For professional investors

ROBECO
The Investment Engineers

STUNNING STATISTICS

of sustainable investing

Sustainable Investing Expertise by
ROBECOSAM

AWARD WINNER!
Savvy Investor Awards 2021
Best ESG Paper 2021
www.savvyinvestor.net
#SIAwards21

Introduction

The progress that sustainable investing has made in recent years has been stunning. It has gone from a niche investment style to a mainstream multi-trillion dollar industry. The rise of sustainability has produced some stunning statistics of its own – from wind turbines the size of skyscrapers to plans to create a Great Wall of Africa using trees.

In January 2017, Robeco decided to collect these amazing facts in a new series called SI's Stunning Statistics. Every month we found an interesting new number from the world of sustainable investing, and added our own investment angle to it. Using the same format for each one, we asked three questions: What has happened? Why is it important? What does it mean for investors?

And it truly did throw up some stunning stories that would otherwise not have seen the light of day. Did you know, for example, that six ships create as much pollution as all the world's traffic? That three bitcoins consume as much energy as a million credit card transactions? Or that the last time CO_2 levels were as high as they are today, wooly mammoths were roaming the earth?

It was also an opportunity to explore some of the contradictions that are present in sustainable investing. We were able to show how super-sustainable Norway is also a major contributor to global warming; how the global population is unsustainable, not because it is rising, but because it is falling; and how shorter flights are worse than longer ones. It got people thinking!

And while we were promoting the main message of sustainability – one of Robeco's investment pillars and core strengths since the 1990s – we were also able to have some fun doing it. We enjoyed delivering some terrible puns about 'light at the end of the funnel', 'Gone with the Wind', and 'How King Coal was dethroned'.

In this compendium, we proudly present our favorites from the series, bracketed in six categories. We hope you get as much pleasure out of reading them as we did compiling them.

Contents

1 CLIMATE CHANGE

Climate change is seen as the greatest threat facing humanity, and tackling it one of the greatest opportunities. Its principle cause is the level of greenhouse gases that are pumped into the atmosphere on a daily basis, led by the carbon dioxide released from burning fossil fuels. We wrote several Stunning Statistics about this issue, led by some stark facts about the sheer scale of the problem, and the surprising news about who the worst offenders (outside power generation) actually are.

CO_2 is at highest level for three million years

SPEED READ

Climate impact research reveals rampant pace of global warming

The last time CO_2 was this high, sea levels were 25m higher than now

Robeco portfolios are overweight stocks with lower carbon footprints

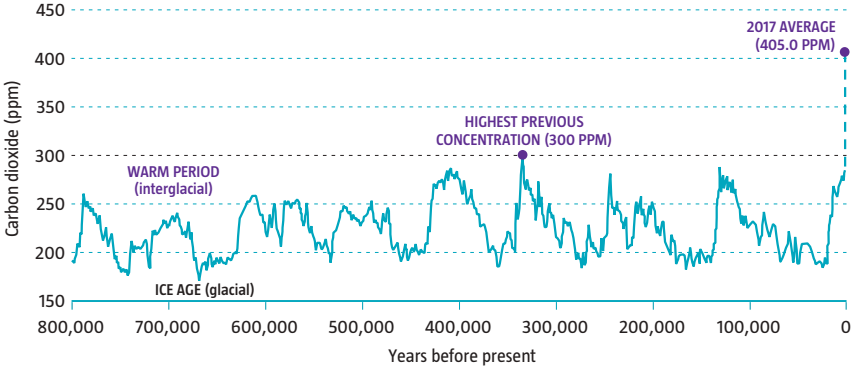
The amount of carbon dioxide in the atmosphere is now at a level last seen in prehistoric times, new research shows.

WHAT HAS HAPPENED?

Research by the Potsdam Institute for Climate Impact Research shows that the level of 405 parts per million (ppm) of carbon dioxide recorded in the atmosphere in 2017 was last seen on Earth three million years ago. Samples of sea bed sediment, ice and other particles dating back that far were used to compare today's levels with that of the Pliocene era.[1]

At that time, the temperature was 2-3 degrees Celsius higher than pre-industrial levels, and the average sea level was up to 25 meters above what it is today. Humans had yet to evolve, wooly mammoths roamed the earth, and the continents were up to 250 kilometers from their present locations, which meant North America was still connected to Asia.

Figure 1: We're off the scale – CO_2 levels during the past 800,0000 years[2]



Source: NOAA Climate.gov, NCEI

1. https://www.eurekalert.org/pub_releases/2019-04/pifc-mct040319.php
2. https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide

WHY IS IT IMPORTANT?

The findings make particularly grim reading regarding sea levels, as melting ice caps from global warming is seen as the biggest threat to modern human existence. Rising carbon dioxide from the Pliocene onwards caused climate change which ushered in the ice ages, creating the polar caps. Reversing this would mean sea levels rising as much as 80 meters, submerging coastal cities and threatening billions of people.

The research also means that global warming is progressing at a faster pace than previously thought, making it harder to meet the conditions of the Paris Agreement. These seek to limit temperature rises to a maximum of 2 degrees above pre-industrial levels by 2100, and preferably no more than 1.5 degrees.

A report issued by the Intergovernmental Panel on Climate change in October 2018 said the world had little chance of meeting the Paris targets unless drastic action was taken now.[3] It said the 2-degree target would probably be reached by 2030 and that global warming of 3 degrees by the end of the century was more likely.

3. https://www.ipcc.ch/sr15/

WHAT DOES IT MEAN FOR INVESTORS?

Investing in those companies that help combat global warming and engaging with those that don't will become more important going forward, says Chris Berkouwer, portfolio manager with Robeco's Sustainable Global Stars Equities strategy. "Our portfolio is structurally overweight companies that have a much lower environmental footprint than the global average," he says.

"The portfolio basically reflects a balance of solution providers to the climate problem, as well as companies with whom we engage to change for the better. For example, we invest in providers of bio-based renewable fuels and wind turbine makers, which also helps in fighting climate change."

"Of course, the easiest way out is not to invest in CO_2-emitting industries at all, but that's too simplistic, and often doesn't solve the underlying problem. The best long-term solution is actually to engage with companies such as the oil majors to move them in the right direction, i.e. actively discussing with them how to lower their environmental footprint and keep management accountable for their actions." ■

Climate change threatens 1.1 meter sea level rise

SPEED READ

IPCC report raises sea level rise threat by 10cm to 1.1m

World needs to become carbon neutral by 2050 to avert it

RobecoSAM SDG Equities targets global warming

Sea levels will rise by over a meter before 2100 unless climate change is tackled, a new report warns.

WHAT HAS HAPPENED?

Analysis by the International Panel on Climate Change (IPCC) makes the prediction in its 'Special Report on the Ocean and Cryosphere in a Changing Climate', which studies the effect of global warming on sea levels.

It says 90% of the 1 degree Celsius rise in average global temperatures above pre-industrial levels seen thus far has been absorbed by the oceans, having a major impact on sea life and corals. The Paris Agreement signed in 2015 aims to restrict global warming to 1.5 degrees Celsius by the end of this century.

However, record levels of carbon emissions that show no signs of abating have accelerated global warming. The IPCC report now warns that unless drastic action is taken for the world to become carbon neutral by 2050, global warming may become uncontrollable.

WHY IS IT IMPORTANT?

Global warming is causing the ice caps to melt, with record levels of glacier melting seen this summer in the Arctic and Antarctic, disgorging billions of tons of fresh water into the ocean. The problem is made worse because frozen areas such as permafrost trap carbon that is released when it melts, causing a vicious cycle of further warming.

The IPCC report says that global average sea levels could now rise by up to 1.1m by 2100, up 10 cm on previous estimates. Rising sea levels threatens dozens of large coastal cities and those that lie on tidal rivers, including London, New York, Mumbai, Shanghai and Jakarta. It also risks flooding countries that lie below or at sea level, such as Bangladesh, the Netherlands and most islands in the Pacific and Indian oceans.

Figure 2: Cities at risk from sea-level rise – Under a high emissions scenario

Source: C40 cities

WHAT DOES IT MEAN FOR INVESTORS?

One way that investors can help the fight against global warming is by investing in the UN's Sustainable Development Goals, particularly SDG 13 on Climate Action. RobecoSAM's Global SDG Equities strategy systematically screens a diversified group of companies based on their SDG impact scores – including their commitments to decarbonizing – and selects the best ones for the strategy.

"For nearly two decades RobecoSAM has been in the business of anticipating significant structural trends that will impact the environment and business models. Climate change is a very powerful and very visible example of one of those trends," says Rainer Baumann, Lead Portfolio Manager for the strategy.

"Our SDG strategy invests in companies which are enabling the transition to a low-carbon economy through clean energy solutions as well as in companies helping to reduce carbon emissions through energy-efficient tools, services, and infrastructure. In addition to climate change, the strategy provides exposure to all 17 SDGs – all of which are aimed at protecting life, society and the planet." ■

Click here for climate change

SPEED READ

Internet use will generate 1.5 gigatons of gases by 2020

Data centers alone use 30 gigawatts of power per year

Major IT companies are switching to use of renewable energy

The internet is often seen as the greatest invention since the railways – but its impact on climate change is increasing.

Many believe that going online bears no environmental cost, since web access is essentially invisible; you're not driving a car emitting smoke or heating your house with fossil fuels. However, all those billions of computers, tablets and smartphones need energy to manufacture and then power as they draw down trillions of items of information each minute.

WHAT HAS HAPPENED?

Research by UK web hosting company Kualo reveals that all the world's computers including data centers, cloud storage and social media platforms will generate 1.5 gigatons of greenhouse gases by 2020, equivalent to 3% of all global emissions.

This is because the world's current tally of 3.5 billion internet users is steadily increasing, particularly as more emerging markets are able to get online. It means that their combined carbon footprint will exceed that of the airline industry, which has been steadily reducing its environmental impact through cleaner and more efficient engines.

WHY IS IT IMPORTANT?

Everyone online – including anyone reading this story – is minutely contributing to global warming every time they open a web page. Clicking on a mouse or keypad to email a friend doesn't seem like it is adding to climate change, yet ever second that someone browses a simple website adds 20 milligrams of CO_2 to the atmosphere. More complex websites with advanced graphics can add up to 300 milligrams per second.

There are currently an estimated 70 million servers in the world, most of which are powered by mainstream electricity grids, contributing 2% to greenhouse gas emissions. Data centers alone use about 30 gigawatts, or 30 billion watts of electricity, according to Green House Data. This is enough to power every house in Italy.

So, can this be curtailed? Many large users or owners of datacenters are aware of the environmental implications; Apple, Facebook, Google and Amazon all have stated targets to increase the use of renewable energy for their facilities.

WHAT DOES IT MEAN FOR INVESTORS?

"In 2013, Apple said all of its data centers were now fully powered by renewable energy, including facilities in California, Texas, Ireland and Germany," says Richard Speetjens, portfolio manager in Robeco's Trends Investing team.

"Data centers that house computing infrastructure for services like iTunes, Siri, Maps and the App Store now get 100% of their power from a combination of renewable energy that the company buys, mixed with on-site generation capacity."

"Google recently stated that somewhere in 2017, all of its data centers around the world will be entirely powered with renewable energy sources, up from 45% in 2015. Google says its vast network of global operations will start purchasing as much renewable energy as it uses across all 13 data centers and all of its office complexes."

"Facebook is already at 30% of clean and renewable energy used in its data center electricity supply mix. The company is now aiming to have at least 50% clean and renewable energy in its total energy mix in 2018. Finally, Amazon Web Services – the cloud business of Amazon – generated over 40% of electricity supply from renewable sources in 2016, and is targeting 50% by the end of 2017."

So, even though these companies might have a bad image with owning a lot of energy-consuming facilities, they all do care a lot about our planet, and are increasingly becoming more dependent on renewable energy sources. ■

2 RENEWABLE ENERGY

One solution to global warming is to replace fossil fuels with renewable sources of energy that emit virtually zero greenhouse gases, led by solar and wind power. The infrastructure needed to generate economically efficient amounts of electricity from the wind or the sun rivals any coal mine or oil rig. A number of our Stunning Statistics addressed this theme, starting with the mind-boggling cityscape scale of this planet-saving technology.

Behold the wind turbine as big as the Shard

SPEED READ

Next-generation wind turbines will be 300 meters tall

Their blades will be longer than an Airbus 380's wing span

First monster machines due in 2025 will generate 13-15 MW

Wind turbines have come a long way since the first windmills centuries ago – with the next generation among Europe's tallest structures.

The need to extract increasingly more power from turbines to make them commercially viable without subsidies means the core structures will stand over 200 meters tall. To the tip of the blades, they'll reach over 300 meters, making them taller than the London skyscraper, the Shard, the tallest building in western Europe.

WHAT HAS HAPPENED?

The blades alone will be longer than the wingspan of an Airbus A380, currently the largest passenger jet in the world. Built by Siemens and Vestas Wind Systems, the new 'monster turbines' are due to come online by 2025, though their eventual buyers have yet to be finalized.

They will have a total generation capacity of 13-15 megawatts of electricity, making them over a thousand times more powerful than the biggest commercial windmills of the 19th century. To this day, the world's largest windmill – standing in Schiedam in the Netherlands, built for the gin industry in 1803 – is only 33 meters tall.

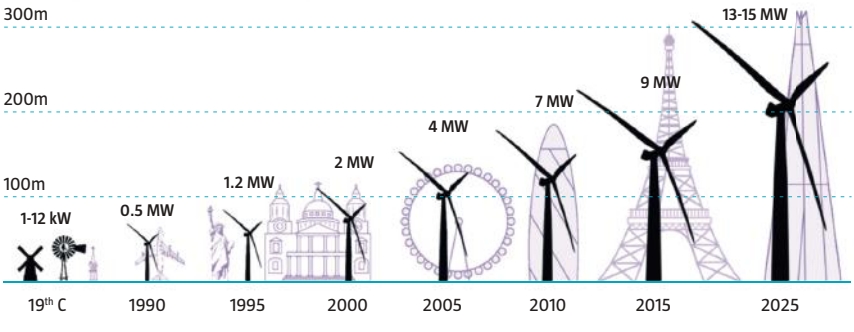
WHY IS IT IMPORTANT?

Power yields from turbines have needed to rise to make them competitive with traditional energy sources and avoid taxpayer-funded subsidies that have raised domestic energy bills. The first generation of commercial wind turbines in the 1990s (standing about 50 meters tall) had a total generation capacity of about 0.5 megawatts of electricity.

The megawatt figure represents the total capacity; depending on the number of hours per year that the blades rotate, the total electricity generation is measured in kilowatts per hour. So if a 10 megawatt capacity turbine operates for 24 hours a day and 365 days a year, the amount of electricity it would generate 87.6 million kilowatts per hour.

Typically, wind turbines operate for only half that time. Since wind power entirely depends on wind availability and speed, both of which are inherently unreliable, the solution has been to make the turbines bigger, more efficient and more productive. The largest turbines have not been able to produce electricity as competitively as fossil fuel burners – until now.

Figure 3: Evolution of wind turbine heights and output



Source: Bloomberg New Energy Finance

WHAT DOES IT MEAN FOR INVESTORS?

"Wind has finally become a competitive alternative to conventional energy," says Chris Berkouwer, an analyst with Robeco's Global Equities team. "Over the lifecycle of a wind turbine, it will return 35 times more energy back to society than it consumes, compared to a negative return for coal power plants."

"The era of subsidies for wind energy is also coming to an end. After the first hype, most turbine companies massively restructured, resulting in much better business models. Now that balance sheets are restored and profitability has improved, 'wind' is a very interesting financial investment too." ■

Don't tell JR, but Texas has 'Gone with the Wind'

SPEED READ

Texas is now the world's fifth-largest producer of wind power

Solar is rapidly increasing capacity as hydro remains no. 1

Opportunities for investors in suppliers to the energy transition

Those of a certain age may recall Dallas, a 1980s US soap opera about a dysfunctional oil-rich family headed by the scheming JR Ewing. And if you mention Texas to most investors, the image of cowboys shouting "yee-haw" against a backdrop of oil wells may spring to mind. But times are changing.

WHAT HAS HAPPENED?

As the US increasingly adopts renewable energy to meet growing needs, Texas has become the world's fifth-largest wind power producer, after India, and by far the largest in the US. The 40 wind farms in Texas have a current capacity of 28,000 megawatts, equivalent to eight average-sized US coal-fired power stations and enough to power seven million homes.

The Roscoe Wind Farm in the middle of the vast state was the largest in the world when it was built in 2009, with 627 turbines and a total installed capacity of 781 megawatts, before it was overtaken in 2012 by a 1,020-megawatt wind farm in California. Wind power accounted for 22% of the energy produced in Texas in 2019, exceeding power generated by coal for the first time. (You might say the state has 'Gone with the Wind'... though the famous film hails from nearby Georgia.)

Meanwhile, Texas is also swapping extraction for refraction, as the amount of solar power capacity has roughly doubled in the state every year since the first panels were installed in 2004. Solar capacity reached 4,300 megawatts in 2019. Progressively larger solar farms have been built in the sunnier western counties, the largest of which – in Upton – now generates 180 megawatts.

WHY IS IT IMPORTANT?

Cutting reliance on fossil fuels and switching to renewables is essential to meeting the targets of the Paris Agreement, which seeks to limit global warming to 2°Celsius above pre-industrial levels by the end of this century. While the US under President Trump pulled out of the Paris Agreement, the country's commitment to switching to wind and solar has remained strong. This is partly because vast tracts of land that are difficult to farm are easy to monetize with renewable power installations.

The biggest contributor to energy in the US remains hydroelectric power, which has been part of the landscape since the Hoover Dam was built in 1936. Renewables made up more than 17% of net US electricity generation in 2018, with the bulk coming from hydroelectric (7%) and wind (6.6%), and rapidly expanding solar currently about 1%, according to the US Energy Information Administration.

JR can rest easy on one point though: oil production in Texas remains at 5.5 million barrels a day, or the bulk of the US 13 million barrels, making it the world's fourth-largest producer after Russia. However, without any new discoveries, its proven reserves will run out in 10 years at the present rate of production. Current estimates are that the world has about 50 years of oil left in total.

WHAT DOES IT MEAN FOR INVESTORS?

The success in Texas is indicative of how renewables are changing the energy market, and the opportunities that lie ahead for forward-thinking investors, says Chris Berkouwer, portfolio manager of the Robeco Sustainable Global Stars Equities strategy.

"The market remains wary of transition stories about traditional oil and gas companies becoming more sustainable," he says. "Investors want to avoid the risk of uncertain terminal values and opt instead for the winners of the future that do see their share of the pie growing."

"Clearly, renewable energy continues to see strong demand in the US, driven by state-level sustainability targets, closures of coal and nuclear plants, and much better economics of renewables."

"Utilities that invested early in the energy transition, as well as other providers of renewable infrastructure such as wind turbine makers and industrial battery companies have the best cards to play this theme. ■

Let the sun shine in – giant solar plants come online

SPEED READ

World's two largest solar parks open in India and China

Electricity generated could power a city the size of London

Investment opportunities abound in emerging market strategies

The world's two largest solar energy parks have come online – with enough generating capacity to power a major city.

WHAT HAS HAPPENED?

Completion of the final phase of the Bhadla Solar Park in Jodhpur, India takes the total operating capacity of the 40 square kilometer park to 2.25 gigawatts. The largest in India, it is the size of 5,600 football pitches – or as Indians would prefer to compare it, about 2,000 cricket grounds.

It comes as China completes its Huanghe solar park at Qinghai in the middle of the country. The park is geographically bigger at 57 square kilometers, but generates slightly less power at 2.2 gigawatts. As the location is remote, a 1,600 kilometer power line was constructed to transmit the electricity to China's major cities in the east.

Each solar plant in sparsely populated desert areas contains more than six million photovoltaic panels and cost around USD 2 billion to build. Combined, they can generate enough electricity to power more than three million homes, equivalent to a city the size of London.

Solar Plant in Qinghai province, China

WHY IS IT IMPORTANT?

Aside from the environmental advantages, solar power is proving to be among the cheapest forms of energy in countries where incomes are low. The Bhadla plant can sell electricity at 2.44 rupees (3.3 US cents) per kilowatt/hour, making it the cheapest in India. Coal power on average costs over 3 rupees per kwh, though its price has been declining due to lower demand during the Covid-19 crisis.

Both China and India are major producers and consumers of coal, and both remain reliant on it. Domestic coal accounts for 57% of energy generation in both countries, making them the world's largest and third-largest emitters of carbon, producing 9.8 million tons and 2.5 billion tons respectively. (The US falls between them with 5.3 billion tons of carbon emitted).

China has committed to phasing out coal to become carbon neutral by 2060, while India intends to double the share of renewable power in its total installed capacity to 40% by 2030. Reducing the carbon emissions of the world's largest countries remains essential if the world is to meet the goals of the Paris Agreement and limit global warming to a maximum of 2 degrees Celsius by 2100.

WHAT DOES IT MEAN FOR INVESTORS?

"In the emerging markets universe, there are several companies that people can invest in to get exposure to the solar energy theme," says Jaap van der Hart, portfolio manager for the Robeco Emerging Stars Equities strategy. "These are mostly Chinese companies, as China dominates the global supply chain."

"In the emerging markets strategies, we own a Chinese solar glass company, which is in a good niche segment, and as one would expect has a strong growth outlook. Of course, the growth of solar energy is hardly an undiscovered theme, valuations are therefore pretty high, and we believe investors should be selective and focus on the companies with a clear competitive edge and reasonable valuation."

"Another consequence is for the effect on other segments in the industry. As solar energy is still getting cheaper and is a cleaner alternative, there is increased pressure on the use of coal and other fossil fuels. The emerging market strategies do not invest in coal companies, which makes sense not only for their negative impact on sustainability, but also given the outlook for declining prices and volumes." ■

3 GO PLANT A TREE

Another solution to global warming is the humble tree, nature's finest and most durable means of removing carbon dioxide from the atmosphere. Trees and other forms of plant life have acted as carbon sinks for millions of years, removing billions of tons of CO_2 daily. As the principle source of carbon offset, it allows humanity to continue with industrial processes that emit greenhouse gases, meaning we don't have to go back to living in huts. But you do need enough trees to make it work.

A trillion trees could stabilize global warming

SPEED READ

One trillion trees would need an area the size of the US

Buying the land and converting it would cost USD 300 billion

Energy companies are joining reforestation carbon sink plans

Planting a trillion trees would be enough to stop global warming from escalating, studies have found.

Such a tree planting campaign would require 9 million square kilometers of land, an area the size of the United States, although this would be spread in land pockets across the world. The tree planting could be targeted at deserts, wastelands, and areas where the soil has been degraded due to over-intensive agriculture, the UN has said.

WHAT HAS HAPPENED?

The UN has identified about 2 billion hectares (20 million square kilometers) of land around the world that has been degraded by misuse, overgrazing or deforestation. Satellites have pinpointed about 900 million hectares (9 million square kilometers) of this land which could be realistically restored.

The program was announced at the UN Convention to Combat Desertification in New Delhi in September 2019. Some 196 countries plus the European Union agreed to a declaration that each country would adopt measures needed to restore unproductive land by 2030.

Such a campaign to buy the necessary land and then convert it to natural forest would cost about USD 300 billion, according to a separate UN report. That is no small amount, as it equates to the GDP of Chile, or put another way, the amount the world spends on military arms every two months.

WHY IS IT IMPORTANT?

Scientists have calculated that reforestation on that scale would be enough to absorb 750 billion tons of carbon dioxide, equivalent to all the CO_2 placed in the atmosphere by human activity for the past 25 years, according to the journal Science. This could stabilize global warming for up to 20 years, giving the world enough time to scale down carbon emissions.

Decarbonization, either through natural forms such as trees which absorb it, or by simply replacing fossil fuels with renewable forms of energy, is essential to meet the terms of the Paris Agreement. This aims to limit global warming to 1.5 degrees Celsius above pre-industrial levels, requiring the world to become carbon neutral by 2050.

Many nations are already taking the lead, such as the Great Wall of Africa project, which has seen millions of hectares of land reclaimed from the Sahara Desert. Kenya's is separately planning to plant 2 billion trees on 500,000 hectares to restore 10% of its forest. In Asia, China has worked to irrigate deserts in Gansu province to support trees, while India has identified up to 20% of its land – an area the size of France – as recoverable wasteland.

WHAT DOES IT MEAN FOR INVESTORS?

"Through technological innovation and capital market pressure, energy companies are forced to step up their efforts to achieve net zero carbon emissions," says Chris Berkouwer, Portfolio Manager of Robeco Sustainable Global Stars Equities, which targets companies specializing in decarbonization.

"To that end, carbon sinks are assumed to be a critical piece of the puzzle, primarily through reforestation initiatives. For example, based on targets set by the major European Integrated Energy companies, about 1.5 million acres a year are reforested going forward from 2019, meaning that by 2030, an area bigger than Ireland will have been designated as a carbon sink by the group."

"Although it's a double-edged sword, we believe that without the financial muscle of Big Energy, it will be very hard to meet the Paris Agreement's targets. So, Robeco continues to push them hard to also keep investing in areas such as carbon capture and reforestation." ■

The Great Wall of Africa is taking shape

SPEED READ

Plans to create 8,000 km green corridor are progressing well

20-nation project meets criteria for at least six of the SDGs

Investments possible in companies that contribute to the goals

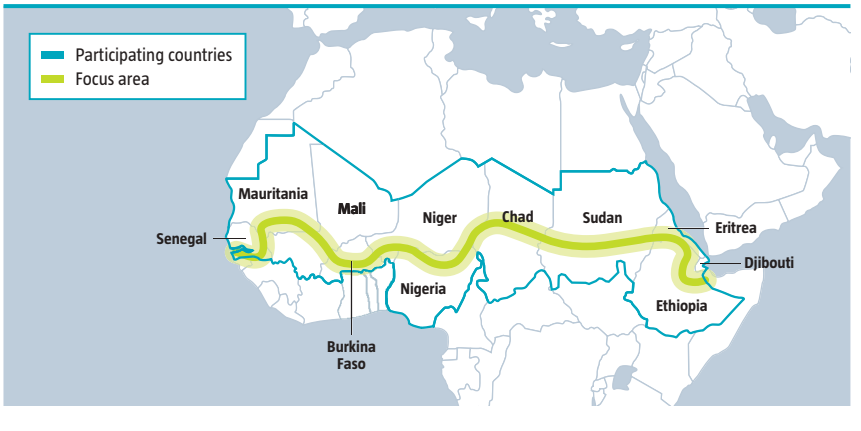
A giant wall of trees that is being built across Africa is making a huge contribution to the UN's Sustainable Development Goals.

WHAT HAS HAPPENED?

The 16 kilometer-wide wall of trees, bushes and shrubs crosses Africa's Sahel region at the southern edge of the Sahara Desert, is now 15% complete. It will eventually span almost 8,000 kilometers and pass through 21 countries, starting on the west coast in Senegal and ending on the east coast in Djibouti. Started in 2007, the USD 8 billion project is expected to create 350,000 jobs in one of the poorest regions of the world.

In Senegal, around 11 million drought-resistant trees such as acacias have already been planted. The millions of plants will make the ground more fertile, allowing about 100 million hectares of once lifeless desert to become agricultural land by 2030. In Ethiopia, 15 million hectares of agricultural land have already been reclaimed from the previously rapidly expanding Sahara.

Figure 4: The great green wall initiative



WHY IS IT IMPORTANT?

Once complete, the Great Green Wall will be the largest living structure on Earth, three times the size of the Great Barrier Reef. The vast expanse of greenery will be able to extract 250 million tons of carbon dioxide from the atmosphere each year. The region is at the front line of climate change, which is causing persistent droughts and famine.

But the project is not just about improving the environment. Its promotional video says it is "growing food; growing a reason to stay for the families forced to migrate to Europe; growing green jobs, giving real incomes and opportunities; growing peace in places where conflict is widespread; and growing a response to climate change in a region where temperatures are rising faster than anywhere else on Earth."

It is therefore making a multi-faceted contribution to the Sustainable Development Goals, as it is relevant to no less than six of them: SDG 1 (no poverty); SDG 2 (zero hunger); SDG 8 (decent work and economic growth); SDG 11 (sustainable cities and communities); SDG 13 (climate action); and SDG 15 (life on land).

WHAT DOES IT MEAN FOR INVESTORS?

"The importance of SDGs to ensure a safe, healthy and economically viable future is becoming increasingly evident," says Rainer Baumann, Head of Investments for RobecoSAM. "The primary focus of the strategy is on companies who are positively contributing to the SDGs and moving us closer to achieving the goals."

"Forward-thinking companies like these are not only making strides towards protecting and preserving people and planet – they are also in a strong position to benefit from the enormous tailwinds created by increased consumer demand and regulatory action towards sustainable products and services."

"Companies in the strategy are carefully screened and selected based on the quality and intensity of their contributions across all 17 SDGs. Only companies with a high net positive impact are selected for inclusion in the portfolio. The result is a concentrated portfolio of sustainably-run, high-impact companies, diversified globally across regions and economic sectors." ■

The drone that can plant millions of trees

SPEED READ

Drones tested in remote parts of Myanmar, Australia and UK

Reforestation can help remedy six billion trees lost each year

Agriculture technology an increasing investment opportunity

A drone that can carpet bomb 100,000 tree seeds a day may solve the issue of deforestation in remote areas.

WHAT HAS HAPPENED?

Developed by a former NASA engineer, it works with a sister drone to reforest areas that are difficult to reach. The first drone scans the landscape to make a 3D map and identify areas for planting, while the second follows this cartography and fires seeds into the soil at the rate of one per second.

The company behind the idea is BioCarbon Engineering, founded by scientist-turned-environmentalist Lauren Fletcher, who holds a PhD in physics and has worked on the International Space Station and Mars programs. He has ambitions to use the drones to plant up to one billion trees a year.

So far, the company has planted 38 tree species across Myanmar, Australia and the UK in temperate, tropical and sub-tropical environments. One of its uses is in mining restoration – replanting trees where massive quarries have finished extracting minerals and the environment can be rehabilitated with forests.[4]

WHY IS IT IMPORTANT?

About six billion trees are lost every year, mostly due to the imbalance between those cut down for commercial forestry and land clearance, and those replanted, according to the World Economic Forum (WEF).[5]

More than 150 acres of forestry or woodland are lost every minute, or more than 300,000 square kilometers a year – an area the size of Germany. More than one-fifth of the Amazon rainforest has already been destroyed.[6]

4. https://www biocarbon engineering.com/faq
5. https://www.weforum.org/agenda/2017/06/drones-plant-100000-trees-a-day/
6. http://www.rain-tree.com/facts.htm#.W_VkLUqnEaY

Trees are important for absorbing CO_2 in the atmosphere, and replacing it with oxygen, thereby acting as the earth's lungs. More than 20% of the world's oxygen is generated in Amazonia alone. The loss of so many trees each year accounts for 17% of global warming, the WEF estimates.

WHAT DOES IT MEAN FOR INVESTORS?

"Half of all fighter pilots that are hired today in the US Air Force never sit in the cockpit, but become drone pilots, watching and bombing large parts of Afghanistan somewhere from a bunker in the Arizona desert," says Jack Neele, portfolio manager in the Robeco Trends Investing team.

"More and more drones are now being used in agriculture, inspecting the crops, spotting problems and bugs and even spraying pesticide or herbicide on each plant. So, using them to drop some seeds would indeed make sense, even for the areas where people can easily go, as drones are far cheaper than any other way of transporting lightweight stuff."

"We do not invest in drones at the moment, but we do invest in the future of agriculture, particularly where it is fully automated. It's a great trend for the future." ■

4 THE NATION STATE
AND STATE OF THE NATION

Many people think some form of global government is needed to truly address climate change. International initiatives such as the United Nations' Sustainable Development Goals can certainly help. But in the meantime, we are stuck with countries trying to change for the good at a domestic level. Several Stunning Statistics focused on how individual nations were tackling sustainability, using the RobecoSAM Country Sustainability Ranking as the medium for comment.

Jakarta: The city with that sinking feeling

SPEED READ

Jakarta is sinking into the Java Sea by up to 20 centimeters a year

Capital is being moved 2,000 km to the east in East Kalimantan

Relocation brings its own problems of environmental damage

If the mountain will not come to Muhammad, then Muhammad must go to the mountain. This old Islamic proverb is coming true in the world's most populous Muslim nation, whose capital city has had that sinking feeling for many years.

WHAT HAS HAPPENED?

Jakarta, originally built on a swamp, is sinking by up to 20 cm a year while the Java Sea has already risen by 8cm since the city was built in the 16th century. At the current rate, most of northern Jakarta will be underwater by 2050.

As the city cannot ultimately be saved as nature takes its inevitable course, the answer was simple: move the capital instead 2,000 km to the east to a new purpose-built home in East Kalimantan on the island of Borneo. The new coastal capital with plans for five satellite towns will occupy about 2,500 square kilometers, making it almost as large as Paris.

Construction has already begun, with plans to complete the initial phase by 2025, and start moving over inhabitants from the most threatened parts of Jakarta. A budget of USD 34 billion has been allocated to creating a 'green city' with plenty of open spaces, electric-based transport, and solar-powered housing.

Figure 5: Indonesia new capital plan

WHY IS IT IMPORTANT?

However, it has also produced the equally inevitable sustainability issues of environmental damage in the new location, led by extensive deforestation. Borneo is one of the most biodiverse places on Earth and home to some of the last pristine tropical rainforests.

The initial phase of construction has already run into problems over future supplies of electricity and water. Hydroelectric power cannot generate enough to serve an influx of millions of people, so three new coal-fired power plants are planned. This comes at a time when the UN has called for coal to be phased out as an energy source to combat climate change.

Meanwhile, Indonesia was already the world's largest exporter of thermal coal that is abundant on its archipelago of islands, and has issued 1,500 mining permits in East Kalimantan spanning more than 50,000 sq. km. – an area bigger than Belgium. This is set to exacerbate both the environmental destruction and the country's contribution to global warming at the same time.

WHAT DOES IT MEAN FOR INVESTORS?

"Indonesia's problems reflect how difficult it can be for many emerging economies to meet their most pressing and manifold challenges in a sustainable way," says Max Schieler, author of the RobecoSAM Country Sustainability Ranking (CSR).

"Indeed, sustainable development consists of a complex and well-balanced relationship between economic growth, social progress and environmental conservation. Certainly, Indonesia's socio-economic performance over the past two decades has been impressive, with millions of people lifted out of poverty, and per capita income doubled."

"However, this economic success has come at a high environmental cost, as all the natural resource-based activities, such as agriculture, forestry, fishery and mining put severe pressure on ecosystems, reflected in Indonesia's mediocre ranking (92 out of 150) for the environmental dimension in the CSR. This also indicates a need for the country to tackle these environmental pressures if it is to avoid putting its economic achievements and its population's well-being at risk." ■

Is oil-rich Norway paying the price?

SPEED READ

Oil-rich Norway is heating up faster than other countries

It tops the current RobecoSAM Country Sustainability Ranking

Coronavirus shows a strong and stable state is also important

Sustainability is often full of contradictions, as can be seen in the case of an oil-rich country which is warming faster than others – Norway.

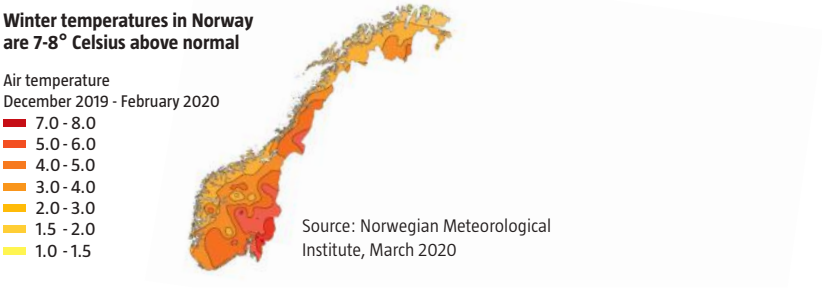
WHAT HAS HAPPENED?

The Scandinavian nation which extends beyond the Arctic Circle is heating up faster than the global average of around 1-1.5 degrees Celsius above pre-industrial levels. Winter temperatures are 8-9°C above normal, according to research from the country's Meteorological Office.

In January 2020, Norway recorded the highest ever temperature seen in winter of 19°C in the town of Sunndalasora, breaking the previous record of 18.6°C set in 1989. The temperature rise threatens wide-scale melting, posing a risk to flooding, wildlife and tourism, and even exposing the country to disease-bearing insects that it currently avoids due to its usually cold climate.

Polar regions are heating faster than more temperate areas due to the 'ice-albedo feedback', where land laid bare by melting ice absorbs more sunlight, causing more heating, which causes more melting. Meanwhile, warmer oceans are gradually eating away at coastal glaciers, melting them even further.

Figure 6: Norway is heating faster than other countries



WHY IS IT IMPORTANT?

Norway was named as the world's most sustainable country in the January 2020 edition of the RobecoSAM Country Sustainable Ranking. As one of the world's richest and most stable nations, its environmental, social and governance (ESG) credentials include some world-beaters.

For environmental factors, 98% of its energy comes from renewable sources led by hydroelectric power, and it has the highest proportion of electric cars in Europe. On the social score, Norway has one of the best gender equality ratios in the world and very low rates of social inequality. And on governance, the country has long been free of corruption and poor corporate practices.

Yet it is also one of the largest oil producers in the world, pumping 1.6 million barrels of oil a day, and making so much money from it that Norway now has the largest sovereign wealth fund in the world. Its contribution to global warming through carbon emissions from oil use is disproportionately large – so it may be karma that the country is also disproportionately heating.

WHAT DOES IT MEAN FOR INVESTORS?

However, it is possible to reconcile the apparent paradox of the world's most sustainable country also being a major oil exporter, and now "reaping what you sew" with global warming, says Max Schieler, compiler of the biannual ranking.

"In our philosophy, sustainability includes – but is not limited to – the use of fossil fuels and climate change," says Schieler. "Even though it has been the main focus of attention in the recent past, climate change is also only one of the major factors driving the current mass extinction, biodiversity loss and ecosystem damage."

"Sustainability is also not equal to environmental sustainability, but comprises a social component as well. This is especially apparent during the current coronavirus pandemic, which is testing the stability of health systems and resilience of economies all over the world."

"And last but not least, it is the robustness and efficiency of state institutions – a key aspect of the governance dimension – that play a crucial role in how a country can cope with such a crisis. Hence, it is the entire ESG profile that is decisive for a country's sustainability performance and economic success in the long run, and it is with this holistic viewpoint that Norway has earned his top mark." ■

How King Coal was dethroned in Britain

SPEED READ

Coal has not been burned for electricity in the UK since 9 April 2020

Renewable energy is set to exceed fossil fuels for the first time

Decarbonization likely to accelerate once the corona dust settles

Take a bow, Britain! The nation that gave the world industrialized coal has become the first industrialized economy to do without it for a sustained period.

WHAT HAS HAPPENED?

First used by the Romans to heat hypocausts, and widely traded from the 13th century, British coal powered the 18th century industrial revolution that made the modern world possible. The skies were so thick with choking coal smog, evoking images of the 'dark satanic mills' and 'pea-souper' fogs, that they ushered in the world's first environmental legislation with the Clean Air Act of 1956.

No coal has been burnt to generate power in the UK for 67 days in a row, after the last four remaining coalfired power plants were taken off the grid on 9 April 2020. This coal-free period smashed the previous record of 18 days that was set in June 2019. The coronavirus pandemic was partly responsible, as the lockdowns led to much less energy being demanded by shops or businesses that were closed.

It is a significant turnaround for a nation that was once so reliant on coal that a miners' strike in the 1970s brought the country to its knees. 'King Coal' accounted for 40% of all the UK's energy production as little as 10 years ago.

WHY IS IT IMPORTANT?

Instead, the country is becoming something of a superpower in renewable energy, already possessing the world's largest offshore wind farm. The giant Drax power station in Yorkshire, which once used coal to generate 3,900 megawatts of electricity, or 6% of the UK total, has been converted to burning wood pellets imported from sustainable forests in the US.

It all means that energy generated from renewable sources is on track to exceed that from fossil fuels for the first time in 2020. Renewable energy led by hydroelectric power from Scotland accounts for 37% of electricity generated in the year to date, compared to 35% for fossil fuels led by offshore natural gas. Nuclear accounts for 18%.

Switching from fossil fuels to renewables is a vital part of the transition to a low-carbon economy, so that countries including the UK can meet their commitments to the Paris Agreement. This aims to limit global warming to 2° Celsius above the levels seen before the industrial revolution that British coal ushered in.

WHAT DOES IT MEAN FOR INVESTORS?

"The demise of coal in the UK, which even accelerated recently, is a strong reminder that fossil fuels will soon be a relic of the past," says Chris Berkouwer, Portfolio Manager of the Robeco Sustainable Global Stars Equities strategy.

"Fortunately, 'green investments' are at the heart of many pandemic recovery plans, most notably that of the EU, which will definitely help scale up the technologies needed to decarbonize societies such as clean hydrogen, green building renovation and the further deployment of renewables."

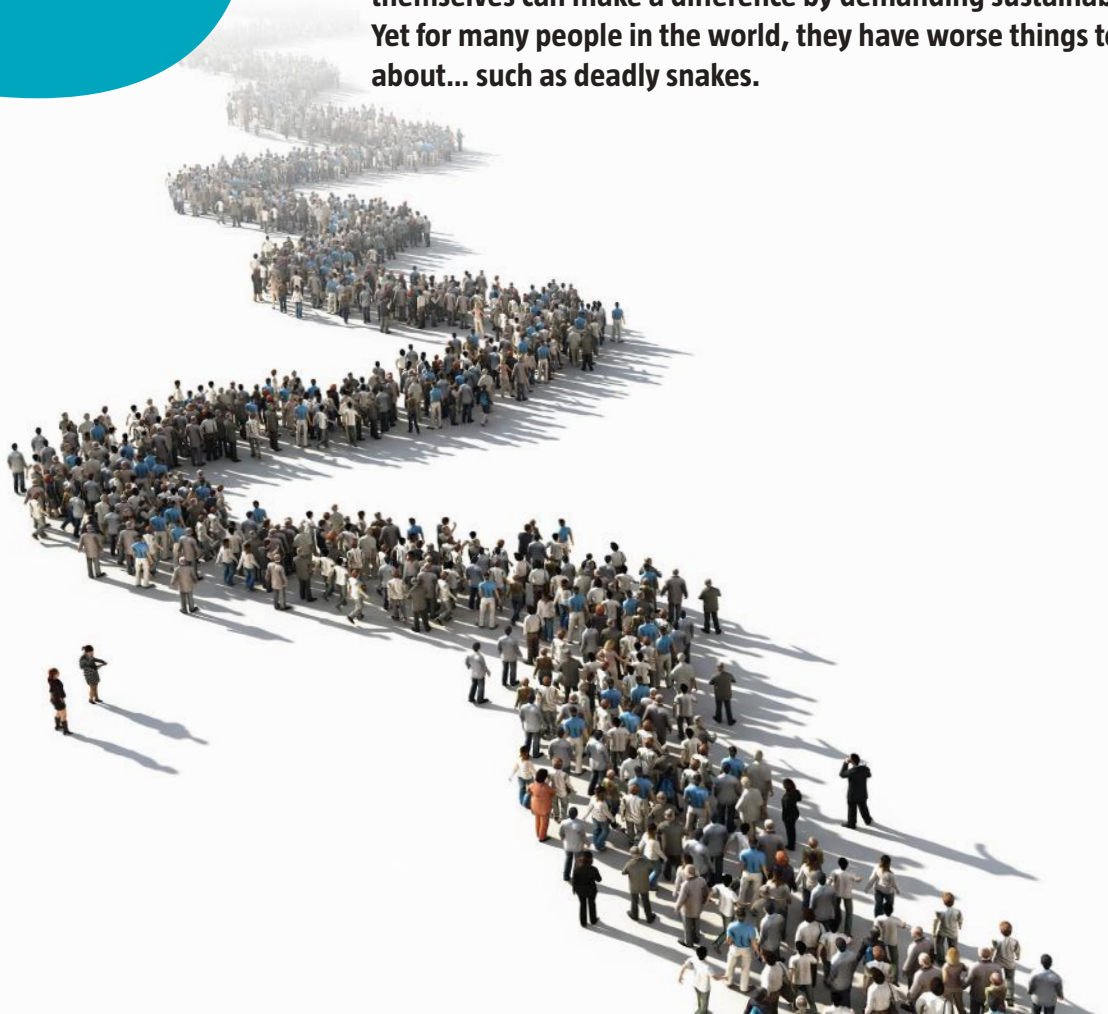
"The decarbonization theme has multi-decade legs and offers many angles with which to play it. Our favorite ways to do so are through biofuel refiners, industrial gases companies making hydrogen and facilitators of renewable energy." ■

5

SNAKES ALIVE!

THE S (SOCIAL, NOT SNAKES) IN ESG

Social issues are often seen as the unloved and underinvested component of ESG – the middle child stuck between the elder brother of environmentalism and the younger sister of governance. One good thing to come from the Covid-19 crisis was raising the importance of looking after our population, and how people themselves can make a difference by demanding sustainability. Yet for many people in the world, they have worse things to worry about... such as deadly snakes.



Investing in the SDGs to tackle snake bites

SPEED READ

Deaths caused by animals are a big problem in emerging markets

Global shortage of antidotes and medicines add to the problem

Investing in the Sustainable Development Goals can alleviate it

Planting a trillion trees would be enough to stop global warming from escalating, studies have found.

WHAT HAS HAPPENED?

Toxic bites by wild animals are still a major public health problem for emerging markets led by India, which suffers about half of all snake bite deaths each year. A further half a million people worldwide are severely injured, often leading to amputation of infected limbs.

And snakes are far from being the biggest killer. The world's most deadly creature is not humans causing wars or famine, as many people think, but the mosquito. Malaria caused by mosquito bites killed 720,000 people in 2016, ranking far above terrorism (34,000) or conflicts (116,000).

The scale of death rates from animals in emerging markets is surprising to people in the west, for whom snakes only reside in zoos and a few pet cages. However, it also offers an opportunity for investors to support the United Nations' Sustainable Development Goals (SDGs), some of which strive to eradicate these problems.

WHY IS IT IMPORTANT?

Treatments for injuries such as snake bites, malaria and other animal-borne diseases such as rabies are not widely available, and are often not affordable. There is a global shortage of snake venom antidotes, and drugs to prevent malaria from mosquito bites are usually a luxury that only western tourists can afford.

Subsequently, the SDGs aim to channel investment into projects that can lead to enhancement. SDG 3, for example, has a goal of promoting good health and well-being, including the availability of medicines in emerging markets. Some investors are now launching strategies to invest in those companies that can directly contribute to the SDGs. "The SDGs function as a taxonomy for investors to categorize the impact that companies

WHAT DOES IT MEAN FOR INVESTORS?

have on society," says Guido Moret, Robeco's Head of Sustainability Integration Credits. "At Robeco and RobecoSAM, we have developed a methodology to assess this impact, based on what companies produce, how their business is run, and if any controversies are known. Next to the positive impact, we also look at the potential negative contribution of a company on the SDGs. If a company does have a negative impact, it is no longer eligible for our SDG credit strategies."

"To illustrate this, let's look at the pharmaceutical industry. As a baseline, pharmaceutical companies have a positive impact on SDG 3 – good health and well-being. However, in our analysis, we also look for instance at the percentage of business in emerging markets, and the pricing strategy of pharmaceutical firms. After this assessment, only the pharmaceutical companies that pass the bar of positive contribution remain eligible for investment." ■

Why the global population is unsustainable... because it is falling

SPEED READ

Global fertility rate is falling below the replacement level of 2.1

There won't be enough working-age people to fund retirees

An aging population has serious long-term implications for investors

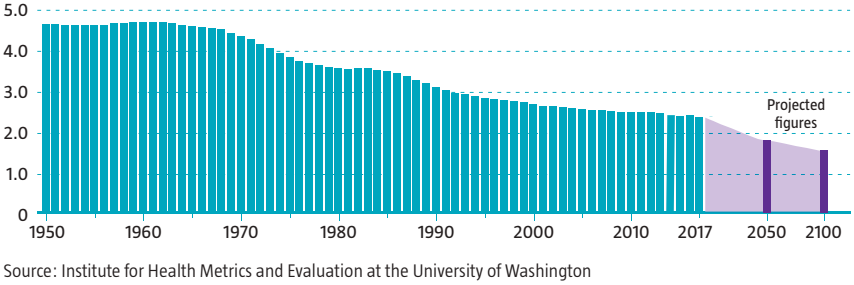
A lower world population is great for sustainability, right? There's less pressure on resources in an overcrowded world, right? Not if it means you can't support an increasingly aging society.

WHAT HAS HAPPENED?

Lower birth rates mean most countries will see shrinking populations by the end of this century, while 23 nations will see their populations halve by 2100, according to research by the University of Washington's Institute for Health Metrics and Evaluation.[7] Japan's population is projected to fall from a peak of 128 million in 2017 to less than 53 million by the end of the century. Italy is expected to see its population fall from 61 million to 28 million over the same timeframe.

At the heart of the problem is the double whammy of a declining birth rate due to greater access to contraception combined with a declining death rate due to massive improvements in health care. If the birth rate falls below 2.1 (since not all children survive into adulthood), then the population gradually loses the ability to replace itself.

Figure 7: Women are having fewer children – Global fertility rate (livebirths per woman)



Source: Institute for Health Metrics and Evaluation at the University of Washington

7. https://www.bbc.com/news/health-53409521

The average number of children that a woman gives birth to – the fertility rate – has fallen from 4.7 in 1950 to 2.4 in 2017 and will fall below 1.7 by 2100, the US institute's research shows. Singapore already has a fertility rate of around 1.3.

WHY DOES IT MATTER?

The sea-change in demographics means there are now as many people turning 80 as there are children being born. This gradually means an increasingly lower number of people of working age to fund an increasingly higher number of people who retire. It causes an 'inverted population pyramid', with more elderly people being supported by ever-fewer youngsters.

And while the global population is still rising – it is set to peak at 9.7 billion in 2064 before declining – much of the growth is in Africa, whose population is seen trebling to 3 billion people by 2100. At current levels of GDP per capita, this would ironically mean that the continent with the best demographics has the lowest chance of funding its pensioners.

It's a problem that is already reflected in lower sustainability scores for otherwise stable and wealthy nations in RobecoSAM's biannual Country Sustainability Ranking. Luxembourg, for example, has seen a downward pressure on its overall score for several years, due to concerns over its future ability to service its aging population.

WHAT DOES IT MEAN FOR INVESTORS?

"The relevance of demographics for a country's ESG profile and financial sustainability results from the fact that there are undoubtedly many and multi-faceted economic and financial risks associated with the population aging," says Max Schieler, Senior SI country analyst at RobecoSAM and compiler of the Country Sustainability Ranking.

"A reform of current pension systems is becoming increasingly urgent in order to prevent a collapse of public welfare systems and sovereign debt problems. However, corresponding policies are not easy to implement, particularly in democracies, where older people are tempted to oppose attempts to cut back their benefits."

"In the long run, investors might also be faced with a decline in the savings rate and a drop in asset markets as retirees dissave and liquidate their assets to support themselves during their retirement." ■

People power: A message in 100 million bottles

SPEED READ

Robeco sponsors the Refill campaign to cut plastic waste

UK-based initiative is saving millions of single-use bottles

Cutting the waste has been a major engagement theme since 2019

A 'people power' campaign to cut plastic waste is on track to save 100 million bottles from being thrown away.

The Refill initiative encourages people to refill their water bottles at a network of participating outlets instead of buying new ones. It is run by City to Sea, a UK not-for-profit group that aims to stop plastic waste from being dumped in the ocean. Following the success of a first year of backing the program, Robeco is sponsoring Refill for another year.

WHAT HAS HAPPENED?

There are now more than 25,000 Refill stations in the UK, all listed on a smartphone app that has now been downloaded by 250,000 people. The stations include restaurants, cafes and shops on the high street, where people can refill their bottles using free tap water supplied by the outlet. The campaign was boosted by the first National Refill Day to be held in the UK on 19 June 2019 which reached 80 million people on the streets and online.

The success of the initiative means Refill is now on course to prevent 100 million plastic bottles from entering the waste stream by the end of 2019. That is equivalent to almost two million a week, or a quarter of a million per day, since the partnership with Robeco began in October 2018. The campaign gained a further boost when it was promoted by London Mayor Sadiq Khan on social media.

WHY IS IT IMPORTANT?

About 95% of all plastic is only used once, and much ends up in the ocean, poisoning marine life and polluting coastlines when it is washed ashore. Eight million tons of plastic waste is dumped at sea every year, now posing a threat to humans, as it is ingested by fish and then enters the food chain.

For plastic waste that isn't dumped, incinerating it provides a different kind of environmental problem, producing an estimated 400 million tons of CO_2 per year. What isn't dumped or incinerates goes to landfill waste sites, where plastic can take thousands of years to break down.

Then there is the wasteful production issue in that it takes more than eight litres of water to produce a single container of bottled 'spring' water, making it an incredibly inefficient use of resources – and that's before the costs of transporting it to places where it can be sold.

WHAT DOES IT MEAN FOR INVESTORS?

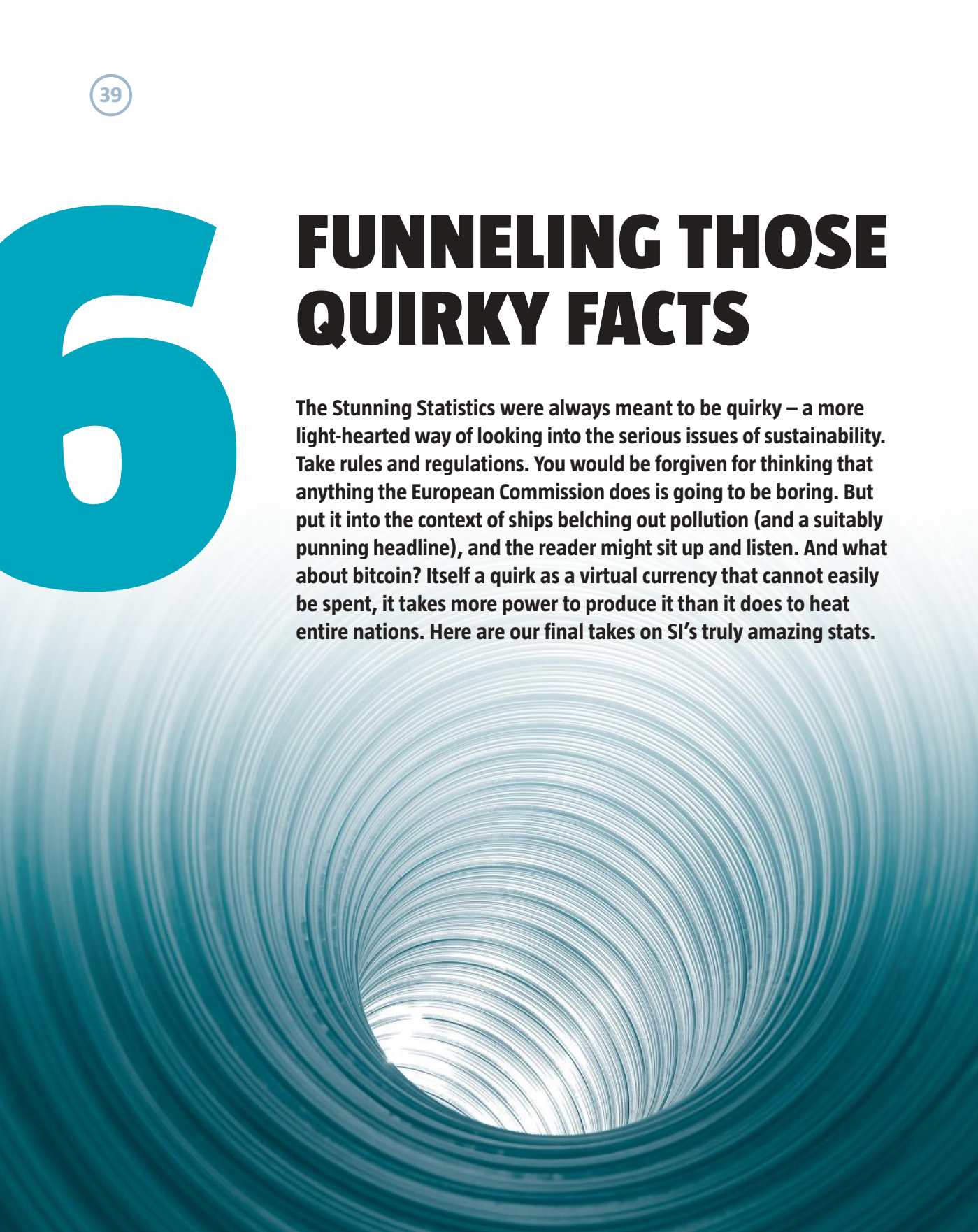
Cutting plastic waste – particularly from single-use bottles or other consumer goods – has been a major engagement theme for Robeco's Active Ownership team since 2019. The engagement focuses on food and beverage producers, along with the plastics manufacturers themselves.

"Working with City to Sea for the past year has enabled Robeco to bring its authentic sustainability credentials to life in a real and tangible way," says Peter Walsh, Head of Robeco UK.

"As a leader in sustainable investing, we are committed to continuing to advance the adoption of environmental, social and governance (ESG) investing across the industry. We've been leading the way with investing in the Sustainable Development Goals (SDGs), active ownership and ESG integration. Together we can have a real world impact on both wealth and wellbeing." ■

6 FUNNELING THOSE QUIRKY FACTS

The Stunning Statistics were always meant to be quirky – a more light-hearted way of looking into the serious issues of sustainability. Take rules and regulations. You would be forgiven for thinking that anything the European Commission does is going to be boring. But put it into the context of ships belching out pollution (and a suitably punning headline), and the reader might sit up and listen. And what about bitcoin? Itself a quirk as a virtual currency that cannot easily be spent, it takes more power to produce it than it does to heat entire nations. Here are our final takes on SI's truly amazing stats.



Light at the end of the funnel for polluting ships

SPEED READ

The 15 biggest ships emit more oxides than all the world's cars

New UN and EU rules force caps on emissions in 2020-2021

Opportunities for equipment makers as well as refiners

The owners of ships generating colossal amounts of pollution have just a few years to clean up their act, offering new opportunities for investors.

The increasing size of ships means that just 15 of the biggest carriers burning heavy fuel oil emit more harmful nitrogen and sulphur oxides than all the world's cars put together, according to research by the Carbon War Room. And there were 1.2 billion cars on the planet at the last count.

WHAT HAS HAPPENED?

The problem can be seen with the 397-meter long *Emma Maersk* container vessel, which until May 2017 was the largest commercial ship in the world, measuring 16 meters longer than the Empire State Building. Carrying up to 15,000 containers and weighing in at 171,000 gross tons, it burns 14,000 liters of bunker fuel – a form of heavy fuel oil that is high in sulphur – per hour.

More modern ships led by the current world record holder, the 400-meter long 211,000 gross ton *OOCL Hong Kong* container ship, are powered by diesel electric engines. These are less polluting than bunker fuel but still burn diesel oil, which generates significant amounts of carbon oxides.

The industry is gradually switching to using the less toxic liquefied natural gas (LNG) as the primary engine fuel. However, converting the engines of existing ships is too expensive for many operators due to overcapacity, low freight rates and high debt levels. Profits among ship owners are at a 25-year low, according to earnings analysis of the main companies transporting containers, bulk commodities, oil and gas.

Further, most ships are chartered by the companies moving the product, and are not owned outright. That means the cost of any engine conversions is borne by the ship owner while the fuel savings and environmental benefits would be enjoyed by the company chartering it, giving the owner little incentive to act.

WHY IS IT IMPORTANT?

Action is now being taken on two fronts. The UN's shipping regulator, the International Maritime Organization, enforced a cap on sulfur emissions from 2020, while shipping is included in the EU's emissions trading scheme from 2021. Failure to meet emissions targets will mean the dirtiest ships cannot sail.

With banks reluctant to lend to a cash-strapped industry, some ship owners are turning to specialist finance to pay for upgrades. 'Save as you Sail' is one such scheme developed by the Sustainable Shipping Initiative, which aims to share the fuel savings between the owner and the charterer over time. The European Investment Bank has also earmarked EUR 250 million in funding for refits.

WHAT DOES IT MEAN FOR INVESTORS?

"New environmental marine legislation increases the fuel bill for the shipping industry, but it provides opportunities for equipment makers as well as refiners," says Chris Berkouwer, an analyst with Robeco's Global Equities team.

"The most material implication from the 2020 sulphur regulations aims to cut the allowed sulphur content of fuel to under 0.5% of total gas emissions from 3.5% today. To comply, shippers can either switch to low-sulphur fuel, which is good for refining companies, or install scrubbers to clean gas emissions, which is good for equipment suppliers."

"The third option of using alternative fuels such as LNG is probably prohibitively expensive. As the total impact is quite material and the regulatory timeline to implement is very ambitious, pressure is building for the shipping industry. Companies providing the tools to reduce these emissions will benefit most." ■

Spending one bitcoin = 330,000 credit card transactions

SPEED READ

Figures quantify the energy used to produce and transact bitcoins

Total energy use is higher than electricity consumption of Romania

Carbon footprint is equivalent to four million petrol engine cars

The average bitcoin transaction now uses 330,000 times more energy than a credit card, new research shows.

WHAT HAS HAPPENED?

The digital currency consumes 511 kilowatt hours of electricity for one coin to change hands, according to research by digiconomist. That is equivalent to 330,000 Visa transactions, making it the most energy-intensive form of electronic trading known today. The computer energy needed to process the immensely complex and power-hungry blockchain algorithms necessary for a single transaction would also be enough to power 17 US households for one day.[8]

In March 2019, the total energy consumption of the entire bitcoin network, including the 'mining' cost of making units of the cryptocurrency, was calculated to be 51.5 terawatt hours per year. That's higher than the entire annual electricity consumption of Romania, which was 49.6 terawatt-hours per year in 2016.[9]

WHY IS IT IMPORTANT?

Despite a boom-to-bust bubble that saw the value of each bitcoin rise to over USD 17,000 in December 2017 before crashing to under USD 8,000 in six weeks, bitcoin remains popular as both an alternative means of exchange, and as an investment. The overall market is worth about USD 70 billion.[10]

Such is the scale of bitcoin use that it now accounts for 0.23% of global energy consumption and 24.4 million tons of CO_2, equivalent to what four million petrol engine cars produce in a year.[11] Another problem is that the leading data mining companies – half of which are known to be based in China – tend to be heavily reliant on coal for generating their electricity. This means the bitcoin industry makes a significant contribution to global warming without falling under the kind of regulation that nations are subject to.

8. https://digiconomist.net/bitcoin-energy-consumption
9. https://www.cia.gov/library/publications/the-world-factbook/geos/ro.html
10. https://www.statista.com/statistics/377382/bitcoin-market-capitalization/
11. https://www.cartalk.com/content/global-warming-and-your-car-0

And it isn't likely to change soon, given that the bitcoin industry had revenues of USD 2.8 billion in 2018. It provides much needed revenue and jobs for many emerging markets such as Georgia, which has one-quarter of the world's bitcoin mining facilities and is responsible for 15% of all bitcoins created globally. The country with the highest carbon intensity is another former Soviet republic, Estonia, whose 793 grams of CO_2 produced per kilowatt hour is higher than China's 711 grams.[12]

12. http://forbes.ge/news/3175/Three-Countries-With-the-Largest-Number-of-Bitcoin-Miners

WHAT DOES IT MEAN FOR INVESTORS?

"We have always expressed our doubts with regard to the proof-of-work consensus mechanism behind Bitcoin: not only are there energy-usage concerns, but also transaction speed is low," says Patrick Lemmens, portfolio manager in the trends investing team. "Fortunately, there are alternatives to proof-of-work that are less energy and time consuming."

"We are not actively investing in cryptocurrencies, but are positive on the underlying technology. We think that cryptocurrencies are likely going to be used by large financial institutions and central banks to increase their system efficiencies. Once regulated cryptocurrencies appear on the market, one should doubt the long-term ability of the 2,000 payment coins available today to survive."

"We do see a lot of new activity besides payment coins that have a lot of potential. Real-asset tokenization is one of those alternative use cases. The energy consumption and transaction speed are important considerations in developing that infrastructure. We seek to invest in companies that enable the technology, and keep a close eye on sophisticated users that can transform the technology to profitable business opportunities." ■

Short-haul flights are the worst offenders for CO_2

SPEED READ

Short-haul flights emit more CO_2 per person km than long haul

Eurostar rail service is the least carbon-intensive form of travel

Smart Mobility strategy targets transformational companies

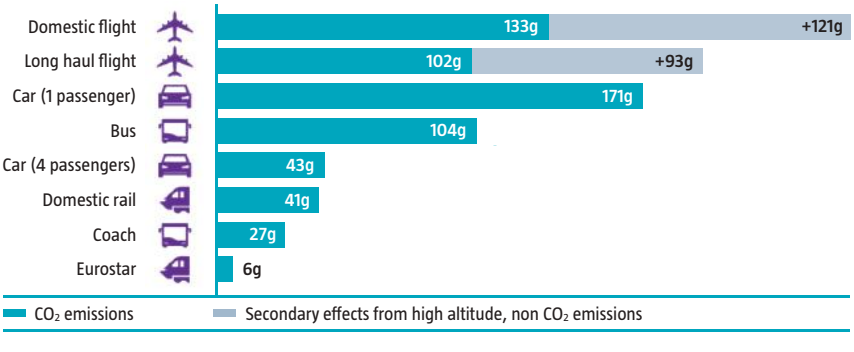
Domestic and other short-haul flights are the most carbon-intensive form of travel, figures show.

WHAT HAS HAPPENED?

Aircraft on routes of 700 kilometers or less emit more carbon dioxide per person for every kilometer traveled than long-haul flights: 251 grams per km for short haul compared to 195 g/km for long haul. That's due to the fact that take-off and landing uses the most fuel, making level flight over whatever distance relatively cleaner.

By comparison, a diesel car emits 171 g/km of CO_2 with one passenger, or an average of 43 g/km for four passengers, according to UK government figures. An urban bus emits 104 g/km and a coach 27 g/km due to its greater weight efficiency. Electrified domestic rail, including shorter suburban services, emits 41 g/km.

Figure 8: Emissions from different modes of transport – per passenger per km travelled



Note: Car refers to average diesel car
Source: BEIS/Defra Greenhouse Gas Conversion Factors 2019

The most efficient form of transport is the transnational Eurostar, emitting only 6 g/km per passenger on trips through the Channel Tunnel. It means someone who flies from Amsterdam to London but returns on the Eurostar will be responsible for 20 times more CO_2 emissions on the flight there than on the train back.

WHY IS IT IMPORTANT?

Reducing carbon emissions from all sources to make the world effectively carbon neutral by 2050 is essential to meet the goals of the Paris Agreement. This seeks to limit global warming to 2 degrees Celsius or less above pre-industrial levels.

The entire transport sector is responsible for about 14.7% of all greenhouse gases emitted. The biggest contributor is not the more CO_2-intensive airline industry, responsible for about 1.7% of all CO_2 emissions, but road vehicles, accounting for 10.5%.

One problem is that unlike cars, aircraft cannot be battery powered – the batteries needed to get a 200-ton aircraft off the ground would currently weigh three times as much as the plane. However, work has begun in the US in trying to develop a hybrid electric engine for a 186-seater plane, with the first test flight due in 2023.

WHAT DOES IT MEAN FOR INVESTORS?

"Electrification will transform all modes of mobility, transport and travel," says Thiemo Lang, portfolio manager of the RobecoSAM Smart Mobility strategy which targets companies operating in this sector. "Though the pace of change varies by vehicle and purpose, the revolution is underway and accelerating."

"Emissions regulations and improved economics are shaping the market, coupled with increasing urbanization and growing megacities which create demand for the sustainability of all modes of public transportation and the rise in private electric vehicles on our streets."

"For investors, this presents an opportunity to participate in the transformative shift towards zero-carbon mobility. The RobecoSAM Smart Mobility strategy focuses on companies enabling this transformation in all its forms – ground, sea, and sky – including component suppliers, electrical grid and charging suppliers, and data connectivity solutions providers." ■

Epilogue: Why the world needs to go on a diet

SPEED READ

Weight of man-made objects on Earth is about 100 billion tons

Humans now generate their own bodyweight in stuff every week

Moving to a circular economy would stop the waste mountain

The weight of man-made objects on Earth now exceeds the mass of all living things, new research reveals.

WHAT HAS HAPPENED?

The combined mass of anything built by humans, from buildings and bridges to mechanical objects and roads reached 100 billion tons (one teraton) in 2020, according to the Weizmann Institute of Sciences in Israel.

This means it is now greater than the estimated weight of all natural phenomena, from trees and plants to animal life – known as the biomass. The tipping point was reached because the amount of things manufactured or built has steadily risen, while the quantity of living things has fallen due to deforestation and the extinction of species from habitat loss.

The research shows the mass of man-made objects has doubled every 20 years, partly driven by the growth of China into an economic superpower, with cities and a road network to rival anything in the west. Development globally has accelerated exponentially since 1950 due to the widespread availability of cheap plastic, concrete and steel.

WHY IS IT IMPORTANT?

The man-made versus natural ratio will get worse because humans are now producing about 30 billion tons of new objects each year, or 4 tons for every person on Earth, the research shows. This means humans now generate their own bodyweight in stuff every week. On the current trajectory, the mass of human production will have tripled to 3 teratons by 2040.

This has major implications for global warming, as the amount of carbon-emitting production processes and the use of their end-products is increasing, while the natural means of absorbing this extra CO_2 through natural carbon sinks such as forests is decreasing.

Much of what is manufactured ends up on landfill waste sites under the take-make-dispose economic model of extracting raw materials, turning them into finished goods, and then throwing away what is no longer needed. The alternative to this linear model is the circular economy, which places greater emphasis on reusing existing materials in a series of loops, thereby putting the earth on something of a diet.

WHAT DOES IT MEAN FOR INVESTORS?

"The human tendency to shape the natural world is creating a flood of man-made objects that increasingly work against the planet's rules of regeneration," says David Kägi, Portfolio Manager of the RobecoSAM Circular Economy Equities strategy.

"As a consequence, today the world is literally drowning in waste, and the damaging environmental and economic effects are surfacing rapidly across the globe. This raises the need for transformative, circular business solutions that restore a sustainable balance between production, consumption and disposal of used goods. For enterprising firms this opens up entirely new markets and investment opportunities." ■

Our stunning commentators

Chris Berkouwer	Portfolio manager of Robeco Sustainable Global Stars Equities
Thiemo Lang	Portfolio manager of RobecoSAM Smart Mobility
Richard Speetjens	Portfolio manager in Robeco's Trends Investing team
Jaap van der Hart	Portfolio manager of Robeco Emerging Stars Equities
Max Schieler	Author of the RobecoSAM Country Sustainability Ranking
Guido Moret	Robeco's Head of Sustainability Integration Credits
Peter Walsh	Head of Robeco UK
Patrick Lemmens	Portfolio manager in Robeco's Trends Investing team
David Kägi	Portfolio manager of RobecoSAM Circular Economy Equities

Contact

Robeco
P.O. Box 973
3000 AZ Rotterdam
The Netherlands

T +31 10 224 1 224
I www.robeco.com

Important information

Robeco Institutional Asset Management B.V. (Robeco B.V.) has a license as manager of Undertakings for Collective Investment in Transferable Securities (UCITS) and Alternative Investment Funds (AIFs) ("Fund(s)") from The Netherlands Authority for the Financial Markets in Amsterdam. This document is solely intended for professional investors, defined as investors qualifying as professional clients, who have requested to be treated as professional clients or who are authorized to receive such information under any applicable laws. Robeco B.V and/or its related, affiliated and subsidiary companies, ("Robeco"), will not be liable for any damages arising out of the use of this document.

The contents of this document are based upon sources of information believed to be reliable and comes without warranties of any kind. Any opinions, estimates or forecasts may be changed at any time without prior notice and readers are expected to take that into consideration when deciding what weight to apply to the document's contents. This document is intended to be provided to professional investors only for the purpose of imparting market information as interpreted by Robeco. It has not been prepared by Robeco as investment advice or investment research nor should it be interpreted as such and it does not constitute an investment recommendation to buy or sell certain securities or investment products and/or to adopt any investment strategy and/or legal, accounting or tax advice.

 Investment involves risks. Before investing, please note the initial capital is not guaranteed. This document is not directed to, nor intended for distribution to or use by any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, document, availability or use would be contrary to law or regulation or which would subject Robeco B.V. or its affiliates to any registration or licensing requirement within such jurisdiction.

This document may be distributed in the US by Robeco Institutional Asset Management US, Inc. ("Robeco US"), an investment adviser registered with the US Securities and Exchange Commission (SEC). Such registration should not be interpreted as an endorsement or approval of Robeco US by the SEC. Robeco B.V. is considered "participating affiliated" and some of their employees are "associated persons" of Robeco US as per relevant SEC no-action guidance. SEC regulations are applicable only to clients, prospects and investors of Robeco US. Robeco US is located at 230 Park Avenue, 33rd floor, New York, NY 10169.


ROBECO
The Investment Engineers