In focus

An investor's guide to climate change: the simple and surprising facts

June 2021

Climate change is real, and is being driven by record and still-rising greenhouse gas emissions. Human activity is mostly responsible for it. The impact of global warming is becoming uncomfortably tangible. Every year, more and more people around the world feel its effects through recurring extreme weather events that harm life and property and dislocate populations.

The good news is that we are concerned enough for Greta Thunberg to be immediately recognizable around the world. The bad news is that we are not scared enough. Despite all the policy action in the last decades, greenhouse gas emissions are still increasing and the planet is still warming.

Perhaps the key lies in climate change literacy. Most of us have heard about global warming and its effects but how much do we really know about how human activity is harming the environment?

This paper puts together some facts about climate change that can help all of us better understand climate change and the role that human activities play. It also makes some suggestions about actions that we can take as individuals to manage our carbon footprint and explains what Schroders is doing as an investor and a company.

Reading this may get scary at times but please do not look away!

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The facts

A quick prelude

For any of the facts that follow to make sense, we need to have a quick introduction to climate change.

We start with **greenhouse gases**. These are gases that exist in the atmosphere and include carbon dioxide, methane, nitrous oxide, and fluorinated gases. These gases are emitted by both human and natural activity and have the unique characteristic that they absorb heat and trap it in the atmosphere. This causes the Earth's temperature to increase. The scale of this rise depends on how much of these gases is emitted, how long they stay up there and how much heat they absorb.

Human activity over the last few centuries has resulted in emissions that are significantly above normal. As a result, the Earth is warming to unprecedented levels, which is called **global warming**. The main (but not the only) culprit is carbon dioxide generated from human activities that stays up in the atmosphere pretty much forever. This is why emissions work in a cumulative way: the more we emit, the more is up there causing more global warming.

This warming is causing the **climate to change**. Scientific research has shown how it connects to a greater probability of extreme weather events, lower access to water, population dislocation and loss of biodiversity, to name only a few issues. The list is scarily long.

Since we (humans) keep emitting greenhouse gases, these keep accumulating in the atmosphere, warming the planet even further which means that climate change and its effects will only get worse and more frequent. At some point (and we don't know exactly when this will be) the emissions from our activities will tip the balance in the environment in a devastating and (this cannot be overemphasized) an irreversible way.

It has been estimated that we may be able to prevent this if we manage to keep the rise in average global temperature to 1.5 degrees Celsius below pre-industrial levels (which is universally used as the baseline and almost always means temperatures in 1850-1900; Source: BBC). We could achieve this by reducing emissions to zero by about 2050 (Source: IPCC).

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That's right: reducing emissions will not be enough – we must get them to zero. As this is practically impossible, the target is actually **"net" zero**. We could achieve this by reducing emissions to an absolute minimum and finding ways to counterbalance them (sometimes with outright removal of greenhouse gases from the atmosphere).

The cumulative nature of greenhouse gases means one further thing: projected warming for the next decades is already set. Whatever mitigation we undertake, temperature projections will only be affected in the second half of this century.

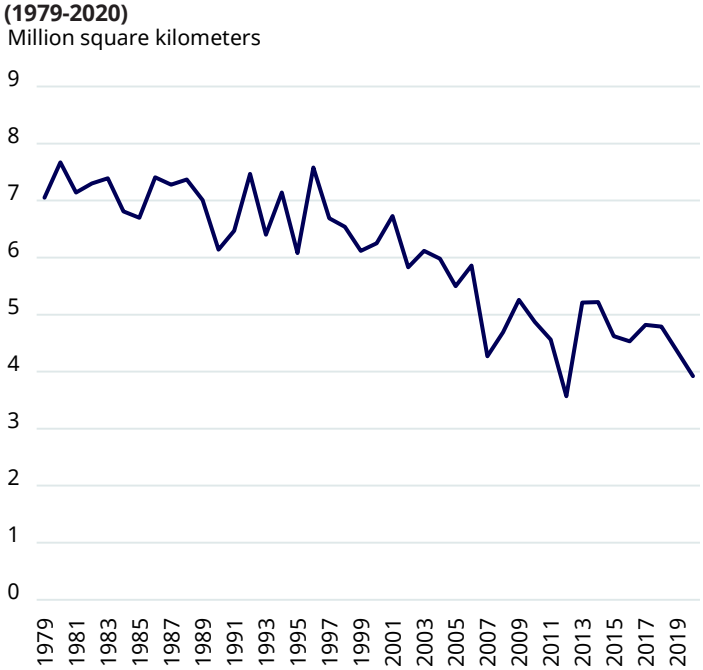
Having introduced the issue in a nutshell, we begin our list of (sometimes scary) facts about the environment and climate change.

On climate change

- The global average temperature already reached about 1.1 to 1.3 degrees Celsius above pre-industrial levels in 2020. The six years 2015-2020 were the warmest six years on record and 2011-2020 was the warmest decade on record (Source: World Meteorological Organization).
- Arctic sea ice is melting fast. Generally, the extent of the Arctic sea ice reaches its minimum each September and this minimum has been declining at a rate of 13.1% per decade (Source: NASA). Unfortunately, it is not just the minimum. The extent of Arctic sea ice has been declining across all times of the year, the illustration of which has been dubbed the "Arctic death spiral" – see right hand chart below (Source: Arctic Death Spiral).
- If global warming continues to grow at the same (exponential) rate, global average sea levels could rise by up to 1.1 meters by 2100 (Source: IPCC) and by 0.5 meters by 2050 for over 570 coastal cities. This could put over 800 million people at risk and create $1 trillion in economic cost (Source: C40 Cities). "Delta cities" like Dhaka, Guangzhou, Ho Chi Minh City, Hong Kong, Manila, Melbourne, Miami, New Orleans, New York, Rotterdam, Tokyo and Venice, home to more than 340 million people, are particularly vulnerable (Source: World Economic Forum).
- Climate change-driven water scarcity, crop failure, sea-level rise and storm surges could dislocate over 140 million people by 2050 in three densely populated regions of the world: Sub-Saharan Africa, South Asia, and Latin America (Source: World Bank). There have already been an estimated 23.1 million displacements of people on average each year over the past decade (2010-2019) due to weather-related events (Source: World Meteorological Organization).
- People tend to think that conflict is the biggest driver of population displacement (Source: Ipsos). However, in the first half of 2020, two thirds of population displacements globally happened due to climate change (Source: Internal Displacement Monitoring Center).
- The difference between 1.5 and 2 degrees Celsius is massive. In a 1.5 degree rise scenario (Source: IPCC):
  - The average rise in sea levels by the end of the 21st century will be lower by about 0.10 meters affecting 10.4 million fewer people than in a 2 degree rise scenario
  - The proportion of birds, animals and plants that is projected to be geographically dislocated due to climate change will be half of that in a 2 degree scenario (but still substantial at 4% of vertebrates and 8% of plants)
  - The estimated permafrost area that will thaw will be somewhere between 1.5 and 2.5 million square kilometers smaller (more on permafrost below)
  - The proportion of population exposed to water stress caused by climate change would be half and 61 million fewer people in Earth's urban areas would be exposed to severe drought
  - There would still be substantial changes. For example, the majority (70–90%) of tropical coral reefs that exist today will disappear
- The world is on course for a 3.6 degrees rise in average global temperature, which is almost two-and-a-half times the upper limit. The good news is that almost four years ago Schroders estimated it to be at 4.1 degrees, so at least the trajectory is in the right direction (Source: Schroders Climate Progress Dashboard).

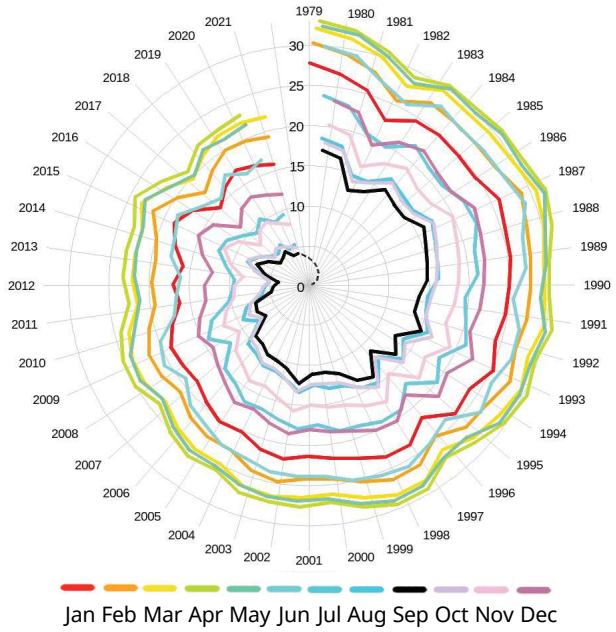
Arctic sea ice is melting fast

Average monthly Arctic sea ice extent each September (1979-2020)



Source: NASA.

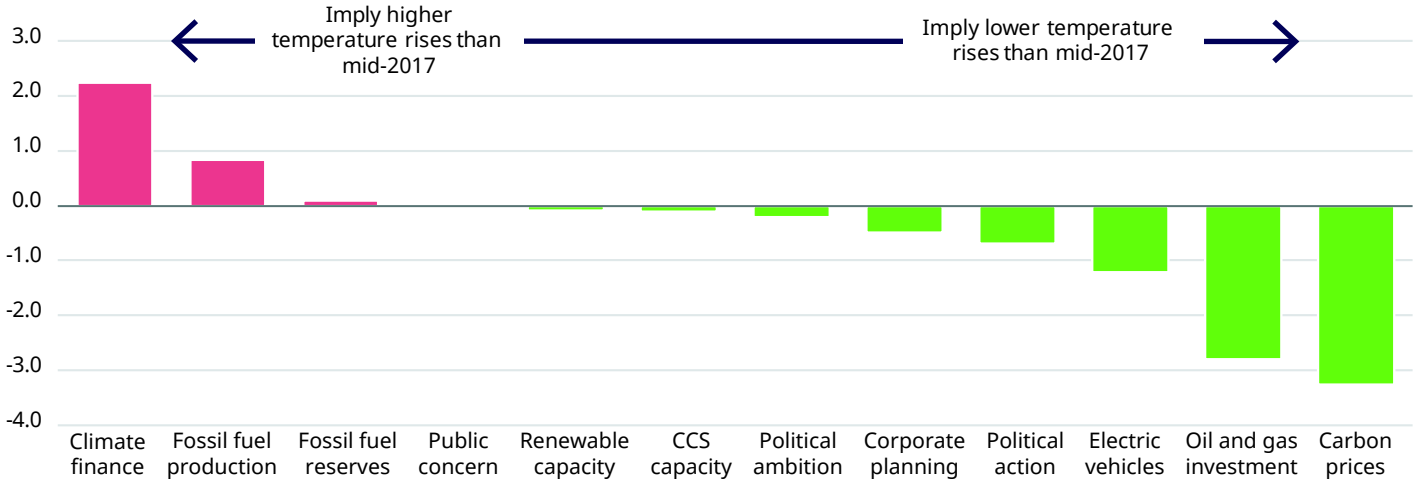
Loss in the Arctic Sea ice volume (1970-2020)



Source: Arctic Death Spiral. Accessed in April 2021.

Schroders Climate Progress Dashboard

Change in implied temperature rise since inception (in degrees Celsius)



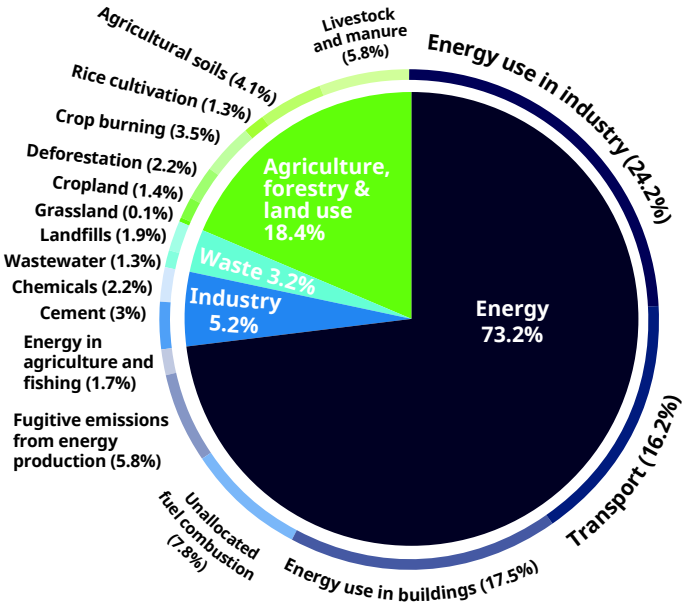
Source: Schroders calculations using inputs from various sources. Please see here for more details. Data updated as of end-March 2021

Our greenhouse gas emissions

- Carbon dioxide in the atmosphere caused by human activities rose by 48% over the 171 year period between 1850 and 2020. This was more than what happened naturally over a 20,000 year period from the Last Glacial Maximum to 1850 (Source: NASA).
- Who are the largest "emissions offenders"? There are two ways to see this. The one is to look at it by sector. Most greenhouse gases are emitted in energy use in industry (24.2%), agriculture, forestry and land use (18.4%), energy use in buildings (17.5%), and transport (16.2%). Overall, the production of energy is responsible for 87% of global greenhouse gas emissions (Source: Our World in Data). The other is to look at it by human activities: making things (31%), plugging in (27%), growing things (19%), getting around (16%), and keeping warm and cool (7%) (Source: Bill Gates, How to avoid a climate disaster, 2021).
- The largest emitters by region are: China (26%), the United States (13%), EU-27 (7.8%), India (6.7%) and Russia (5.3%). The top 10 emitters by country account for over two-thirds of global emissions, over 50% of the global population and almost 60% of the world's GDP (Source: World Resources Institute).
- COVID-induced lockdowns and travel bans have made a difference: global energy-related carbon emissions fell by 5.8% in 2020, which is the largest annual decline since World War II (Source: International Energy Agency). Unfortunately, this is likely to be a one-off and despite the drop in 2020, the concentration of greenhouse gases now stands at record levels (Source: World Meteorological Organization).
- The last time there was so much carbon dioxide in the Earth's atmosphere was around 3.6 million years ago (the Mid-Pliocene Warm Period which is commonly used for climate change analysis) (Source: National Oceanic and Atmospheric Administration).

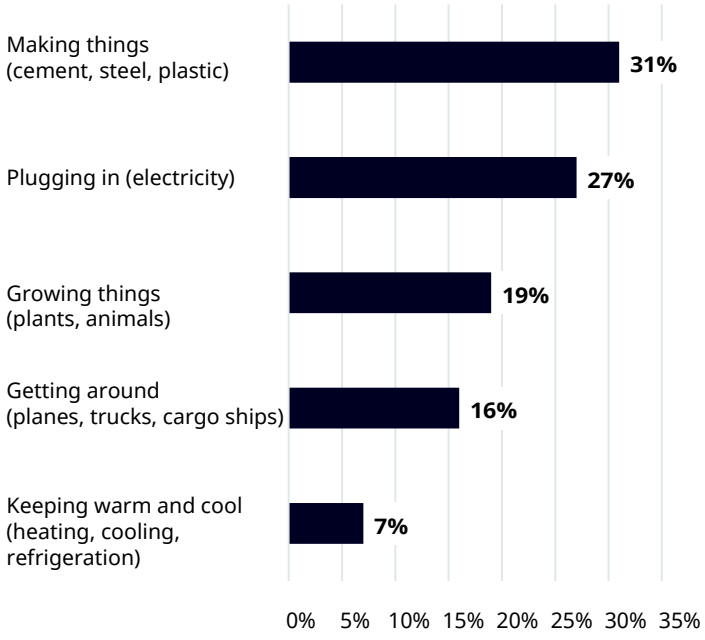
Which activities are responsible for greenhouse gas emissions?

Global greenhouse gas emissions by sector



Source: Our World in Data. Information as at 2016.

Greenhouse gas emissions by human activity



Source: Bill Gates, How to avoid a climate disaster, 2021.

Our methane emissions

- Once emitted, methane stays in the atmosphere for about nine years but has a substantially higher warming effect than carbon dioxide. When averaged over 20 years, methane's warming potential is 86 times higher than that of carbon dioxide. Over 100 years, one kilogram of methane has approximately 28 times the warming impact of one kilogram of carbon dioxide (Source: The Conversation).
- Despite their relatively short life in the atmosphere, methane emissions have so far driven between 23% and 40% of the total warming (Source: Our World in Data).
- A lot of methane is trapped in Arctic permafrost which means a vicious circle: methane emissions cause global warming, which causes the Arctic to melt, which releases more methane emissions etc. (Source: Schroders). This is sometimes referred to as the "methane rebound".
- Currently, the main emitters of methane are agriculture and livestock, followed by waste (includes waste from food, burning waste, wastewater treatment etc.) (Source: McKinsey).

Our energy use

- The average person uses about 59 kilowatt-hours every day, which in energy terms corresponds to approximately 6 liters of petrol (enough to drive a car for about 110km) or enough food (calorific value) for 22 people for one day (Source: Mike Berners-Lee, There is no planet B, 2019).
- We use over three times the energy we did 59 years ago. The development of new energy sources has added to our energy use rather than replaced old energy sources (Source: Mike Berners-Lee, There is no planet B, 2019).
- In 2020, 83% of global energy consumption came from fossil fuels, one third of which was coal (Source: Schroders – see chart below).

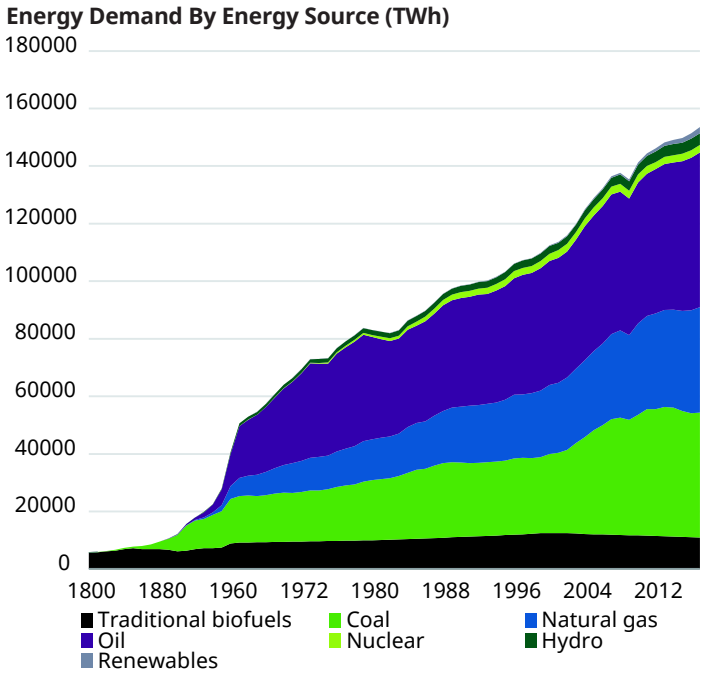
Our use of fossil fuels

- Scientific research has established that emissions from our burning of fossil fuels is the biggest cause of human-induced climate change. The reason we are so reliant on fossil fuels is that since they don't factor in the cost of climate change, they are cheap and produce vast amounts of reliable energy. One gallon of gasoline produces as much energy as 130 sticks of dynamite (Source: Bill Gates, How to avoid a climate disaster, 2021).
- When it comes to emissions, nothing is worse than coal: one small coalmine is roughly equivalent to the annual carbon footprint of 650,000 people (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- We would need to leave 84% of the remaining fossil fuels in the ground to meet the 1.5 degrees target and 59% to meet the 2 degrees target. Only 4% of remaining fossil fuels would be left untouched in a 3 degree scenario (Source: Financial Times).
- Given our current levels of oil consumption and the known world oil reserves, the world has about 47 years of oil left (Source: Worldometer).

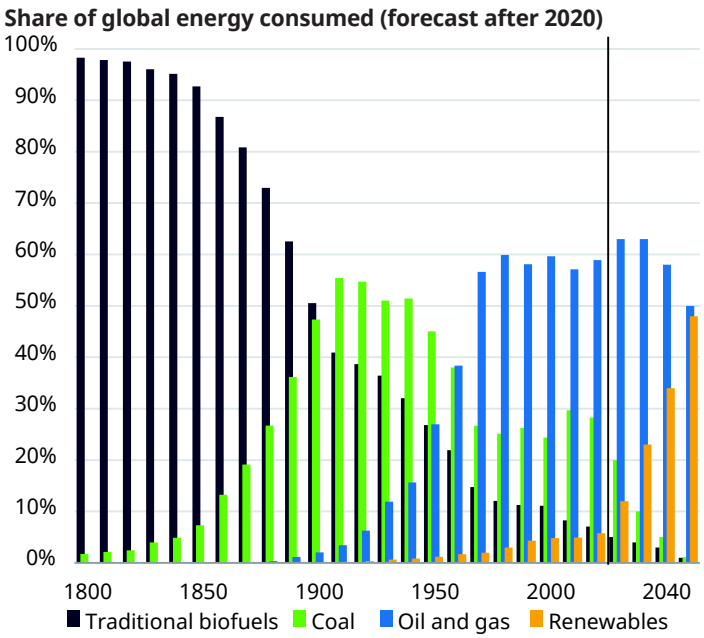
Our use of renewables

- More than 80% of all new electricity capacity added last year was renewable, with solar and wind accounting for 91% of new renewables (Source: International Renewable Energy Agency). As a result, the share of renewables in electricity generation is expected to reach 30% in 2021. China is estimated to account for about half of the global increase in renewable electricity generation in 2021 (Source: International Energy Agency).
- By 2050, the world will need to more than double the length of global power lines and transformers to enable the growth of renewables, otherwise wind and solar farms will sit idle, unable to send their power to the grid. On average, between 5% and 10% of all electricity produced is lost on the grid due to inefficient distribution systems (Source: Schroders).
- Solar and wind energy require substantial space to provide energy. Fossil fuels and nuclear have at least 100 times more power density (energy generation per square meter) than solar energy and 500 times more than wind energy (Source: Bill Gates, How to avoid a climate disaster, 2021).

Global energy mix over the last two centuries



Source: IEA, IRENA, BNEF, SEIA, Schroders. Data from 1800 to 2017.



Source: IEA, IRENA, BNEF, SEIA, Schroders. Information as of December 31, 2020.

- With existing technology, nuclear energy remains the only energy source that is carbon-free and can deliver power reliably with no interruptions. It accounts for 10% of world's electricity compared to 62% from fossil fuels (Source: Bill Gates, How to avoid a climate disaster, 2021).
- Every bit of land we use for biofuels means that there is less land available to grow food. The wheat required to power a Toyota Corolla on bioethanol for 1.1 miles could feed a person for a day (Source: Mike Berners-Lee, There is no planet B, 2019).

Our transport

- The entire transport sector is responsible for about 16.2% of global greenhouse gases, putting it behind agriculture and the energy we use to power and heat our buildings. Road transport and aviation account for 11.9% and 1.9% of global emissions respectively. If we look at passenger use specifically, emissions are 7.1% and 1.5% from road transport and aviation respectively. So human use of cars has almost five times the carbon footprint of flying (Source: Our World in Data).
- A drive in congested traffic can emit three times as much as the same drive on a clear road (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- Global sales of electric vehicles reached three million in 2020; an increase of more than 40% from 2019. 46% of sales were in Europe, 39% in China, and 12% in North America (Source: McKinsey). But even if all new cars were electric now, it would still take 15-20 years to replace the world's fossil fuel car fleet (Source: World Economic Forum).
- Cycling can result in 30 times lower emissions than driving a car powered by fossil fuels, and about 10 times lower than driving an electric vehicle. (Source: The Conversation).
- Strictly speaking, the carbon footprint of cycling depends on what we eat to generate the energy to cycle. Getting the energy from burgers has almost 8 times the footprint of getting the energy from bananas (Source: Mike Berners-Lee, How bad are bananas?, 2020). More on our eating habits follows below.

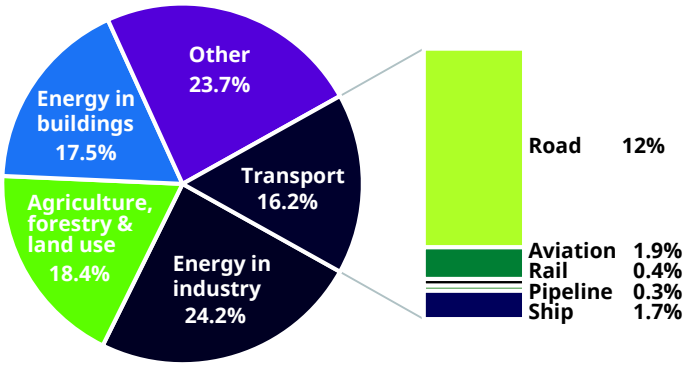
Our use of plastic

The three main offenders in the carbon footprint of manufacturing are steel, cement and plastic. Making one tonne of steel and one tonne of cement produces about 1.8 and 1 metric tons of carbon dioxide respectively. This is why steel and cement account for 8% and 4.5% of the world's carbon dioxide emissions. The biggest issue with plastic is what we most value in it: it does not degrade. Hence, it is one of the biggest sources of environmental pollution (Sources: Bill Gates, How to avoid a climate disaster, 2021; Mike Berners-Lee, How bad are bananas?, 2020).

- If nothing changes in human habits between 2016 and 2040, plastic waste generation is predicted to double, plastic leakage in the ocean to triple and plastic stock in the ocean to more than quadruple. If we implement all existing government and industry commitments by 2040, we will manage to reduce annual plastic flows to the ocean by only 7% (Source: Pew Trust).
- If all the plastic we have discarded in the world were cling film, we would be able to wrap the whole planet one and a half times in it (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- Marine plastic pollution is already affecting more than 800 species (Source: Pew Trust).
- Insufficient collection in rural areas has resulted in 45% of today's plastic leakage to the ocean. Approximately 4 billion people will need to be connected to collection services by 2040 which means connecting about 500,000 people per day, every day, until 2040 (Source: Pew Trust).
- The plastics that end up in our oceans and seas come mostly from flexible packaging, such as cling film and plastic bags (46% of leakage), multilayer plastics such as drinks cartons and diapers (26%) and microplastics (11%) (Source: Pew Trust).
- An average person could be ingesting 5 grams of plastic every week which is the equivalent of a whole credit card. The largest source of plastic ingestion is drinking water (Source: WWF).

Putting aviation emissions into context

Share of each sector as % of global greenhouse gas emissions (49.4 billion metric tons of carbon dioxide equivalent in 2016)



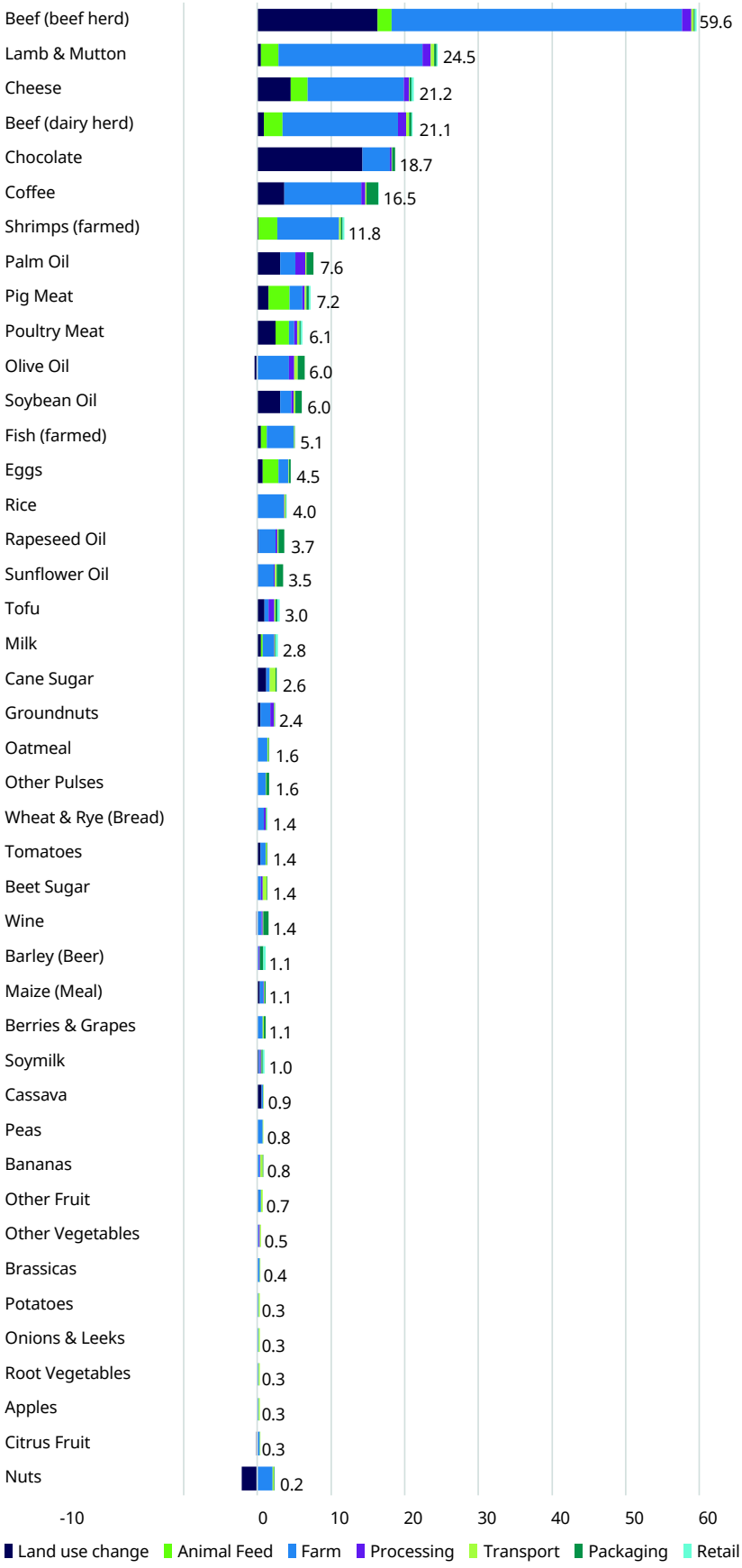
Source: Our World in Data. Emissions data as of 2016.

Our food consumption

- Protein from beef and lamb has 10 times more emissions than poultry and fish and 30 times the emissions of pulses (Source: McKinsey).
- The methane from beef has the same warming effect as 2 billion metric tons of carbon dioxide and accounts for about 4% of global emissions (Source: Bill Gates, How to avoid a climate disaster, 2021).
- A block of cheddar (250g) is equivalent to 10 kg of carrots in terms of emissions generated. (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- Producing meat and dairy requires us to grow more food. A chicken needs to eat two calories worth of feed to give us one calorie of poultry. A pig eats three times as many calories as we get when we eat it. And cows need six calories of feed for every calorie we get when we eat beef (Source: Bill Gates, How to avoid a climate disaster, 2021).
- Chocolate has almost the same carbon footprint as beef (for dairy). The problem with chocolate is that it contains some environmentally damaging ingredients, such as dairy, cocoa, sugar, and palm oil. And the land use impact of growing cocoa is the single biggest contributor to chocolate's sticky footprint (Source: Schroders).
- A liter of orange juice has a carbon footprint similar to over 6 kg of oranges due to additional emissions from processing, pasteurizing, refrigerating, and the footprint from the carton (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- About six garbage trucks full of edible food is lost or wasted every second (Source: Ellen MacArthur Foundation). This corresponds to around 25% of the calories the world produces (Source: Our world in data).
- When wasted food rots, it produces enough methane to cause as much warming as 3.3 billion metric tons of carbon dioxide each year (Source: Bill Gates, How to avoid a climate disaster, 2021). This is roughly three times the greenhouse gas emissions from the aviation sector (Source: Our world in data).
- Consumption patterns of G7 countries cause the loss of 3.9 trees per person per year, on average. Chocolate consumption in the UK and Germany can drive deforestation in Ivory Coast and Ghana. Beef and soy demand in the US, the EU and China causes deforestation in Brazil. Drinking coffee in the US, Germany and Italy causes deforestation in central Vietnam. Demand for timber in China, South Korea and Japan results in deforestation in northern Vietnam (Source: Hoang and Kanemoto, Mapping the deforestation footprint of nations reveals growing threat to tropical forests).
- Deforestation accounts for about 30% of all agriculture-related emissions (Source: Bill Gates, How to avoid a climate disaster, 2021). One deforested hectare (about the size of a rugby field) results in emissions equivalent to driving a car 50-100 times around the Earth (Source: Mike Berners-Lee, How bad are bananas?, 2020).

Food: greenhouse gases across the supply chain

kg CO2 – equivalents per kg of foodstuff



Source: Our World In Data, January 2020. Data source: Reducing food's environmental impacts through producers and consumers, Science, Poore, J., & Nemecek, T, 2018.

Our impact on biodiversity

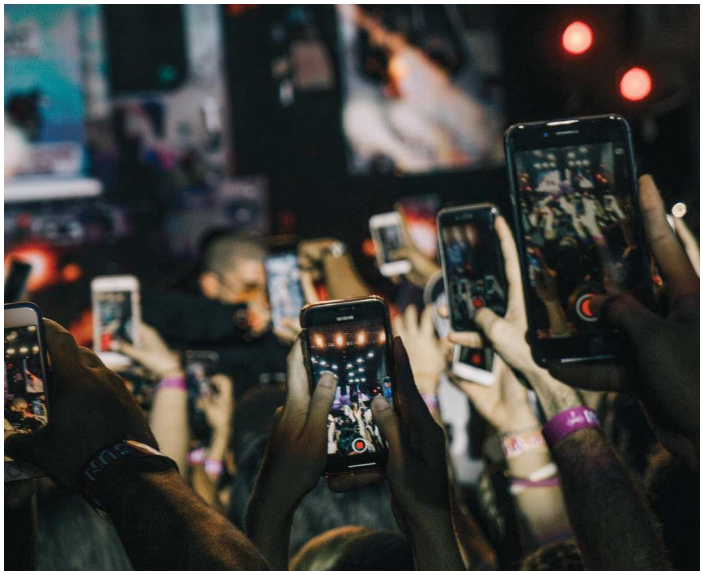
- The world population (7.6 billion) represents just 0.01% of all living things by weight but human activities have managed to cause the loss of 83% of all wild animal and half of all plant species (Source: World Economic Forum).
- 1 in 8 species is threatened with extinction, in many cases within decades (Source: United Nations).
- Human activity has significantly changed 75% of the land-based environment and about 66% of the marine environment. More than a third of the world's land surface and nearly 75% of freshwater resources are now devoted to crop or livestock production (Source: United Nations).
- Only 2% - 3% of the Earth's land surface can be considered ecologically intact (Source: World Economic Forum).
- Loss of biodiversity is bad news for human health as it means: less rich and diverse diet, more diseases as human activities encroach upon the natural world, fewer natural ingredients that serve as sources for pharmaceuticals, fewer buffers from natural disasters such as floods (Source: World Economic Forum).

Our use of fashion

- The fashion industry accounts for 10% of annual global emissions and is a major driver of deforestation and soil degradation (Source: European Parliament Think Tank).
- In the last 15 years, clothing production has doubled while our use of clothing has declined by almost 40% (Source: Ellen MacArthur Foundation).
- As much as 30% of clothes are over-produced and thrown away without anyone having worn them (Source: European Parliament Think Tank).
- We throw away more than half of "fast fashion" within a year of its production. It is estimated that one truckload of clothing is landfilled or burned every second (Source: Ellen MacArthur Foundation).
- The fashion industry consumes 1.5 trillion liters of water each year and causes 20% of global clean water pollution (Source: European Parliament Think Tank).
- It can take 2,700 liters to produce the cotton needed to make a single t-shirt. This amount equals a person's drinking needs for 2.5 years (Source: WWF).

Our use of information technology and communications

- Our use of phones, computers, tablets, TVs, networks and even cryptocurrencies accounts for 2.5% of global emissions (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- A new laptop has the footprint of a flight from London to Rome but its use is low-carbon. A video call has similarly low emissions but can save emissions by reducing travel from people going to the same point (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- Most of the emissions from a smartphone are caused by its manufacture and transport. Using a smartphone is a low-emitting activity: it would take approximately 34 years of average smartphone use for the electricity footprint to equal the footprint from making and transporting the smartphone (Source: Mike Berners-Lee, How bad are bananas?, 2020).
- The annual energy consumption of Bitcoin (120 terawatts) is similar to that of the Netherlands. The emissions from a $1billion inflow into Bitcoin are equivalent to 1.4 coal fired power plants per year or the yearly energy use of 632,000 homes. The high carbon footprint is mainly driven by the mechanisms set in place to prevent a hack (Source: Bank of America Global Research).



What can each of us do?

The facts about climate change create one long list of bad news. The good news is that since climate change and environmental damage is caused by human behavior then we, humans, can prevent further damage by changing our behavior.

To state the obvious, there is no silver bullet. This problem is so multifaceted that many things need to happen together. This in itself is perhaps part of the challenge as we are faced with one massive tragedy of the commons: our habits harm the environment but no one is individually accountable or responsible for fixing it. Hence, the main (but not only) driver in managing climate change will have to be government policy. It is immensely good news to see so many governments around the world committing to a net zero emissions target.

For us as individuals, it may be very tempting to put this in the "too difficult" or "I couldn't possibly make a difference" bucket. The reality is that each one of us must change a great many aspects of our lives and everyday habits.

What can individuals do?

First of all, we need to educate ourselves. We need to become as climate change savvy as possible, not least so that we can judge which changes can make the biggest difference to our own carbon footprint. The evidence suggests that we are not as good at it as we may think (Source: Ipsos).

The good news is that there is no shortage of material out there. A quick internet search will point to numerous books, research reports by independent organizations, documentaries and podcasts.

Moreover, it has become easier to calculate our own carbon footprint. This is important as we can't reduce what we can't measure. Again a simple internet search produces several options.

Second, we can use our power as consumers and as voters. Some changes will probably seem quite obvious:

- Developing greener transport habits such as driving less, using more public transport, cycling or walking. In the case of electric vehicles, it is important to make sure that the electricity that powers the car is not reliant on fossil fuels
- Changing our diets by consuming less meat in general (red meat in particular), eating more grains, opting for organic and fair-trade food, buying local products where possible, and wasting much less of every food item we buy
- Exhausting all possibilities of repairing or re-using before replacing and recycling
- Appreciating all the clothes we already have much more and wearing them for as long as possible
- Cutting out single-use plastics such as cups or straws, and reducing the amount of plastic we throw away, for example by using bags for life instead of plastic bags and using re-fillable and re-usable containers (even if they are plastic!) for food, cleaning products etc.
- Renovating our homes to insulate them better and opting for a greener energy provider

Individual actions that may seem less obvious include:

- Writing to the manufacturers of products we buy to ask them to provide carbon footprint information (one that includes the footprint of supply chains) or use biodegradable packaging. Simply signaling greater demand for something could be enough of an incentive for a product manufacturer to start thinking about it.
- Contacting the local government representative to understand their intentions about environmental policy. This is part of our rights as constituents and we can (literally) vote with our feet if we want.
- Raising awareness among a bigger audience by organizing local community groups and even protests. If you think this cannot bring anything I have two words for you: Greta Thunberg.
- Where investment is an option, choosing an investment product that allocates money in a way that supports environmental goals and contributes towards net zero emissions by 2050. Schroders has put together a glossary of key sustainability terms for investors to help them navigate this field: An A-Z of sustainability terms for investors

What is Schroders doing?

Asset managers are in a key position and can have a significant impact by allocating capital to economic activities that contribute to the transition. At Schroders, we use a multipronged approach.

Integrating climate change risk in our investment decisions

Schroders has invested heavily in proprietary research and tools to help our investment desks to better understand the risks climate change poses to investments. These tools include:

- Climate progress dashboard: estimates the average global temperature increase implied by indicators measuring progress in political action, business and investment, technology development and fossil fuel use.
- Carbon Value at Risk (VaR): estimates the impact of rising carbon costs on a company's profitability. We find that up to 20% of the value of global equity indices is at risk under a scenario in which we transition toward the commitments made under the Paris Agreement. On the other hand, up to $2 trillion of investment will be needed every year to meet those goals, with commensurate opportunities.
- Physical risks: estimates what businesses would have to pay to insure their physical assets against hazards caused by rising global temperatures and weather disruption. The potential costs to some companies of insuring their assets against the impact of climate change could equate to more than 4% of their market values, according to our physical risk assessment. We find that oil & gas, utilities and basic resources are the sectors most exposed to the physical impact of climate change while technology, personal & household goods and healthcare are the least exposed.
- Stranded assets risk: estimates the impact on the value of the reserves fossil fuel producers own but would be unable to develop if the global economy transitions toward a 2 degrees pathway.
- Climate change growth model: measures the positive or negative impacts on companies' value from the faster or slower growth in demand for different products and services resulting from a low carbon transition.

- SustainEx: estimates the positive and negative externalities that companies have on society. This is made up by about 50 indicators (including carbon emissions) and using academic research, reported data and big data analytics, we translate all externalities into a concrete financial figure. This then serves as a measure of risk that these externalities pose for the value of each company.
- Long-term asset return forecasts: our economics team has adjusted its 30-year asset return forecasts to reflect the physical and transition risks of climate change.

Active ownership

We engage with companies to make sure that they are aware of the risks and opportunities that climate change may pose for their business model and that they are adapting accordingly.

Often our proprietary tools will flag a specific risk which we then use in our discussion with companies as well as to monitor progress afterwards. Put in a different way, our tools help us identify which companies are most exposed to climate change risk and active ownership is about supporting and monitoring how companies are managing and adjusting to this risk.

Moreover, Schroders is pushing for best practice. For example, our CEO wrote to FTSE 350 companies asking them to produce and publish detailed, costed, transition plans.

Schroders as a corporate

Schroders is a company that itself needs to be aware of climate change risks and adapt.

Schroders is one of the few asset managers to have committed to the Science-based Target Initiative. This means that we commit to set targets to reduce our carbon footprint in line with the Paris Agreement, including Scope 1, 2 and 3 emissions[1], as well as report on progress every year.

Moreover, we are part of the Net Zero Asset Managers Initiative, which includes 73 asset managers with combined assets of $32 trillion that have committed to support the goal of achieving net zero greenhouse gas emissions by 2050.

The reason asset managers' net zero pledges are important actually lies in the assets that they manage. According to Schroders estimates, the asset management sector is the third lowest emitting sector if one considers only Scope 1 and 2 emissions. The carbon footprint, however, increases substantially if Scope 3 emissions are added, which includes emissions of companies in which asset managers invest and the assets that they own. These account for 97% of the asset management sector's emissions and if we include them in our analysis, the asset management sector becomes the third highest emitting sector.

1 For company reporting, there are three types of emissions: Scope 1: direct emissions from owned or controlled sources; Scope 2: indirect emissions from the generation of purchased energy; Scope 3: all indirect emissions that occur in the value chain, including those related to the use of its products.

Light at the end of the 'climate change' tunnel

Each one of us needs to become more climate change savvy. We need to understand why climate change is happening, how human behavior contributes to it and what we can change to prevent irreversible damage to our planet.

There is no shortage of knowledge material on climate change. The issue is not where to start but rather to not get discouraged by the magnitude of the problem. The truth is that learning about climate change involves being confronted with an endless array of very bad news. It is an intense experience but we simply cannot afford to stay in denial.

We may not be able to change what will happen in the next couple of decades as our past actions have already set this. But we can change what will happen in the second half of this century which is the future that our children will experience. That is why we must focus on both climate change adaptation for the near-term future and climate change mitigation for the longer-term future.

It is easy to think that no one can make a difference. If Greta can, so can we!

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