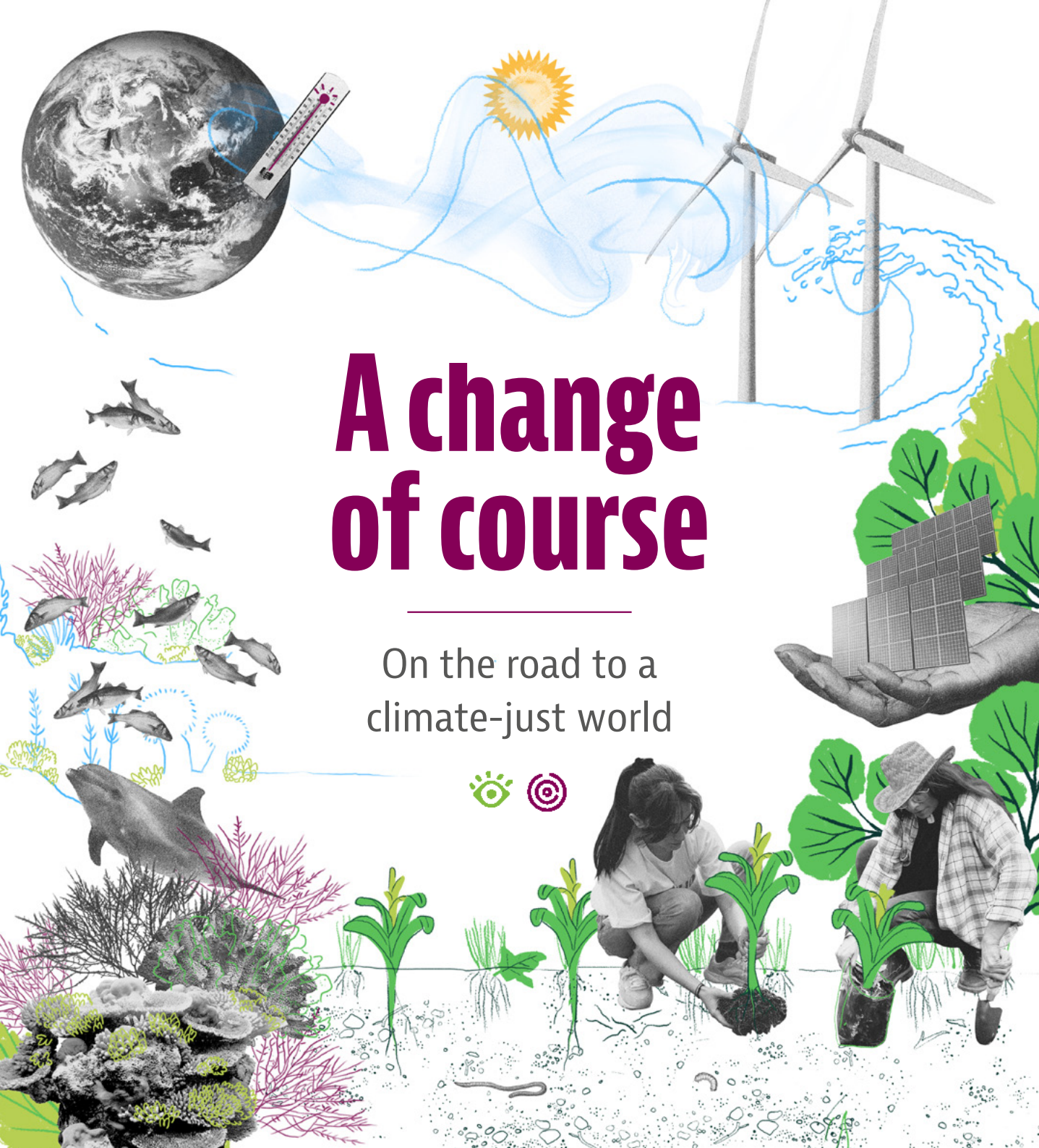

A change of course

On the road to a climate-just world

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Berlin, November 2024

A change of course

On the road to a climate-just world

A change of course is urgently needed

In 2024, the use of fossil fuels and the destruction of ecosystems worldwide yet again produced more CO_2 than ever before – despite the UN's Paris Agreement, decades of climate research and a succession of record-breaking weather extremes. At the same time, energy-related emissions finally seem to be nearing a turning point. To genuinely stay on track, a faster pace is required – along with a change of course towards climate justice.

With the Paris Agreement, governments at the 2015 United Nations Climate Change Conference made a firm commitment to keep global warming well below 2° Celcius and to strive to limit it to 1.5° Celsius. In the meantime, the Earth has already experienced phases in which the global average temperature rise exceeded 1.5° C for months on end.

The climate crisis confronts us with an age-old question with increasing urgency: What kind of world do we want? One which respects every individual's fundamental needs and safeguards their livelihood resources? One in which fair rules ensure social justice? With all of this preserved for future generations as well?

Instead of moving closer to this just world, we are drifting further away. We are witnessing a global shift to the right, combined with shrinking spaces for civil society and the fossil fuel industry's fightback against effective climate action.

Around the world, more and more people are dying in heatwaves or drowning in floods. Droughts are forcing hundreds of thousands of people off their parched fields into overcrowded slums on the outskirts of megacities. Ecosystems and species diversity are being irretrievably lost. In view of the climate crisis, is it utopian to push for a good life for everyone? It is no more unrealistic than the utopian vision of infinite growth on a finite planet on the backs of the most vulnerable. This publication describes pathways towards a sustainable and liveable world for all – and reveals some of the false hopes and high-risk pseudo-solutions.

It shows that we can live well and have decent work and a healthy economy within planetary boundaries – with a change of course.

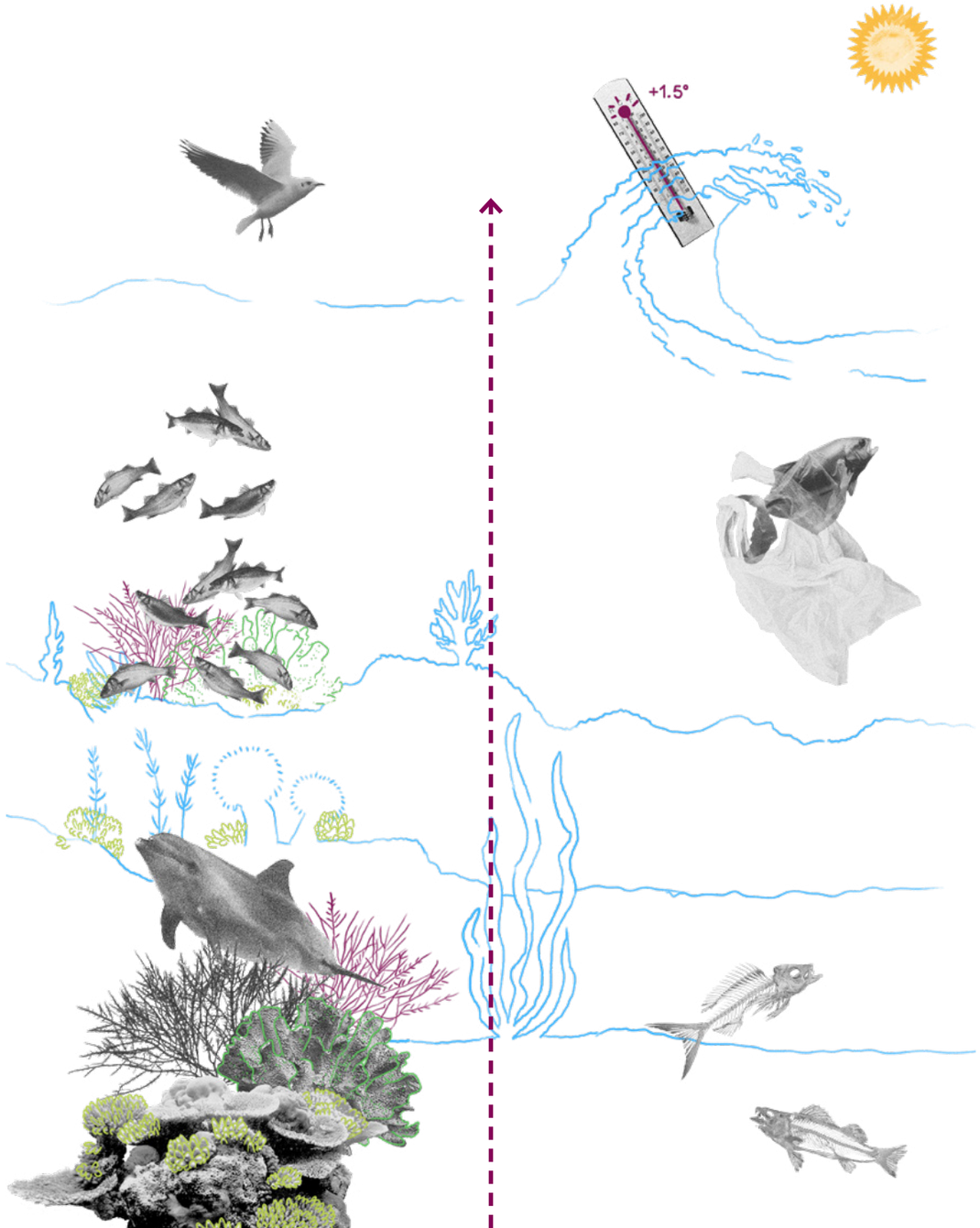
We have the solutions

We don't need to reinvent the wheel – we just have to use it. Ways to reduce greenhouse gas emissions effectively have long been common knowledge: shut down fossil fuel power plants (> p.10), replace fossil fuel heating systems and air conditioning, reduce aviation and car traffic (> p.18), insulate buildings, decrease the size of livestock herds, conserve and regenerate ecosystems (> p.20) and cut consumption of energy and resources (> p.15).

Granted, protecting the climate means that a lot will change – certainly including some of the things we hold dear – but if it is done well, it will improve quality of life for everyone. Without oil, coal and gas, our air will be purer and our water will be cleaner. With fewer cars on the roads, people in cities will have more room for safe mobility on foot or by bike, for green spaces or meeting places. Intact mangroves store CO_2 and protect the coasts from storm surges. The list continues.

But time is running out. The climate crisis is already causing colossal damage. This is happening everywhere, but the most dramatic impacts are felt by people in the Global South and poor communities worldwide who have done little to cause the climate crisis. For example, they are particularly affected by price shocks when extreme weather leads to crop failures.

Genuine climate action therefore also means climate justice. We must tackle the climate crisis so that we achieve a good life for everyone. Climate policy, in other words, must be equitable, both within societies and on a global scale. Only then can we cushion the impacts of the climate crisis effectively and share the burdens associated with the urgently needed transformation. Fossil fuel corporations and petro-states are still earning billions from the climate crisis – but bear none of the immense social costs that they cause. Action for climate justice is therefore also a fightback against a fossil-fuelled system that creates injustice at every level.
The task now is to set the right policy course.



Dangerous distractions

The urgent need for climate action is impossible to ignore – and yet there are still powerful corporations and states that are determined to cling on to the profits and privileges that they enjoyed in the fossil fuel era. No wonder they invest in spreading disinformation, creating uncertainty and promoting pseudo-solutions. One of the false leads is the assumption that we can exceed the remaining CO_2 budget that would keep global warming within the 1.5° C limit and rely instead on high-risk technologies to remove these emissions from the atmosphere later on. This is a perilous, overdraft mindset that might work for bank balances but certainly does not for the atmosphere.

None of these technologies has undergone large-scale testing, nor are any of them ready for use. What we can expect instead are incalculable environmental damage and social inequalities (> p.24). Even if it were possible to remove large quantities of CO_2 from the atmosphere, risks remain. Perhaps the temperature at the Earth's surface could thus be lowered to some degree – but there are major question marks over how the climate system would react to these interventions. And there would be no bringing back the habitats and livelihood resources that had already been destroyed by then. In addition, there are so-called tipping points in the climate system – for example, the transformation of the Amazon rainforest into savannah and the melting of the world's permafrost soils. Even with subsequent reductions in the atmospheric concentration of greenhouse gases, these developments cannot simply be reversed – and in many cases, they are unstoppable.

The fossil fuel industry and petro-states lead the field in advocating for these dangerous distractions – diverting attention away from the greenhouse gas emission reductions that are genuinely needed here and now (> p.10). For example, they publish strategies on climate neutrality but make no mention of a phase-out of climate-polluting oil, relying instead on every conceivable accounting trick and tech fantasy.

This overdraft mindset towards emissions and the reliance on future techno-fixes entrench the fossil-fuelled status quo. It is not a plan for a planet that is liveable for everyone.

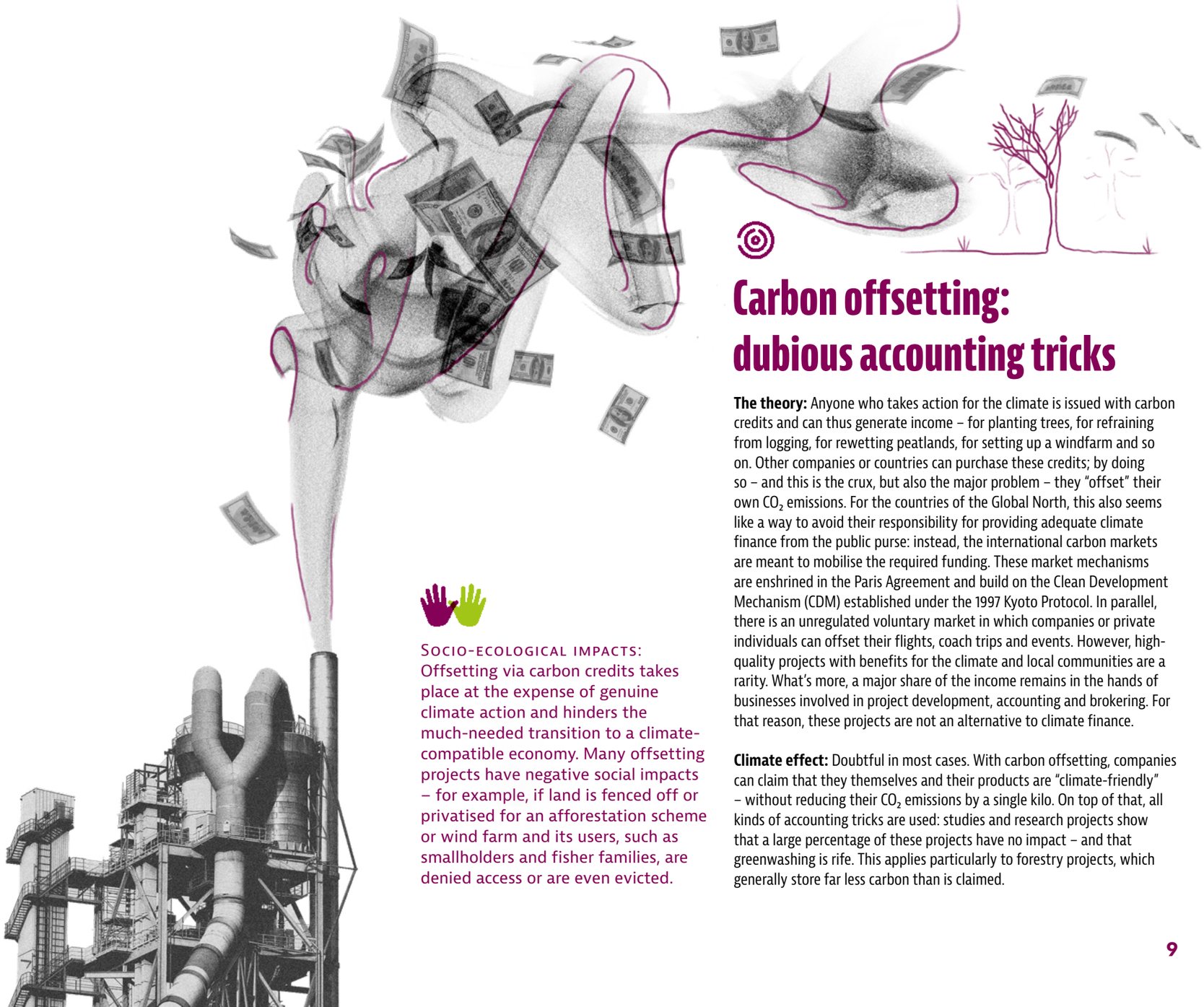
Down from the climate debt mountain

The Global North owes a considerable debt to the Global South. It has established a fossil-fuelled, resource-guzzling economic system, built its prosperity around it, and almost single-handedly unleashed the climate crisis. In order to settle these climate debts, the industrialised countries must provide financial support for the ecological transformation of the economy and for adaptation to the impacts of the climate crisis in the Global South.

In 2009, it was agreed that the emitter countries would mobilise USD 100 billion annually for this purpose by 2020. Currently, however, a substantial share of these funds goes to emerging economies and takes the form of loans that must be repaid. As for managing the climate crisis, the poorer countries are largely left to fend for themselves. It is clear that in future, sums of a very different order of magnitude will be required – running into trillions annually, and provided mainly in the form of public funds, not loans.

In addition, there is the issue of compensation for the impacts of the climate crisis. It is already causing massive damage and the problem is getting worse. Faced with the increasing economic damage brought about by the climate crisis, many highly indebted states are sliding deeper into a debt spiral. At the UN Climate Change Conference in Egypt in 2022, a breakthrough was finally achieved despite opposition from the wealthy countries, which were determined to avoid any discussion of legal liability for the climate crisis: There is now a fund to deal with loss and damage, which must be fully resourced without delay.

The challenges are diverse and costly. The multitude of issues to be addressed include coastal protection, disaster risk reduction, alternative income sources, e.g. for fishing communities whose fishing grounds are vanishing as coral reefs die off, the construction of water retention basins for periods of drought, and even resettlement programmes for entire island states. To achieve climate justice, the most vulnerable must receive the support to which they are entitled: an appropriate amount, fairly distributed, for local projects and initiatives and based on respect for human rights.



Socio-ecological impacts: Offsetting via carbon credits takes place at the expense of genuine climate action and hinders the much-needed transition to a climate-compatible economy. Many offsetting projects have negative social impacts – for example, if land is fenced off or privatised for an afforestation scheme or wind farm and its users, such as smallholders and fisher families, are denied access or are even evicted.

Carbon offsetting: dubious accounting tricks

The theory: Anyone who takes action for the climate is issued with carbon credits and can thus generate income – for planting trees, for refraining from logging, for rewetting peatlands, for setting up a windfarm and so on. Other companies or countries can purchase these credits; by doing so – and this is the crux, but also the major problem – they "offset" their own CO_2 emissions. For the countries of the Global North, this also seems like a way to avoid their responsibility for providing adequate climate finance from the public purse: instead, the international carbon markets are meant to mobilise the required funding. These market mechanisms are enshrined in the Paris Agreement and build on the Clean Development Mechanism (CDM) established under the 1997 Kyoto Protocol. In parallel, there is an unregulated voluntary market in which companies or private individuals can offset their flights, coach trips and events. However, high-quality projects with benefits for the climate and local communities are a rarity. What's more, a major share of the income remains in the hands of businesses involved in project development, accounting and brokering. For that reason, these projects are not an alternative to climate finance.

Climate effect: Doubtful in most cases. With carbon offsetting, companies can claim that they themselves and their products are "climate-friendly" – without reducing their CO_2 emissions by a single kilo. On top of that, all kinds of accounting tricks are used: studies and research projects show that a large percentage of these projects have no impact – and that greenwashing is rife. This applies particularly to forestry projects, which generally store far less carbon than is claimed.

A world without coal, oil and gas

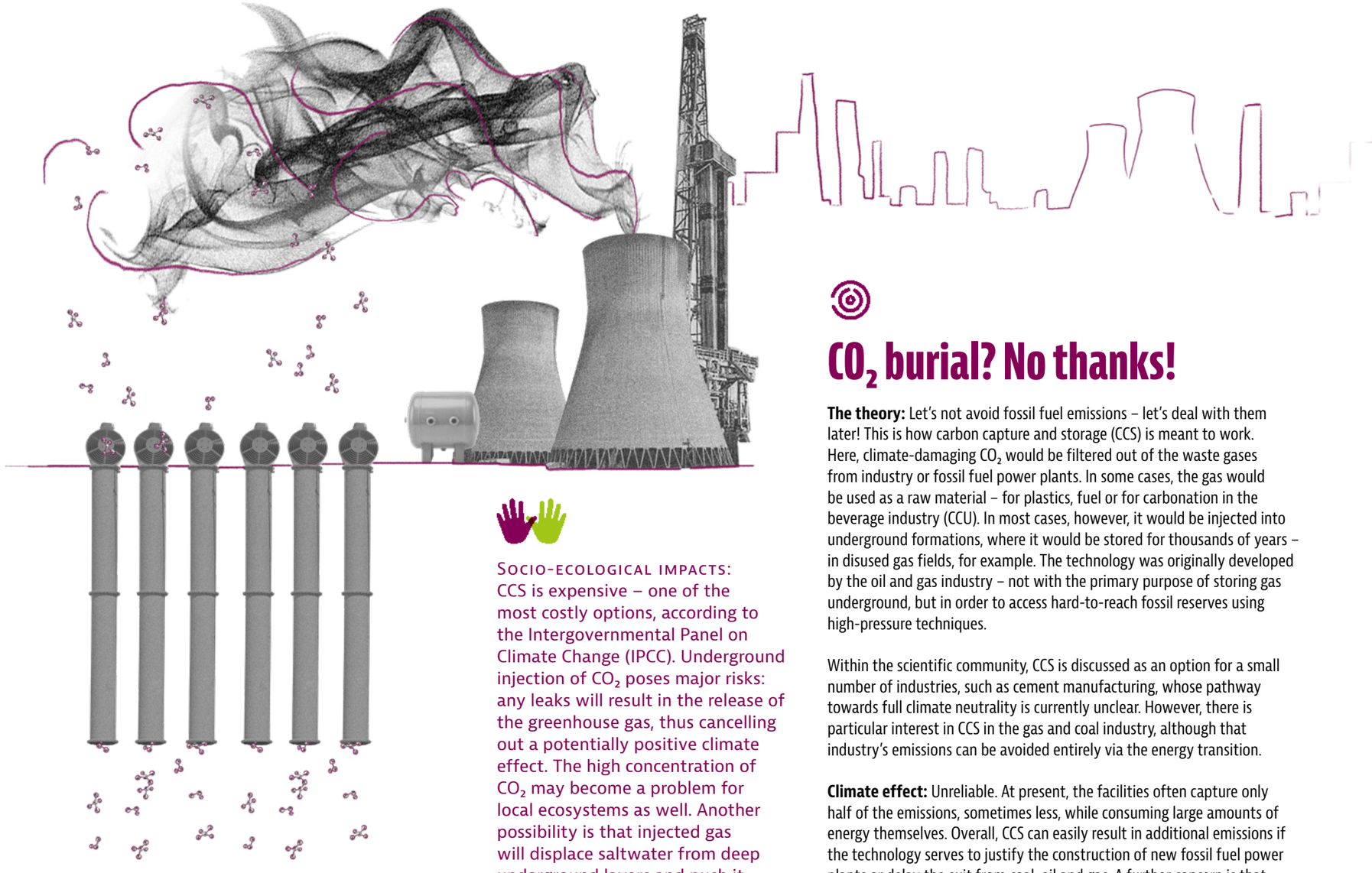
Tackling the climate problem directly at the roots is relatively simple: as the major share of the world's emissions still comes from the burning of fossil fuels, a rapid exit from coal, oil and gas is the way forward. It took a good 30 years for this to feature as a topic at the UN climate summit: during the UN Climate Change Conference in Dubai in 2023, countries pledged for the first time to transition away from fossil fuels and invest in renewable energy and energy efficiency.

But paper is patient, as we know: the pledge needs to be translated into reality, and this must be done as swiftly as possible. To ensure that the CO_2 budget, which is already far too tight, does not shrink any further and dangerous tipping points are not crossed, the exit from fossil fuels must be accelerated as a matter of urgency. Specifically, this means that oil fields, gas fields and coal mines must be rapidly consigned to history, along with investments in the expansion of fossil fuel infrastructures.

Together with a reduction of our global energy consumption, the expansion of solar and wind energy plants to replace our obsolete fossil-fuelled energy system must be massively accelerated at the same time (> p.12).

The wealthy countries bear particular responsibility here. As the main contributors to the climate crisis, they must exit coal, oil and gas especially fast. They also have a responsibility to support mitigation action by the poorer countries and thus facilitate a fair and equitable transition to a world without fossil fuels.

The exit from fossil fuels can free up the very substantial financial resources that are still being channelled into fossil fuel subsidies at present. According to figures from the International Monetary Fund (IMF), these subsidies currently amount to USD 1.3 trillion annually worldwide – at minimum. Instead, investing these funds in climate action, a green transition, education, healthcare and sustainable development would be the right way forward.



Socio-ecological impacts: CCS is expensive – one of the most costly options, according to the Intergovernmental Panel on Climate Change (IPCC). Underground injection of CO_2 poses major risks: any leaks will result in the release of the greenhouse gas, thus cancelling out a potentially positive climate effect. The high concentration of CO_2 may become a problem for local ecosystems as well. Another possibility is that injected gas will displace saltwater from deep underground layers and push it upwards into the strata that carry drinking water.

CO_2 burial? No thanks!

The theory: Let's not avoid fossil fuel emissions – let's deal with them later! This is how carbon capture and storage (CCS) is meant to work. Here, climate-damaging CO_2 would be filtered out of the waste gases from industry or fossil fuel power plants. In some cases, the gas would be used as a raw material – for plastics, fuel or for carbonation in the beverage industry (CCU). In most cases, however, it would be injected into underground formations, where it would be stored for thousands of years – in disused gas fields, for example. The technology was originally developed by the oil and gas industry – not with the primary purpose of storing gas underground, but in order to access hard-to-reach fossil reserves using high-pressure techniques.

Within the scientific community, CCS is discussed as an option for a small number of industries, such as cement manufacturing, whose pathway towards full climate neutrality is currently unclear. However, there is particular interest in CCS in the gas and coal industry, although that industry's emissions can be avoided entirely via the energy transition.

Climate effect: Unreliable. At present, the facilities often capture only half of the emissions, sometimes less, while consuming large amounts of energy themselves. Overall, CCS can easily result in additional emissions if the technology serves to justify the construction of new fossil fuel power plants or delay the exit from coal, oil and gas. A further concern is that innovations which support a genuinely green transition of industry will be derailed if the CCS option entrenches the status quo.

Energy for people, by people

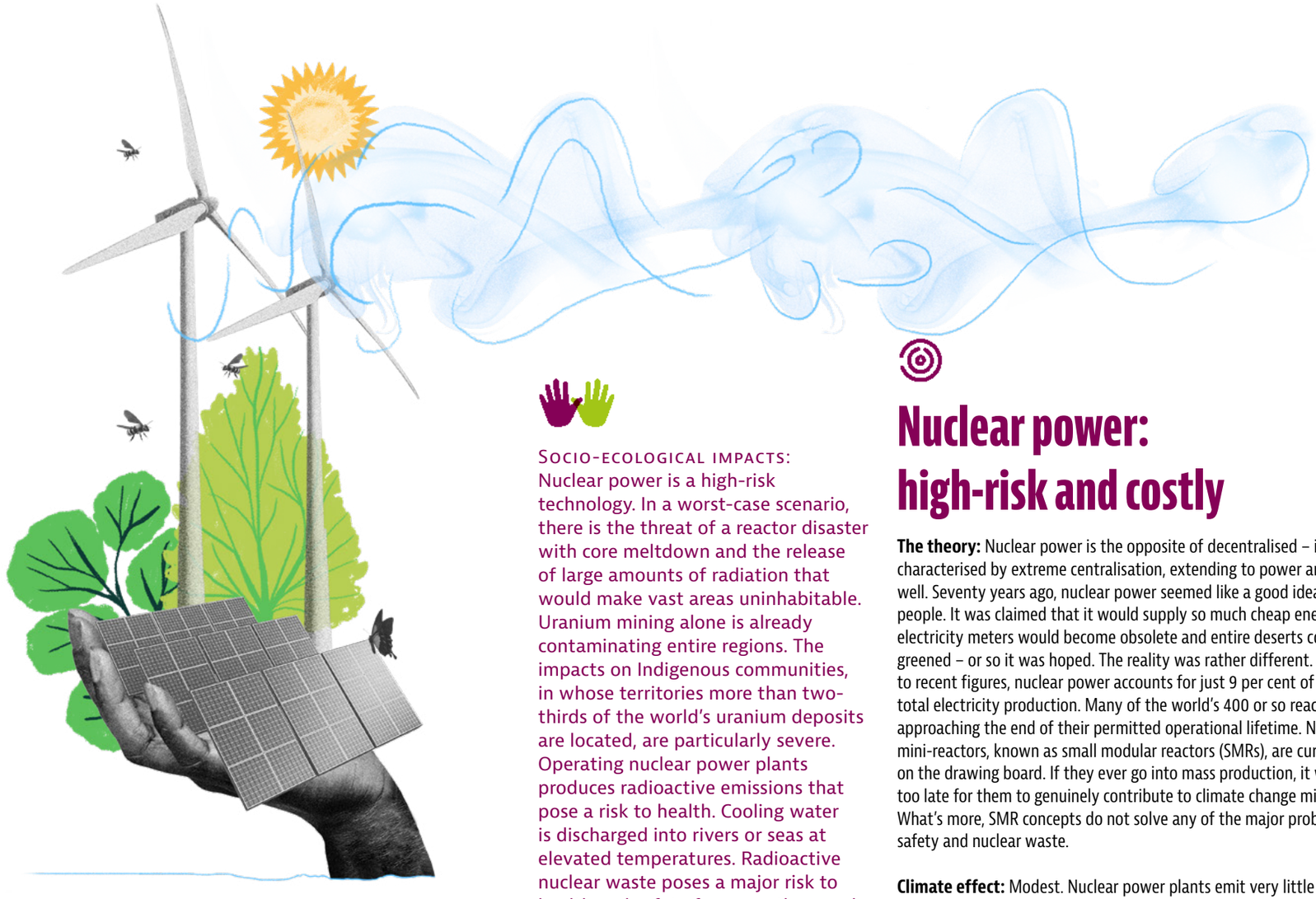
The decentralised energy transition not only provides us with a key climate solution, which is a major plus point in itself. It also strengthens the democratic community and social participation, creates jobs, stimulates local investment and combats energy poverty by providing access to affordable energy.

The principle is simple. The outdated fossil-fuelled energy supply is based around a centralised system of large power plants that are controlled by a handful of corporations. This means that these corporations have immense power – in the Global North and the Global South alike. At the same time, fossil fuels sabotage sustainable and equitable development in many cases and drive national economies into dangerous dependencies.

A decentralised renewable energy system comprising a multitude of smaller facilities draws a line under this system and is able to redistribute power. Renewable energy sources can become communal assets, offering scope for all citizens to participate and benefit – with affordable electricity, regional value-added and new jobs. This system is also more crisis-resilient than centralised large-scale power plants. This is the real opportunity afforded by the energy transition.

In parallel, we can also avoid much of the other damage resulting from the extraction and production, processing, transport and consumption of fossil fuels. A renewable energy system protects human health as well as air, water, soil and nature.

A distant vision? Not at all. Although a citizen-led energy transition cannot be successfully implemented in all locations yet, the shift towards a renewable energy system is well under way throughout the world – and is "unstoppable", according to the International Energy Agency (IEA), a long-standing advocate of fossil fuels and now a champion of the global energy transition.



Socio-ecological impacts: Nuclear power is a high-risk technology. In a worst-case scenario, there is the threat of a reactor disaster with core meltdown and the release of large amounts of radiation that would make vast areas uninhabitable. Uranium mining alone is already contaminating entire regions. The impacts on Indigenous communities, in whose territories more than two-thirds of the world's uranium deposits are located, are particularly severe. Operating nuclear power plants produces radioactive emissions that pose a risk to health. Cooling water is discharged into rivers or seas at elevated temperatures. Radioactive nuclear waste poses a major risk to health and safety for many thousands of years. And finally: nuclear power is only economically viable if governments provide generous subsidies.

Nuclear power: high-risk and costly

The theory: Nuclear power is the opposite of decentralised – it is characterised by extreme centralisation, extending to power and profits as well. Seventy years ago, nuclear power seemed like a good idea to many people. It was claimed that it would supply so much cheap energy that electricity meters would become obsolete and entire deserts could be greened – or so it was hoped. The reality was rather different. According to recent figures, nuclear power accounts for just 9 per cent of the world's total electricity production. Many of the world's 400 or so reactors are approaching the end of their permitted operational lifetime. New types of mini-reactors, known as small modular reactors (SMRs), are currently still on the drawing board. If they ever go into mass production, it will be far too late for them to genuinely contribute to climate change mitigation. What's more, SMR concepts do not solve any of the major problems with safety and nuclear waste.

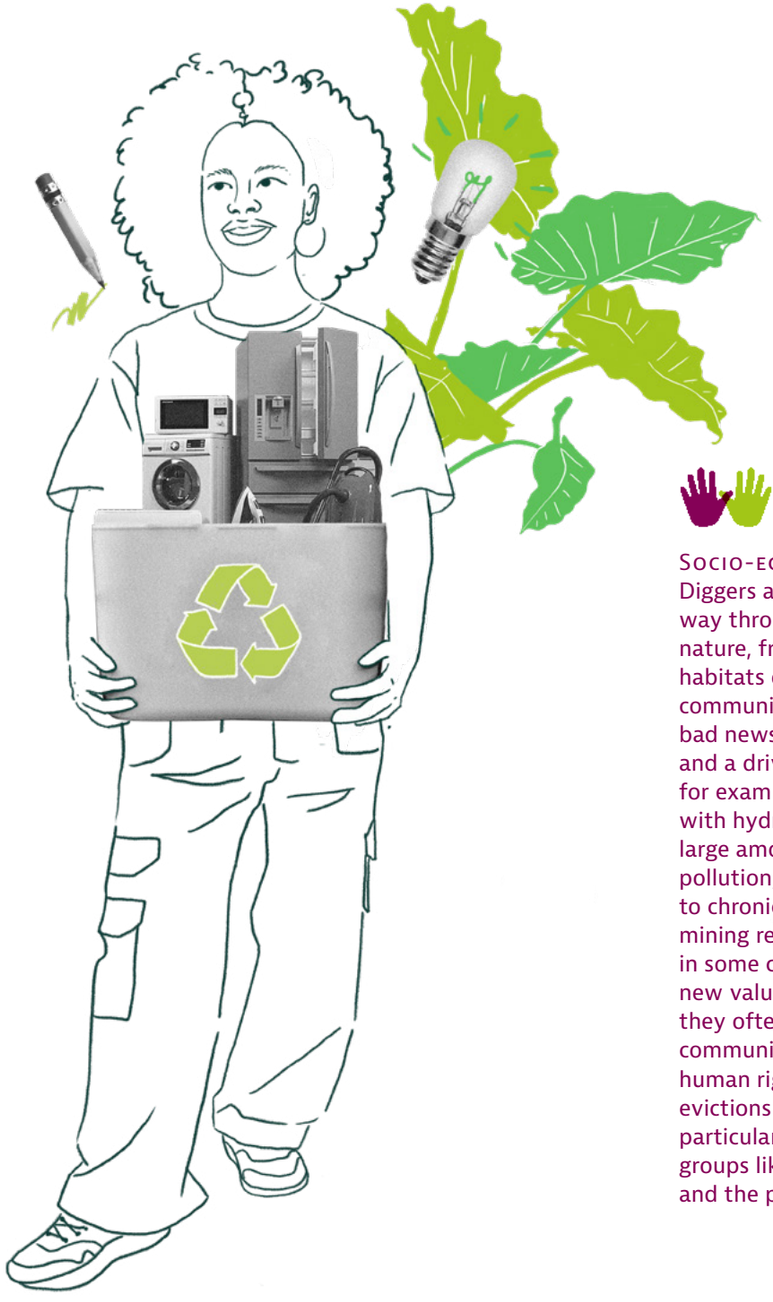
Climate effect: Modest. Nuclear power plants emit very little CO_2 from electricity generation, but emissions are produced nonetheless – in uranium mining, in fuel rod manufacturing, in the construction and decommissioning of reactors, and in the final storage of nuclear waste. As a result, nuclear power's carbon footprint is far worse than that of renewable energies.

A circular economy: from excess to enough

To achieve a sustainable economy within planetary boundaries, a paradigm shift is required – away from a linear economy in which products have short lifespans and are thrown away and incinerated, towards a circular economy in which raw materials remain in circulation for a very long time and consumption of these materials and natural resources such as water and energy is substantially reduced. The overproduction and overconsumption which currently lead to the transgression of planetary boundaries, mainly by the wealthy and the global middle classes, must give way to a strategy that provides enough for everyone.

There are many potential areas where savings can be made: for example, in the construction and transport sector, with smart living concepts and better public transport to reduce the demand for cars. Products can be designed with durability and the recovery of their raw materials in mind. The same applies to renewable energy systems, which contain many metallic raw materials. Due to our raw material consumption, too, it is important – and sensible – to reduce our use of energy with efficiency and sufficiency strategies and, above all, ensure globally just distribution. Durable products, a right to repair, support for the artisanal trades so that repair skills are preserved within our society for the long term, and an efficient collection system for end-of-life goods in order to improve recovery of metals, for example, during the recycling process – these are important steps in keeping raw materials in circulation for as long as possible. These raw materials were previously extracted in complex and costly processes, often with devastating impacts on the environment and human rights.

Integrated closed loops in line with this model, coupled with a resource-efficient economy, will not only help to mitigate environmental and human rights risks, but will also build economic resilience by reducing dependency, particularly on metallic raw materials that are the focus of geopolitical conflicts. Away from excess for a select few towards enough for everyone: this can help to preserve the Earth's resources and ensure more global justice, including for future generations.



Socio-ecological impacts: Diggers and drilling rigs grind their way through previously unspoiled nature, fragmenting and destroying habitats of flora, fauna and human communities – resource extraction is bad news for the natural environment and a driver of global deforestation, for example. Mining interferes with hydrological cycles, consumes large amounts of water and causes pollution, which in turn can lead to chronic illnesses. The impacts in mining regions are mixed: granted, in some cases, jobs are created and new value-added generated, but they often bring no benefits to local communities. In addition, there are human rights violations such as evictions and loss of livelihoods, particularly impacting marginalised groups like Indigenous communities and the poor.

Resource consumption: more of the same

The theory: We need renewable energies, electromobility and digitalisation for the transition. The manufacture, installation and operation of the new technologies have created new industries and jobs. That's the good news – but in some cases, this causes problems that are familiar to us from the fossil-fuelled world. Green technologies also need vast amounts of raw materials that must be dug out of the ground in pit or open-cast mines. Copper, nickel, cobalt and lithium are examples of resources in high demand. Governments are outbidding each other in order to secure access to the most sought-after raw materials. There are now plans to source raw materials from the deep ocean and from space. In this fierce competition, environmental and human rights standards are soon crushed underfoot.

Climate effect: The extraction of the world's seven most commonly used raw materials alone accounts for 7 per cent of global greenhouse gas emissions. Infinite growth is therefore a problem here as well. Policy frameworks should therefore be geared towards ensuring that the quantities of raw materials that have to be extracted are kept as low as possible.

Industry within planetary boundaries

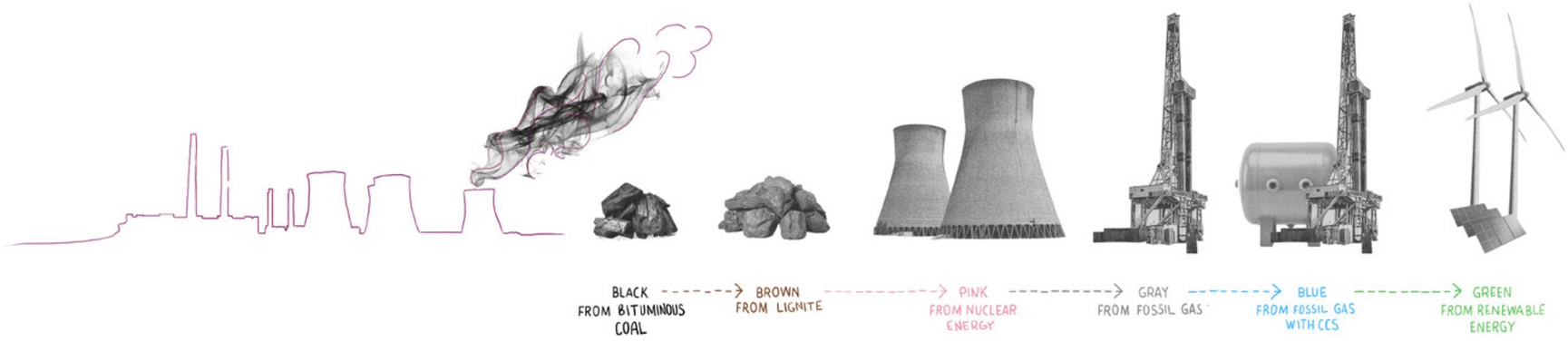
The climate crisis has its origins in industrialisation: fossil fuels powered the machines that made mass production possible and brought prosperity for many people. But in a finite world, we cannot simply continue along the path of infinite production. Industry and manufacturing need to change. If planetary boundaries are to be respected, growth cannot be an end in itself.

Many companies are keen to be part of the solution or have already made a start by investing in energy efficiency, using recycled or recyclable raw materials and thus promoting a switch to a circular economy (> p.14). Nevertheless, there is still a lot of work to do.

The potential for energy efficiency and sufficiency must be utilised rigorously with a view to cutting energy consumption in industry. Almost all processes can now be converted to electricity as a substitute for fossil fuels. Future-fit industrial production is pivotal to a successful socio-ecological transformation: it creates decent jobs and supplies the raw materials and products that we need for the energy transition.

If demand for cars falls in the course of the transport and mobility transition, steel production can be reduced. If we use green building materials, distribute living space more equitably, avoid leaving properties standing empty, and repurpose office buildings that are no longer in use, for example, there will be less need for newbuilds, thus enabling cement production to be reduced. Government funding schemes can support industry during the transition. It is important to set quality standards in order to curb soil sealing, resource consumption (> p.14) and environmental degradation (> p.23).

For products such as plastics that cause other environmental crises, reducing production must be the goal. However, these transition processes in industry need to be designed with social justice in mind. Trade unions are already playing an active role here.



Socio-ecological impacts:
Vast amounts of water are required for hydrogen production. Many countries that come into question as potential exporters of hydrogen are already struggling with water scarcity – Namibia, Chile, Colombia and Australia are examples. Seawater desalination is an option but creates new problems of its own: it is costly and energy-intensive, and marine ecosystems are also at risk if the extremely salty effluent is discharged via pipelines back into the sea. It is also uncertain whether the local population will benefit if new hydrogen infrastructures are established but much of the output is exported. There is then a risk that neocolonial structures will emerge.

Hydrogen: between hope, hype and risk

The theory: Splitting water using electricity produces hydrogen – an energy source which can replace coal, oil and gas almost everywhere and is therefore raising high hopes. Green hydrogen is produced using electricity from renewables. To achieve a climate-neutral world – according to the hydrogen hype – there would, in principle, be no need for change. We would simply switch to a different fuel: in industrial processes, in aviation, in shipping, in road transport, even in our heating systems. But green is not the only "colour" of hydrogen: with natural gas, nuclear power or in CCS-based processes, it is also produced in grey, pink or blue.

Climate effect: That depends. At present, green hydrogen only exists in small quantities and is expensive. It can make a contribution to decarbonisation, but to a far lesser extent than is often claimed. In addition, hydrogen is associated with high efficiency losses, especially if it has to be transported. Compared with direct use – in electric vehicles or heat pumps, for example – hydrogen requires three to five times more green electricity. Hydrogen that is based on natural gas, nuclear power or CCS creates many additional problems and also has a poor carbon footprint.

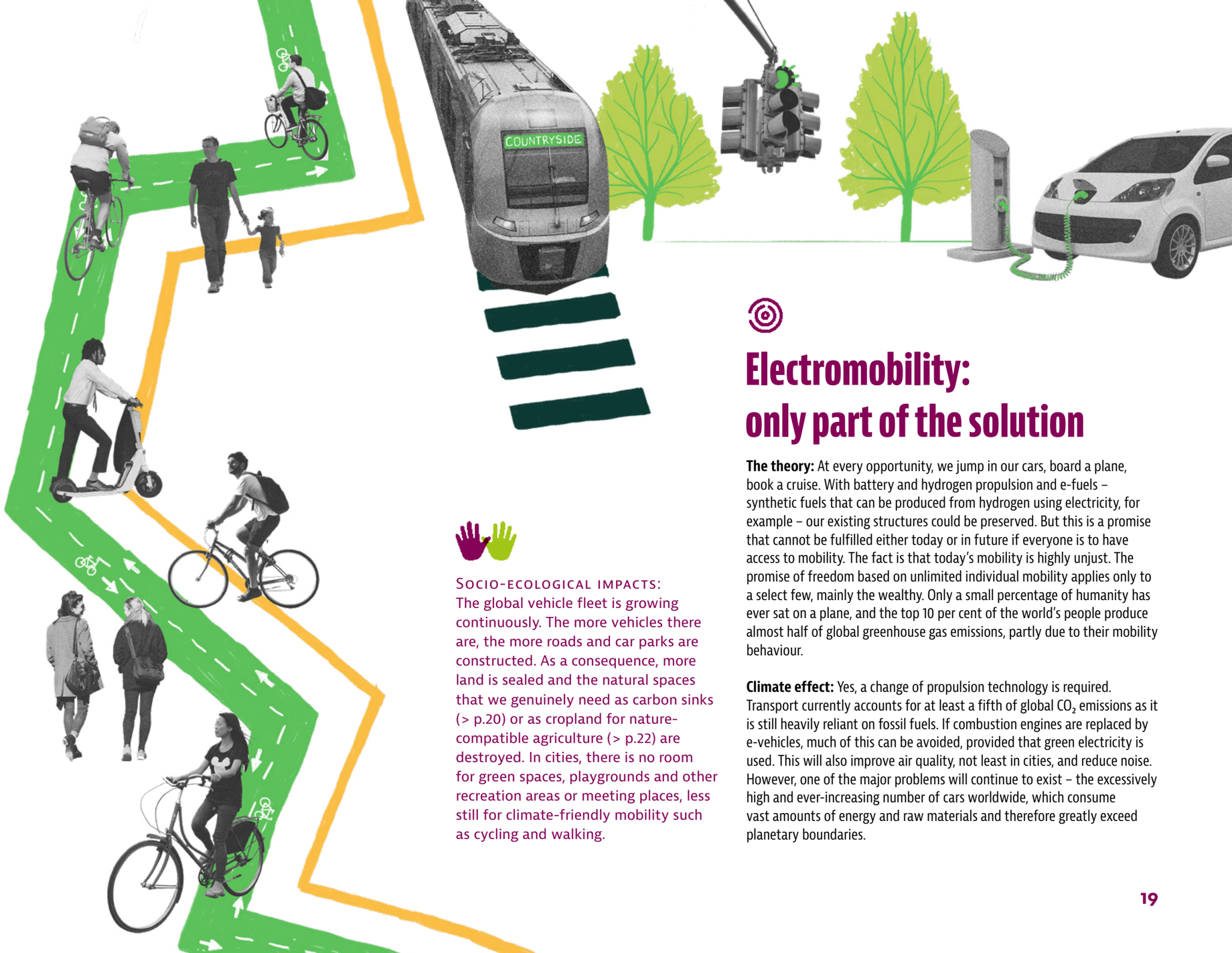
Mobility for everyone

We don't need to look far to find good examples of how mobility can be (re-)designed to be a win for the environment and climate: a reliable, punctual railway system in Switzerland, priority for bicycles in the Netherlands, removal of car parking spots to make space for new cycle paths in Paris, and a cable car linking poorer districts to the city centre in Bogotá. In the French capital, for example, cycling has clearly overtaken the car as the preferred mode of transport. Revived rural railway lines offer good alternatives to car travel.

Less stress, less noise, less pollution: a modern, climate-just concept of mobility focuses on all demographic groups, including those who are often overlooked at present – children, women, the elderly, people with disabilities and those on lower incomes, in urban and rural areas alike. Mobility for all means that public transport is safe, accessible, attractive and affordable. There is enough space available for walking and cycling. The streets are no longer dominated by private cars.

The concept of the compact city – the city of short distances – serves as the guiding vision for the urban space; this means that all everyday destinations can be reached within 15 minutes on foot or by bike, bus or rail. In rural areas, modes of transport need to be combined wisely. For instance, a good rail and bus network in tandem with free and safe parking at the stops makes the network attractive for longer distances for which otherwise the car would be taken.

There are benefits for nature too if car parks are converted into green spaces, for example. More trees and parks mitigate the heat island effect, which drives up temperatures in inner cities, especially in summer. With the right frameworks, smart incentives and investment, policy-makers can drive the mobility transition forward – for example, by ending fossil fuel subsidies or by consistently investing in rail transport and the cycling infrastructure.



Socio-ecological impacts:
The global vehicle fleet is growing continuously. The more vehicles there are, the more roads and car parks are constructed. As a consequence, more land is sealed and the natural spaces that we genuinely need as carbon sinks (> p.20) or as cropland for nature-compatible agriculture (> p.22) are destroyed. In cities, there is no room for green spaces, playgrounds and other recreation areas or meeting places, less still for climate-friendly mobility such as cycling and walking.

Electromobility: only part of the solution

The theory: At every opportunity, we jump in our cars, board a plane, book a cruise. With battery and hydrogen propulsion and e-fuels – synthetic fuels that can be produced from hydrogen using electricity, for example – our existing structures could be preserved. But this is a promise that cannot be fulfilled either today or in future if everyone is to have access to mobility. The fact is that today's mobility is highly unjust. The promise of freedom based on unlimited individual mobility applies only to a select few, mainly the wealthy. Only a small percentage of humanity has ever sat on a plane, and the top 10 per cent of the world's people produce almost half of global greenhouse gas emissions, partly due to their mobility behaviour.

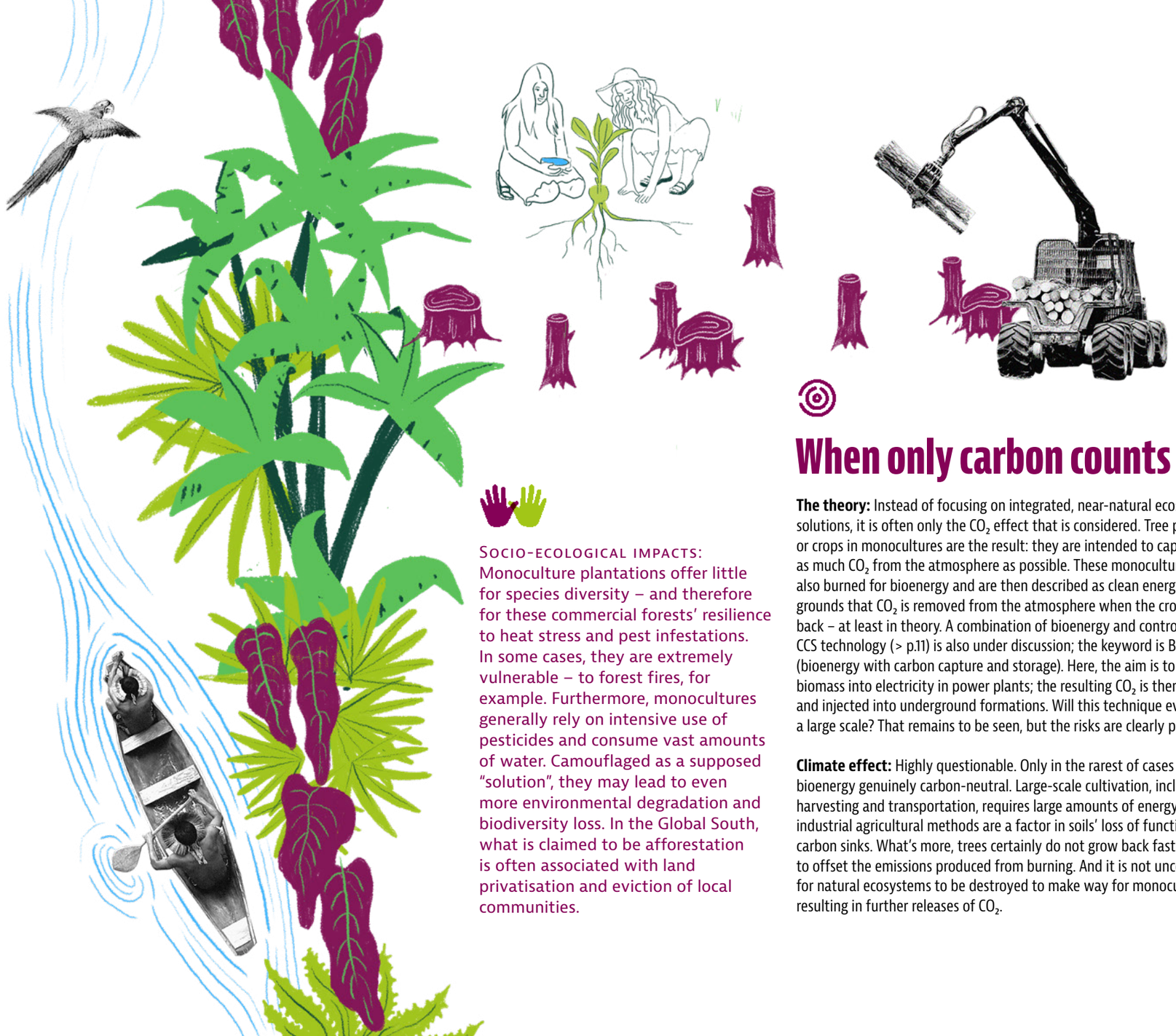
Climate effect: Yes, a change of propulsion technology is required. Transport currently accounts for at least a fifth of global CO_2 emissions as it is still heavily reliant on fossil fuels. If combustion engines are replaced by e-vehicles, much of this can be avoided, provided that green electricity is used. This will also improve air quality, not least in cities, and reduce noise. However, one of the major problems will continue to exist – the excessively high and ever-increasing number of cars worldwide, which consume vast amounts of energy and raw materials and therefore greatly exceed planetary boundaries.

Nature: Don't wreck it – respect it!

The climate crisis and the biodiversity crisis are interlinked – and they can and must be solved together. On the one hand, the destruction of ecosystems is driving the climate crisis. On the other, rising temperatures and more severe and more frequent weather extremes are destroying entire ecosystems and habitats, which are then less able to absorb CO_2; they may even become a CO_2 source. Conversely, intact ecosystems cool the local environment, retain water and act as windbreaks, thus mitigating the impacts of extreme weather events.

What is needed, therefore, are comprehensive, integrated strategies that include rigorous protection of the environment and respect the specific rights of Indigenous communities as well as human rights for all. For traditional and Indigenous communities, the natural environment is a source of food, medicine, building material and fuel. In many regions, these communities manage these resources sustainably. Satellite images show that wherever Indigenous communities are able to protect and utilise their land, these territories are hotspots of biodiversity and important carbon sinks.

Preserving intact ecosystem is essential throughout the world – and so is their restoration. Near-natural mixed forests are one example: they are less vulnerable to heat stress and pest infestations and are therefore able to lock away CO_2 on a more stable basis while simultaneously promoting biodiversity. Peatlands are another: with rewetting, they can play a major role in stabilising our climate and can safeguard the survival of rare plant and animal species. Grasslands store large amounts of carbon in their vegetation and especially in soil, as well as supplying food and retaining floodwater. The prerequisite, however, is that when grassland is used for agricultural purposes, severe over- or under-grazing and excessive fertiliser inputs must be avoided as they pollute groundwater and cause the depletion of biodiversity.



Socio-ecological impacts: Monoculture plantations offer little for species diversity – and therefore for these commercial forests' resilience to heat stress and pest infestations. In some cases, they are extremely vulnerable – to forest fires, for example. Furthermore, monocultures generally rely on intensive use of pesticides and consume vast amounts of water. Camouflaged as a supposed "solution", they may lead to even more environmental degradation and biodiversity loss. In the Global South, what is claimed to be afforestation is often associated with land privatisation and eviction of local communities.

When only carbon counts

The theory: Instead of focusing on integrated, near-natural ecosystem solutions, it is often only the CO_2 effect that is considered. Tree plantations or crops in monocultures are the result: they are intended to capture as much CO_2 from the atmosphere as possible. These monocultures are also burned for bioenergy and are then described as clean energy on the grounds that CO_2 is removed from the atmosphere when the crops grow back – at least in theory. A combination of bioenergy and controversial CCS technology (> p.11) is also under discussion; the keyword is BECCS (bioenergy with carbon capture and storage). Here, the aim is to convert biomass into electricity in power plants; the resulting CO_2 is then captured and injected into underground formations. Will this technique ever work on a large scale? That remains to be seen, but the risks are clearly predictable.

Climate effect: Highly questionable. Only in the rarest of cases is bioenergy genuinely carbon-neutral. Large-scale cultivation, including harvesting and transportation, requires large amounts of energy, while industrial agricultural methods are a factor in soils' loss of functionality as carbon sinks. What's more, trees certainly do not grow back fast enough to offset the emissions produced from burning. And it is not uncommon for natural ecosystems to be destroyed to make way for monocultures, resulting in further releases of CO_2.

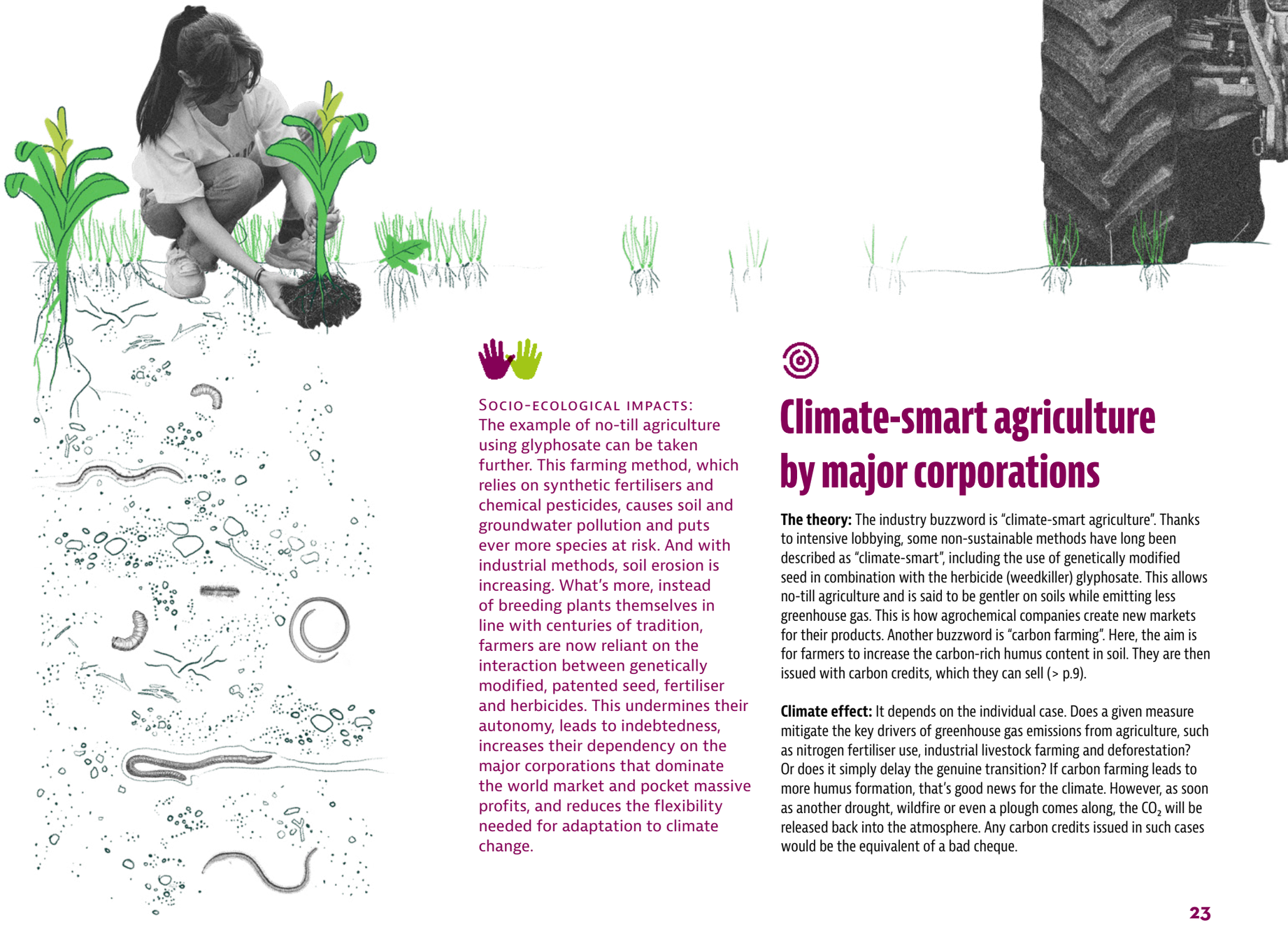
Agroecology: food security and climate action

Food production is a vital service. We all need good food on our plates and may fall ill if we have a poor diet or are undernourished. However, our present agricultural system relies far too much on productivity increases, and this comes with high environmental and social costs – species extinction, water scarcity, greenhouse gas emissions and land degradation. In addition, there is heavy price pressure on farmers, as well as land grabbing.

There is another way. Agroecology offers an alternative: this holistic concept was developed mainly in Latin America but is applied across the world and points the way towards resilient, future-fit agriculture. It builds on organic farming principles, which stand for sustainable, resource-conserving, environmentally compatible farming and food production. This means maintaining and increasing soil fertility, growing diverse, robust and resilient crop varieties, and keeping and feeding livestock – pigs, cattle, poultry etc. – in line with animal welfare standards.

But agroecology does more than that. It strengthens traditional farming and safeguards decent jobs in rural communities. Agroecological systems bolster farm businesses' resilience to the impacts of climate change and to price fluctuations in the agricultural markets. This means that smallholders, particularly in the Global South, are less dependent on multinational pesticide, seed and fertiliser corporations.

Studies also show that in some contexts – such as semi-arid regions in Brazil or Senegal – agroecological production methods result in higher productivity overall and thus help to protect against deforestation by reducing the demand for land to feed the population. However, according to the United Nations Food and Agriculture Organization (FAO), a principal driver of deforestation is not food cultivation but the production of oil palm and soya beans for animal feed. A genuine turnaround in the food system must therefore encompass all aspects of the system.



Socio-ecological impacts:
The example of no-till agriculture using glyphosate can be taken further. This farming method, which relies on synthetic fertilisers and chemical pesticides, causes soil and groundwater pollution and puts ever more species at risk. And with industrial methods, soil erosion is increasing. What's more, instead of breeding plants themselves in line with centuries of tradition, farmers are now reliant on the interaction between genetically modified, patented seed, fertiliser and herbicides. This undermines their autonomy, leads to indebtedness, increases their dependency on the major corporations that dominate the world market and pocket massive profits, and reduces the flexibility needed for adaptation to climate change.

Climate-smart agriculture by major corporations

The theory: The industry buzzword is "climate-smart agriculture". Thanks to intensive lobbying, some non-sustainable methods have long been described as "climate-smart", including the use of genetically modified seed in combination with the herbicide (weedkiller) glyphosate. This allows no-till agriculture and is said to be gentler on soils while emitting less greenhouse gas. This is how agrochemical companies create new markets for their products. Another buzzword is "carbon farming". Here, the aim is for farmers to increase the carbon-rich humus content in soil. They are then issued with carbon credits, which they can sell (> p.9).

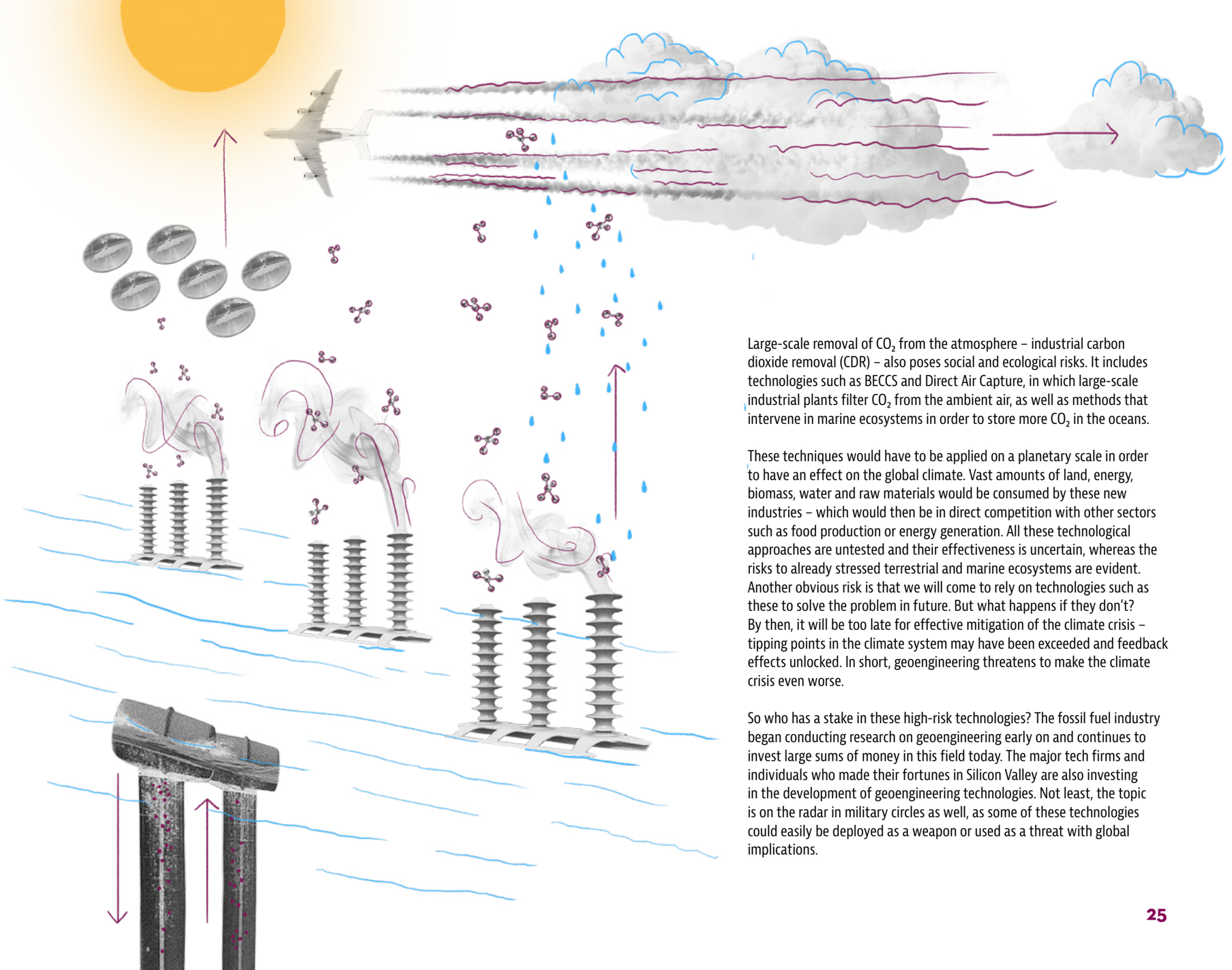
Climate effect: It depends on the individual case. Does a given measure mitigate the key drivers of greenhouse gas emissions from agriculture, such as nitrogen fertiliser use, industrial livestock farming and deforestation? Or does it simply delay the genuine transition? If carbon farming leads to more humus formation, that's good news for the climate. However, as soon as another drought, wildfire or even a plough comes along, the CO_2 will be released back into the atmosphere. Any carbon credits issued in such cases would be the equivalent of a bad cheque.

Geoengineering: manipulating the climate

Proponents of large-scale technological climate interventions – so-called geoengineering – chime in with the sense of hopelessness at the state of the climate, claiming that we must now resort to riskier methods. But it is clear that manipulating the climate and ecosystems has major risks and ripple effects – and could exacerbate other global crises.

Possibly the most radical proposal is solar geoengineering. This would involve the large-scale injection of aerosols, mainly sulphates, into the atmosphere to reflect incoming sunlight back into space and thus supress the Earth's temperature increase. The consequences of this type of human intervention at planetary level are extremely difficult to predict. The impacts can be expected to vary considerably from one region to another due to changing global circulation and precipitation patterns, potentially causing droughts in some regions and floods in others. In a global climate system that is already spiralling out of control, solar geoengineering means even more climate chaos.

What's more, the cooling effect would only be temporary. Once it had started, the injection of sulphates would be almost impossible to stop. On the contrary, they would have to be used in ever-increasing quantities in order to cool an overheating Earth. And there would always be the threat of a termination shock: if solar geoengineering were to cease, the climate crisis would accelerate at a rate that would make adaptation impossible. An international agreement on deploying such a high-risk technology of an experimental nature on a planetary scale is scarcely conceivable – especially if the impacts, such as floods and droughts, were to vary considerably from region to region and some powerful states were able to deploy the technology at others' expense. This scenario is impossible to reconcile with democratic principles, human rights and the urgently needed protection of ecosystems. For that reason, there are increasingly vocal calls for an international ban on solar geoengineering and its field trials: the technology is simply too dangerous.



Large-scale removal of CO_2 from the atmosphere – industrial carbon dioxide removal (CDR) – also poses social and ecological risks. It includes technologies such as BECCS and Direct Air Capture, in which large-scale industrial plants filter CO_2 from the ambient air, as well as methods that intervene in marine ecosystems in order to store more CO_2 in the oceans.

These techniques would have to be applied on a planetary scale in order to have an effect on the global climate. Vast amounts of land, energy, biomass, water and raw materials would be consumed by these new industries – which would then be in direct competition with other sectors such as food production or energy generation. All these technological approaches are untested and their effectiveness is uncertain, whereas the risks to already stressed terrestrial and marine ecosystems are evident. Another obvious risk is that we will come to rely on technologies such as these to solve the problem in future. But what happens if they don't? By then, it will be too late for effective mitigation of the climate crisis – tipping points in the climate system may have been exceeded and feedback effects unlocked. In short, geoengineering threatens to make the climate crisis even worse.

So who has a stake in these high-risk technologies? The fossil fuel industry began conducting research on geoengineering early on and continues to invest large sums of money in this field today. The major tech firms and individuals who made their fortunes in Silicon Valley are also investing in the development of geoengineering technologies. Not least, the topic is on the radar in military circles as well, as some of these technologies could easily be deployed as a weapon or used as a threat with global implications.

Together for a climate-just world

If we are successful in making the transition to a climate-just world, we can avoid much of the suffering that we are already experiencing today due to the climate crisis. And that's not all. There are also vast gains for us to make: a more equitable lifestyle and economic system within planetary boundaries, providing a guarantee of a positive future.

In this publication, we have mapped out pathways towards a sustainable and liveable world for all. All these solutions have something in common: they are practical, proven and viable strategies. They offer positive hope for the future. They focus on the benefits for everyone, across the globe and across the generations – and, simultaneously, for the natural world. They also build more climate resilience. In other words, they will also work in a world that will be increasingly impacted by more extreme temperatures and weather events. Their importance cannot be overstated: they mean caring for ourselves and our planet.

Every tenth of a degree of global warming that we avoid pays off – for us and for future generations. It saves lives each and every day. This applies not just to the stabilisation of our climate system and hence to our livelihood resources. It also applies to our social relations. Climate action, if done in a participatory and equitable manner, can strengthen democracy and help to build peace.

Putting this into practice started long ago, but progress is too slow – and still risks being derailed by dangerous distractions. We need people – in politics, in towns and villages, in associations and neighbourhoods, in business – to drive forward the solutions. To encourage more engagement and awaken a desire to shape the future, these solutions must be foregrounded more strongly in the public debate.

We don't have all the answers, but we invite everyone to come together and think more about our vision, the practical solutions and how we can make them a reality. Together, let's take action for a climate-just world!

BUND

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