

# CLIMATE REVIEW

**TSKB**

Economic Research

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**Climate technologies require  
a multidisciplinary approach**

**Climate Justice:**

Legal link between  
the climate crisis and  
human rights gradu-  
ally being established

**Climate technologies: Investment,  
Employment, and 5 to watch**

The content of Climate Review was written by Onur Bülbul, PhD.  
under the supervision of TSKB Economic Research

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## Syntax Error



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### Upcoming Events

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The 28th United Nations Climate Change Conference (COP28) will be held in Dubai, United Arab Emirates between 30 November and 12 December.

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Intergovernmental Negotiating Committee on Plastic Pollution will be held in Nairobi, Kenya, between 13-19 November.

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Welcome to the 12<sup>th</sup> issue of our Climate Review!

The main focus of this issue is “Climate Technologies”. What is that, you may ask? Both words - climate and technology - are trending topics and I would surely have quite a lot to say about on their own. But when I see them together, it occurs to me that this is a brand new field which we have not considered in depth before.

Assuming we are on the same page, the Climate Review’s current issue offers us a most worthy chance to familiarize ourselves with the subject. A description of the term might be a good starting point. Technology and innovation that contribute to our efforts to tackle climate change, including emission abating, adaptation and mitigation, can be broadly classified as climate technology.

And yet, I have to admit that it is easier said than done. First of all, climate technologies cannot be boiled down to a single entity or body. Put in another way, there is no such scenario where we can develop a magic machine or technology, press a button and end climate change, no matter how hard we may wish. It is time to get real and look at some of the features of climate technologies which will need to be handled with care:

1. Climate technologies require a multidisciplinary approach. It is not just about the engineering. Material science, economics, communication and law all contribute to the development of climate technologies from different but complimentary perspectives. Nevertheless, such a multidisciplinary field requires internationally competitive education in these fields, well trained human capital and just management of the impact associated with both climate change and related technologies.
2. Obviously, climate technologies require investment. So, let’s talk about the financial aspect. Climate technologies attracted USD 82bn of investment in 2022, an increase of 19% compared to the previous year. Even though there has been some slowing in the annual growth rate, the expansion of the investment pool is an important development.
3. Yet, question marks continue to hang over the life span of the technology. Changes associated with ecosystem crisis deliver a new world almost every day. By the time one reaps the fruits of a climate technology investment, one might end up in a new world with new needs, where the by now redundant investment is discarded. And that would be no good for anyone, would it?

Let me elaborate on this last point. When it comes to climate technologies, the time to *act* is most certainly *right now*, but what we should be prepared for is, without a doubt, *the future*. For example, in the last decade, Denmark’s newly built houses and offices started use more glass in their facades to utilize more of the sunshine and solar energy. However, the recent rise in average temperatures has made these new houses and offices uncomfortable as they traditionally lack the cooling systems designed for hot summers. Now the Vikings need to worry about heat or take another look at their construction style. As the Danish example shows, it took less than a decade to turn a brilliant idea into a problem. So, when it comes to climate technologies, the focal point is to be durable against time.

Looking at a problem that is brewing up because of actions of **in the past**, creating a road map **now** for a better world **in the future** requires understanding and projecting what is coming. Otherwise, outdated approaches behind climate technologies may risk delivering a syntax error. One smart way to avoid this is to stay close to your economists while reading the Climate Review.

## The Rationale of Investing in Climate Technologies

When asked if they want to hear the good news or the bad news first, many people tend to go for the bad news before the good, perhaps to end on a high note eventually. Following the same logic, the bad news is that the world is on [track](#) to exceed the 1.5°C threshold for average global warming compared to pre-industrial times. The good news, however, is that already mature climate technologies could [deliver](#) about 60% of the required emissions reductions for climate neutrality by 2050, if scaled up.

The term climate technology [refers](#) to a combination of different areas of expertise such as engineering, materials science, environmental science, economics, law, and policy making as well as technologies and systems directly aimed at mitigating or adapting to climate change. The United Nations Framework Convention on Climate Change (UNFCCC) [defines](#) the term as technologies that are used to address climate change, including the reduction of greenhouse gas (GHG) emissions, as well as those that help the world adapt to the adverse effects of climate change. Within this perspective, climate technologies include many areas of innovation ranging from

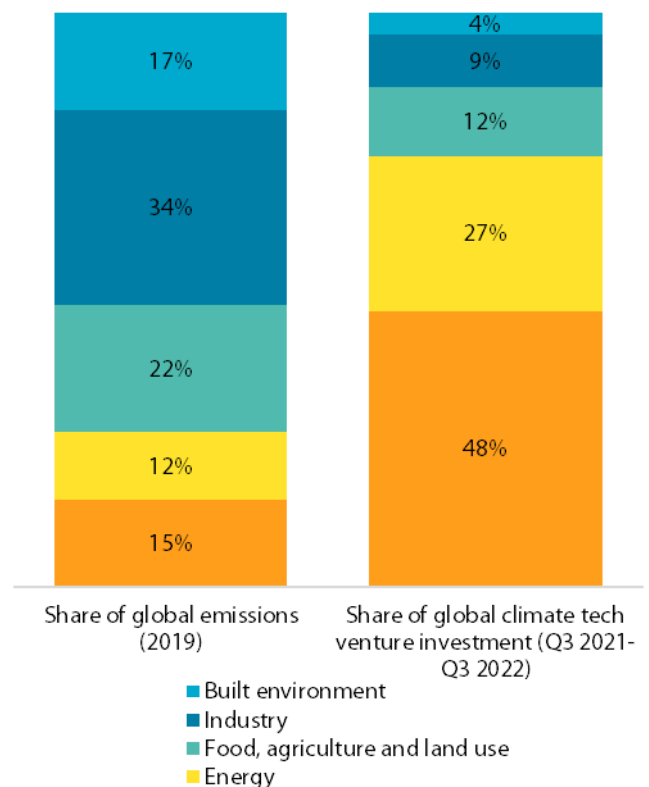
green energy (such as wind, solar, hydro-electric power, hydrogen) to electric vehicles, drought-resistant crops, early warning systems, sea walls, LED lighting, high-efficiency HVACs, carbon capture, utilization and storage technology (CCUS).

The urgency of climate action inherently turns the not-so-old climate technologies market into a booming field. Despite its comparatively small scale, more than USD 260 billion has been [invested](#) in the market globally between the first quarter (Q1) of 2018 and the third quarter (Q3) of 2022. These investments resulted in the creation of over 240 climate tech unicorns (startups valued at over USD 1billion) mostly in the mobility and transport area (read; EVs and their ecosystem).

Nevertheless, there is some discrepancy between the share of global emissions of specific sectors and the amount of investment they receive. While investing in high-emitting sectors to ensure the biggest impact on climate appears sensible, the temptation to reap a short-term return on investment often still outweighs the long-term prospective benefits.



Share of global emissions and climate tech venture by sector



Source: PwC, TSKB Economic Research



A case in point is the mobility and transport sector which is **responsible** for 15% of global emissions in 2019 but attracted 48% of global venture capital between Q3 2021 and Q3 2022. It is followed by the energy sector, which attracted 27% of investment despite only having a 12% of global emissions, while the food, agriculture and land use sector attract a mere 12% of investment despite a 22 % share of global emissions. Climate tech investments, not surprisingly, **concentrate** in familiar regions with the US attracting the bulk of funding, followed by the EU and China.

Such a promising market inevitably turns into a field for industrial competition, mainly among these big players. The US, for instance, aims to **triple** federal government spending on climate tech and clean energy to more than USD 500 billion over the next ten years with Inflation Reduction Act (IRA), the Infrastructure Investment and Jobs Act and the CHIPS and Science Act. The EU, meanwhile, is **projected** to spend 30% of its expenditure on climate-related projects - 10% of which is directly **aimed** at R&D activities - until 2027. This expenditure comes on top of other regulatory efforts like Fit-for-55, RePowerEU and the carbon border adjustment mechanism (CBAM). China, on the other hand, was the top country for energy transition **investments** in 2022 with a total investment volume of USD 546 billion – accounting for around half of USD 1.1 trillion in global investments.

Heat records are already being shattered, the impacts and frequency of extreme weather events are becoming more widespread and the world is heading towards a climate catastrophe while we are running out of time... Considering the time limit we now face, long term solutions like climate technologies need to be coupled with nature-based solutions (such as combating deforestation) to tackle the climate crisis.

# Climate 101

## Climate Technologies

*climate technologies are technology-based solutions that are specifically aimed at tackling climate change including in almost all aspects, including adaptation and mitigation, as well as reducing greenhouse gas emissions.*

## Clean Technologies

*clean technologies refer to technologies or businesses aimed at finding environmentally friendly alternatives to limit the damaging impacts of existing “conventional” technologies such as coal, oil, mining, transportation and manufacturing to achieve results such as cleaner water, air and energy or recycled waste.*

## Carbon Capture, Utilization, and Storage (CCUS)

*CCUS is a form of carbon sequestration which aims to reduce or eliminate carbon emissions from traditional processes such as power generation, transport, or manufacturing by capturing carbon from the point of emission and using it in a range of applications or storing it in nature.*

## Climate Neutrality

*climate neutrality refers to reaching net-zero greenhouse gas (GHG) emissions by emitting equal or lower level of emissions than those absorbed by the planet, either via natural absorption or by removing carbon from the atmosphere.*

## Nature Based Solutions (NbS)

*NbS refers to actions aimed at mitigating or adapting to climate change that are based on protecting and restoring the ability of nature and ecosystems to minimize the adverse effects of climate change.*



**The average precipitation in Türkiye was recorded 2.8 millimeters above seasonal normal in July whereas the average precipitation in August was 8.4 millimeters below seasonal normal.**

## China shows off at the Munich Auto Show and raises eyebrows in Europe

This year's Munich Auto Show has set the stage for the future of electric vehicle (EV) competition. Against a backdrop of domestic economic woes, China is looking to expand into export markets to sustain its dominance in the EV market, causing consternation in Europe.

EV sales in Europe [reached](#) about 820,000 vehicles in the first seven months of 2023, accounting for around 13% of all cars sold and an increase of 55% from the previous year. Even though China appears to have captured a relatively small share of around 8% of total EV sales in Europe, the sharp rise in this rate from 6% in 2022 and 4% in 2021 is causing disquiet among European auto manufacturers. Around 41% of exhibitors at this year's Munich Auto Show were based in Asia.

Companies such as Volkswagen, BMW and Mercedes are struggling to keep up with Chinese manufacturers on the basis of cost. In the first half of 2022, for instance, an average EV cost less than \$35,000 in China, compared to around \$60,000 in Europe. EV batteries, making up almost 50% of the cost of an EV, is where the competition lies and Europeans are either trying to cut prices by partnering with Chinese companies or planning to completely leave several segments, as seen in BMW CEO Oliver Zipse's [comment](#) mentioning that "the base car market segment will either vanish completely or not be catered to by European manufacturers."

Unsurprisingly, such conditions have prompted the EU

to [launch](#) an anti-subsidy investigation into Chinese EVs alleging that prices are kept artificially low by massive state subsidies, hence distorting competition in the EU market. The other side of the coin, however, offers a very different picture. The Chinese are also struggling to keep up with the price war in the EV market, [started](#) by Tesla and other leading manufacturers seeking creative ways of cutting costs. In addition, subsidy and countervailing duty (CVD) investigations are technical, subsidies are usually difficult to find and establishing a link between subsidies and market distortion is another legal challenge. However, they have a psychological effect as any CVD threat usually prompts manufacturers to get back in the game of fair competition.

In fact, China is not the only country [providing](#) incentives to the EV market such as tax breaks, funds for plant construction, low interest loans or subsidies to consumers to buy products. The EU and the US have also engaged in the same actions to support the EV industry. Hence, picking a legal fight in the sector also carries the risk of revealing the extent of the EU's own support to the industry.

The waters in the global EV market appear somewhat murky these days. What the EU anti-subsidy investigation will result in remains unclear for now. What the future holds for the EV market remains to be seen.

## Inaugural Africa Climate Week Focused on the Carbon Credits

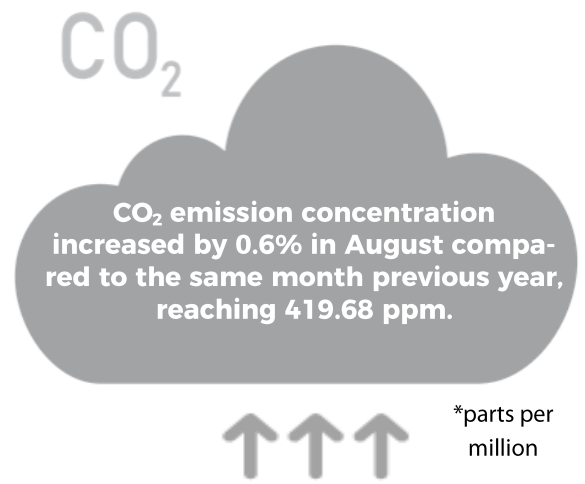
The first Africa Climate Week held in Nairobi in September aimed to showcase Africa's potential for climate investment. A number of deals were announced during the summit including the United Arab Emirates' (UAE) [pledge](#) to buy \$450 million worth carbon credits from the Africa Carbon Markets Initiative (ACMI) that was launched during COP27 last year. Several other financing announcements such as \$200 million investment by an HSBC joint venture in projects to produce ACMI credits or Germany's \$65 million debt swap agreement with Kenya unfortunately fall short of the continent's \$277 billion annual investment need to implement the nationally determined contributions to meet 2030 climate goals. Despite being responsible for only 4% of global greenhouse gas (GHG) emissions, Africa is disproportionately impacted from the adverse effects of the climate crisis. The African Development Bank (AfDB) [states](#) that only climate change related loss and damage costs in Africa is estimated to be between \$289.2 billion and \$440.5 billion in 2022-2030 period.





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## Green Metals and Developments in Demand

The newly defined "Green metals" have entered our lives with the rapid growth in climate technologies and environmentally friendly energy production models in recent years. The metals in this group, which include aluminium, copper, lithium, cobalt and nickel, are referred to as green metals because of their frequent use in renewable energy production. A report published by the World Bank in 2017 found that there are as many as 15 metals used in low-carbon technologies such as renewable energy. The demand for these metals resulting from the green transformation is referred to as green demand.

Green metals are used in a multitude of areas such as electric vehicles, battery systems, wind turbines and solar panels. For example, lithium and cobalt are among the most important inputs used in the production of lithium-ion batteries and are vital for electric vehicles, as well having uses in other areas. On the other hand, metals such as aluminium and copper are also frequently used in more traditional areas, such as infrastructure and construction, transportation, industrial machinery and tool production and energy infrastructure in addition to meeting green demand. Aluminium and copper are used in various areas of green technology, including solar panels, turbines, electric vehicles and charging stations. Likewise, nickel is a vital input for battery systems used in wind turbines and electric vehicles.

While there has been a surge in investment in environmentally friendly technologies lately with the steps taken by many governments to meet the targets set out in the Paris Agreement, targets have also been established to limit the use of fossil fuels in the long term. While these developments increase the demand for green metals, future demand expectations for some of these will be much higher than their current levels.

Demand for green metals is expected to grow over the next decade with the increased solar and wind energy investments and electric vehicle sales in China, the RePowerEU plan in Europe and the Inflation Reduction Act (IRA) in the USA, supporting the trend towards environmentally friendly technologies focused on the green transformation. The share of green demand in total consumption has therefore increased in recent years, and is **expected** to reach significant levels by 2030 (see the table below). Rising overall green demand is expected to be the factor behind the increase in these rates, rather than any decrease in traditional demand. Between 2021 and 2030, green demand is set to increase on a quantitative basis with a quadrupling in such green demand for copper, a 5-fold increase for aluminium and cobalt, a 7-fold increase for nickel and as much as a ten-fold increase for lithium. Considering the impact of the changes in the supply-demand balance on metal prices, this increase in demand for green metals is expected to place upward pressure on prices.

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\*Use of aluminum and copper is 2 and 3,6 times higher respectively in electric vehicles compared to others

Share of Green Demand in Total Demand						
	2020	2021	2022F	2023F	2025F	2030F
<b>Aluminium</b>	3%	4%	5%	7%	10%	14%
<b>Copper</b>	4%	5%	7%	8%	12%	17%
<b>Lithium</b>	36%	50%	53%	69%	80%	87%
<b>Cobalt</b>	18%	30%	33%	39%	48%	58%
<b>Nickel</b>	6%	8%	10%	12%	19%	33%

Source: Goldman Sachs Commodity Research , TSKB Economic Research  
(F: Forecast)

## When the Labour Market Goes Green

The looming “great transformation” towards greening economies has far-reaching implications not only for the future of industrial competitiveness but also for the labor markets. Investments need to be scaled up to effectively utilize mature climate technologies and introduce innovative solutions in efforts to curb greenhouse gas emissions and switch to environmentally friendly alternatives for goods, services, production processes and in labor. The expansion of climate technologies will simultaneously require skills to operate these new technologies.

The International Labor Organization (ILO) [defines](#) green jobs as decent jobs that reduce the consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems and enable enterprises and communities to adapt to climate change. Despite differing definitions of green jobs at a country level - which renders the measurement and comparison of such jobs difficult - they generally go beyond those that produce mere environmental goods and services to include the promotion of environmentally friendly production processes and workplaces within enterprises. Such a definition, therefore, includes positions in sectors ranging from renewable energy, electrification, greening buildings or manufacturing to efficient use of water, waste treatment and agriculture.

The greening of the labor market comes with its own unique opportunities and challenges as this switch is expected to create new jobs - sometimes at the expense of other sectors, and sometimes requiring reskilling. For example, the ILO [estimates](#) that switching to sustainable energy production and energy efficiency would result in a net gain of 18 million by creating 24 million new jobs against a loss of 6 million, with most of those jobs lost in the oil extraction and refining industries, before 2030. Beyond the energy sector, it is [estimated](#) that a total of 60 million jobs could be created by 2030 by transitioning to low carbon and green economies.

However, the skill gap turns out to be a major challenge as the demand for workers able to install and maintain heat pumps, solar panels and electric vehicle batteries or chargers continues to grow. In Europe, for instance, meeting the 2030 renewable energy targets would [require](#) 1 million more workers in the solar energy sector. The rapidly growing electric vehicles (EV) industry is no exception. Australia could have a shortage

of around 9,000 electricians by 2030 with the U.S. predicted to require around 80,000 electricians each year by 2031, with Britain [forecasted](#) to be short of 25,000 EV technicians by 2032. The new opportunities, of course, come with new challenges as we see in the world’s biggest EV manufacturer and market, China. The brutal price competition in an ever-expanding EV market with declining profitability has given rise to cost cutting practices that have included slashing [wages](#) by nearly two thirds since 2016.

Hence, clinging to the “decent work” requirement of green jobs while transitioning to low-carbon economies renders a “just transition” an indispensable component of the labor market. ILO Guidelines [indicate](#) that in order to keep the transition to green jobs “just” while addressing environmental, economic, and social sustainability, industrial and sectoral policies, skills development, social protection, and active labor market policies stand as key policy areas among others. Achieving a just transition also [requires](#) implementing social protection measures and income support along with stepping up reskilling policies.

Accelerating the development of climate technologies and the new jobs they will need present massive opportunities for green growth provided that the transition in the labor market is also “just”. This can and must be achieved by implementing a diverse set of industrial and labor policies. It would appear that successful transitions depend on early intervention in this age of great transformation.







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## The impact of investment in climate technologies on macro balances


In developing economies, green technology investments to transform themselves into environmentally friendly economies may face resistance due to its cost. However, a number of studies have found that provided effective prioritization and planning is carried out, the short-term burden of these investments can remain limited, and that the transition to a more resilient and net-zero emission economy may provide a whole range of benefits to the economy and social structure in the medium term.

In its Net Zero Roadmap, [A Global Pathway to Keep the 1.5 °C Goal in Reach](#) report, International Energy Agency (IEA) stated that global investment in clean energy is recorded at 1.8 trillion dollar in 2023. However, it claims that investments needs to advance to around 4.5 trillion dollar a year by early 2030s to be in line with reaching net zero emission in 2050. As a result, IEA estimates that global net savings will be 12 trillion dollar in 2050.

In an economy like Turkey's, which is highly dependent on imported energy, increasing the share of renewable resources and increasing energy efficiency through digitalization is considered to be a means of reducing the current account deficit. A [study](#) conducted by H. Emre Yalçın and Cihan Yalçın and published by the Central Bank of the Republic of Turkey (CBRT) in 2021 concludes that Turkey can achieve significant reductions in its net energy imports and substantial improvements in its current account balance with achievable increases in the share of renewable energy and efficiency improvements. The results of the econometric study and scenario analysis conducted with the country groups including Turkey find that if the share of renewable energy were to in-

crease by 20 percentage points and a 30% increase in energy efficiency was achieved by 2030, the current account deficit could decrease to 2% of GDP. The study determines that the payback period of investments has shortened thanks to the developments in renewable energy technology, while reiterating that the rate of localization in investments in this field may also change the impact on the external balance, since the benefit to the external balance would grow in parallel with any increase in domestic inputs used in the investments in the transition to renewable energy. This would also alleviate any rise in imports which could occur during the transition period, helping ease concerns over the short-term costs. The study also suggests exchange rate volatility will decrease thanks to the narrowing in the current account deficit, providing an increased contribution to macroeconomic stability.

The World Bank's Country [Climate and Development Report](#), published in mid-2022, provides calculations regarding the investment amount Turkey needs to carry out in order to transition to a net-zero emission economy by 2053, as well as the final benefit that will result. In the report, the World Bank estimates that Turkey should invest a total of USD 165 billion between 2022 and 2040 to reduce greenhouse gas emissions across the country by taking effective and appropriate steps that will increase resilience and adaptation to climate change. While highlighting the trend towards renewable sources of energy and increases in efficiency, the report highlights the necessity of investments that will reduce carbon emissions through the electrification of buildings, transportation and industry. Energy security and improvement in the external balance by bringing down the import bill are cited as being among the expected direct benefits. The report cites that a more energy efficient transportation system and buildings would have a positive impact on public health due to the improvement of the supply chain and the reduction of air pollution, paving the way for lower spending on health care. After deducting the investments to be undertaken for the transition to a net zero



**Average temperatures in Türkiye were recorded 0.7°C and 2.0°C above seasonal averages in July and August respectively.**

emission economy based on these two factors, it is calculated that the net gain to be obtained from lower energy imports and health spending could reach USD 146 billion between 2022-40.

The report suggests that the ratio of investment in GDP in the transition period would remain at around 1%, not therefore having a significant impact on the external balance and public debt while having a clear positive effects on growth and employment. However, while the report highlights that the success of the transition depends on macroeconomic conditions, it warns that the policies would need to be well designed to keep costs low and support the segments that will be affected by the process.

With the transition to a green economy, the risks that the industrial sector may face through the European Union's Border Carbon Adjustment Mechanism (CBAM) may ease and the country's overall competitiveness in foreign markets may increase through the use of efficient technologies. Ensuring emission-reducing developments in forestry and land use could contribute to price stability by alleviating vulnerabilities in agricultural production and food security. At the same time, we note an increased awareness of the multidimensionality of the is-

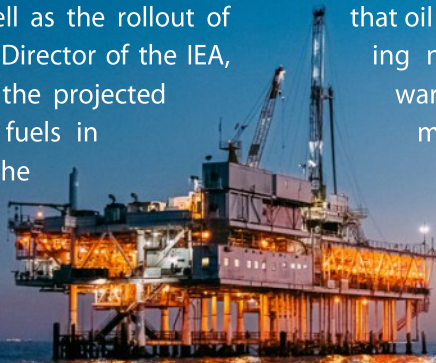
sue among policy makers. In fact, one of the main targets of the [2024-2026 Medium Term Program](#) announced at the beginning of September was to strengthen Turkey's international competitive position with sustainable, low-emission, high-technology-based production techniques by adopting integrated and environmentally friendly policies, especially in the energy, industry, transportation and agricultural sectors.

As a result, it is noted that the final gains of the investments to be undertaken for the transition from an economy with high foreign dependence in energy, such as Turkey, to a zero-emission economy, exceed their costs, even when calculated only on the basis of a reduced energy bill. A narrower current account deficit could reduce sensitivity to shocks in exchange rates and energy prices, while macro-financial risks could also ease thanks to an increase in investments and potential growth along with an improvement in the external debt profile. There are also additional gains, such as not being at a disadvantage in key export markets, further factors which will attract foreign investment, reduced volatility in food prices by reaching a more efficient, stable and environmentally friendly agricultural production structure with digitalization and increased public health and welfare.

## Use of fossil fuels is declining - but not fast enough!

The International Energy Agency (IEA) has forecasted that demand for fossil fuels (oil, natural gas, and coal) will peak before 2030 – even without any new climate policies. The IEA's World Energy Outlook 2022 [report](#) states that the share of fossil fuels in the global energy mix, which has stood at 80% for several decades, is expected to fall below 75% by 2030 and to just over 60% by 2050. The decline is [expected](#) to be a result of the rapid growth in the renewable energy sector as well as the rollout of electric vehicles. The Executive Director of the IEA, Fatih Birol, [warns](#) that despite the projected decline in the share of fossil fuels in global energy mix, achieving the target to limit global warming to 1.5°C will require impressively stronger and faster

policy action by governments. The European Parliament's [vote](#) in September in favor of raising the renewable energy target to 42.5% of total consumption by 2030 is an example of such policy actions. The Organization of Petroleum Exporting Countries (OPEC) [blasted](#) the IEA report for not being fact-based as it allegedly ignores the ongoing technological progress by the oil and gas industry to cut emissions. Birol, on the other hand, stressed that oil and gas companies may be misjudging new large-scale fossil fuel projects, warning that they may not only carry major climate risks but also serious financial risks.







## What are the Climate Technologies to Watch?

With the world fast expending its carbon budget, the urgency of climate action necessitates the rapid deployment of climate technologies. However, bringing the cost of these technologies down and their commercialization requires further investment. A [McKinsey](#) study on the potential emissions benefits of climate technologies finds that electrification, agriculture, power grids, hydrogen, and carbon capture emerge as the most promising areas where technologies could attract between USD 1.5 and 2 trillion in annual capital investment by 2025 and abate around 40% of greenhouse gas (GHG) emissions by 2050.

Electrification of transportation, buildings and industry is an ongoing process but remains an expensive effort. The challenges in the electrification sector emerge as manufacturing better electric vehicle (EV) batteries, which soak up around half of the overall cost of an EV, inventing better battery control software to shorten charging times, increasing the energy efficiency of buildings and switching to electricity for heating and cooling, and electrifying industrial production processes. Overcoming these challenges would reduce carbon dioxide (CO<sub>2</sub>) emissions by an estimated 5 gigatons (gt) per year by 2050 with between USD 700 billion and USD 1 trillion of investment by 2025.

Greening agriculture, which is responsible for around 20% of global greenhouse gas emissions, would also help

abate around 10 gt of CO<sub>2</sub> emissions per year by 2050 with an annual investment of USD 400-600 billion by 2025. Promising areas in agriculture emerge as switching to zero-emissions farm equipment (not yet widely available) which could result in cost savings amounting to USD 229 per tonne of CO<sub>2</sub> equivalent, opting for alternatives to meat to help cut between one-quarter and one-third of global methane emissions, and bio-engineering such as gene editing to enhance crop resistance.

Power grids are perhaps the most challenging areas when it comes to greening as they are often old, inefficient and carbon intensive. The route to remain within the 1.5°C warming threshold by modernizing and decarbonizing the grid requires a jump in the global renewable installation rate from around 3 gigawatts (GW) to 15-18 GW per week, increasing energy storage capacity to strengthen the reliability of renewables and upgrading the transmission and distribution network. Annual investment of between USD 200 and USD 250 billion in power grids by 2025 would be expected to abate CO<sub>2</sub> emissions by 5gt per year by 2050.

While hydrogen and carbon capture and storage (CCS) technologies are at an early stage in their development, they offer massive potential in reducing carbon emissions according to the study.

It is thought that hydrogen, for instance, could help abate 30% of global greenhouse emissions across various sectors by 2050 where electricity alone cannot suffice. The challenges in this sector include achieving low-cost hydrogen production, using hydrogen for road transport and aviation fuel and using hydrogen in steel production, where electricity alone cannot provide the required level of heating. CCS as another expensive and hence underutilized technology which could also help reduce CO<sub>2</sub> emissions by 3 gt by 2050 with an investment of USD 10 to 50 billion by 2025. This amount could reach as

much as 5.5 gt per year with an annual investment of around USD100-150 billion in clean hydrogen technologies.

The road to net-zero is paved with huge challenges which need to be addressed collectively by governments, the private sector, communities and individuals. Even though the rate of progress towards avoiding the most catastrophic consequences of the ecosystem crisis is far from satisfactory, emerging climate technologies do offer a glimmer of hope of some relief once they are fully utilized.

## 2023 Global Sustainable Development Report should serve as a Wake-Up Call

The 2023 version of the United Nations (UN) Global Sustainable Development Report ([GSDR](#)) was made public during this year's UN General Assembly meetings. Published every four years, the independent scientific assessment is a stark reminder that the world is some way from being on-track to reach the SDGs by 2030. That's the part we already know. What most of us were not aware of, however, is that we are not only inching towards Sustainable Development Goals (SDGs) when the planet is warming faster than anticipated, we have fallen back from the previous levels of progress in the last four years.

The report explicitly warns that at the current rate of progress, it will take 300 years to [attain](#) gender equality, while still leaving in 575 million people living in extreme poverty with 600 million facing hunger, and 84 million children out of school by 2030. In fact, studies indicate that the current level of progress casts doubt over the achievement of the SDGs, even by 2050.

Out of the 36 SDG targets analyzed by the GSDR to measure progress, only two were on track - access to mobile networks and internet usage. Progress on the eight targets on the other hand, including reducing greenhouse gas (GHG) emissions, fossil fuel subsidies, supporting economic growth and preventing the extinction of species were found to be deteriorating. The remaining 26 targets found either fair or limited to no progress. These topics include those where modest but important gains had been made previously, such as child mortality and gender equality. Overall, only 15% of SDG targets are on [track](#) to being achieved by 2030.



Two major reasons behind this lack of progress are cited in the report as the inaction of governments and an inadequate amount of financing being directed towards the SDGs. Both are key to implementing the necessary systemic transformations at the halfway point between the introduction of the SDGs in 2015 and 2030 as the target year.



# Climate Finance

## GSS+ bonds passes the USD 4 trillion threshold

The Climate Bonds Initiative [announced](#) the sustainable debt figures for the first half (H1) of this year. According to the data, the green, social, sustainability, sustainability-linked and transition (GSS+) bonds market has cumulatively reached USD 4.2 trillion. GSS+ bonds are defined in line with the Climate Bonds Initiative's screening methodology that classifies bonds on the basis of their performance in meeting the Climate Bonds Initiative's climate requirements.

The Climate Bonds Initiative indicates that the volume of GSS+ debt accumulated in the first half of this year was 15% lower than in the first half of 2022, but still enough for the market to pass the USD 4 trillion mark on a cumulative basis. Green bonds accounted for 62% of H1 volume at USD 278.8 billion, followed by social bonds (15%) and sustainability bonds (14%). 47% of the GSS+ deals were conducted in Euro denominations, placing the currency at the top of the list for the sixth

consecutive year thanks to Germany's leading role with a share of 14% of total GSS+ bonds in H1 2023. Germany was followed by China (USD 37.4 billion) and the US (around USD 27 billion). The Climate Bonds Initiative blames part of the decline in GSS+ issuance in the US (from USD 65 billion in H1 2022 to USD 39.8 billion in H1 2023) to the anti-ESG (Environmental, Social and Governance) political rhetoric in the US.

Even though the figures indicate that green bond issuances [overtook](#) fossil fuel deals in the first half of this year with a share of 58%, the CEO of the Climate Bonds Initiative, Sean Kidney, indicates that preventing future climate collapse would require reaching USD 5 trillion in sustainable finance annually, compared to the current cumulative USD 4.2 trillion figure. The good news, however, is that despite comprising only around one quarter of the global bond market, the share of sustainability linked bonds is on an increasing trend.

## The effects of local weather events can go beyond national borders



India faced an interesting but widely anticipated problem in August. Burgers in fast food chains came without tomatoes and local restaurants were forced to [increase](#) the price of their tomato-based dishes. In fact, vegetable prices increased by 37% year-on-year in July while tomato prices soared fifteen-fold over the course of summer, pushing the annual-food inflation to its highest level in more than three years. Heavy rains submerging farmland and disrupting supply chains led Indian farmers to plant 40% less than annual averages this July, while an exceptionally dry August further hurt harvests. Extreme weather has also rendered economic policy decisions more difficult than ever. In efforts to deal with food security concerns, the government imposed a 40% tax on onion exports in August and removed some import restrictions on tomatoes from Nepal. The Reserve Bank of India is also on its toes as it watches food inflation closely. The adverse effects of the climate crisis are now becoming widespread with concerns over food security starting to mount as the crisis shows the potential to go beyond national borders.

# Climate Justice

## Legal Link between the Climate Crisis and Human Rights gradually being established

One of the mostly overlooked dimensions of the ecosystem crisis is its uneven negative impacts on communities of different age, race and gender, as well as social and economic status. The scientifically established [link](#) between human activities and the pace of climate change, as well as the Paris Agreement signatories' legally [binding](#) commitments to limit global warming have already triggered legal action against governments when it comes to their responsibilities to protect their citizens from climate change.

In August, the United Nations (UN) Committee on the Rights of the Child [adopted](#) environmental degradation, including the climate change as a form of structural violence against children. Despite not being legally binding, the decision is important as it explicitly recognizes the right of children to take legal action against their governments to force them to tackle climate change - including regulation of business enterprises. This [decision](#) comes following the ruling by a court in Montana to recognize the right of the young people to a "clean and healthful environment" against the State's policies to promote fossil fuels.

Meanwhile, in Switzerland, the legal link between the climate crisis and the responsibilities of governments

was brought to the European Court of Human Rights (ECHR) in a [case](#) brought by senior Swiss citizens over their government's inaction in preventing climate change. A major [argument](#) of the plaintiffs was based on the Intergovernmental Panel on Climate Change (IPCC) finding that hot extremes have become more frequent and intense due to human induced climate change and that most of the excess deaths due to heat were occurring among the elderly.

The legal link between human rights and the responsibility of governments to act against climate change was first established in 2015 in Europe when the Hague Court of Appeal [upheld](#) an order requiring the Dutch Government to reduce its greenhouse gas emissions (GHG) by at least 25% relative to 1990 levels by the end of 2020. However, the significance of the latest climate case brought by Swiss seniors is a confirmation by the ECHR that the governments' responsibilities to act against the adverse effects of climate change falls within the realm of human rights. This could mark an important milestone in the climate-law landscape by bringing legally binding climate action beyond national borders. The ECHR decision is expected by early 2024.





# Company Highlights

## NESTE

One of the companies working on clean technologies to help mitigate the negative impacts of the climate crisis is [Neste](#), from Finland, which stands out with its solutions on refining waste, residues and other raw materials into renewable diesel, sustainable aviation fuel and more sustainable feedstocks for the polymers and chemicals industry. With around 5,200 employees, EUR 25.7 billion in revenues and operations in 16 countries as of 2022, Neste is the world's largest producer of renewable diesel and jet fuel.

Under the banner of “change runs on renewables”, the company creates climate friendly solutions to be used in the air, on land or at sea, and for materials. Neste's climate friendly jet fuel, for instance, reduces greenhouse gas (GHG) emissions by up to 80% throughout the life cycle of the fuel when compared to fossil jet fuel. Starting from 2023, the company will provide around 1.26 billion liters of sustainable aviation fuel (SAF) to Air France-KLM Group over the course of 8 years, which will help Airbus aircraft reach their certification target of running entirely on SAF by 2030. On land, Neste's renewable diesel produced from 100% renewable raw materials can be used with modifications to engines or infrastructure, and can reduce greenhouse gas emissions by between 75-95%. Deutsche Bahn and Liebherr are among the company's prominent customers. At sea, Neste's low-emission marine fuel helps reduce greenhouse emissions by up to 80% over the life cycle of the fuel when compared to fossil fuel. The company is also a producer of renewable and recycled raw materials to replace fossil feedstock in the production of polymers and chemicals, with a carbon footprint more than 85% lower over its life cycle.

Neste's renewable products enabled its customers to reduce their greenhouse gas emissions by 11.1 million tonnes of carbon dioxide (CO<sub>2</sub>) equivalent in 2022 and the company aims to increase this amount to 20 million tonnes by 2030.

This 2022 figure is equal to the annual emissions of 4 million passenger cars or the annual carbon footprint of 1.8 million average EU citizens.

Innovation and sustainability stand at the heart of Neste's business model. The company had approximately 2,000 patents granted by 2022 and had undertaken EUR 85 million of R&D expenditure in 2022. Neste is currently working on sustainable raw materials and technologies such as renewable hydrogen, power-to-X (a form of electricity conversion and energy storage using surplus electricity), algae, lignocellulose and municipal solid waste for its long-term business development and innovation. When it comes to its sustainability efforts, Neste targets a carbon neutral and nature positive value chain by 2040. In line with this goal, the company is planning to eliminate the use of conventional palm oil used in its renewable raw material inputs by the end of this year and to reduce scope 1 and 2 emissions by 50% by 2030 compared to the 2019 levels and halve the use phase emission intensity of sold products by 2040 compared to 2020 levels. Neste is a regular in Dow Jones Sustainability Indices and the Global 100 list of the world's most sustainable companies, as well as being a top performer in Carbon Disclosure Project's (CDP) climate and forest ratings.

Over the last four quarters (3Q22-2Q22) Neste succeeded in generating a net profit of EUR 1.54 billion. By the end of August, with a market capitalization of EUR 28.3 billion, the company ranks as the second most valuable company behind Bank Nordea in the Finland stock market.



# In Short...

## Fossil Fuel subsidies hit new record in 2022

According to the 2023 update of International Monetary Fund (IMF) Fossil Fuel Subsidies Data, fossil fuel subsidies reached a record USD 7 trillion in 2022. This amount is more than annual public spending on education and around two thirds of public healthcare budget. The IMF also estimates that ending fossil fuel subsidies would prevent 1.6 million premature deaths per year, increase public revenues by USD 4.4 trillion and help cut emissions.

## Maui Fires may have contaminated the air, water and Soil

The wildfires that have almost overwhelmed the Hawaiian Island of Maui in August could also have contaminated the island's air, soil and waters [according](#) to scientists. Early indicators show that pollutants released by the wildfires have already compromised local water systems in several spots. The wildfires also threaten the island's diverse coastal ecosystem. Lead and asbestos are the leading chemicals remaining in ash and dust, whereas arsenic used as a herbicide in the early 1900s could have been stirred up in the soil.

## World Bank to double its Türkiye portfolio

The World Bank is in talks with Türkiye to [increase](#) its exposure in the country from an already committed portfolio of USD 17 billion to USD 35 billion over the next three years. The USD 18 billion in additional funding is projected to be used in both direct government lending and private sector support. The package is expected to include short term

guarantees for trade financing as well as increased support for the reconstruction efforts after the devastating earthquake earlier this year.

## Hong Kong's torrential rain

Hong Kong has [suffered](#) the heaviest rainfall of the last 140 years, resulting in school closures, flooded subway stations and stock exchange shut downs. Meanwhile, heavy rains in Libya left the country submerged in water for days, leading to an [estimated](#) 11,000 deaths with another 10,000 missing. Scientists think the above average temperatures are fueling the heavy rainfall.

## Biden Courts the Global South

Amid China's economic woes and President Xi Jinping's absence at the G20 summit held in India, the U.S. President Joe Biden tried to assure the Global South with promises to prop up development aid by [reforming](#) the World Bank to step-up funding in climate and infrastructure aid in the developing world. The African Union, representing 55 member states, has also been made a [permanent](#) member of G20. The expansion comes following an earlier BRICS summit that invited Iran, Saudi Arabia, Egypt, Argentina, the United Arab Emirates and Ethiopia to join the club starting from early 2024. The G20 represents 85% of global GDP, with the BRICS group of economies having a share of around 30%.

## Is the Amazon Rainforest turning into a carbon source?

Scientists think that the biggest carbon absorption in the land ecosystems takes place in forests and the Amazon is the world's largest. However, deforestation mainly due to

human activity has already [turned](#) southeastern Amazon into a carbon source, with the northwest Amazon on track to lose its characteristic of being a carbon sink. Climate change is also thought to be a major culprit as the Amazon Rainforest has warmed by 1°C in the past 60 years with an increase in the variability of rainfall.

## Invasive species harming the global economy

A UN report [states](#) that invasive species are costing the global economy USD 423 billion annually. Invasive species are plants or animals that take hold in an environment with effects ranging from outcompeting native wildlife and damaging infrastructure to threatening human health and livelihoods. They are often moved around by human activity. The parties to the Kunming-Montreal Global Biodiversity Framework have committed to cutting the introduction and establishment of priority invasive species by at least 50% by 2030.

## Africa Backs Global Carbon Tax

The first African Climate Summit held in Nairobi in September [resulted](#) in a declaration calling for a global carbon price on the fossil fuel trade, shipping and aviation, as well as a global financial transaction tax. The Nairobi Declaration which proposes to utilize global carbon taxes to aid lower income countries' green energy transformation, is expected to be used as a negotiating document by African leaders at the upcoming COP28 summit. During the summit, African leaders also called for increased concessional lending to poorer countries by development banks.



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