up research and development, and motivate governments and businesses to interact closely to develop innovative regulations to support new types of solutions. These kind of part-

nerships are convincingly spelled out in the UN Global Compact's new initiative "Ambition Loop". *See article by Lise Kingo page 12*. The perspective is not only interesting, it is crucial. Without governments' support and the development of stable and long-ranging frameworks we cannot win the climate battle.

In this publication we have looked into six sectors which are strongly affected by climate changes. They include connectivity, energy, finance, built environment, mobility, and food. We outline why each sector can be a market game-changer - and are all supported by a number of concrete solutions. The estimates of the total market value of the six sectors exceeds trillions of dollars - economic opportunities that can be realised over a relatively short number of years. It might foster new types of climate entrepreneurs and companies, and turn the old market structures upside down - unleashing what could be remembered as a climate-market revolution.

But the ticket to these market opportunities is a new business approach. Any company and executive has to understand and react to seven cross pressures that will change the rules of the game.

Seven cross pressures
The new market reality is defined by seven pressures:

1) New political pressure: To achieve the commitments of the Paris Agreement, most governments will increasingly, in some cases drastically, introduce new regulation favouring more sustainable business and market growth. These regulations will increasingly favour climate-friendly business. Some countries are setting deadlines to phase out fossil fuels, or incentivise sales of electric vehicles.

2) New resource pressure: The demand for many crucial resources is growing rapidly, and climate change is putting a great strain on natural resources - for example water and food. In many cases we might experience a lack of various resources, making prices surge and forcing businesses to look for new kinds of resources.

3) New consumer and employee pressure: Consumer choices are becoming increasingly ethical and climate-conscious, and that trend will only grow as the climate challenge is more broadly understood and accepted. Talent will increasingly be attracted to jobs and companies that are operating sustainably and with a purpose, shown clearly by the millennial generation's job preferences.

4) New market pressure: Alternative and new 'climate-safe' products and markets are emerging everywhere, with a rapid rate of innovation. These new alternatives are developed by incumbents as well as start-ups.

5) New technological pressure: Digitalisation is one of the most disrupting

“To win or lose the climate game is a question of mindsets and the innovation power in the boardrooms and executive suites”

factors in the 1,000 days to come. It might too be the most rapid and efficient weapon in the climate war deciding who will win and who will lose.

6) New investor pressure: Sustainability is gaining ground in the minds and wallets of investors. The trend is that they will gradually steer away from the environmentally harmful sectors and businesses, as these will increasingly be perceived as risky territory.

7) New time pressure: Companies need to adapt to the new market reality within a very short time frame. New companies will arise and prosper faster than ever, and old, well-established companies will fade and fold faster than ever. The difference between a risk and an opportunity is how soon you discover it. And the climate game is a fast game.

This market reality will no longer be driven only by the traditional and well-established markets. All corporations must rethink their missions, strategies, products, and services in order to thrive in climate-disrupted times.

The elimination race

The sectors, industries, and companies not able to respond to the risks brought about by climate change will lose - maybe not tomorrow, but they will lock themselves into a trajectory that will make them disappear in the years and decades to come. The most obvious examples comes from the fossil fuel industry – the companies working with coal, oil and gas. Here we are already witnessing new political regulation, investors pulling back their allocations, and new industries and technologies challenging the market with renewable alternatives - and looking ahead this pressure will only grow if you take the global political commitments for face value. Thus, companies within this sector face a stark choice of working progressively to diversify, or face inevitable long-term decline.

But the fossil fuel companies are just one example out of many. There are a number of business sectors and companies next in line - those who are also not prepared for imminent political regulation, still putting great pressure on global resources, and not looking closely enough at the development of consumer demand trends.

The elimination race is already happening. A series of new companies fit to grow in the climate-driven markets are mushrooming and new solutions, alliances, and markets are starting to see the green light. Many of the world’s biggest companies are already trying to adjust themselves to the new market reality. Today nearly half of the Fortune 500 companies have set clear energy targets or greenhouse gas reduction goals. Now the challenge is to fulfill them and encourage the other half to follow suit. ‘The winner takes it all, and the loser stands small’ - or disappears.

It is all about mindsets

There is no doubt that climate change is the biggest challenge ever and no doubt either, that it can be turned into the biggest opportunity ever. It is all a question of mindsets. Numerous reports and analyses document both challenges and potentials. To win or lose the climate game is a question of mindsets and the innovation power in boardrooms and executive suites. When sustainability became a hot issue, many of the large companies hired sustainability officers, established sustainability departments, and issued sustainability reports - and the company could demonstrate its sustainable profile and brand. But that was yesterday. Today and tomorrow climate change and the 17 Sustainable Development Goals have to have top board priority and decide the overall strategy of the company and its core values.

Any company failing to meet these criteria will be among the losers. And any company embracing this concept is a potential winner. Therefore conquering and benefitting from the expanding climate markets will not be a competition between types of companies but types of executives and mindsets. Here only the right mindsets can turn climate risks into climate opportunities.

Join the most important mission of our time

The *Global Opportunity Explorer 2019 Insights* exemplifies the work of Sustainia's mission of turning global risks into new opportunities. This past year we focused on climate change for obvious reasons. It is not only the biggest and most urgent global challenge right now, it is also sending out the loudest call ever for new breakthrough solutions, new mindsets and new ways of organising the entire global community.

It will be the ultimate test of how the world can form alliances that within a few years, can turn this challenge into a safe and sustainable future for mankind. This will without any doubt demand that we bring about and complete a new industrial revolution. But this revolution must be different from all past industrial revolutions. It has to be value-based, extensive, planned, and global - and it has to be the fastest in history. No less. And businesses have to play a key role in this by setting the course, providing the solutions, and creating the new markets.

In 2019 Sustainia celebrates our 10-year anniversary as the catalyst for turning risks into opportunities and solutions. We have served that purpose by building the world's largest platform with sustainable solutions, already featuring 1,000 sustainable breakthrough solutions.

Here we present a selection of insights, we demonstrate and communicate best practice and how selected sectors deal with the climate change risks - and why it demands new business models and mindsets. We introduce outstanding climate leaders whom we have interviewed within the past months and who all signal the mindset needed to kickstart revolutions.

Sustainia will continue to focus on how these great cases can be part of a global ecosystem that innovates systemic solutions to growing complex global challenges. That is how we will play our part, and we invite you to join us | sustainiaworld.com

“We will need far more corporate leadership”

A principle-based approach to climate change

Climate change has become the new reality. It is forcing businesses to build strong partnerships and push for a low-carbon economy. Frontrunners are already proving that multi-stakeholder partnerships are key for sustainable, inclusive and principle-based solutions.

By Lise Kingo

CEO and Executive Director
of United Nations Global Compact

The recent report by the Intergovernmental Panel on Climate Change (IPCC) sent a stark reminder of both the immense challenge of climate change and the dramatic scale and pace of the effort required to keep our world safe. In order to hold global warming to an increase of 1.5°C above pre-industrial levels, the report says, we have to slash greenhouse gas emissions by about 45% in 12 years.

No easy task, but climate change is a daily reality, affecting every country on every continent. It is disrupting national economies and affecting lives, across peoples, communities and countries - with the world's poorest and most vulnerable people affected the most.

We face enormous challenges that can't be solved by any country or any company on its own. Climate change is the defining challenge of our time. Yet, it is still possible to limit warming to 1.5°C and the ambition is there. At COP24, member states reaffirmed the timeline agreed in Paris for countries to submit national climate commitments by 2020.

Governments know it, companies know it: Climate action is also the mega driver to achieve the 2030 Agenda for Sustainable Development. Or, in other words, urgent action to halt climate change and deal with its impacts is integral to the successful implementation of all 17 of the Sustainable Development Goals.

The private sector has a critical role to play and every reason to do its part. Last year we saw an unprecedented rise in the number of companies aligning with the Paris Agreement. One-fifth of Global Fortune 500 companies have now committed to set science-based targets. The New Climate Economy report suggests that all Fortune 500 companies set science-based targets by 2020.

As these companies recognize that greater ambition reaps greater benefits, some are now also pursuing 1.5°C aligned emissions reductions targets and committing to be net-zero by 2050.

Moving up the agenda

Climate change is the highest priority ESG issue facing investors today. We have seen an upward trend of major investors that are making serious efforts to manage the risks and capture the opportunities that climate change presents. Companies are acting because these

investors, their employees, and consumers expect them to capture new market opportunities and prepare for risks in a changing climate. Over 400 investors representing $32 trillion call for a carbon price between $38-100 by 2030.

The world requires more urgency and far more ambitious corporate and governmental action to cut emissions by half by 2030 and reach net zero emissions by 2050. All companies need to align their business strategies with what the science says is needed to avoid the worst impacts of climate change. This will take unprecedented changes in all aspects of society.

New forms of inclusive multilateralism
We live in a critical time in human history. While geopolitical issues remain challenging, we need new forms of cooperation and a new networked multilateralism, with the UN at its centre, but with closer links with the private sector, civil society and other stakeholders. Networking and being inclusive is essential in the shift toward a net-zero world so that we can bring about an economy-wide transformation on a scale we have never seen before.

This call for an inclusive multilateralism requires raised ambition, and is an opportunity for every business leader to take climate action based on a principles-based approach that places human rights at the centre of their strategy.

At the UN Global Compact, we continue to be at the forefront of mobilizing and challenging the international business community to do its part to help create the world we all want. As businesses around the world are rising to the challenge of building a low-carbon economy and accelerating action on climate change, we can no longer call isolated corporate climate action 'leadership'. It remains vital that all climate action and corporate operations are interlinked with the achievement of the Sustainable Development Goals and promotion of human rights.

Opportunity for a great "Ambition Loop"
The deep changes needed to achieve the Paris Agreement and the Sustainable Development Goals will require transforming value systems, establishing a culture of integrity and aligning business practices with universal principles.

With hundreds of businesses pursuing bold climate change solutions and hundreds of countries updating their national climate plans, the opportunity for greater ambition abounds. Businesses now have the opportunity to send strong signals to government and build commercial demand with bold targets to invest in climate change solutions. Responsible business leaders do so in a manner that inspires, and can be replicated in the world around them.

From carbon pricing to science-based targets, commitments by the private sector at the global level have informed policy shaping at the country level. These global commitments are encouraging governments to ramp up their Nationally Determined Contributions (NDCs) towards the Paris Agreement implementation.

When businesses set ambitious public commitments, governments have more political support and confidence to pass ambitious climate policies. When governments set effective, clear policies that favor innovations to reduce greenhouse gas emissions, businesses have greater certainty and incentives to invest. This is an Ambition Loop: bold business leadership supports bold policy action, that in turn accelerates action and investment, and unlocks further opportunities with clear benefits to people and natural ecosystems while limiting global warming to 1.5°C.

Mobilising businesses everywhere
Governments looking to speed progress on climate and development goals will need to find champions among those companies with shared interest in policies that limiting global warming to 1.5°C. To this end, we will need far more corporate leadership to help assess the implications of climate change, integrating their climate commitments into policy positions and providing constructive, responsible input to government.

In this spirit, the UN Global Compact will mobilize businesses everywhere to support the UN Secretary General's call for raised ambition and leadership, and create the "tipping points" needed to make climate action business as usual.

Together with the London-based think-thank Volans, we will mobilize leading companies to commit to building a new carbon economy and come forward with new breakthrough solutions where businesses are sequestering more carbon through their operations than they emit.

Leading up to the UN Secretary General's Climate Summit in September 2019, the Caring for Climate initiative and the UN Global Compact Action Platform on Pathways to Low-Carbon & Resilient Development will serve as an incubator to help companies around the world to provide ambitious and meaningful contributions.

Let's work together to transform business models and spark breakthrough innovation. There is still time to secure the world that we know. We are at a critical juncture, where every day climate change is moving faster than we are, and where every half degree of global warming will make a world of difference. Although the window is closing fast, there is still time to change course and move toward a 1.5°C pathway. We have the technology, the tools, and most importantly we know the actions that are necessary to close the emissions gap.

Together we can take urgent action to combat climate change and its impacts and send strong market signals, accelerating pathways to low-carbon and resilient development. By catalyzing multi-stakeholder dialogues and partnerships, we can create more sustainable, inclusive and principle-based solutions.

“We are part of the solution”

Inge Jan Henjesand,

President of BI Norwegian Business School

BI has made the conscious decision to be a part of the solution rather than the problem. We are working to integrate the UN’s sustainable development goals in all our programs, research and operations. Our ambition is to contribute to a sustainable societal development by equipping students with skills and a mindset to face future challenges in a sustainable way.

Guide

Interact with the solutions, strategies, and mindsets for a new market reality.

The *Global Opportunity Explorer 2019 Insights* showcases how to turn climate risks into climate opportunities.

New breakthrough **solutions** are vital in moving us towards a climate-safe future. Within six sectors - and selected among 1,000 solutions on the Global Opportunity Explorer - we feature examples that clearly show how climate change risks are fostering new business innovations and possibilities.

To gain a better hold of the **strategies** necessary to thrive in the new market reality, we have also included examples of why, and how, some of the world's most innovative companies act, and their business case for doing so.

New **mindsets** drive companies towards the new market reality. Here, and on the Global Opportunity Explorer, we feature thought leaders, climate change experts, and pioneering CEOs who are leading this transition.

Explore more
Scan the QR codes and continue on goexplorer.org where you can find more information about the solutions, see how they impact the Sustainable Development Goals, connect directly with the solutions or explore how they relate to other sectors or challenges.

We highlight solutions across the following six sectors:

Connectivity

Energy

Finance

Built Environment

Mobility

Food

Why these solutions

To determine whether or not a solution is qualified to claim a spot on the Global Opportunity Explorer, we use six assessment criteria:

1

Readily available

Global Opportunity Explorer solutions must be more than just vague ideas or blueprints. Candidates must be or have concrete projects that are making an impact in societies and markets. They must be readily available products or services, meaning they have already done something before and are able to do the same again.

2

Commercially viable

Financial sustainability of projects is a key quality for solutions, which should not completely rely on a funding or donation-based business model.

3

Positive environmental impact

Global Opportunity Explorer solutions must have a direct positive impact on climatic or environmental factors, at some scale. There can be challenges and trade offs associated with all companies but overall it must be deemed the solution has a net positive benefit.

4

Improve quality of life

Global Opportunity Explorer solutions are assessed on their ability to deliver a better and more sustainable life for the people impacted by the solution. Solutions should enhance well-being either at an individual or societal level.

5

Innovative

Global Opportunity Explorer solutions should have a certain je ne sais quoi – they should provoke excitement and intrigue through their uniqueness or innovative nature. Innovation is a notoriously difficult property to measure and it is rare to find a product or service that is truly unique, but solutions that offer a product or service that is common-place may not be featured on the Global Opportunity Explorer.

6

Other exclusion criteria

Being part of the following industries: tobacco, weapons, pornography, gambling, drugs.

A world of solutions

Taking Root | Canada | Connectivity
Building Livelihoods Through Reforestation

Geotab | Canada | Mobility
Intelligent Transport Monitoring Supports Safer Cities

Brisk Synergies | Canada | Mobility
Machine Learning To Improve Road Safety

Bluetown | Denmark | Connectivity
Wireless Internet Stations Connect The Unconnected

Everimpact | Denmark | Built Environment
Real-Time Emissions and Air-Quality Data for Cities

Beyond Coffee | Denmark | Food
Farming Mushrooms with Coffee Grounds

Regen Network | USA | Connectivity
Ecological Blockchain For Agricultural Regeneration

Consensys, LO3 & Siemens | USA | Energy
Brooklyn's Blockchain-Enabled Energy Microgrid

Agility Fuel Solutions | USA | Energy
Storage Cylinder Innovation Unlocks Potential for Biogas in Transport

Ecovative | USA | Built Environment
Magic Mushrooms: Using Mycelium to Create Packaging and Building Materials

Golden Gate Zero Emission Marine & Hydrogenics | USA | Mobility
Pioneering Hydrogen-Powered Ferry

ReGrained | USA | Food
Crafting New Uses For Brewery Byproducts

Aqutonix | USA | Food
Water Efficiency Gives More Crop Per Drop

Leafy Green Machine | USA | Food
High-Tech Hydroponic Urban Farming in Shipping Containers

Engaged Tracking | UK | Finance
Leveraging Decarbonisation Through Investment

Snact | UK | Food
A Delicious Protest Against Food Waste

Ignitia | Ghana & Sweden | Connectivity
SMS-Based Weather Forecasts For Tropical Farmers

Scan and explore a selection of solutions across six sectors telling the stories of how climate change risks can be turned into business opportunities

Telenor | Norway | Connectivity
Birth Registration Using Smartphones

DNV GL | Norway | Connectivity
Digital Mapping Tool Aids Disaster Management

Enersize | Finland | Energy
Software Drives Compressed Air Efficiency

Storebrand | Norway | Finance
Sustainable Asset Management

Loudspring | Finland | Finance
Financial Capital Can Boost Natural Capital

Ecosubsea | Norway | Mobility
Ship Cleaning Robots Cut Emissions And Costs

Climeon | Sweden | Energy
Utilising Waste Heat to Generate Power

Ubitricity | Germany | Mobility
Intelligent Charging For Electric Vehicles

Climate Recovery | Sweden | Built Environment
Fresh Approach to Indoor Air Ventilation

Sustainer Homes | The Netherlands | Built Environment
Rethinking Construction with Modular Wooden Homes

TRINE | Sweden | Finance
Crowdfunded Solar Investments for the Global South

Studio Roosegaarde | The Netherlands | Built Environment
Diamonds from the Dust: Rethinking Particulate Pollution

Miniwiz | Taiwan | Built Environment
Putting Waste To The Test To Create New Materials

SHV Energy & Neste | The Netherlands & Finland | Mobility
Europe's First Bio Liquid Petroleum Gas

Telenor & Yoma Bank | Norway & Myanmar| Finance
Mobile Money Opens Doors for the Unbanked in Myanmar

Futurepump | Kenya | Food
Solar Irrigation Pumps For Smallholder Farmers

Bombora Wave Power | Australia | Energy
Making Waves in Renewable Energy Generation

"De-risking the political process is the new CEO agenda"

Paul Polman

CEOs must be activists

CEOs play a key role in tackling climate change and the entire sustainability agenda. This is the clear message from former Unilever CEO, Paul Polman.

"CEOs have to step up to de-risk the political process." That is the new CEO agenda for the next 1,000 days, says Paul Polman. He has just retired as CEO for Unilever and has in recent years been one of the most prominent leaders and speakers on sustainable capitalism.

Paul Polman is calling on business leaders to step into a leadership void and take lead in the climate change battle and the sustainable transformation. Polman argues that post-war institutions built for an economy dominated by US and European wealth are losing the battle for the global agenda, set a little more than 1,000 days ago. Though many institutions are adapting by reaching out to the private sector, the world is seriously behind.

"We are 15% on the way in the first 1,000 days since the adoption and frankly the plane hasn't taken off the runway yet... We have to accelerate," Polman says.

He still supports the work of international organisations like the UN Global Compact that he is currently Vice Chair of, but insists that business must be in the driver's seat to speed up the climate change and sustainability agenda. CEOs must take responsibility.

"The political system that has been designed to deal with global issues dates from the time of Bretton Woods...This was in 1944 when 80% of the global wealth was in Europe and the US... Now we can be cynical about politicians, we can be mad about them, we can laugh at them but that doesn't serve anything, we have to fill that void," says Polman.

De-risking politics

Polman wants CEOs to step in and de-risk politics like they managed to do in Paris in 2015, when the private sector played a very important role in delivering the landmark Paris Agreement on climate change: "We've seen an enormous acceleration, once that signal was given, the green bond market started to move, the vestiture market started to move, people started to call for a price on carbon. The disclosure of financially-related risks is happening now, so we saw an acceleration because the financial market came on board," he points out.

For Polman, the Paris Agreement showed that we can succeed in transforming the world by acting together.

Sustainable CEOs are respected

An important part of Paris' success was a new model of business leadership based on a wider purpose than just economic gain: "Your company must be here for a purpose other than shareholders," says Paul Polman.

According to the former Unilever CEO, business leaders also have to become activists because their customers expect it. This is supported by research that shows that despite the low trust in executives, millennials believe CEOs have a responsibility to take a stand on sustainability issues. A majority would pay more for ethical brands. Doing good benefits the bottom line as well.

With Polman as CEO, Unilever's sustainable business model generated a 300% shareholder return over the last 10 years, double the rate of the market. In 2017 the consumer products giant's sustainable brands delivered 70% of its growth.

"While trust in companies is low and trust in CEOs is sometimes lower, the citizens of this world still see the private sector as a solution provider to many of the problems. And the CEOs that have a point of view, that speak up, are actually well appreciated" says Paul Polman.

Using connectivity for doing good

As much as connectivity tech is the beating heart of changing the future, it is also a double-edged sword. On one hand, the sector is deeply engulfed in vast energy consumption, massive e-waste and raw material depletion for manufacturing purposes. On the other hand, the sector continues to deliver innovative solutions that enable significant emissions reductions across sectors, as well as better climate change adaptation. And this market opportunity will only get bigger, as the need for new breakthrough climate change solutions rises.

But to tap into the many opportunities requires bold leadership and long-term strategies - and the sector will have to rethink its role in society. It will have to become a much more visible social actor and actively take part in mitigating climate change, as well as helping the world's most vulnerable people adapt to the effects of climate change.

The risks of growing

Overconsumption is a growing pressure confronting the connectivity tech sector. As the deployment of connectivity tech is experiencing dramatic development, and connectivity between humans as well as between devices (Internet of Things) increases almost exponentially, the energy consumption of the entire connectivity sector is expected to have a steep yearly growth rate of six to nine percent in a business-as-usual scenario. At this rate it is estimated to make up for well over 10% of global electrical energy consumption in 2030.

The increased global online activity is already having effects on the climate. Today, it accounts for more than two percent of anthropogenic carbon emissions. To put this into perspective, if the sector's total energy consumption was a country, it would be the third largest energy consumer, only surpassed by China and the US.

Data centers alone consume more than two percent of the world's electricity. As consumers, companies, and governments' demand for data increases in the coming years, an additional 290 hyperscale data centers will be constructed between 2016 and 2021 worldwide - making the sector an even bigger electricity consumer.

On the manufacturing side, there are also risks of overconsumption. One example: The production of one smartphone uses at least 62 different raw materials, many of which are precious and scarce. The sector is thus a great contributor to the depletion of scarce natural resources.

Even though stronger regulations have not yet hit the sector in terms of energy and material use, it must be expected within the coming years, given the sectors current and rising consumption level. Furthermore, the sector is experiencing pressure from a growing political and consumer demand for more socially responsible and ethical use of data and digital technologies.

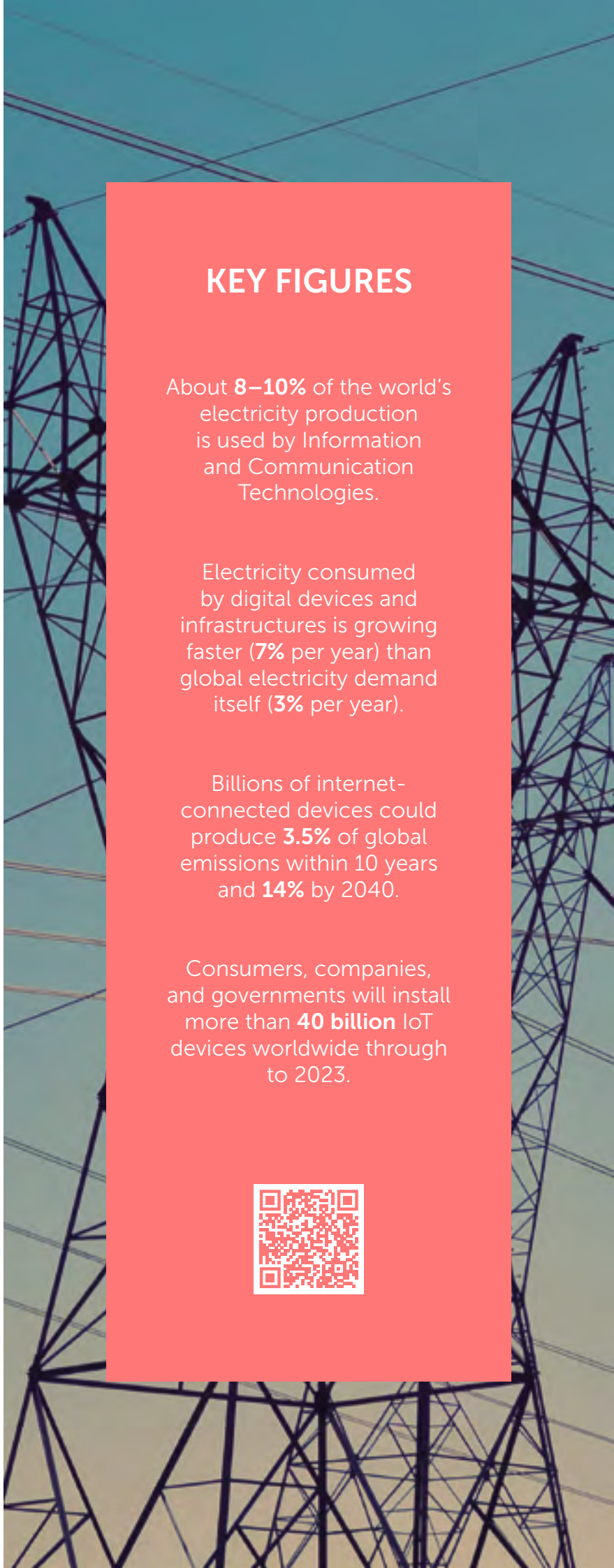
Connectivity as a force for doing good

The human and natural worlds are changing radically due to climate change. Connectivity providers must understand they have a key role in driving connectivity-dependent climate mitigation and adaptation solutions. In particular, when it comes to providing data that can help communities vulnerable to climate change, connectivity providers have the capabilities to provide data for mini-grids and blockchain solutions in communities without internet access. Access to weather information through telecommunications, for instance, can help farmers use smarter farming methods. Mobile technology can provide access to financial services for unbanked populations. And the list goes on.

This is not only a moral or social obligation for the connectivity sector. It is a great market opportunity. When it comes to achieving the 17 SDGs and responding to the climate change challenge, the possibilities of using connectivity solutions and data seems almost endless. There is thus an estimated $2.1 trillion revenue opportunity for the digital industry by 2030 by delivering solutions with positive SDG impacts - a figure that is 60% higher than current levels.

Roughly $400 billion of that potential is coming from increasing connectivity, while the remaining $1.7 trillion lies in deploying digital solutions, such as e-commerce, e-work, telehealth, smart buildings, e-government and e-learning. Other substantial benefits for the sector include increasing agricultural crop yields by 30%, safeguarding over 300 trillion litres of water and saving 25 billion barrels of oil per year.

It is estimated that connectivity solutions will generate over $11 trillion in sustainable economic benefits across sectors per year until 2030, while also enabling a 20% reduction of global CO2 emissions by 2030. In essence, this means that the negative trade-off between economic prosperity and environmental protection can be avoided, and connectivity tech could be the key to decoupling economic growth from emissions growth while empowering the vulnerable.



KEY FIGURES

About **8–10%** of the world's electricity production is used by Information and Communication Technologies.

Electricity consumed by digital devices and infrastructures is growing faster (**7%** per year) than global electricity demand itself (**3%** per year).

Billions of internet-connected devices could produce **3.5%** of global emissions within 10 years and **14%** by 2040.

Consumers, companies, and governments will install more than **40 billion** IoT devices worldwide through to 2023.

Telenor CEO

IoT is our great opportunity maker

Data is vital if we are to turn climate risks into new opportunities. For major telecompany Telenor, this is an opportunity to simultaneously secure future growth and to do good for the world. This is the key message from Telenor CEO, Sigve Brekke.

When it comes to mitigating climate risks and tapping into opportunities, data has massive potential as a positive game changer. The mobile industry and smart services through the Internet of Things (IoT) have the potential to cut global carbon emissions, reduce resource intensity, stimulate economic growth and deliver substantial social benefits.

This notion is an important driver for one of the biggest telecompanies in Northern Europe, the Telenor Group. The company bases its future growth on the fundamental notion that they can and should try to drive positive change.

"We all have a responsibility to ensure that our activities drive equitable and inclusive growth in the markets we serve. Doing so in a sustainable way, leaders must become ambassadors of change. Now is the time to move from words to numbers to impact," says Sigve Brekke, CEO President and CEO of Telenor Group.

When it comes to climate change, the possibilities of applying more data are enormous - in close to all sectors and businesses. The SMARTer 2030 report has identified a number of sectors where the enabling potential of ICT can deliver significant carbon emissions reduction – up to 20% by 2030 and close to ten times the ICT industry's own direct emissions. This places ICT as one of the key instruments for the achievement of the climate commitments undertaken in Paris in 2015 and the implementation of related national action plans.

For Telenor this is a business opportunity that they expect will only grow in the coming years.

"We believe that a virtuous cycle in green consumption, awareness and green tech development will take shape in 2019, given a boost in large part by mobile technology. The UN's Intergovernmental Panel on Climate Change's late 2018 report came as a wake-up call to those not already paying attention. As climate change worries and awareness of consumption both skyrocket in society, a wave of mobile-driven people live and consume more smartly than ever. In 2019, this wave will reach its much needed crest," says Sigve Brekke.

The business of doing good

For decades, the telecompany has been working towards the ambition to bring connectivity for the many, not just the few. The company is thus committed to responsible business conduct and driven by the ambition of empowering societies. That's why sustainability is - and has long been - an integrated part of how they do business.

"Telenor fully supports the UN Global Compact Principles, and together with customers and partners we are well positioned to help deliver on the UN Sustainable Development Goals," says Sigve Brekke.

As part of this work, Telenor have chosen

to focus particularly on the SDG #10, "Reduced Inequalities" – since it is one of the global goals that is trending in the wrong direction and needs more focus, and is one of the challenges where increased connectivity and data is an important part of the solution.

Working across sectors

To catalyse positive change when it comes to the UN Sustainable Development Goals, Sigve Brekke believes it is necessary to work across sectors and partner with a wide range of stakeholders.

This is also very much defining for Telenor. In October 2018, Sigve Brekke joined a group of Nordic-based CEOs to announce a joint initiative to speed up the realisation of the SDGs.

"Technology creates new opportunities to solve massive challenges connected to health, education and inequality. Businesses and the public sector play a key role in facilitating positive impact on society – that's why we need close and constructive collaboration across sectors and industries," says Sigve Brekke.

A focus on partnerships is not something that is new to Telenor. Over the years, the company has engaged with the industry, customers, organisations – such as GSMA - and industry partners to embrace new opportunities.

Approaching mainstreaming IoT

Today Telenor is a top-10 global player in IoT connectivity, with more than 12 million SIM cards deployed and about 160 experts dedicated to IoT across the Group. As it is a major growth area for the telecoms and data industries, this is also high priority for Telenor, and in 2019, IoT will be one of the strategic priorities of the group.

"We think 2019 will be the year when industrial IoT customers crack the transition from proof-of-concepts, which we've seen in recent years and months, to large-scale commercial deployments," says Telenor's CEO.

Telenor expects IoT including the LPWA ecosystems stems to blossom this year, enabling larger industrial applications which to date haven't matured quickly enough.

"We can expect to see industries start to roll out large scale IoT, particularly within the arenas of smart cities, industrial manufacturing and process industries as well as shipping, traffic and transport monitoring, and fisheries. In short, IoT is going industrial in 2019," says Brekke.

About Telenor

Telenor Group is one of the world's major mobile companies across Scandinavia and Asia. Today they have more than 173 million customers and 20.000 employees worldwide. The company was founded in 1855 and builds on over a 160 years of telecom experience.

TELENOR | NORWAY | CONNECTIVITY

Birth registration using smartphones

Telenor has developed an android app for mobile birth registration, giving millions of children an official identity and a passport to education and health services, crucial in the aftermath of climate-related disasters.

Telenor Pakistan has partnered with the Pakistani government and UNICEF to develop a smartphone app for birth registration. The rapid proliferation of mobile phones amongst the population of Pakistan provides a suitable platform for birth registration that prevents families from having to undertake costly and time-consuming travel to registration offices, as well as overcoming lack of awareness of the importance of official registration.

Registration takes place either through door-to-door registration drives, or a family can alternatively approach a Digital Birth Registration franchise, where a nominated facilitator registers the child using the app and submits the registration to the relevant authorities. Once the registration is approved, the family will receive an official birth certificate. Using the data collected from the programme, stakeholders can also identify the most critical areas, and use a more targeted approach to door-to-door registrations.

Pakistan is expected to see an increase in frequency and severity of flooding under even the mildest climate change scenarios. Improving birth registrations can help reunite families in the aftermath of natural disasters, helping communities become more resilient to climatic changes.

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IGNITIA | GHANA & SWEDEN | CONNECTIVITY

SMS-based weather forecasts for tropical farmers

Ignitia delivers SMS-based, short-term weather forecasts to smallholder farmers in tropical areas. Regular, accurate weather forecasting helps farmers to make well-informed decisions and optimise their farming practices.

Ignitia uses highly localised weather forecasting models to deliver timely, accurate weather forecasts to farmers in tropical areas. They collect high-resolution weather data using remote sensing technology and satellites, due to the lack of quality data available from ground monitoring stations in Sub-Saharan Africa. The data is processed remotely in Stockholm, and then each morning, a GPS-specific 48-hour forecast is delivered to farmers by SMS. They estimate these forecasts to be twice as accurate as conventional forecasting systems, with 84% accuracy, because they are specifically tailored to the different weather conditions in tropical regions.

Tropical weather patterns are challenging to predict accurately – in higher and lower latitudes, weather patterns are influenced by large scale temperature and pressure changes, but in tropical areas the weather is driven by convective processes that happen on a much smaller scale and much more quickly. Therefore, conventional forecasting systems, which analyse weather in 50 km grids often miss these small, rapid changes and deliver inaccurate predictions. Ignitia's forecasting models analyse weather patterns in three kilometre grids, allowing them to identify the development of tropical storms and more accurately predict weather.

The service was developed in Ghana and has now been extended to a number of West African countries. Ignitia estimates that they have already delivered over 8.5 million localised weather predictions to date.

Scan to explore

REGEN NETWORK | USA | CONNECTIVITY

Ecological blockchain for agricultural regeneration

Regen Network is a global community and platform focused on ecological monitoring and regeneration. The company aims to catalyse the regeneration of ecosystems.

Using a combination of monitoring technologies such as satellites and ground sensors, Regen Network aims to provide a global picture of ecosystem health, and provide incentives for regeneration across the many degraded landscapes. Thirty-seven percent of the Earth's surface is used for agriculture in some way, so the company has chosen to focus on farmers as change makers for the system. Users are able to input ecological data to an immutable blockchain system, then choose to share or sell that data with other network users. Smart contracts can then be used to pay farmers for regenerative practices, according to a number of ecological protocols developed collaboratively by network users and scientists.

Regenerative land management practices can lead to dramatic increases in biodiversity, water retention, and carbon sequestration. For example, tilling is an agricultural practice that contributes to greenhouse gas emissions and the loss of soil nutrients. It is also something that can be monitored by open-source satellite technology. Farmers choosing not to till their fields can be verified by the satellite technology and rewarded for contributing to a more sustainable and regenerative agricultural industry. Other examples of good practice that can be tracked and incentivised relatively easily include: urban tree planting, agroforestry practices, and collections of ocean plastic waste.

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DNV GL | NORWAY | CONNECTIVITY

Digital mapping tool aids disaster management

DNV GL has developed a digital mapping tool to aid communities vulnerable to natural disasters such as floods or earthquakes.

The emergency management system is a cloud-based platform called CEP MAP (Capacity, Emergency, and Post-emergency Management And Preparedness). It has three mapping applications – capacity, emergency, and post emergency – that operate by centralising information from multiple sources and making it readily accessible for anyone with a hand-held, internet-connected device. The data-driven solution provides an overview of disaster risks, for example the extent of fires or flooding in an area, alongside small details for decision-makers to make effective plans and preparations, and to effectively respond and recover from emergency situations.

It is a data-led solution for managing disaster risk with intelligent, interactive, integrated, and real-time digital maps. During its development, with the Norwegian Red Cross and the Philippine Red Cross, CEP MAP was tested on the ground in Caloocan, the third largest town in the Philippines, which is exposed to storm surges and vulnerable to post-cyclonic floods.

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BLUETOWN | DENMARK | CONNECTIVITY

Wireless internet stations connect the unconnected

Bluetown provides affordable, adaptable and solar-powered internet stations in rural and remote areas, delivering a number of benefits for health, education and governance.

Since 2006, Bluetown has been developing and distributing affordable internet stations to disconnected populations in semi-urban, rural and remote areas. Over the next five years, they expect to use their solution to grant secure access to over 100 million people in their four target regions, Africa, the Middle East, India and South America.

Bluetown's solution is a solar-powered base station that provides a Wifi connection within a one kilometre range. These internet stations connect to existing internet infrastructure, such as satellites, allowing them to create secure and consistent internet access in the most remote areas. A single internet connection can be used to service multiple villages because the base stations can connect to each other using microwave links.

Because the stations are 100% solar-powered, they do not have to be connected to a centralised energy grid, making them particularly effective in remote areas. What's more, they are fitted with a battery system to store excess energy, meaning they can also be used to charge devices.

The centrepiece of Bluetown's solution is the 'Local Cloud', which acts as a free platform for distributing information. This has enormous benefits for e-governance, health, education, and agriculture by giving individuals access to up-to-date information streams developed by governments, NGOs and companies. For instance, nurses have access to up-to-date clinical guidelines to help improve the quality of healthcare.

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TAKING ROOT | CANADA | CONNECTIVITY

Building livelihoods through reforestation

Taking Root is putting a face on the smallholder farmers in Nicaragua who are reforesting their land. Through sales of carbon credits and traceable forest products, they can connect farmers who choose to reforest parts of their land with access to additional income streams.

Taking Root works with smallholder farmers in northern Nicaragua to encourage them to plant trees in exchange for income from either carbon credits or traceable forest products.

Taking Root uses GPS techniques and field visits to monitor the growth of trees on every plot, in order to generate carbon credits certified by international standard 'Plan Vivo'. These carbon credits are then sold by Taking Root on behalf of the farmers who are then paid in cash. Every farm and farmer can be seen online with their digital map called Farm-Trace. The company estimates that their carbon offsets program employs over 1,200 farmers each year, and has resulted in 2.2 million trees being planted.

The company also works with farmers to plant and harvest coffee and timber products that can be traced back to where they were grown, using their Farm-Trace website, which also tracks how many trees have been planted, the total area reforested, and how much income has been generated by farmers.

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“One intention can unleash change in three thousand worlds”

Tatsuo Akimura

Co-Founder
Next Leaders' Initiative
for Sustainability

Connie Hedegaard

Climate Thought Leader

Five tips for climate change profits

"To be considered educated in the 21st century, sustainability and climate change is a basic requirement. If you're the CEO of a company, you should be getting at least the very basic facts. Once you have understood that... then you say, wow, we have to deviate from business as usual, we have to become faster at finding new solutions," says Connie Hedegaard, one of the world's leading climate experts. She helped win the greatest battle for sustainability, first as a politician in Denmark and later as EU commissioner, representing Brussels at the UN climate change talks.

From her perspective, business capital and knowhow play key roles in tackling accelerating climate change. Though many companies are overwhelmed by its seeming complexity, Connie Hedegaard insists climate change is not rocket science if you take some simple steps.

1

Know your climate change facts and options
Start by knowing the facts of climate change and how it will affect your business – once you know them, you'll never want to go back to business-as-usual.

2

Set targets and timescales
See where you are when it comes to sustainability: set targets and timetables to align your business with climate change.

3

Tackle barriers together
Work with political and business leaders to identify barriers and find solutions.

4

Don't be late to the game
The sooner you build climate change in your business model, the more competitive you will be.

5

Get the pricing right
Price in the environmental and social cost of doing business to avoid being hit with negative profit margins.

ENERGY

Fueling change

Modern civilisation was built on burning fossil fuels - they have long been the backbone of our industries, our economies, and our societies. The strong and well-known linkage between carbon emissions and energy production leaves the energy sector acutely exposed to the forces of the disruptive new market reality under climate change. Today, the energy sector is responsible for two-thirds of global greenhouse gas emissions, and thus, in order to safeguard a Paris-compliant future, significant changes will be required of the energy sector within a relatively short time-frame.

For too long, inertia has inhibited the renewable energy transition, but today it is gaining considerable momentum. New forces such as technological innovation, new market competitors, and synergetic regulation, are transforming the energy sector - and this will continue over the coming years. This is a potentially huge risk for the companies not transitioning, and a great opportunity for the ones that are.

At a crossroads

When it comes to sustainable energy, we are witnessing some great progress. In terms of regulatory signalling, there has been some progress - 179 countries now have renewable energy targets of some degree, 57 of which aim to use 100% renewable electricity. Renewable energy capacity also increased by 8.3% in 2017, and non-fossil sources now provide 19% of total global energy consumption. The global economy is also becoming more energy efficient, with energy intensity falling on average 1.8% per year since 2010.

But the outlook isn't entirely sunny. Despite flatlining for three years, global energy-related CO2 emissions rose in 2017, and are forecast to have risen a further 2.7% in 2018. This is mostly a result of sustained growth in energy demand - 2.1% in 2017 - in connection with strong global economic growth of 3.7%. Forecasts expect that total energy demand will actually continue to increase until 2035. In addition, increased use of coal to create electricity in emerging economies like China and India, growing oil consumption for transportation, and insufficient improvements in energy efficiency all contributed to the growth in energy-related emissions.

One of the main challenges is to develop a global scale renewable energy grid. This is currently not possible, because renewables are not yet able to provide power 24/7. And when you look specifically at many of the vulnerable and economically disadvantaged communities, they still often rely on off-grid energy systems such as diesel, kerosene and biofuels that pose a persistent threat to human health and the environment.

New regulations to accelerate decarbonisation create a host of challenges for the incumbent fossil fuels sector - schemes such as carbon pricing, which are already in place in 46 countries, increase operating costs for fossil fuel producers by forcing them to cover the costs of their CO2 emissions.

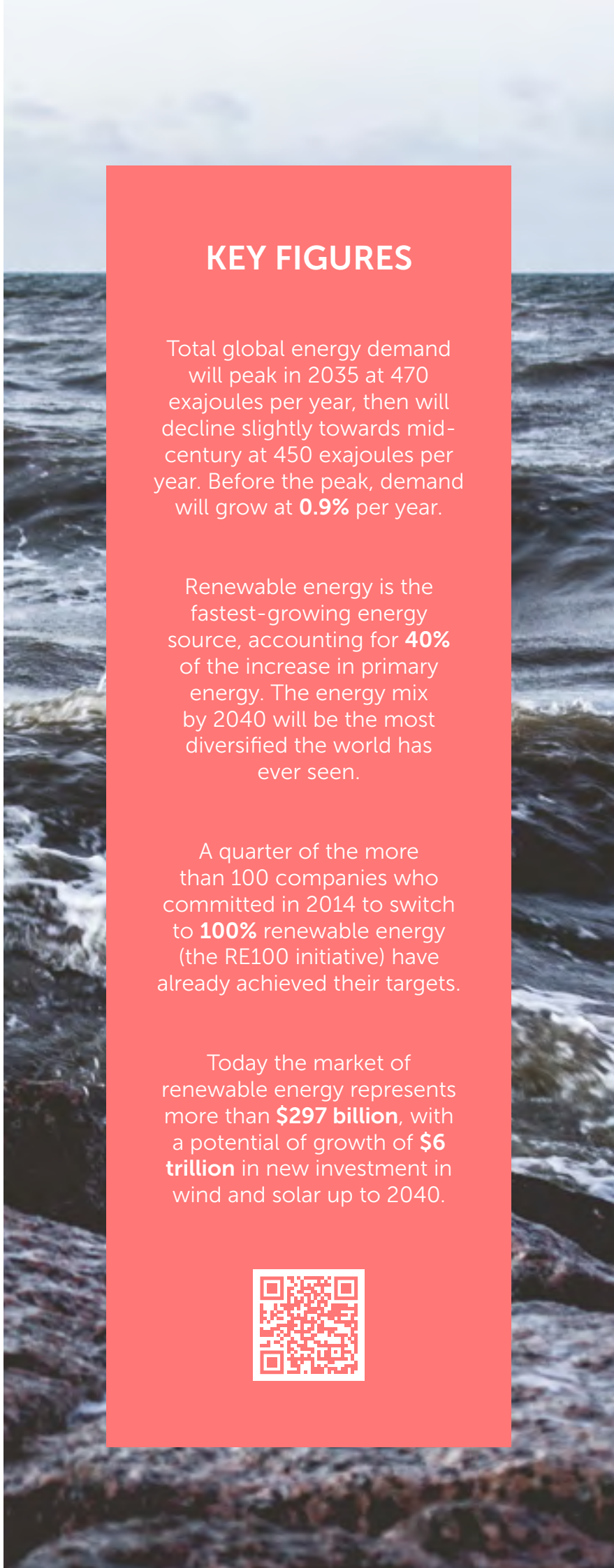
The financial sustainability of the fossil fuels industry is uncertain. Financial institutions are beginning to price in the long-term risks faced by fossil fuels, and yet the industry often makes long-term decisions based on short term fluctuations in fuel prices - and is consequentially 'locked-in' to these decisions for decades. In fact, channelling further investment into fossil fuel assets today could result in up to $11 trillion worth of stranded assets being written down by 2050 due to regulation, uncompetitiveness, or investor demands. This is both a real and immediate concern - it is estimated that 42% of the world's coal plants are already running at a loss.

Renewable energy is a gold mine
The business opportunities in redesigning the energy system are not to be underestimated. Estimates suggest that the incremental opportunity of expanding renewable energy infrastructure could be between $165-605 billion by 2030, while enhancing energy efficiency could be worth $305-490 billion. And over the past decade solar and wind energy generation costs have plummeted by 80%.

A line of innovators are already pioneering energy solutions - creating new materials for storage, using data to manage demand and supply, and developing new technologies for capturing renewable energy sources such as wave or thermal.

There is a great business opportunity in developing and scaling renewable alternatives that are affordable, clean and stable - especially when you look at markets such as China, India and Africa. Although still in early stages, microgrids hold potential to create greater access to affordable renewable energy for these markets. A myriad of new companies are starting to offer these services to the 1.2 billion people living without access to electricity.

But it is not only the new disruptors who are taking advantage - some major energy companies have already begun the process of divestment from fossil fuels. Ørsted, Denmark's biggest energy company, divested all its oil and gas assets in September 2017, and has committed to phasing coal out of its power plants by 2023. By 2023, Ørsted expects to have reduced their greenhouse gas emissions by 96%. Realising that renewable energy is more cost effective and carries lower regulatory risks than fossil fuels, Ørsted have invested significantly in alternative energy and are now the world's largest offshore wind company. In 2017, the energy company enjoyed almost 10% growth in profits while cutting emissions by almost 50%.



KEY FIGURES

Total global energy demand will peak in 2035 at 470 exajoules per year, then will decline slightly towards mid-century at 450 exajoules per year. Before the peak, demand will grow at **0.9%** per year.

Renewable energy is the fastest-growing energy source, accounting for **40%** of the increase in primary energy. The energy mix by 2040 will be the most diversified the world has ever seen.

A quarter of the more than 100 companies who committed in 2014 to switch to **100%** renewable energy (the RE100 initiative) have already achieved their targets.

Today the market of renewable energy represents more than **$297 billion**, with a potential of growth of **$6 trillion** in new investment in wind and solar up to 2040.

Six highlights from the DNV GL Energy Transition Outlook 2018

"For us, and for many of our customers, the energy transition itself is the greatest source of risk – and opportunity"

Remi Eriksen
Group President & CEO DNV GL

1. The world will need less energy from the 2030s onwards owing to rapid energy efficiency gains; we forecast that primary energy supply will peak in 2032.

2. The world's energy system will decarbonise, with the 2050 primary energy mix split equally between fossil and non-fossil sources.

3. Oil demand will peak in the 2020s and natural gas will take over as the biggest energy source in 2026. Existing fields will deplete at a faster rate than the decrease in oil demand. New oil fields will be required through to 2040.

4. Electricity consumption will more than double by mid-century to meet 45% of world energy demand, and solar PV and wind energy will supply more than two-thirds of that electricity.

5. The energy transition is affordable. As a proportion of world GDP, expenditure on energy will be lower in 2050 than today. Big shifts in investments are expected: more capex will go into grids and renewables than into fossil projects from 2029 onwards.

6. The rapid transition we forecast will not be sufficient to achieve the less than 2°C climate goal. A combination of more energy efficiency, more renewables and more carbon capture and storage (CCS) is needed to meet the ambitions of the Paris Agreement.

CONSENSYS, LO3 & SIEMENS | USA | ENERGY

Brooklyn's blockchain-enabled energy microgrid

The Brooklyn Microgrid is a small-scale energy system whereby households can trade their excess renewable energy capacity with their neighbours using a secure blockchain platform.

The Brooklyn Microgrid is a prototype for peer-to-peer energy exchange systems, launched by LO3, Consensys, and Siemens in 2016. Energy is generated from individually owned household renewable energy systems such as rooftop solar, and connected to the microgrid using existing energy transmission infrastructure. The grid is fitted with LO3's TransActive Grid technology, which measures the production and consumption of energy within the system, and filters this data to the trading platform.

Participants in the microgrid have access to a platform developed by LO3 called Exergy, which facilitates peer-to-peer transactions between participants using blockchain technology and smart contracts. Incorporating smart contracts and blockchain technology creates a secure and automated process that cuts costs for users and removes the need for energy suppliers or transmission companies. What's more, decentralised grids are more resilient in emergency situations like natural disasters, because the energy is generated, stored and consumed within a small geographical area.

Instead of selling surplus energy back to the grid, direct transactions between prosumers (energy producers and consumers) helps to remove intermediaries and reduce the price for those involved.

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BOMBORA WAVE POWER | AUSTRALIA | ENERGY

Making waves in renewable energy generation

Bombora Wave Energy has developed a technology for harnessing the consistent energy in waves. The mWave sits on the ocean floor, making it resilient in storms and unobtrusive to other marine activity.

The Bombora mWave captures energy from waves and converts it into clean electricity. Due to the risk of damage from strong storms, wave energy technologies are typically expensive and have a complex design. However, realising that 80% of wave energy can be harnessed from 10m below the ocean's surface, the mWave lies on the ocean floor.

It has three main components: a concrete bed that anchors it to the ocean floor; a series of flexible rubber membranes; and a turbine. The membranes are filled with air, and upon receiving pressure from the waves, the air is driven through the turbine, generating electricity. The air is then recycled back into the membranes, ready for the next wave. A sub-sea cable then transports the electricity to shore where it is distributed into the local power grid. Because the device sits on the ocean floor, most other marine activities, including recreational pursuits, can still take place uninterrupted.

At present, the company is developing a series of 1.5MW converters in Albany, Western Australia, which are expected to come into operation in 2020. In 2018 they received £10.3 million in funding to build a 1.5MW demonstration project in Wales, and are also pursuing further projects including a 60MW wave farm in Peniche in Portugal, and another in the Orkney Islands in Scotland.

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CLIMEON | SWEDEN | ENERGY

Utilising waste heat to generate power

Climeon improves the efficiency of primary energy production by using waste heat to generate electricity, cutting bills and emissions for those with excess heat.

Climeon have created a compact device to convert low-grade waste heat from shipping, industry and geothermal resources into electricity. The low-temperature energy, which ranges between 70-120°C, heats and vaporises a fluid which then drives a turbine to create electricity. The vapours then re-condense, ready for reuse. Climeon's technology can convert approximately 14% of low-grade heat energy into electricity, and is cost-competitive with conventional electricity sources according to the company.

In 2015, Climeon partnered with Viking Line, a passenger and cargo shipping company operating in the Baltic Sea. They installed a waste heat to energy converter in Viking Line's ship 'Grace', the first LNG-fuelled passenger ship of its size. Using the waste heat generated by the ship's engine, Climeon was able to generate one megawatt of power and cut the ship's energy costs by between 2-5%. Climeon has since also partnered with Virgin Voyages to install multiple devices into three new cruise ships, expected to launch in 2020.

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ENERSIZE | FINLAND | ENERGY

Software drives compressed air efficiency

Enersize uses sensors to collect data about the usage of compressed air systems. Their software analyses the data, identifies trends, and assists industry in optimising their energy consumption.

Compressed air is commonly referred to as the fourth utility, and is ubiquitous in manufacturing and industry. Over 90% of all factories employ the technology, where it powers many of the mechanical processes. Enersize has developed a software for analysing compressed air efficiency in the manufacturing industry in order to improve processes and cut emissions. By installing sensors throughout a factory, the company can monitor energy usage in real time, and identify issues such as bottlenecks and design flaws. Their software then visualises and simplifies the data on compressed air usage to make it accessible to industrial managers. The company estimates that by using their software, manufacturers save on average more than a quarter of their energy consumption on compressed air.

At present, Enersize is operating in China and the Nordics. They estimate that their current customers are enjoying an average of 26.4% reductions in energy usage.

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AGILITY FUEL SOLUTIONS | USA | ENERGY

Storage cylinder innovation unlocks potential for biogas in transport

In order to make compressed natural gas (CNG) and biogas more attractive alternatives to diesel and reduce emissions from heavy-duty vehicles, Agility Fuel Solutions has developed long-range, lightweight gas storage systems.

Agility Fuel Solutions has created a light-weight compressed natural gas (CNG) storage system for large vehicles – including trucks, buses, and other fleet vehicles – that allows them to store more gas and travel further without refuelling than existing CNG fuel storage. Agility's fuel storage systems are based on CNG cylinders made from a carbon fibre composite that weighs 70% less than conventional steel cylinders while storing more gas in the same volume of space. Vehicles using these systems can travel over 800 km before having to refill, which greatly increases the opportunities for driving with this cleaner energy source in locations where refilling services are limited.

Switching fleets to biogas or CNG as an alternative to diesel has the potential to reduce greenhouse gas emissions and air pollution – lifecycle emissions of these fuels are 84% and 15% less than diesel respectively. However, limited refuelling infrastructure can act as a barrier to fleets switching to biogas or CNG. Agility Fuel Solutions is breaking down these barriers by helping fleets go further between refuelling.

In the UK, grocery giant Waitrose is now operating a fleet of 58 vehicles that operate using biomethane generated from their own food waste, contributing to a truly closed loop value chain. Their renewable biomethane, made by CNG Fuels, generates 83% less greenhouse gases than diesel and also costs 40% less. By using Agility Fuel Solutions' lightweight cylinders, they were also able to extend the distance travelled per refill by 240 km making biomethane trucks a viable alternative for all the routes covered by their fleet.

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Thomas Friedman

"We need greedy leaders"

The Pulitzer Prize winning columnist has a radical idea – he wants to make the market greedy for sustainability.

The profit motive is the only way to a climate safe future.

This is the main message from New York Times columnist and Pulitzer Prize winner Thomas Friedman. He wants to disrupt the climate change challenge with greed.

"I don't see how you get scale on clean energy, on decarbonising, without leveraging the market. There is only one force bigger than Mother Nature, and that is Father Greed. Only the market can take on Mother Nature," he says.

The three time Pulitzer Prize winner fears we can never reach the Paris goals at the current pace, so he argues for a radical new approach. Governments should make markets "do the right thing for the wrong reason." Politicians can spark massive investment in sustainability by leveraging corporate greed.

Strong leadership is needed
Friedman stresses his radical approach needs key players like the USA, China, the EU and Brazil to scale up decarbonisation with policies like carbon taxes, regulatory reforms, or mandates for new homes with solar power as in California.

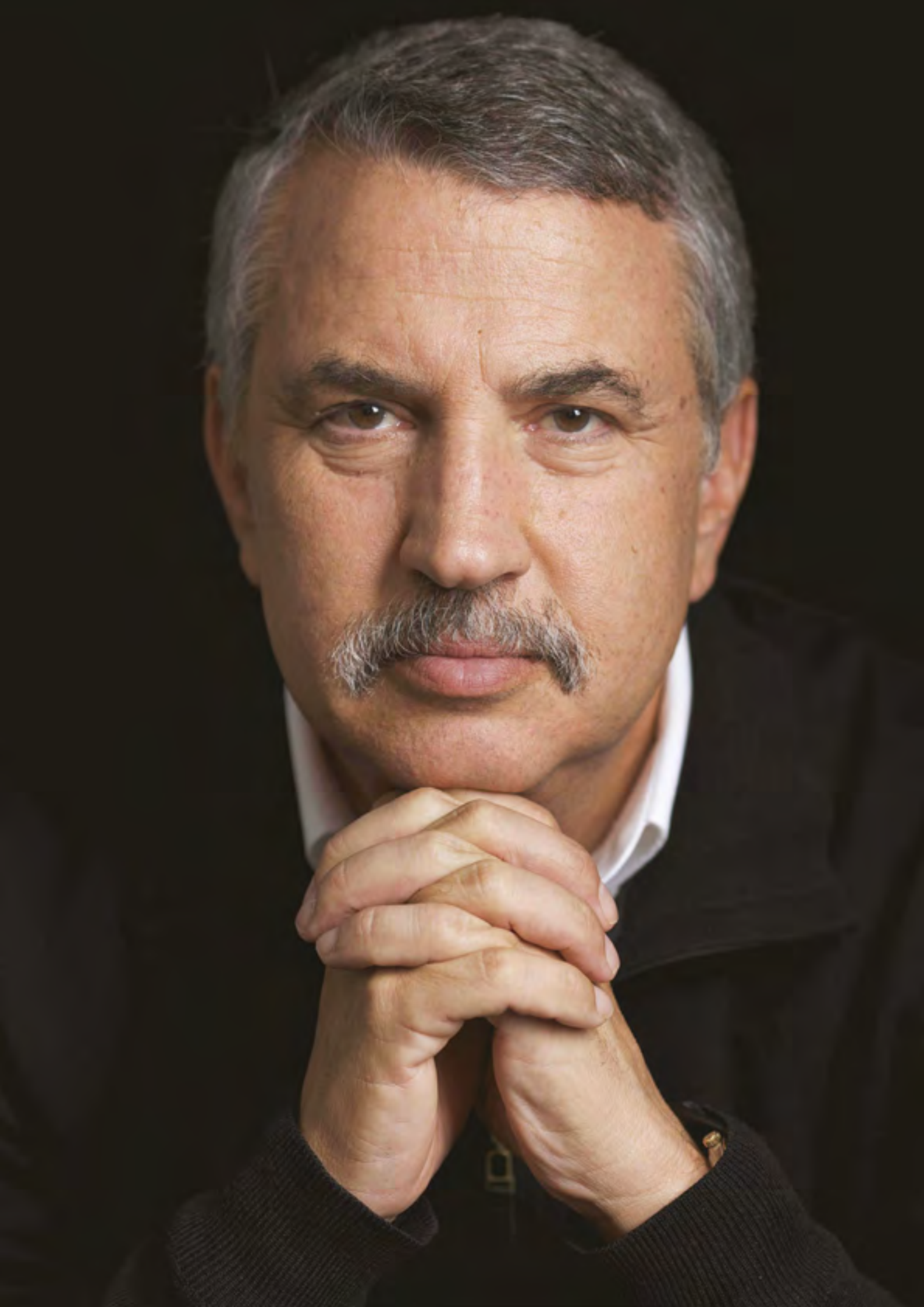
He is thus also furious that Donald Trump is promoting coal instead of clean energy, and asking business leaders to change the President's mind.

"I've done all that I could, but getting global business, American business to persuade the President that our future is not in coal jobs, that our future is in clean energy jobs. I'm afraid nothing is more important."

Climate change holds market opportunities
Defusing the looming population timebomb is also high on Thomas Friedman's list. He warns of environmental chaos from the projected one billion more people added to the planet by 2030. He worries many would want "to live in American-sized homes, drive American-sized cars and eat American-sized Big Macs. And if we don't find ways to deliver them cleaner power, more efficient power, those billion people are going to burn up, heat up and choke the planet far faster than even Al Gore predicts."

The New York Times columnist calls on companies to seize the market opportunities that these challenges bring. In relation to this, Thomas Friedman argues that climate change needs massive scale solutions that can only be delivered by the market. That is why he is issuing an urgent call for governments to disrupt sustainability with market greed.

"The next great global industry has to be clean energy, clean water and energy efficiency, otherwise, we are going to be a bad biological experiment," says Thomas Friedman.



FINANCE

Financing our future

The new market reality caused by climate change is already starting to send shockwaves through the financial sector. There is need for a paradigm shift, or a systemic push, if the sector is to align with the new reality.

The sector is at the same time struggling with legitimation issues. A survey of 15 industry sectors revealed that the financial sector ranks last in credibility, falling considerably behind sectors such as automotive, food and beverage, entertainment, and fashion. By seriously addressing the challenges of climate change, the sector might regain credibility as one working on behalf of society and not against it.

Some trends are however pointing to the fact that the sector is awakening. Financial flows are increasingly directed towards sustainable assets, and in just a few years, broad investor alliances have come together to make a plea to governments and companies to increase their climate action ambitions.

A push for green investments

The financial sector can be expected to face extensive regulation in the near future, compelling it to follow a more sustainable path. In 2016, the Principles for Responsible Investment (PRI) identified almost 300 regulations in the world's 50 largest economies which supported ESG investing, with most of these created after 2013. Active and responsible ownership is also the main element of a new EU directive that applies to more than 8,000 listed companies. The member states now have up to two years to transpose the new provision into domestic law.

From an investor perspective, companies are facing growing pressure to capitulate to their climate change demands. The Climate Action 100+ initiative, a group of 296 international investors with more than $31 trillion in assets under management, is demanding the 150 most polluting companies in the world to align their actions and emissions with the Paris Agreement within the next five years. This sentiment was also on display at last year's COP24 in Katowice. These alliances have become so big that the major oil companies are starting to consider divestment on par with other financial risks.

Looking at consumers, a recent survey revealed that if millennials are considering investing, 86% say they would be interested in sustainable investing. This corresponds with a general trend that millennials demand something from companies in terms of purpose. As a recent PwC report outlines, wealth and asset managers have to enhance transparency and ethical business conduct if they want to attract millennials at all.

The grave risk of stranded assets should also make investors ditch fossil fuels. If we are serious about meeting the targets of the Paris Agreement, including staying below a 2°C rise in global temperatures, it means that 60-80% of coal, oil and gas reserves of publicly listed companies could be classified as 'unburnable'. This imposes a huge 'transition risk' for the whole financial sector with a risk of $30 trillion of stranded assets in the oil sector alone.

Easier - and more profitable - than ever
As the return on investment of ESG investments is only becoming more convincing, the whole field is gradually maturing, and it bolsters these once niche assets with credibility, making them appear as less risky than just a few years ago. The pool of sustainable investment funds has grown large enough to be able to ensure investments for sustainable assets, while enabling sufficient diversification.

For many years, the challenge of standardised metrics for reporting has made many investors hesitant when it comes to sustainable investments. A PwC report showed that 82% of investors were frustrated with the inconsistencies in sustainability reporting.

But the EU has recently launched a proposal to develop over time a unified classification system on what can be considered sustainable economic activities, thus facilitating sustainable investments. Once there are better reporting metrics, the notorious snowball effect could start.

There are increasingly new platforms and indices for comprehensive and transparent public ranking of the world's largest listed companies according to the carbon intensity of their activities. These mechanisms incentivise companies to reduce their emissions, and can protect investors from exposure to climate risk.

Another challenge is getting access to finance for small energy firms, which tend to be ignored by traditional finance schemes and considered high risk. But there are increasingly solutions that can bring finance to renewable energy projects, and provide a green and reliable return on investment for everyday people. Also, the crowdinvesting model for financing solar energy solutions provides electricity to communities that cannot bear the upfront costs themselves, while delivering a financial return for investors.

KEY FIGURES

$1.5 trillion of climate finance must be mobilised every year to fill the climate finance gap.

120 investors with **$5.6** trillion assets under management have now signed a COP24 investor statement.

Investor interest in so-called ESG funds – investments screening for environmental, social and governance issues – has driven a **37%** increase in assets to **$445 billion** in 2017.

Stranded fossil fuel assets may amount to a discounted global wealth loss of **$1–4 trillion**.

“Investing sustainably is the right thing to do”

Jan Erik Saugestad

CEO Storebrand Asset Management

STOREBRAND | NORWAY | FINANCE

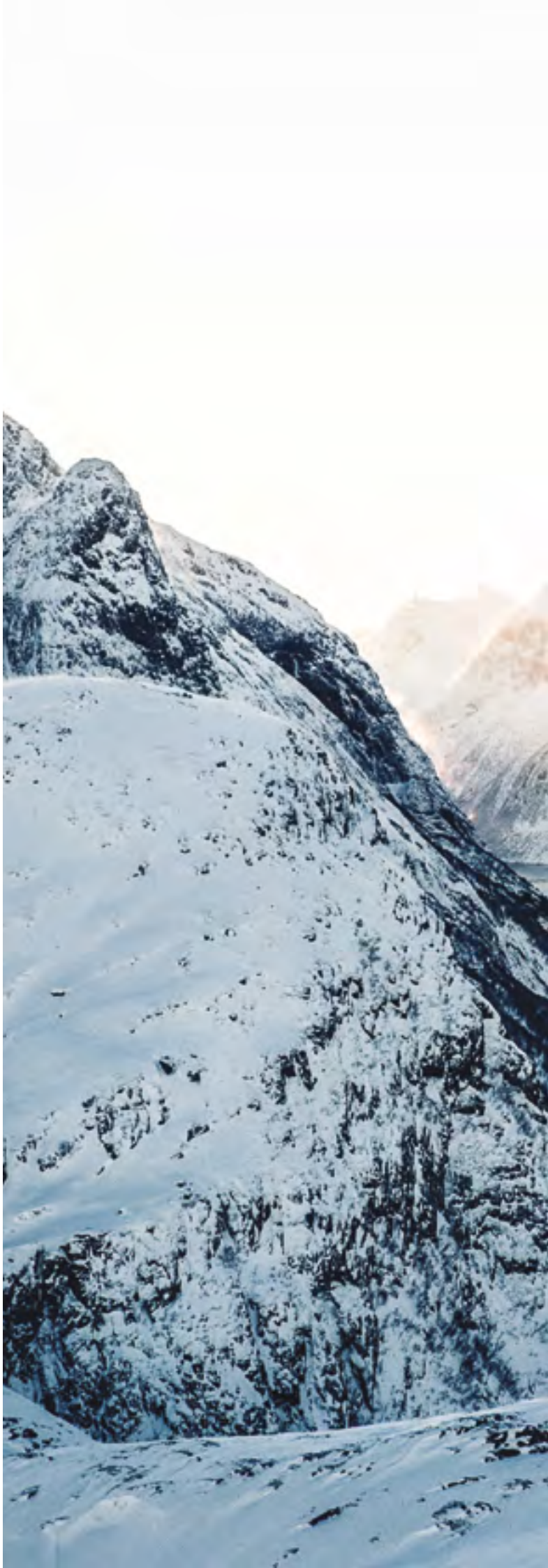
Sustainable asset management

Storebrand PLUS Fund is a sustainability-driven, low-risk alternative to traditional equity fund management for ecologically-conscious capital.

Developed to champion global sustainability within the world of asset management, Storebrand's PLUS fund is a fossil-free equity fund modeled around index- and risk factor-based management strategies, channeling assets towards green projects. They are guided by elaborate sustainability requirements: the Storebrand Standard and the extended PLUS criteria.

The Storebrand Standard process complies with UN Global Compact standards and is supported by a number of Scandinavian and international organisations (Fossilfritt Sverige, UNEP Finance Initiative, Transparency International...). In effect, it prevents any company violating international norms and conventions from being listed.

The PLUS criteria exclude companies that are part of the weaponry, alcohol, gambling, pornography, tobacco, as well as fossil fuel extraction industries, and companies with a share of sales from fossil fuels higher than 5%. Extended fossil-free criteria additionally apply, granting a higher priority to investments with specific sustainability solutions such as renewable energy and low-carbon transportation.



Scan to explore

WE SUPPORT UN GLOBAL COMPACT

ENGAGED TRACKING | UK | FINANCE

Leveraging decarbonisation through investment

Engaged Tracking is incentivising companies to reduce their carbon footprints by shifting investor capital towards low-carbon companies using a financial market mechanism.

Every year, Engaged Tracking produces a comprehensive and transparent public ranking of over 1,000 of the world's largest listed companies according to the carbon intensity of their activities. The ranking position of each company in this index – the Low Carbon Index Series – then determines the weighting of investment the companies receive.

This mechanism incentivises companies to reduce their emissions, and can protect investors from exposure to climate risk. Unlike other low-carbon indexes, Engaged Tracking's rankings score companies according to their direct (Scope 1), indirect electricity (Scope 2) and indirect supply chain emissions (Scope 3). This gives a more holistic overview of the total emissions that companies are responsible for.

The rankings represent $39 trillion in market value, $20 trillion in sales, and 5 billion tonnes of CO2 in direct and indirect electricity emissions. This exceeds the combined emissions of the European Union.

Scan to explore

LOUDSPRING | FINLAND | FINANCE

Financial capital can boost natural capital

By growing companies that preserve natural resources, buying a share in Loudspring means showing support for sustainable companies and finance.

Based in Finland, Loudspring is an industrial group focused on saving natural resources through owning and operating Nordic growth businesses that are making big environmental impacts. They focus on five global industries – food, fashion, energy, manufacturing, and real estate – and every year calculate the impact their investments have on carbon emissions and water usage. In 2017 the company estimated they had saved 158,000 tonnes of carbon dioxide and 13.7 million cubic metres of fresh water.

To date, Loudspring have raised more than $180 million in financing for companies that aim to save natural resources, including Nuuka, a Finnish firm that provides energy savings and optimisation as a service in the real estate sector, and Eagle Filters, a firm that helps natural gas burning power generation utilities become more efficient through improved intake air filtration.

Scan to explore

TELENOR & YOMA BANK | NORWAY & MYANMAR | FINANCE

Mobile money opens doors for the unbanked in Myanmar

Wave Money is a mobile-based financial service that facilitates secure, real-time transactions, with the aim of improving financial inclusion in Myanmar.

Wave Money was launched in Myanmar in 2016, as a joint venture between Telenor and Yoma Bank. The platform aims to bring financial inclusion to Myanmar's population, by providing them access with secure and convenient financial transfers using mobile technology.

Individuals and businesses can conduct transactions using Wave Money in two ways. Users with access to a mobile phone can transfer funds directly using the Wave Money app. Their account is linked to their phone number, and can be used to store and transfer money securely. The recipient can then collect the funds from an authorised Wave Shop. Alternatively, anyone with a valid legal ID such as a driver's license can conduct transfers in the Wave Shop, regardless of whether they have a Wave Money account. There is a small fee to send money, but there is no fee to collect it.

Wave Money can be used for trade, payment of wages, and transferring remittances to family members in rural and remote areas without formal bank access. There are currently over 31,000 authorised Wave Shops operating in Myanmar, covering 85% of the country and around 1.3 million customers.

Scan to explore

WE SUPPORT UN GLOBAL COMPACT

TRINE | SWEDEN | FINANCE

Crowdfunded solar investments for the global south

TRINE's financing model makes it easy to invest private capital in solar projects in the developing world.

TRINE's crowdinvesting model for financing solar energy solutions provides electricity to communities that cannot bear the upfront costs themselves, while delivering a financial return for investors. With an investment minimum of only $25, the start-up makes it easy for even small-scale investors to profit from contributing to improve access to renewable energy in developing countries, in the process also improving livelihoods, and mitigating CO2 emissions from sources such a kerosene.

TRINE carefully vets potential projects so it can offer sound investment opportunities to customers. Since its launch in 2016, the platform has helped finance projects worth more than €500,000, delivering electricity to more than 48,000 people and reducing CO2 emissions by 7,000 tonnes. The impact from a pilot investment project saw 180% more girls going to school and a 72% reduced usage of kerosene.

Scan to explore

BUILT ENVIRONMENT

New building blocks for a climate-safe sector

The built environment provides the material framework for human activity. From residential housing and industrial buildings to hospitals and infrastructure, the sector spans a wide palette of companies working within architecture, urban planning, supply and vendoring, construction, real estate investment, and waste management.

The construction sector faces huge market turbulence due to the drivers of the new market reality formed by climate change. The sector can expect new policies and regulations, changes in investor demands for more certified buildings, increased energy and resource scarcity, new competitors putting circular building principles at the core of their business model, and not least, growing citizen demand for resilient infrastructure and people-centred cities.

In the midst of profound renovation

Globally, buildings account for 30% of energy consumption and produce close to a third of human-induced carbon emissions, making the construction sector one of the largest emitter of all sectors. If you combine this number with the fact that 1.6 billion people will need affordable housing by 2025, and urbanisation is projected to continue - with two-thirds of the world's population living in urban areas by 2050 - the sector is at risk of potentially emitting enormous amounts of greenhouse gases.

According to the 2018 IPCC 1.5°C report, 1.5°C-consistent pathways require building emissions to be reduced by 80–90% by 2050. Given the carbon footprint of both the industry and the buildings themselves, the sector can expect numerous new regulations and building codes relating to energy, resources and waste, and circularity. The European Commission already launched a circular economy package in 2018, following new legislation on energy consumption in the building sector in 2017.

Investors across the world are also starting to demand that buildings are certified through

green certifications like LEED and DGNB. Consumer demand for liveable, resilient and smart cities with improved infrastructure and air quality is growing. Resource scarcity is another ticking bomb: The building sector consumes 40% of the total materials produced and is the biggest consumer of non-renewable resources of all sectors. Global concrete production is becoming endangered as natural sand starts to become scarce.

The multitude of pressures is pushing the entire construction sector to develop and implement new solutions, value chains and building models.

Opportunities for first movers

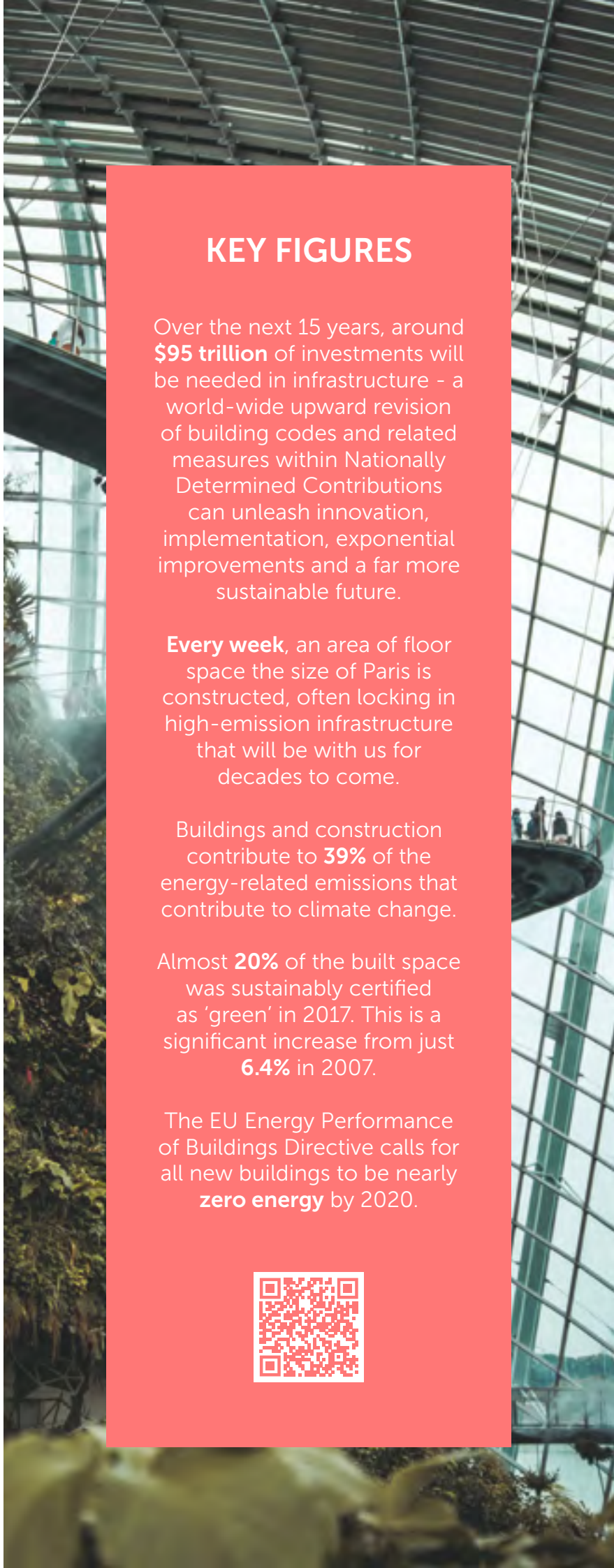
Many companies within the building sector are already reinventing themselves. Some are quick to apply circular principles and smart technology to innovate design of buildings and infrastructure. This holds great opportunities. New materials from biodegradable materials such as wood, fungi, or recycled waste can address the issue of waste and large carbon footprints.

Modular systems, whereby products are combined mechanically rather than being glued together, and a line of new smart technology solutions are other growing trends.

There are great opportunities in the combination of digital solutions to increase buildings' operational efficiency and develop new carbon friendly materials - this together can help ensure low-carbon buildings and also help improve the buildings' livability.

Several companies are already moving in this direction. One example is the Danish architecture firm 3XN, who has established an intrapreneurial company, GXN. GXN has the clear task to develop, test, and scale new sustainable building solutions and alliances, as a response to growing global challenges.

The companies that are stepping into the new market reality as first movers face astonishing economics gains. If you look at the market opportunities to companies providing clean energy in cities, the value is expected to rise to between $555-770 billion. The circular economy - as a whole - is a $4.5 trillion opportunity. Steering onto a circular path for a country like India could bring annual benefits of $624 billion by 2050 – equivalent to 30% of India's current GDP. The estimated markets for affordable housing are expected to exceed a staggering $1,080 billion in 2030.



KEY FIGURES

Over the next 15 years, around **$95 trillion** of investments will be needed in infrastructure - a world-wide upward revision of building codes and related measures within Nationally Determined Contributions can unleash innovation, implementation, exponential improvements and a far more sustainable future.

Every week, an area of floor space the size of Paris is constructed, often locking in high-emission infrastructure that will be with us for decades to come.

Buildings and construction contribute to **39%** of the energy-related emissions that contribute to climate change.

Almost **20%** of the built space was sustainably certified as 'green' in 2017. This is a significant increase from just **6.4%** in 2007.

The EU Energy Performance of Buildings Directive calls for all new buildings to be nearly **zero energy** by 2020.

"Sustainable cities are important market makers"

Mark Watts
C40 Executive Director

Cities around the world are already driving the sustainable transformation - and thereby also creating new business opportunities. This is the positive message from C40 Executive Director, Mark Watts.

We are losing the battle of climate change. After a three-year downward trend, fossil fuel emissions rose an estimated 2% in 2017, and continue to grow. These rising emissions are currently upending the Paris climate targets. Mark Watts, who as C40 Executive Director, leads the most influential group of city mayors driving climate action around the world, is sounding a serious alarm about this looming climate threat.

"There's so much positivity about the shift to a low carbon world, lots of people think we're winning – that the emissions are going down. Sadly they're not!" he says.

Mark Watts believes that cities hold many of the answers to the growing climate threat. One very important part of this is that cities have to leverage the market to reverse this trend. According to the C40 Executive Director, cities have become market makers and create business incentives for a shift to clean solutions.

"Mayors are starting to realise that they're market makers. They don't have to wait and follow where the markets go. They can create opportunities for a green shift," Mark Watts says.

This is also the reason why C40 city mayors are currently writing new rules to create new clean business opportunities in the city network, which consists of over 90 cities representing 650 million people and a quarter of the global economy.

The new market: Electric buses and green buildings
At a global level, there are numerous examples of city administrations writing new laws to stimulate action against the main drivers of urban emissions – inefficient heating and cooling systems, traffic congestion and energy waste.

Watts sees big market opportunities in addressing two extreme needs – lack of affordable housing in the developed world, and quality homes for growing urban populations in developing countries.

"Places like London, which are highly desirable to live but professionals can no longer afford to buy... At the other end of the scale, Nairobi, in one of the big slums – the Makuru slum – 400,000 people are living in tin shacks, with no toilets and sanitation," the C40 Executive Director points out.

Mark Watts is calling on businesses to invest in low-carbon solutions ahead of future government mandates.

"Legislators are just ready to start requiring that, and you are going to lose market share if you are not able to go with that trend," he warns.

That trend is also driven by the C40 network's long term vision for cities, where most trips will be by foot, bike or shared transportation by 2030. C40 targets include 100% electric buses, 95% ultra high efficiency buildings and 90% renewable energy power by 2030.

The 2020 deadline
Right now, Mark Watts is very focused on 2020 – the year when carbon emissions have to start a steep decline for the world to stay within a safe level. The renewed upward trend of global greenhouse gas is adding urgency to his network's Deadline 2020 plan of action. The current C40 estimates predict a 35% rise in emissions by 2020, instead of remaining within the 5% limit needed to avoid dangerous climate change.

"I think 2020 is important because we want to get a sense of urgency, which there needs to be around the climate challenge – 2020 is the date by which global emissions have to peak and then come down very steeply if we have a real chance of staying within a safe carbon budget," Mark Watts says.

SUSTAINER HOMES | THE NETHERLANDS | BUILT ENVIRONMENT

Rethinking construction with modular wooden homes

Sustainer Homes designs and constructs unique buildings through innovative sustainable design principles and a focus on renewable energy. Their buildings are modular, customisable and self-contained to suit a variety of needs, including residential and commercial property.

Seeking to reduce the environmental impact of the construction industry, Sustainer Homes has developed a modular system for constructing customisable homes and office buildings. The company uses Finnish Pine wood as the key material in the building modules, due to its low environmental footprint, versatility and durability.

Buildings can either be selected from a catalogue of designs or custom-designed using a combination of the company's different models. Each piece of the building is carved out using high precision techniques involving computer-controlled saws. Further, each piece has a unique identification code, which speeds up the construction process and means that individual parts can be easily replicated and replaced in case of damage. Once the components of the house are cut, they are assembled in a warehouse, meaning there is no delay or damage due to adverse weather conditions (an important consideration in the Netherlands). Afterwards, the finished pieces are transported to the site, where they are installed in one to two days.

Energy is a key consideration in their design. Each building is fitted with solar panels to provide energy for electricity and heating, and are properly insulated to maximise the energy efficiency of heating and cooling systems. Thanks to the integration of renewable energy systems and smart use of materials, Sustainer Homes estimates that their buildings generate 90% less CO2 emissions than conventionally built properties made from steel and concrete.

At present they are only operating in the Netherlands, as their buildings are designed to comply with Dutch regulatory standards. In the future they intend to extend their services beyond homes and offices, to hotels and even emergency accommodation in off-grid areas.

Scan to explore

EVERIMPACT | DENMARK | BUILT ENVIRONMENT

Real-time emissions and air quality data for cities

Everimpact provides the technology to measure greenhouse gas emissions and air quality in cities and regions. Their platform provides real-time data, allowing users to measure policy effectiveness and participate in emissions trading.

Everimpact utilises a combination of satellite data and ground sensors to measure greenhouse gas emissions in cities and regions in real-time. They have established partnerships with space agencies like the European Space Agency (ESA) and Group on Earth Observations (GEO), giving them access to high quality satellite data. They then partner with cities and regions to install mobile ground sensors, which allow them to measure and compare emissions and air quality in different areas of the city throughout the day.

Estimating the carbon emissions at a city or regional level can be notoriously difficult, making it challenging for cities to set realistic carbon emission reduction targets and assess progress towards those targets. With Everimpact's data visualisation tools, cities can be better equipped to understand and improve both their air quality for citizens as well as the carbon emissions from the city. In particular, it allows cities to identify hotspots where citizens may be exposed to high air pollution levels and make changes to reduce health risks.

The company has recently teamed up with IoT specialists GSMA to produce a smart map of air quality across London, integrating the measurements from thousands of devices across the city with satellites, and context data such as traffic and weather. This is then analysed using machine learning to better predict and understand air quality. By providing an accurate baseline of air quality throughout the city, the companies hope to be able to measure more accurately the results of air quality improvement interventions the city undertakes, and help improve air quality across the city faster.

Scan to explore

ECOVATIVE | USA | BUILT ENVIRONMENT

Magic mushrooms: Using mycelium to create packaging and building materials

Ecovative uses mycelium, the 'roots' of mushrooms, as a natural binding agent for packaging and building materials. Using agricultural byproducts as a base, they can literally grow new materials for a range of industries.

Ecovative has developed an alternative to conventional packaging and building materials. Taking inspiration from the structural composition of mushrooms, they can produce a durable material from agricultural byproducts like corn stalks and rice husks. The waste material is cleaned, then injected with a special strain of mycelium – the vegetative root structures found in mushrooms and other fungi – which then acts as a natural binding agent.

This process takes place in a cast, allowing the material to be formed into blocks, sheets, or customised shapes such as encasings for shipping. It takes between four to six days to 'grow' the material, after which it is placed in a heat press to remove any excess moisture and to kill the mycelium, preventing any additional growth. The material is fully biodegradable, but won't start to degrade unless it is exposed to the right conditions.

At their pilot plant in New York, Ecovative are currently manufacturing boards and custom moulded packaging material. However, they envisage that their product will in future be used in more large scale applications such as housing. They also offer a 'grow it yourself' system, whereby they can equip customers to produce custom materials for their own use. A number of creative designers are already using these materials to make furniture, lamps, vases and more.

Scan to explore

CLIMATE RECOVERY | SWEDEN | BUILT ENVIRONMENT

Fresh approach to indoor air ventilation

Climate Recovery provides a full assortment of responsibly constructed parts for the heating, ventilation and air conditioning market to save emissions and costs.

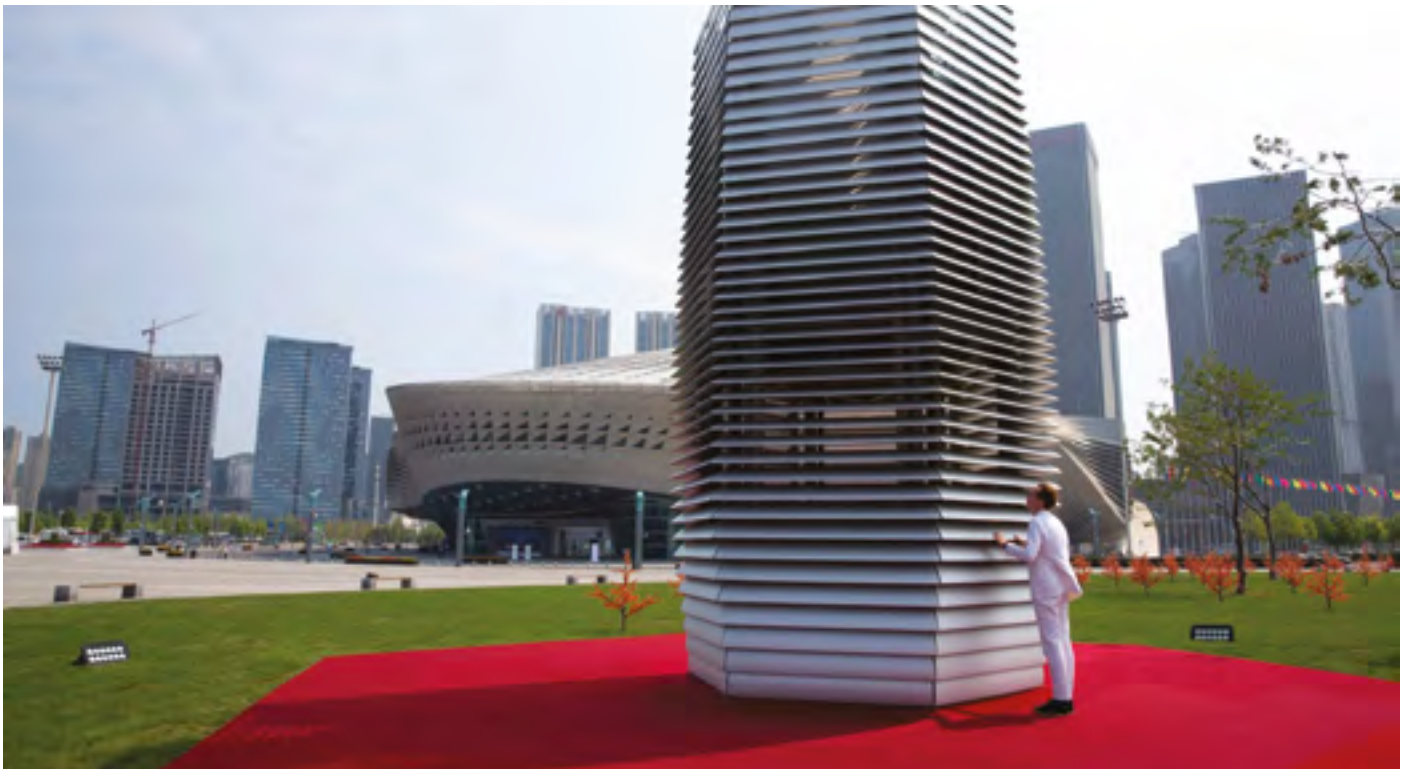
An effective heating, ventilation, and air conditioning (HVAC) system is crucial for a healthy and productive indoor climate in large buildings. Climate Recovery recognises this, and has designed a range of parts and fittings that achieve the result without the high environmental price tag associated with traditional products. The company's duct system is produced almost entirely from recycled glass and sand, and pre-insulated to improve building acoustics and energy efficiency. The company also estimates that their products weigh up to half as much as standard sheet metal fittings, reducing installation times and costs for developers.

Climate Recovery estimates that by replacing metal and plastic fittings with their recycled alternative, their products can cut CO2 emissions by up to 80-90% in the production phase, which translates to an average saving of eight kilograms of CO2 per square metre over a 10-year period.

Scan to explore

STUDIO ROOSEGAARDE | THE NETHERLANDS | BUILT ENVIRONMENT

Diamonds from the dust: Rethinking particulate pollution



The Smog Free Tower is a seven-metre-tall smog vacuum cleaner. Using ionisation technology, it filters 30,000m^3 of air each hour, removing particulates and crushing the particulate carbon to make thought-provoking gemstones.

As part of their Smog Free Project, Studio Roosegaarde has developed a seven-metre-tall aluminium tower that they liken to a giant pollution vacuum. However, unlike a conventional vacuum cleaner, the towers rely on positive ionisation technology, whereby statically charged particles attract polluting particulates and remove them from the air.

The Smog Free Tower consumes around the same amount of electricity as a kettle, but where possible, the designers have attempted to run them from renewable energy sources. The Tower can filter 30,000m^3 of air every hour, and removes between 50-70% of small particulate matter. To date, it has been installed in cities in the Netherlands, Poland, India and China. The company also produce jewellery featuring black, diamond-like rocks from the collected particulate matter.

Scan to explore

MINIWIZ | TAIWAN | BUILT ENVIRONMENT

Putting waste to the test to create new materials

Miniwiz's Trash Lab is reinventing waste into new materials for architecture, fashion, and consumer goods. In doing so, they hope to turn problematic waste streams into the key materials in a more circular economy.

The Trash Lab, by Miniwiz, is an innovation studio dedicated to the creation of new materials and consumer goods from varied waste materials. In the same way that different metals can be combined to create alloys with varying structural properties, so can different waste products. By combining unlikely waste products like PET bottles and rice husks, Miniwiz's Trash Lab is creating thousands of new composite materials, each with its own unique subset of properties for architecture, apparel, transportation, and more. Modularity is a central principle in their designs, so where possible their products are combined mechanically rather than being glued together with adhesives, in order to improve their reusability and recyclability.

Amongst their many solutions is the POLLI-Brick, a lightweight and low cost building material created using plastic bottles. It is assembled using a honeycomb-like interlocking system and was the key building material in the facade for Taipei's EcoArk pavilion, which is made from the equivalent of 1.5 million plastic bottles. Miniwiz estimates that POLLI-Brick systems cost 80% less than conventional construction materials, and generate significantly lower emissions. POLLI-Bricks have also been used to make reusable drinking containers, and even as the hull of a boat.

Miniwiz is headquartered in Taipei, which already boasts high recycling rates – 52% of municipal waste and 77% of industrial waste. Miniwiz has expanded to Beijing, Berlin and Milan. The company is also well known for their Trashpresso, a self-contained mobile recycling device.

Scan to explore

MOBILITY

Driving sustainably into the new market reality

The transportation and mobility sector is very susceptible to climate market disruptions due to several factors. Foremost, more than 95% of the world's transportation energy comes from fossil fuels, and the sector is responsible for 14-15% of global greenhouse gas emissions. By far the largest contribution comes from ground transportation, followed by air and then marine transportation, but the sector as a whole is under pressure to take climate action - and more so in the coming years, with a growing political focus on how to limit the sector's climate footprint.

Furthermore, the sector is highly weather dependent - turbulence on the North Atlantic flight corridor could increase by 40-170% if carbon dioxide emissions double by 2050, as the International Energy Agency forecasts, which will inevitably lead to costs from wear and tear, damaged infrastructure and disrupted flights connections.

Risks are shaking the sector

The regulatory landscape is about to become a considerable disruptor of the mobility and transportation sector, as government and international organisations slowly start to acknowledge the sector's environmental impacts. Some nations are already pushing to phase out fossil fuel-powered vehicles - which are major contributors to air pollution and climate change - and incentivise electric vehicle use. Sixteen countries have already planned to ban fossil fuel car sales, most by 2030 to 2040, and major cities are following suit, with some even banning the use of petrol and diesel cars. More nations will most likely join, which will effectuate a surge in demand for EVs (which are forecast to reach full cost parity with fossil-fueled light vehicles in 2024), improved electric charging infrastructure, and alternative fuels such as biofuels and hydrogen for trucks and ships. There is even the possibility of overhead wiring on major roads for long-distance electric trucks.

Cities are also reacting rapidly to growing climate issues related to land transport. One-third of greenhouse gas emissions from C40 cities come from transport, and cities such as London, Paris, Los Angeles, Seattle, Mexico City, and Tokyo, have already committed to creating zero-emission areas by 2030. This will induce a great transformation of the entire mobility sector - calling for new col-

lective transportation solutions and for new carbon neutral land transportation.

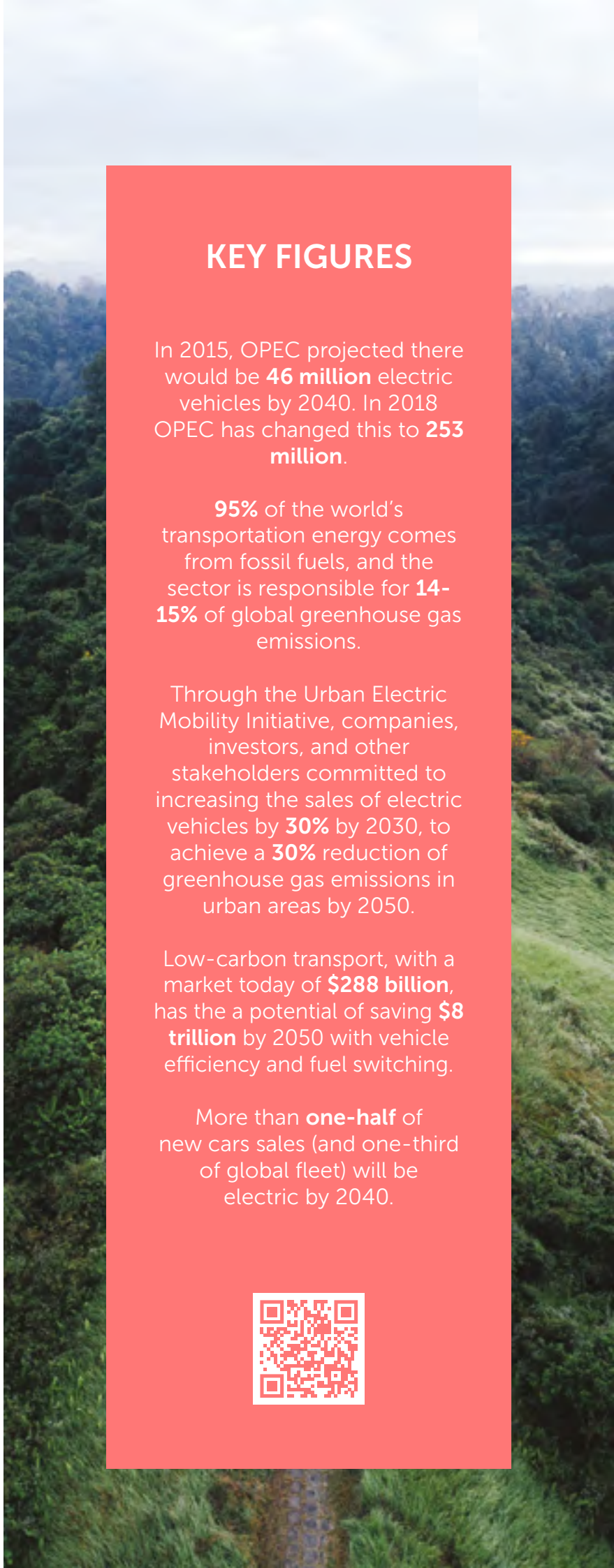
For the maritime shipping industry, 2018 became a turning point, as it was the year that extensive climate regulations were finally introduced. A new international agreement by the International Maritime Organisation obliges the industry to cut carbon emissions by at least half by 2050. The International Air Transport Association has already passed laws and initiatives for reduction in aviation carbon emissions of 50% by 2050, relative to 2005 levels. To safeguard this ambitious target, a reduction and monitoring scheme has been launched that aims to stabilise carbon emissions at 2020 levels by requiring airlines to monitor emissions on all international routes and offset the growth of their emissions after 2020.

These goals will be hard to meet, given the fact that large growth rates in flight transport and shipping are projected due to the expanding middle class in emerging countries. The number of flight passengers are expected to reach 16 billion by 2050, a 384% increase on today's numbers - a huge pressure on the climate, but also a huge opportunity for the companies pursuing sustainable solutions.

A ride to new opportunities
For the transportation sector, the business opportunities of the new market reality should be clear. The sustainable mobility market as a whole could unlock a staggering $4 trillion by 2030 according to the *Better Business Better World* report.

In fact, the total market for sustainable mobility solutions - including public transport, circular models in the automotive industry, manufacturing of electric and hybrid vehicles, car sharing, new smart solutions etc. - is estimated to be $2 trillion annually.

The realisation that pursuing market opportunities as first movers carries massive advantages has gained momentum amongst some companies. EasyJet, the British-based budget airline, has pledged to develop a fleet of electric planes to cover short-haul routes of less than two hours by 2030, which would significantly reduce carbon emissions and noise from its operations: They are projected to be 50% quieter and 10% cheaper than traditional aircraft for airlines to buy and operate. Another example is the Volkswagen Group, that has made aspiring claims to have electric vehicles as good as Tesla's for half the price by 2020 based on continuously growing consumer demand in global markets.



KEY FIGURES

In 2015, OPEC projected there would be **46 million** electric vehicles by 2040. In 2018 OPEC has changed this to **253 million**.

95% of the world's transportation energy comes from fossil fuels, and the sector is responsible for **14-15%** of global greenhouse gas emissions.

Through the Urban Electric Mobility Initiative, companies, investors, and other stakeholders committed to increasing the sales of electric vehicles by **30%** by 2030, to achieve a **30%** reduction of greenhouse gas emissions in urban areas by 2050.

Low-carbon transport, with a market today of **$288 billion**, has the a potential of saving **$8 trillion** by 2050 with vehicle efficiency and fuel switching.

More than **one-half** of new cars sales (and one-third of global fleet) will be electric by 2040.

Bertrand Piccard

Aviation Innovator

"Business explorers can move us forward"

The private sector must play a key role as explorer of the new clean economy. This is the key message from Bertrand Piccard, one of the most influential voices within climate change and sustainability, and a true pioneer when it comes to innovative mobility.

"Explorers understand that we have to free ourselves from old patterns of thinking and doing... You have to invent completely new ways to think."

This is the clear message from Bertrand Piccard, one of today's most influential voices in climate change and sustainability innovation. He is urging the the private sector to join his quest for a new clean economy.

Scientific exploration is in Bertrand Piccard's DNA. His grandfather Auguste was the first human to reach the stratosphere, his father Jacques the deepest point on Earth, and he himself flew around the globe in a plane powered only by the Sun.

In 2016 Bertrand Piccard made the first round-the-world solar flight to demonstrate what energy efficiency and renewable technologies are capable of. The aviator's feat landed his plane, Solar Impulse 2, in the prestigious Smithsonian Museum in Washington DC. But Piccard made aviation history in order to change the present - which he finds scarier than anything he's faced.

"It is not flying around the world in a solar-powered airplane that makes me afraid, but to think that with each passing hour...we burn one million tonnes of oil, we deplete natural resources, we destroy the environment, we change the climate. This makes me really afraid," says Bertrand Piccard.

Explorer of profitable clean solutions

Piccard's climate fears have turned him into an explorer of profitable clean solutions. The Swiss visionary will use them to recruit business explorers for a renewable energy transition. He is summoning the pioneering spirit that took man to the Moon to achieve his high ambition.

Piccard's first step is to dispel the stubborn misconception that clean solutions are a luxury that few companies can afford, and he is leading a global campaign to show that protecting the environment and generating profits go hand in hand.

"The fact that now it is profitable to bring clean technologies onto the market is an argument that absolutely everybody should know," Piccard says.

Clean energy has become cost-competitive as prices have continued to fall. The International Renewable Energy Agency expects green power to be cheaper than fossil fuel electricity by 2020. The higher upfront construction cost makes renewable energy look more risky, however over the lifespan of green projects, wind and solar are the least expensive power sources, according to asset management company Lazarus.

We need a broad alliance – including deniers

Bertrand Piccard believes the climate change battle requires a broad alliance, including government, business, non-governmental organisations and even those who do not believe carbon emissions cause global warming. He makes his case to climate change deniers by leveraging the profit motive.

"A lot of people have no compassion, no love for the planet and for other human beings... We have to bring these people, even the climate change deniers on board by speaking their language. And what is their language? It is profit, and power, and personal advantage," Piccard points out.

He is frustrated that with so much money to be made in clean energy, the dirty status quo remains entrenched and is getting worse. Last year greenhouse gas emissions started rising after remaining flat for almost four years, adding to the urgency for action on scaling renewables.

"Imagine the size of the markets if we were to replace all the old polluting systems with new modern and clean systems, new infrastructure, smart grids, new insulation of buildings, new types of heating, cooling and lighting systems and electric mobility. This is the biggest market of the century," says Bertrand Piccard.

GEOTAB | CANADA | MOBILITY

Intelligent transport monitoring supports safer cities

Geotab is working with cities' transportation networks to collect and analyse data from air pollution to collision risk, helping to make cities smarter and safer.

Transportation is the blood of every city on the planet, running through the cardiovascular system of roads and railways. As a member organisation of Together for Safer Roads, Geotab is collecting and analysing data from vehicles to monitor and improve cities' health as they continue to grow.

As wireless communication capabilities improve and their costs fall, it is becoming easier to collect data about a large range of city metrics. Geotab leverages data from over 1.3 million connected vehicles in a number of different cities to monitor and improve conditions including air pollution, traffic flows, collision frequencies, and emissions data.

In Columbus, Ohio, Geotab is working with the city to integrate its smart city insights data sets into their Smart Columbus Operating System (SCOS). By gathering, storing, analysing, and visualising real-time and historic data about the local transport network, Columbus will gain a more complete picture of local transport conditions. This traffic system intelligence will be essential in the effort to improve road safety as part of their smart city implementation plan.

In another example, Geotab installed air quality sensors on fleet vehicles in Houston, Texas, and revealed that just 10 or 20 fleet vehicles could map 50–70% of a city, indicating the potential for cities' own fleet vehicles to be used as air quality monitoring devices without extra cost.

Scan to explore

SHV ENERGY & NESTE | THE NETHERLANDS & FINLAND | MOBILITY

Europe's first bio liquid petroleum gas

SHV Energy has paired with Neste to produce Europe's first BioLPG, made from waste and residues from industry, and renewable vegetable oils.

BioLPG is a low carbon alternative to conventional liquefied petroleum gas (LPG). LPG, otherwise known as propane or butane, is a common energy source that can be used for cooking, heating, transportation or refrigeration. It is especially useful for applications where access to other energy sources is limited.

The BioLPG is actually a co-product from the Neste biodiesel production facility in Rotterdam. Biodiesel is made from a combination of around 60% waste and residue materials from industry – animal fats from meat and fish processing for example – and 40% renewable vegetable oils. The vegetable oil mix used to produce biodiesel, which includes palm oil, is sourced from certified sustainably grown producers. Specifically, their inputs are certified by the Roundtable on Sustainable Palm Oil (RPSO), meaning they act in accordance with standards on labour standards, biodiversity conservation, land use change, pollution and more.

BioLPG has the same chemical composition as conventional LPG, meaning that it can be mixed with LPG to ensure that it can be seamlessly integrated into existing logistics networks. Each shipment is issued with certification stating how it was produced and the origins of the fuel feedstocks, in keeping with traceability legislation imposed by the European Union.

SHV Energy received their first shipment of BioLPG from the Neste refinery in March 2018, and is expecting 160,000 tonnes more over the next four years. It is the first BioLPG fuel available in Europe.

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GOLDEN GATE ZERO EMISSION MARINE & HYDROGENICS | USA | MOBILITY

Pioneering hydrogen-powered ferry

The world's first high-speed, hydrogen-powered ferry will be built in the San Francisco Bay area and will be financed by the state's cap-and-trade emissions reduction scheme.

Hydrogen is the most abundant element in the universe and using it as a fuel to generate energy is one of the cleanest and most versatile power generation methods available. Hydrogenics works to develop the technology and implement it across the world. Working with Golden Gate Zero Emission Marine, they are creating the 'Water-Go-Round' – a 70-foot aluminum catamaran designed by Incat Crowther and built by Bay Ship and Yacht, with a top speed of 22-knots and capacity of 84 passengers.

The project was awarded $3 million in funding from the California Air Resources Board (CARB), that comes from California's state-wide cap-and-trade programme, working to reduce emissions and strengthen the economy throughout the state. There will also be a three month monitoring study following the vessel's launch. Data gathered by Sandia National Laboratories will be analysed to assess the suitability of the technology for further marine use.

Scan to explore

UBITRICITY | GERMANY | MOBILITY

Intelligent charging for electric vehicles

Ubitricity has developed a simple, easy-to-install electric vehicle (EV) charging port to increase access to power for drivers. Their intelligent design also helps manage demand for variable renewable energy sources.

Ubitricity provides installation and management services for electric vehicle charging stations. Their simple charging sockets are designed to be installed where they are needed. This may range from public lamp posts, to private car parks, residential buildings, hotels, and more. Rather than each charging point being fitted with complex metering technology, the meter is installed in Ubitricity's Smart Cable, making charging points cheaper and easier to install, thus accelerating their proliferation.

Customers can purchase their own Smart Cable, which is compatible with existing commercial EV charging points as well as their own. Integrating the meter into the cable means customers get more accurate information about each recharge and can determine more precisely how much electricity their car consumes. Customers manage their electricity use on either a web or mobile-based app, which includes detailed consumption data, as well as a search function to help customers locate nearby charging stations.

Ubitricity has also recognised the important role that electric vehicles play in smart grid systems. Because EVs consume so much electricity, recharging at peak times can put a lot of pressure on variable renewable energy sources. The company uses smart metering technology, altering prices to reflect demand and encouraging users to charge their vehicles in off-peak times. By installing charging stations in places like office buildings and residential buildings, Ubitricity can give EV drivers more access to charging ports during these off-peak times.

Scan to explore

ECOSUBSEA | NORWAY | MOBILITY

Ship-cleaning robots cut emissions and costs

Ecosubsea uses remotely controlled mini-submarines to clean large vessels while at port to reduce subsurface pollution, fuel costs, and spread of invasive species.

Clean and smooth underwater ship surfaces protect vessels from corrosion and allow smoother operation. Conventional cleaning methods such as scouring hulls with metal brushes or using high-pressure cleaners are being banned around the world due to release of paint debris and spread of invasive species. The Ecosubsea solution uses remotely controlled mini-submarines equipped with cleaning and collection technology to clean hulls efficiently without damaging anti-fouling paint.

The underwater 'robots' blast water at an angle almost parallel with the surface of the hull, which spares paint from abrasion but hits marine growth to release sea and paint debris. Ecosubsea collects up to 97.5% of all debris released in cleaning operations according to the company, preventing marine pollution and spread of invasive species which can latch onto hull surfaces. Furthermore, scraping the hull lightens the ship and reduces water friction which leads to lower carbon emissions for ships during voyages.

Ecosubsea has set up a base in the port of Southampton with two cleaning stations for vessels. The English port has some of the most rigorous and strict bio-risk policies in the world and didn't allow for hull-cleaning before letting Ecosubsea set up the cleaning stations. To date, some 350 vessels have been cleaned using Ecosubsea's mini-submarines and the services are now available in ports in Norway, Sweden, Denmark and Belgium.

Scan to explore

BRISK SYNERGIES | CANADA | MOBILITY

Machine learning to improve road safety

Brisk Synergies' Lumina software utilises artificial intelligence and machine learning to analyse thousands of traffic interactions and help design safer roads for all users.

As a member organisation of Together for Safer Roads, Brisk Synergies is putting machine learning and artificial intelligence to the test by analysing variations in traffic conditions and movements. Using existing city CCTV infrastructure, the company analyses conflict scenarios and high-risk behaviour in different settings throughout the city, that usually involve complex interactions between cyclists, pedestrians, and vehicles. Understanding the causes of high-risk scenarios can help cities to design, test, and improve road safety conditions for all road users.

In May 2018, Brisk Synergies deployed the software in downtown Atlanta to analyse the difference in safety conditions after a change to the sequence of pedestrian crossings. The company collected data about potential conflicts at one intersection at varying levels of severity before and after the change to the sequence of pedestrian crossings. The company found a reduction in instances of conflict after the change in pedestrian crossings using the software output.

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FOOD

Opportunities not to be wasted

The global food sector is greatly exposed to the risks of the climate change. As such, several market risks caused by climate change will need to be navigated by companies operating in this sector. Supply chain disruptions will become a more regular occurrence due to more frequent and unpredictable weather extremes - think severe droughts, intensified floods, hurricanes and even extreme coldness. At the same time, food companies can expect increasing consumer demands for low carbon, ethical and plant-based food production.

On top of this, the global food sector - from farmers to retailers - are to an increasing extent being met by new regulation and tariffs pushing for a more sustainable production system. And there are good reasons for this. The food sector is accountable for 25-33% of global greenhouse gas emissions, when considering the sector's whole value chain from farm to fork.

Navigating risky fields

If the food sector continues down its current path, the world's ecological and biological systems will be compromised. Between 2010-50, as a result of expected changes in population and income levels, the environmental effects of the food system could increase by as much as 50-90% in a business-as-usual scenario, which is highly feasible.

One great challenge is food loss and waste - both with regards to the fact that food waste is accounting for 8% of all greenhouse gas emissions and also due to the fact that one in nine people go hungry while a third of all food is lost or wasted. In addition, food loss and waste accounts for about $1.2 trillion in financial losses each year.

This calls for new and ambitious targets to take control of food waste. Today, about 20% of the world's largest food companies have started to measure and report on food waste. This pushes the rest of the sector to take action in reducing food waste. Usage of by-products of food production is also a challenge. A key example is that we only utilise 0.2% of the nutrition contained in a coffee bean.

There is also growing political pressure on the food sector, with more regulations and tariffs in response to demands for more sustainable production methods, reductions in food loss and waste, and transparency in supply chains. This is also supported by growing consumer demand for ethically-produced food. This forces food

companies to be able to deliver supply chain sourcing data from agribusinesses and traders to augment transparency.

Growing consumer demands for plant-based, low-carbon, organic, and locally produced food also challenges the entire food supply chain. This trend can only be expected to accelerate - either by demand or new regulation - because the consumption of beef, lamb and pork in most Western countries will have to be reduced by 93%, eggs by 71%, milk by 60%, sugar by 64%, and chicken by 45% in order to live up to the obligations of the Paris Agreement and the UN Sustainable Development Goals.

Opportunities are up for grabs

The new market reality unlocks a number of opportunities for first-movers in the food sector. According to the Better Business, Better World 2017 Report, developing sustainable food business models could be worth up to $2.3 trillion a year and generate over 70 million jobs by 2030.

Reducing food waste is not only the right thing to do, but it also carries a major economic prize. The business initiative Champions 12.3 has shown that there is a 1:14 ratio in positive returns on investment in reducing food loss and waste. Add to this that just one-quarter of the food currently lost or wasted could feed 870 million people annually.

To tap into this opportunity, the food sector needs to proactively invest in new production chains, new products, new technological solutions, and reinvented business models - and it needs to be based on a strategic understanding of how the food sector, the climate and the pressures for transformation are creating a new market reality.

Many companies are already trying to do so. For instance, Forbes found in 2018 that the number of food and beverage brands claiming to be ethical on their packaging has increased seven-fold since 2010. Looking to digital solutions, several food companies are also responding to the need for enhanced transparency, traceability and legality, enabled by satellite imagery and other technologies.

KEY FIGURES

Crop yield declines of **10-25%** may be widespread by 2050 due to climate change.

Currently, one-third of the food we produce is either lost or wasted. The global costs of food wastage **$2.6 trillion** a year, including **$700 billion** of environmental costs and **$900 billion** of social costs.

Without radical changes to the current food and agriculture system, the cost of biodiversity and ecosystem damage could reach up to **18%** of global economic output by 2050, up from around **$2 trillion**, or **3.1%**, in 2008.

Seven of the world's **10** largest food and beverage companies have committed to setting Science Based Targets to reduce greenhouse gas emissions.

In 2017, Supply Change reported that there were **447** companies making public commitments to address commodity-driven deforestation, a **22%** increase from the year before.

Furniture giant

How we are fighting food waste

We can and must play a key role in advancing a sustainable food system - and it is good for our business. This is the key message from Michael la Cour, Managing Director of IKEA Food Services.

When you think of IKEA, you think flat pack furniture, not innovative food. The Swedish company has revolutionised the way we live, offering inexpensive, simple products for the home. Now the Managing Director of IKEA Food Services Michael la Cour wants to revolutionise the way we eat – he wants you to come to IKEA for sustainable food. Why would people go to a furniture store for innovative eats? Because food has been part of the shopping experience since its humble beginnings in the Swedish town of Ålmhult 75 years ago, La Cour insists.

"Ingvar (Kamprad), our founder, very early on recognised that it's very difficult to do business with customers on an empty stomach, so he installed restaurants. At that point that was very visionary to do," Michael la Cour points out.

Over the years the furniture retailer's food sales soared, rising to $1.6 billion in 2016. That might pale in comparison with its $36.5 billion in overall sales, but 20% of its customers go there just for the food. Last year 660 million people in 48 countries dined at IKEA.

The home goods giant is now using its global reach to advance sustainability in food. The push is part of IKEA's People & Planet Positive sustainability strategy, committing the company to inspire positive change in society by setting a good example. IKEA points to the staggering statistics about the carbon emissions challenge and the global hunger that persists while food gets thrown away. One billion tonnes of it ends up in the garbage every year, according to the Food and Agriculture Organisation (FAO). Yet one in nine people do not have enough to eat. Just a quarter of the wasted food is enough to feed the world's 870 million hungry people. Add to this that food waste also wastes one-quarter of water used in agriculture, and releases 8% of annual greenhouse gas emissions, according to the United Nations Development Program (UNDP). Those numbers have turned IKEA into a warrior against food waste.

Horse meat scandal shake-up

IKEA Foods' focus on sustainability was sparked by a scandal which rocked some of Europe's major brands in 2013. Traces of horsemeat were found in IKEA's iconic Swedish meatballs. The mislabeled product revealed a vulnerability where profiteers could substitute horse meat for beef to lower costs. Michael La Cour says he did not know about the problem because he relied on suppliers to inform him in a very fragmented supply chain. He says IKEA Foods has since increased its focus on transparency:

"We are building up a supply chain that mirrors what we do on the furniture side. What that means is that we will have a transparent supply chain that is sustainable, that is flexible, and that is where

we can secure everything worldwide of what we do," La Cour says.

The search for a solution to the horse-meat scandal also opened La Cour's eyes to the harmful effects of food waste. The damaging impact made La Cour rethink his entire food production strategy to reduce IKEA's waste of food.

"We experienced that as a wake-up call. We suddenly found out that we have a major business. It's about two billion Euros on a global scale in sales and we have 660 million visitors to our restaurants, so a massive amount of people. That is a great opportunity, but it's also a great responsibility."

In December 2016, IKEA launched its Food is Precious initiative, committing the company to cut food waste by 50% in its restaurants, bistros and markets by August 2020. That target is 10 years ahead of the 2030 Global Goal set by the UN. One important step in reaching this goal is a smart scale that enables IKEA employees to measure the food chefs throw away. The technology also allows staff to enter on a touchscreen the type of food which ends up in the garbage. It also calculates the environmental and economic cost of waste.

La Cour was most impressed by how the technology changed workers' relationship with food. Fifty percent of them said that measuring food at work changed their behavior at home. By the end of October 2017, IKEA's smart scales saved almost 600,000 meals and prevented more than one million kilograms of carbon emissions. IKEA also cut 20% of its costs and received a positive return on its investment in 20 weeks. According to Michael La Cour, the business case is a no-brainer.

"The business case is very, very simple. And then you ask – "Well why wasn't it done before?" Often it takes this sort of focus on something specific to get people's minds around it. I do think that we've helped, because then people start understanding what food waste does from a sustainability perspective."

Insect meatballs and veggie burgers

IKEA is not only into waste, but is also trying to make its menu more sustainable and change people's mindsets towards food choices. IKEA is currently collaborating with food-tech startup Space10 in Copenhagen to create five new versions of IKEA favourites made with sustainable ingredients like algae and beetroot, spirulina, and even insects.

Bugs gross out a lot of people, but IKEA wants to change minds about a sustainable staple enjoyed by many Asian countries which is making its way to supermarkets around the world. Insects are touted as a tasty, protein-rich alternative to meat with a low environmental impact. Producing a kilogram of crickets takes less than a fifth of the feed cattle need, requires significantly less water and emits a fraction of greenhouse gases compared to cattle. La Cour says insect alternatives still need a couple of years to pass testing and regulation hurdles, so no bugs yet on IKEA's new menu. But the company has introduced vegetarian meat substitutes, priced lower for their lesser environmental impact. In 2018, IKEA launched vegetarian hot dogs in all it's stores in Europe and North-America, where they were well received.

"So far we've done consumer tests in Sweden and one in the US. It's been overwhelming in terms of positivity. What we've learned is that you can do healthy and sustainable products but they have to be just delicious."

Selling vegetarian hot dogs and cutting food waste in IKEA's kitchens made La Cour realise that every step counts. The changed mindsets of his own employees shows that even a furniture company can be a changemaker in food. La Cour now wants to be the first to develop smart solutions to cut waste in people's kitchens.

"Imagine that we could even develop smart kitchens, smart solutions in the kitchens. The technology is out there, but could we be the first ones to involve that? So with my colleagues, we're working on that over the next couple of years," Michael la Cour says.

REGRAINED | USA | FOOD

Crafting new uses for brewery byproducts

Supergrain+ is a flour made from the 'spent grain', a byproduct of brewing beers. This fibre- and protein-rich flour is converted into nutritious snack bars wrapped in biodegradable packaging.

ReGrained was founded by two friends with a hobby for home-brewing beer. Upon realising the vast amount of grain that is wasted in the brewing process, referred to as 'spent grain', they set out to develop a way to create value from this nutritious byproduct. The result is Supergrain+, an alternative to flour that is produced using spent grain from local craft breweries around San Francisco.

In the brewing process, grains such as barley, wheat and rye are mixed with hot water to extract most of their sugars and create alcohol. Without these starches, the remaining byproduct is packed with insoluble fibre, protein and micronutrients. In fact, Supergrain+ contains 20g of protein and 27g of fibre per 100g, compared to 12g and three grams respectively in plain white flour. It is also a good source of prebiotics, the nutrients that feed probiotics in the gut and promote digestive health. Supergrain+ is currently sold in the form of flavoured snack bars, but ReGrained is experimenting with other products such as chips and bread. To date, they've upcycled over 20,000 kg of grain.

ReGrained has partnered with packaging industry experts to develop a wrapper that is biodegradable and compostable, in keeping with their no-waste philosophy. Their solution is part of a growing trend of what the founders call 'edible upcycling', whereby the byproducts from food production are transformed into new food products. They are a certified B-Corp organisation, meaning they have been independently verified as an environmentally and socially responsible company. In addition, they are a member of the 1% For the Planet movement and donate 1% of their profits to non-profit organisations.

Scan to explore

AQUTONIX | USA | FOOD

Water efficiency gives more crop per drop

Aqutonix is a water efficiency enhancement technology that facilitates the absorption of the water in plants' roots, reducing water consumption and boosting yields.

Due to water's chemical properties, molecules tend to group together in 'clusters' which have to be broken down by the plant before the individual molecules can be absorbed through the roots' cell walls. Aqutonix facilitates water absorption through exposure to a high voltage electric field which breaks the clusters down, making individual molecules available to plants. Increasing absorption rates means that less water is required, resulting in water savings for farmers. What's more, the product increases the photosynthetic efficiency of plants – because the water molecules are broken down before they are consumed by the plant, it leaves the plant more energy for photosynthesis. This process has been shown to increase yields by up to 43%.

The device is compatible with existing commercial irrigation systems, making it easy to install. Although it runs on electricity, it requires very little, around 500 watts per hour. The company expects that savings on water usage will make up for the extra energy costs, and may reduce them overall if farms have to irrigate less.

Scan to explore

LEAFY GREEN MACHINE | USA | FOOD

High-tech hydroponic urban farming in shipping containers

The Leafy Green Machine is a fully assembled, vertical hydroponic farming system built inside a 12m shipping container, allowing any individual, community, or organisation to grow fresh produce all year round.

Shipping containers can do more than transport goods across the oceans. Freight Farms has created a container suited for growing lettuces, herbs, and other greens using a fraction of the natural resources that would usually be required. The Leafy Green Machine is designed for easy operation and requires no previous farming experience to operate. The company estimates that once up and running and connected to water and electricity, farmers can expect to harvest up to 70 kg of produce a week. It works using hydroponic and vertical farming techniques to optimise space and reduce water requirements by 98% compared to conventional techniques. Smart monitoring tools and software also help to maintain optimal growth conditions inside the container, 365 days a year.

More than 200 Leafy Green Machines are now in operation all over the world, with some interesting stories behind them. For instance, a university in Maryville has set up an on-campus container farm, Ford Motors has donated a container to help to feed Detroit's food-insecure areas, and an American entrepreneur has built an urban farming business with a Leafy Green Machine, growing and selling a variety of fresh herbs in Brooklyn.

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FUTUREPUMP | KENYA | FOOD

Solar irrigation pumps for smallholder farmers

Futurepump's solar-powered irrigation systems provide clean and cost effective water management solutions for farmers operating on a small scale.

Futurepump manufactures portable, solar powered irrigation systems for use by smallholder farmers. Each irrigation kit comes with a pump mechanism powered by a solar panel, a suction pipe, hose for water distribution, and irrigation sprinklers. The suction pipe can retrieve water from depths of up to seven and a half metres – making it ideal for farmers that rely on shallow wells, rivers, or lakes to water their crops – and can pump up to one litre per second. The pump mechanism is lightweight and foldable, including the solar panels, making it more easily transported than heavy diesel alternatives.

Their price level was determined with affordability for smallholder farmers in mind, and comes with a five year warranty. A key feature of the design is its simplicity, meaning that many farmers are able to fix problems themselves using the user manual and spare parts provided by the distributors. In addition, all new pumps are fitted with a sim card and data logging system, which tracks usage of the pump and can be used to forecast maintenance needs – for instance, the sensor devices could detect if a part needs changing, and send a text notification to the user to repair it.

The solar irrigation pumps are currently available in nine countries across Africa and Asia.

Scan to explore

SNACT | UK | FOOD

A delicious protest against food waste

Snact has developed a range of fruit-based snacks made from produce that would otherwise have been wasted, helping to reduce food waste and provide healthy snack options.

Snact rescues produce that fails to meet cosmetic standards and turns it into healthy snack bars. These products have a longer shelf-life than fresh fruit, reducing the volumes of food waste. Their first product was fruit jerky, a dried fruit snack made with 100% fruit and nothing else. They've since launched banana bars made with some of the 1.4 million bananas that go to waste in the UK every day.

In Britain where the company is based, supermarkets are the main customer for farmers, and impose strict guidelines on what constitutes acceptable fruit. If a banana is too wonky, an apple too blemished, or a carrot too kinky, the supermarkets reject the produce and the fruit goes to waste, despite no issues with taste or nutritional value. The company has also developed packaging for their snack bars that will biodegrade in six months, taking inspiration from nature's own packing – the banana skin – and helping to ensure their product does not have a negative environmental consequence after consumption.

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BEYOND COFFEE | DENMARK | FOOD

Farming mushrooms with coffee grounds

Beyond Coffee has put together a kit that allows people to reuse their coffee grounds to grow edible mushrooms in a small bucket in just four weeks.

Only 0.2% of nutrition from coffee beans is utilised when making coffee. Once the aroma has been infused in the water, the remaining 99.8% ends up in the bin. Beyond Coffee has found a way, as the name suggests, to take advantage of the remaining grounds by designing a GrowKit for people to grow edible oyster mushrooms in coffee grounds.

To grow the mushrooms, a small amount of cooled coffee grounds must be mixed with a bag of mycelium – the vegetative part of a fungus – and left in a dark location for a couple of days. After a white mass of mycelium covers the surface of the grounds, more can be added repeatedly over the course of three weeks or until the bucket is full, kickstarting the fruiting phase. The bucket is moved to a lighter, colder and more humid location. After approximately one week, the first oyster mushrooms begin to make their way through small holes covered by tape, and a few days later the first round of oyster mushrooms should be ready for harvest.

Mushroom lovers who lack patience can also purchase all they need for a fungi feast. In their store, Beyond Coffee sells fully grown and harvested mushrooms, grown on grounds collected from local restaurants. To ensure nothing goes to waste, the mushroom substrate from the production is upcycled by an organic farmer who uses it as soil fertiliser.

Scan to explore

Printing Partner **Rosendahls**

Printing while protecting the ENVIRONMENT

Limiting their environmental impact is absolutely key for the Danish printing company Rosendahls. Therefore, the company works strategically by applying structured environmental management certifications. An important part of this work is to set measurable targets for the company's environmental work, and to review them continuously.

This work is not one shot only, but a continuous process to reduce their environmental impacts by using less environmentally damaging materials and processes. Rosendahls also actively tries to influence their customers' choice of materials in an environmentally friendly direction through dialogue.

Rosendahls currently offer customers a variety of ecolabel print choices:
The Swan
The Flower
FSC
CO2

The printing company also compile all their annual environmental accounts. This makes them aware of their environmental footprint and able to target their biggest contributors to CO2 emissions. One of the main focus areas for the company at present is the electricity consumption of machinery, which generates significant CO2 emissions. That is why Rosendahls constantly seek to adapt and streamline their production machinery to reduce the amount of CO2 emissions per tonne of printed matter.

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COP24 in Katowice,
December 2018

“Let us rise to the challenge”

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Secretary-General of United Nations

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The Global Opportunity Explorer 2019 Insights is a celebration of solutions addressing one of the pressing challenges of our time. With climate change set to disrupt natural and business climates, the time is now to seize new strategies and mindsets.

With a selection of solutions across six sectors directly exposed to climate change, the Global Opportunity Explorer 2019 Insights demonstrates that even when the risks are great, the opportunities are greater still.

Navigate with embedded QR codes to the digital ecosystem where the solutions come alive - the Global Opportunity Explorer. Here you can find more information about the solutions, see how they impact the Sustainable Development Goals, and connect with them directly.

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